Installation and service instructions

for contractors

HWS-G2501
CNHMV-E
DHW heat pump with dry immersion heater EHT
ENHMV-E
DHW heat pump with connection for external heat generator or solar collectors

HWS-G2501

6222509_EN 05/2024

Please keep safe.

Safety instructions

⚠ Please follow these safety instructions closely to prevent accidents and material losses.

Safety instructions explained

⚠ **Danger**
This symbol warns against the risk of injury.

! **Please note**
This symbol warns against the risk of material losses and environmental pollution.

Note
Details identified by the word "Note" contain additional information.

Target group

These instructions are exclusively intended for qualified contractors.

- Work on the refrigerant circuit may only be carried out by authorised refrigeration engineers.
- Work on electrical equipment may only be carried out by a qualified electrician.
- The system must be commissioned by the system installer or a qualified person authorised by the installer.

Regulations to be observed

- National installation regulations
- Statutory regulations for the prevention of accidents
- Statutory regulations for environmental protection
- Codes of practice of the relevant trade associations
- Relevant country-specific safety regulations

Safety instructions (cont.)

Safety instructions for working on the system

Working on the system

- Isolate the system from the power supply, e.g. by removing the separate fuse or by means of a mains isolator, and check that it is no longer live.
  Note
  In addition to the control circuit there may be several power circuits.

  ⚠ **Danger**
  Contact with live components can result in severe injuries. Some components on PCBs remain live even after the power supply has been switched off.
  Prior to removing covers from the appliances, wait at least 4 minutes until the voltage has completely dropped out.
- Safeguard the system against reconnection.
- Wear suitable personal protective equipment when carrying out any work.

⚠ **Danger**
Hot surfaces and fluids can lead to burns or scalding.
- Before maintenance and service work, switch off the appliance and let it cool down.
- Do not touch hot surfaces on the appliance, fittings or pipework.

! **Please note**
Electronic assemblies can be damaged by electrostatic discharge.
Before beginning work, touch earthed objects, such as heating or water pipes, to discharge any static.

Work on the refrigerant circuit

Refrigerant R1234ze is a colourless, odourless gas that displaces air.
- R1234ze is mildly flammable (safety class A2L according to ISO 817).
- R1234ze belongs to fluid group 2 (according to the Pressure Equipment Directive 2014/68/EU).

⚠ **Danger**
Direct contact with liquid and gaseous refrigerant can cause serious damage to health.
- Avoid direct contact with liquid and gaseous refrigerant.
- Wear protective gloves/protective clothing/eye protection/face protection (P280).
- Wear respiratory protection (P284).
- If exposed or concerned: Get medical advice/attention (P308+P313).
- Protect from sunlight and store in a well ventilated place (P410+P403).

Details in brackets pursuant to Regulation (EC) No 1272/2008

⚠ **Danger**
Contains gas under pressure; may explode if heated (H280).
Do not heat the refrigerant circuit from the outside.

Safety instructions (cont.)

Danger
Unregulated escape of refrigerant in enclosed spaces can lead to breathing difficulties and suffocation.
- Do not breathe dust/fumes/gas/mist/vapours/spray (P260).
- Ensure adequate ventilation in enclosed spaces.

Perform the following measures before beginning work on the refrigerant circuit:
- Check the refrigerant circuit for leaks.
- Ensure very good ventilation especially in the floor area and sustain this for the duration of the work.
- Inform all persons in the vicinity of the system about the type of work to be carried out.
- Secure the area surrounding the work area.

Danger
Damage to the refrigerant circuit can cause refrigerant to enter the hydraulic system. This can cause serious damage to health.
After completion of work on the refrigerant circuit, professionally vent the hydraulic system on the primary and secondary sides.

Repair work

Please note
Repairing components that fulfil a safety function can compromise the safe operation of the system.
Replace faulty components only with genuine Toshiba spare parts.

Auxiliary components, spare and wearing parts

Please note
Spare and wearing parts that have not been tested together with the system can compromise its function. Installing non-authorised components and making non-approved modifications or conversions can compromise safety and may invalidate our warranty.
For replacements, use only original spare parts supplied or approved by Toshiba.

Safety instructions for operating the system

What to do if water escapes from the appliance

Danger
If water escapes from the appliance there is a risk of electric shock.
Switch off the heating system at the external isolator (e.g. fuse box, domestic distribution board).

Danger
If water escapes from the appliance there is a risk of scalding.
Never touch hot heating water.

Index

Disposal of packaging

Please dispose of waste packaging in line with statutory regulations.

Symbols

Symbol	Meaning
	Reference to other document containing further information
	Step in a diagram: The numbers correspond to the order in which the steps are carried out.
	Warning of material losses and environmental pollution
	Live electrical area
	Pay particular attention.
	▪ Component must audibly click into place. or ▪ Acoustic signal
	▪ Fit new component. or ▪ In conjunction with a tool: Clean the surface.
	Dispose of component correctly.
	Dispose of component at a suitable collection point. Do **not** dispose of component in domestic waste.

The sequences of steps for commissioning, inspection and maintenance are summarised in the section "Commissioning, inspection and maintenance" and are identified as follows:

Symbol	Meaning
	Steps required during commissioning
	Not required during commissioning
	Steps required during inspection
	Not required during inspection
	Steps required during maintenance
	Not required during maintenance

Intended use

The appliance is intended solely for installation and operation in sealed unvented heating systems that comply with EN 12828, with due attention paid to the associated installation, service and operating instructions.

The appliance may only be used for heating DHW.

The range of functions can be extended with additional components and accessories.

Intended use presupposes that a fixed installation in conjunction with permissible, system-specific components has been carried out.

Commercial or industrial use for purposes other than domestic hot water heating shall be deemed inappropriate.

Any usage beyond this must be approved by the manufacturer in each individual case.

Intended use (cont.)

Incorrect use or operation of the appliance (e.g. the appliance being opened by the system user) is prohibited and will result in an exclusion of liability. Incorrect use also occurs if the components in the heating system are modified from their intended function.

Note
The appliance is intended exclusively for domestic use, i.e. even users who have not had any instruction are able to operate the appliance safely.

Product information

HWS-G2501

A DHW cylinder is integrated into the CNHMV-E DHW heat pump.
The heat pump uses the thermal energy in the indoor or outdoor air for DHW heating.
At times of peak DHW demand, an immersion heater EHT can provide reheating (factory-fitted for type T0E-ze; accessory for ENHMV-E contains the full function range of CNHMV-E. In addition, a solar thermal system or external heat generator (e.g. oil/gas boiler can be connected. The heat pump is available for **recirculation aimode**, **outdoor air mode** and **recirculation air modewith air discharge to the outside**.

Recirculation air mode

In recirculation air mode, the ambient temperature (indoor air in the installation room is used for DHW heating.

When DHW is being heated, the installation room is cooled and dehumidified.

Recirculation air mode with air discharge to the outside

Ambient air is supplied to the DHW heat pump. A separate outdoor air aperture simultaneously allows outdoor air to enter the room.
The ambient air that is cooled down during DHW heating is routed outdoors by the DHW heat pump.

Outdoor air mode

In outdoor air mode, outdoor air is supplied via a duct.
The outdoor air that is cooled down during DHW heating is routed outdoors by the DHW heat pump.

Outside temperature limits

Note
What DHW temperature the heat pump can achieve depends on the outside temperature.
The maximum achieved is 62 °C.

Product information (cont.)

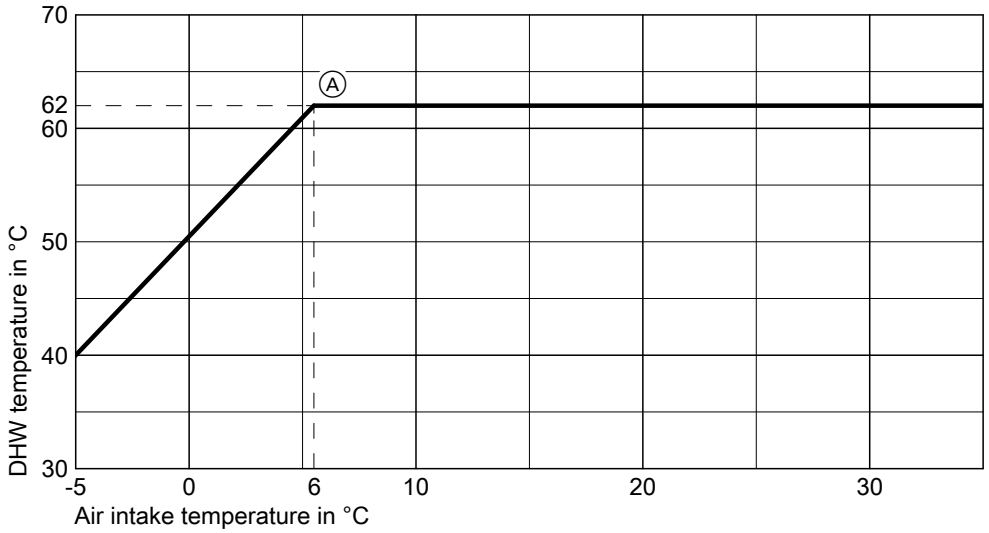

Fig. 1

Ⓐ Maximum DHW temperature achievable by the heat pump: 62 °C

Permissible air intake temperatures

The DHW heat pump shuts down outside the permissible air intake temperatures. In some operating programs, DHW can also be heated outside the permissible air intake temperatures, through the use of an immersion heater (accessories). With ENHMV-E an external heat generator can be connected.

Permissible air intake temperatures:

- For DHW heating in recirculation air mode and recirculation air mode with air discharge to the outside (temperature in the installation room):
  3 °C to 35 °C.
- For DHW heating in outdoor air mode (outside temperature):
  -5 °C to 35 °C.

Preparing for installation

Overview of connections

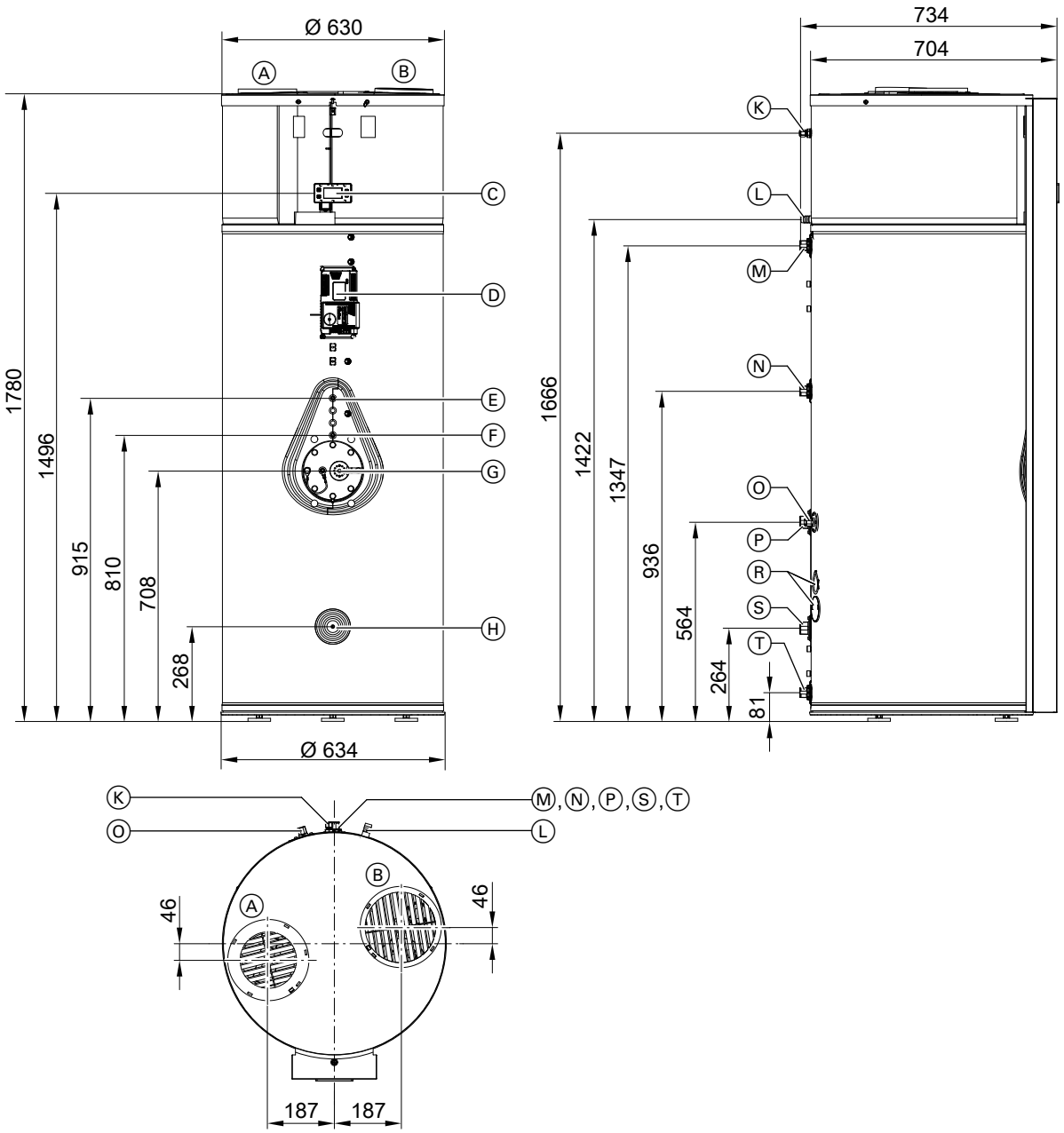

Fig. 2

Ⓐ Air discharge
- With grille: For recirculation air mode
- With DN 160 outdoor air adaptor: For recirculation air mode with air discharge to the outside and outdoor air mode

Ⓑ Air intake
- With grille: For recirculation air mode
- With DN 160 outdoor air adaptor: For recirculation air mode with air discharge to the outside and outdoor air mode

Ⓒ Programming unit
Ⓓ Heat pump control unit
Ⓔ Sensor well for draw-off profile L
Factory-fitted temperature sensors:
- Cylinder temperature sensor and
- High limit safety cut-out for DHW heat pump

Ⓕ Sensor well for draw-off profile XL
Ⓖ
- Inspection port
- Protective magnesium anode
- Impressed current anode (accessories
- Immersion heater EHT (accessory for ENHMV-E, standard delivery for CNHMV-E)

Ⓗ Sensor well for draw-off profile recognition
Ⓚ Power cable (3 m long)
Ⓛ Condensate ∅ 20 mm
Ⓜ DHW R ¾
Ⓝ DHW circulation R ¾

Preparing for installation (cont.)

Ⓞ ENHMV-E only:
- Temperature sensor, external heat generator
  or
- High limit safety cut-out for stopping the solar circuit pump

Ⓟ ENHMV-E only:
Flow for external heat generator/solar collector G 1

Ⓡ Injection process plug (do not open, do not insert anything)

Ⓢ ENHMV-E only:
- External heat generator:
  Return G 1
- Solar collector:
  Return G 1 and threaded elbow (accessories) for bottom cylinder temperature sensor

Ⓣ Cold water/drain R ¾

Transport and siting

! **Please note**
Impacts, compression and tensile loads can cause damage to the outside panels of the appliance.
Never put weight on the top or front of the appliance or cylinder jacket.

The DHW heat pump can be transported vertically or horizontally.

Note for horizontal transport
Position the DHW heat pump. Allow the DHW heat pump to stand for at least 24 hours before commissioning.
Lifting straps (accessories) are available to facilitate transport.

Preparing for installation (cont.)

Unpacking and handling

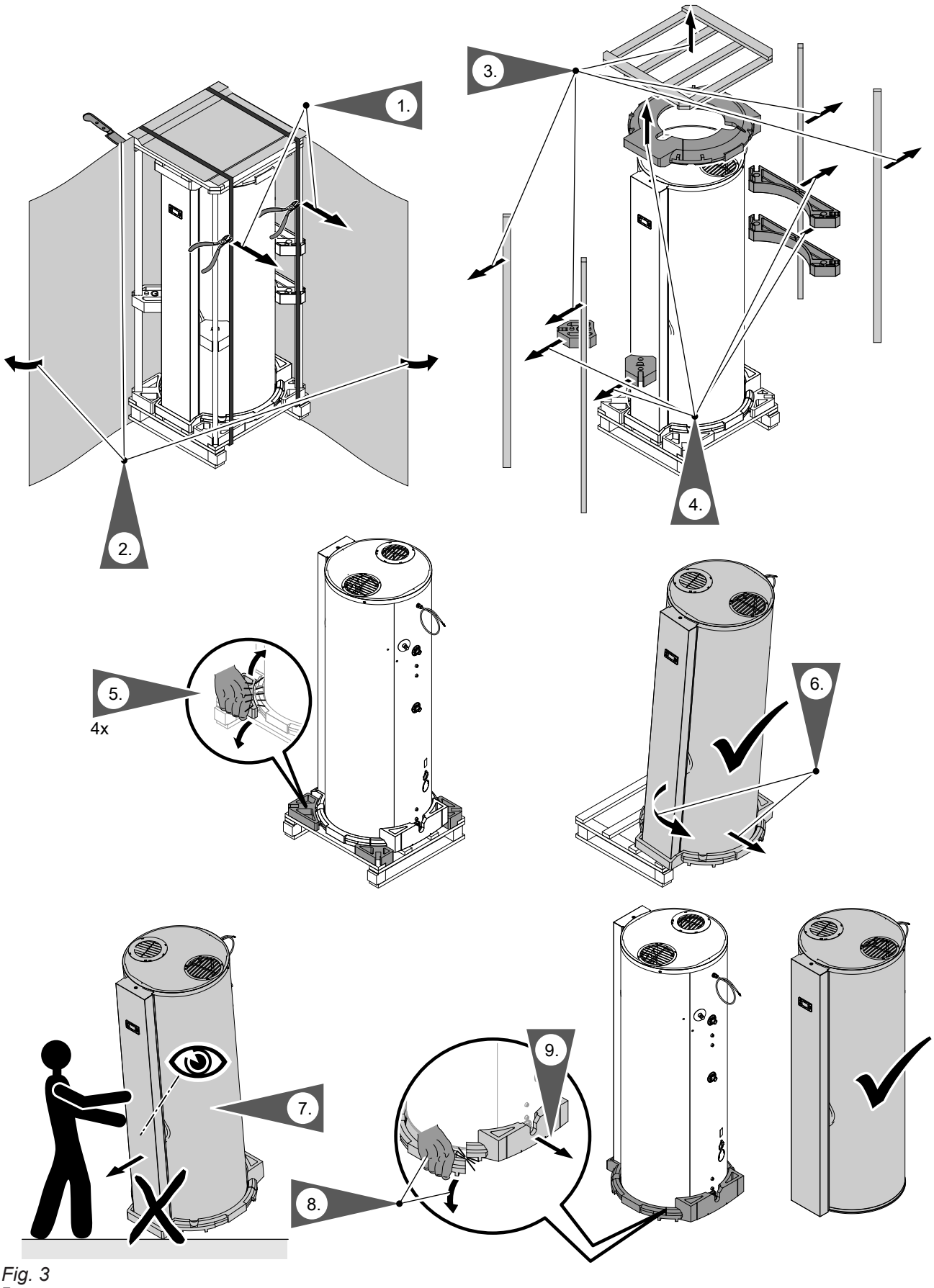

Fig. 3

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Preparing for installation (cont.)

Installation room requirements

Note
Do not install the appliance in a room with open ignition sources in continuous operation (e.g. open flames, radiant gas heaters with open burners or an operating electric heater).

- The installation room must be dry and free from the risk of frost.
- The intake air must be kept free from dust, grease and contamination through halogenated hydrocarbons (e.g. as contained in sprays, paints, solvents and cleaning agents).
- To prevent the transmission of structure-borne noise, do not site the appliance above ceilings with wooden joists (e.g. in the attic).
- A separately fused standard power socket must be available.
- A condensate drain pipe must be available.
- Always maintain the minimum clearances for service and maintenance work.

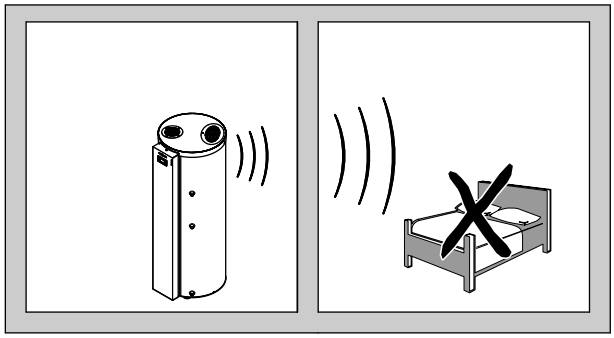

Fig. 4

Minimum clearances

Recirculation air mode

Note
The specified appliance output cannot be guaranteed if the room volume is < 20 m³.

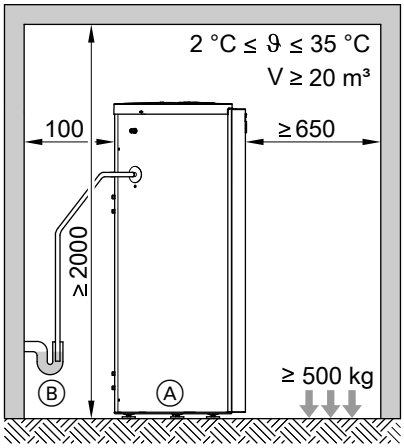

Fig. 5

Ⓐ DHW heat pump
Ⓑ Condensate drain pipe

Recirculation air mode with air discharge to the outside

Note
- *The specified appliance output cannot be guaranteed if the room volume is < 20 m³.*
- *This operating mode is only permissible in unheated rooms.*

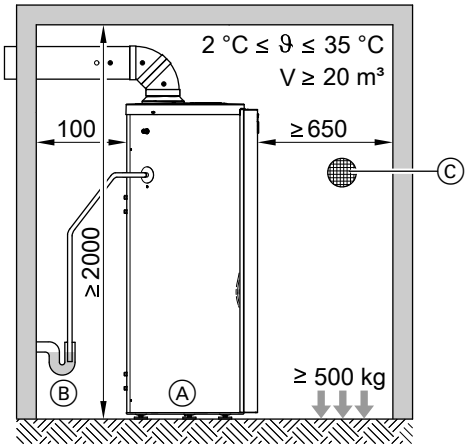

Fig. 6

Ⓐ DHW heat pump
Ⓑ Condensate drain pipe
Ⓒ Outdoor air aperture:
With outdoor air adaptor DN 160: ≥ DN 160

Minimum room height
When using ductwork made from EPP (accessories), the height of the room must be at least 2085 mm.

Preparing for installation (cont.)

Outdoor air mode

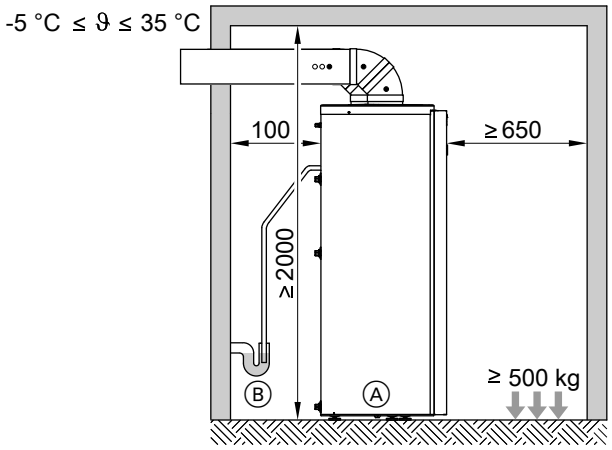

Fig. 7

Ⓐ DHW heat pump
Ⓑ Condensate drain pipe

Minimum room height
When using ductwork made from EPP (accessories), the height of the room must be at least 2085 mm.

Siting the DHW heat pump

Please note
Incorrect handling can lead to irreparable damage to the DHW heat pump.
- **Never** drill into the sheet steel casing of the DHW heat pump.
- **Never** use the connectors as a transport aid.

Align the DHW heat pump horizontally.

Note
Only use one or two of the adjustable feet to level the appliance. At least one of the adjustable feet must remain fully screwed in.

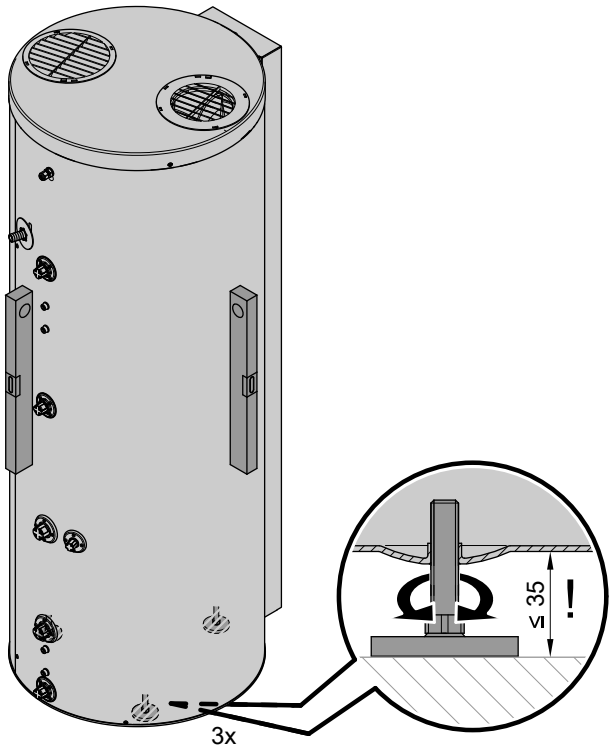

Fig. 8

Conversion to outdoor air mode

Note
*In outdoor air mode, at outside temperatures below 6 °C, the maximum DHW temperature of 62 °C is not achieved in the **"ECO"** and **"SMART"** operating programs.*

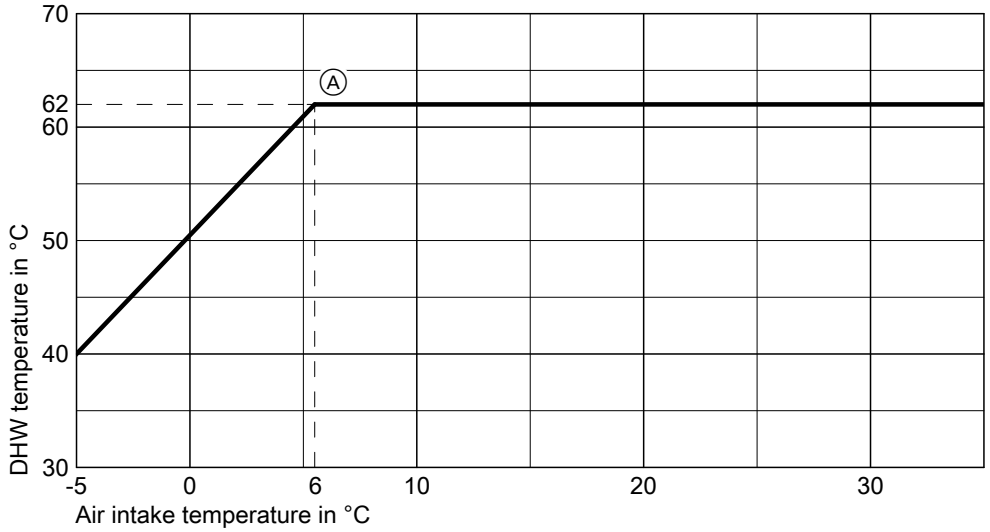

Fig. 9

Ⓐ *Max. DHW temperature achievable by the heat pump*

Conversion to outdoor air mode (cont.)

Fitting the outdoor air adaptor

Danger
Hot surfaces can cause burns.
- Switch off the appliance before carrying out maintenance and service work. Allow the appliance to cool down.
- Do not touch hot surfaces on the appliance, fittings or pipework.

Danger
Sharp-edged fins can cause injury.
Wear protective clothing.

Conversion to outdoor air mode (cont.)

Note
The air discharge aperture is converted for recirculation air mode with air discharge to the outside.

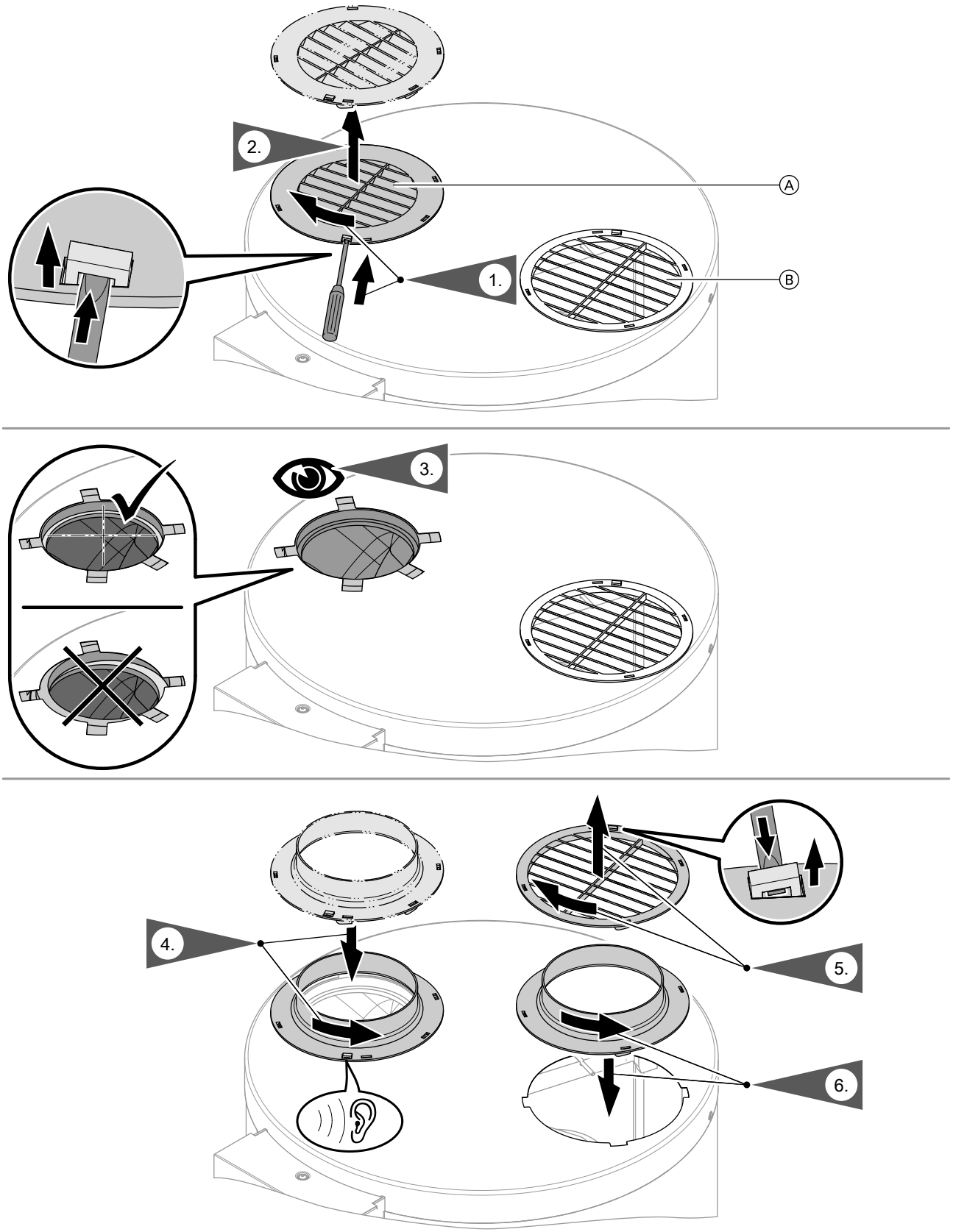

Fig. 10

Ⓐ Air discharge
Ⓑ Air intake

Conversion to outdoor air mode (cont.)

Fitting the air intake/air discharge ductwork

System diagram

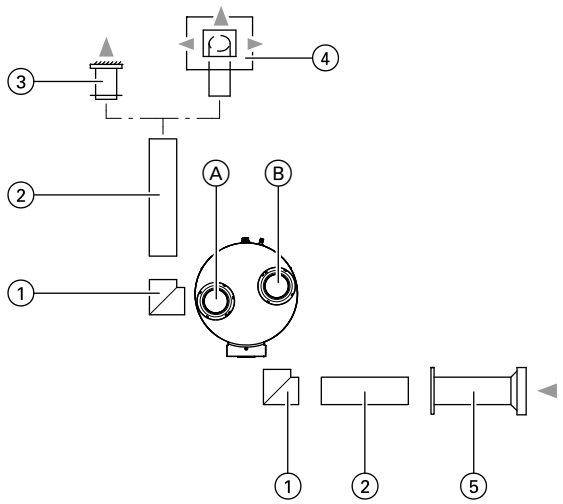

Fig. 11

Ⓐ Air discharge
Ⓑ Air intake

Ductwork			DN
①	**Bend**	90°	160
		45°	160
②	▪ **Folded spiral-seam tube** ▪ **Flexible pipe** ▪ **EPP pipe**	Length 3.0 m	160
③	**Outdoor air intake grille as air discharge duct wall outlet**		160
④	**Exhaust air roof outlet**	Round, with protective grille and insulation sleeve, for air discharge duct	160
⑤	**Supply air element**	Wall/external connection, for air intake duct	160
	Check valve (on site)		

Conversion to outdoor air mode (cont.)

Information on ductwork

Please note
The simultaneous operation of open flue combustion equipment (e.g. an open fireplace) and the DHW heat pump in a space with combustion air interconnection results in dangerous negative pressure inside the room. Negative pressure can result in flue gas re-entering the room.

- Do **not** operate the DHW heat pump simultaneously with **open** flue combustion equipment (e.g. an open fireplace).
- Operate combustion equipment exclusively in **room sealed** mode with a separate supply of combustion air. We recommend combustion equipment with general building regulations approval as **room sealed** combustion equipment, issued by the Deutsches Institut für Bautechnik DIBt [or local equivalent].
- Doors to boiler rooms where the combustion air supply is not interconnected with the living space must be airtight and kept shut.

Note
In recirculation air mode with air discharge to the outside, ensure an adequate supply of fresh air to the installation room (on site), e.g. via separate supply air apertures (min. DN 160).

- Thermally insulate the ductwork with vapour diffusion-proof material.
- Always route the ducts for air intake and air discharge with a 2 to 3° fall, so that rain and condensate can drain away to the outdoors.
- Ensure air intake temperatures from -5 to 35 °C.
- Max. permissible total pressure drop Δp_{total} (ductwork and appliance): 100 Pa
- Fit silencers to prevent flow noise.
- Ducts, wall outlets and connections to the DHW heat pump can be installed using anti-vibration insulation to reduce noise (see diagram).

Connections and installation options which are not permissible:

- Connection of kitchen extractor hoods to the ductwork
- Installation of a DHW heat pump with recirculation air mode in a heated room
- Connection of the air intake duct to a mechanical ventilation system
- Connection of the air intake duct to an air/geothermal heat exchanger
- Connection of the air intake duct to a tumble dryer
- Reversed connections (air intake to the outside and air discharge to the inside)
- Installation of the DHW heat pump in an attic
- Installation of the DHW heat pump in dusty rooms
- Operation of the DHW heat pump in conjunction with an open flue boiler

Vibration isolation

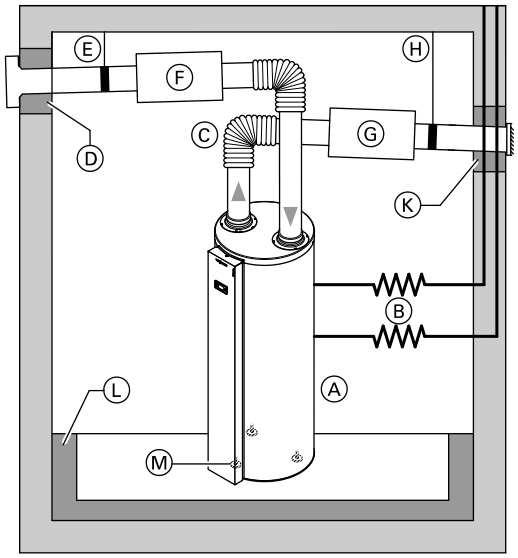

Fig. 12

Ⓐ DHW heat pump
Ⓑ Flexible hydraulic connections
Ⓒ EPP insulated plastic pipes or insulated flexible pipes (min. DN 160) for air intake/air discharge ductwork
Ⓓ Anti-vibration insulation for air intake wall duct
Ⓔ Anti-vibration bracket for air intake duct
Ⓕ Air intake silencer
Ⓖ Air discharge silencer
Ⓗ Anti-vibration bracket for air discharge duct
Ⓚ Anti-vibration insulation for air discharge wall duct
Ⓛ Anti-vibration insulation for floor
Ⓜ Adjustable feet

Measures for minimising the pressure drop

- Use as few bends as possible.
- As far as possible, avoid elements that increase the pressure drop.
- Route the air intake duct above the air discharge duct if possible.

Positioning of air intake and air discharge apertures

Please note
An "air short circuit" will result in the cooled discharged air being drawn back in to the unit. This can result in reduced heat pump efficiency and defrosting problems.
Position the air intake and air discharge apertures so that any "air short circuit" is prevented.

Conversion to outdoor air mode (cont.)

Air intake and air discharge duct through the wall

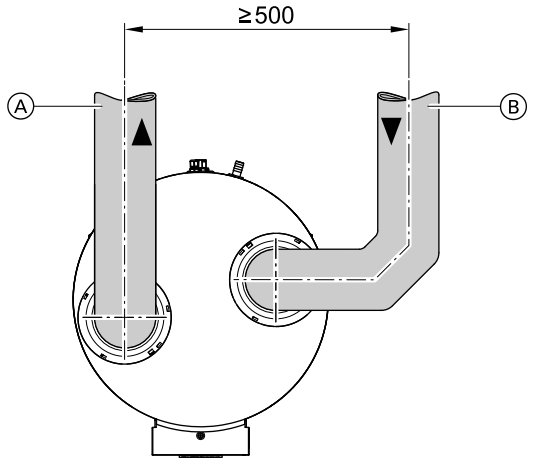

Fig. 13

Ⓐ Air discharge
Ⓑ Air intake

Air intake and air discharge duct through the roof

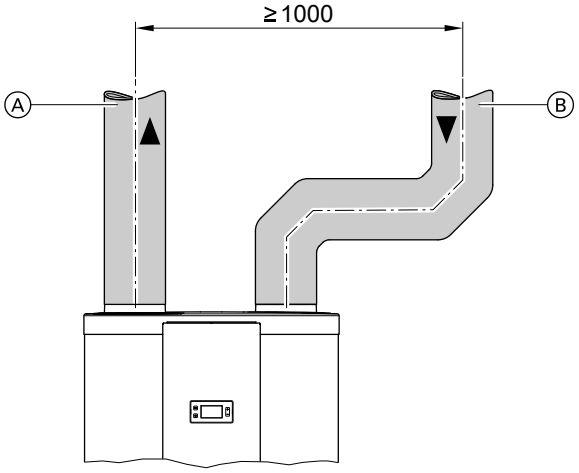

Fig. 14

Ⓐ Air discharge
Ⓑ Air intake

Installation sequence

1. Join individual duct sections using connection pieces or female connections (see system diagram on page 17).

   Please note
   Drilling swarf can cause faults in the DHW heat pump.
   Never allow drilling swarf to fall into the DHW heat pump air intake aperture or air discharge aperture.

2. Secure the connections with self-tapping screws or blind rivets. Use shrink tape to make the connections airtight.

Connecting the condensate drain

When heating DHW, condensate forms on the inside of the heat pump module. This condensate needs to be routed via the condensate drain to a sewer.

1. Secure the condensate drain hose to the condensate drain connector with a hose clip.

   Please note
   Mechanical stress will damage the condensate connection and may cause leaks.
   Do not twist the condensate drain connector on the appliance.

2. Route the condensate hose as a U-bend and connect with a constant fall and a pipe vent to the public sewage system or a neutralising system. If necessary, connect to an on-site trap. Ensure that the trap is connected securely.

   Note
   Connecting the condensate drain to rainwater downpipes is not permissible.

3. Check that the condensate can drain freely. Flush the condensate drain if necessary.

Connecting the condensate drain (cont.)

4. Should the condensate drain run partially through unheated rooms, provide thermal insulation or a ribbon heater around the condensate drain on site.

> **!** **Please note**
> Freezing condensate in the heat pump leads to appliance damage.
> If required, fit the condensate drain with thermal insulation or a ribbon heater on site.

Condensate drain via trap

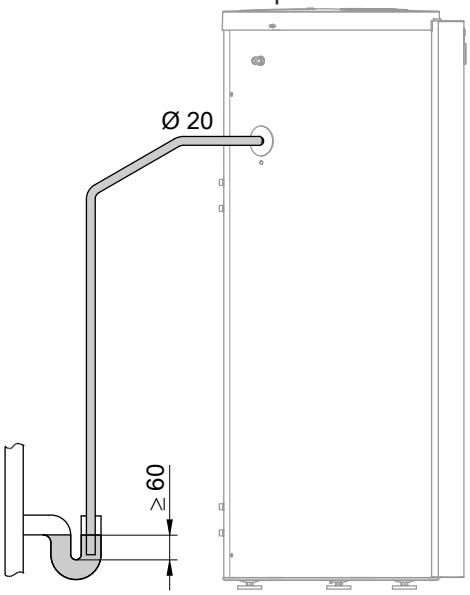

Fig. 15

Condensate drain via water seal

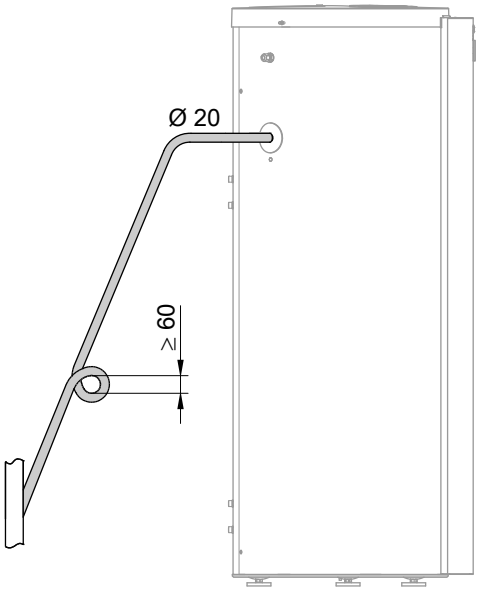

Fig. 16

Connections on the DHW side

The DHW heat pump is designed to be connected permanently to the water supply.
For connecting the DHW side, observe DIN 1988, DIN 4753 and EN 806.

Furthermore observe the following:
- Connect all pipework with detachable fittings.
- Equip the DHW circulation pipe with a DHW circulation pump, check valve and time switch. Gravity operation is possible only to a limited extent.

Connections on the DHW side (cont.)

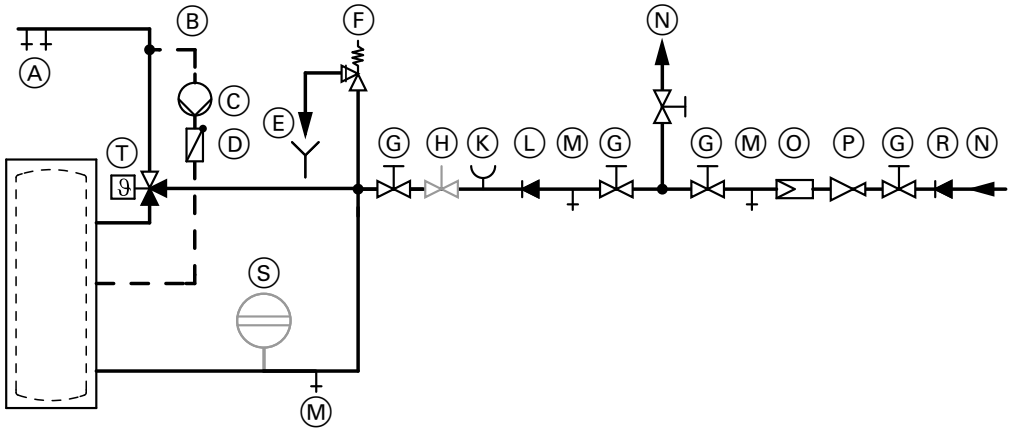

Fig. 17

Ⓐ DHW
Ⓑ DHW circulation pipe
If no DHW circulation is being connected, seal the relevant connection.
Ⓒ DHW circulation pump
Ⓓ Spring-loaded check valve
Ⓔ Visible discharge pipe outlet point
Ⓕ Safety valve
Ⓖ Shut-off valve
Ⓗ Flow regulating valve
Ⓚ Pressure gauge connector
Ⓛ Non-return valve
Ⓜ Drain valve
Ⓝ Cold water
Ⓞ Drinking water filter
Ⓟ Pressure reducer
Ⓡ Non-return valve/pipe separator
Ⓢ Expansion vessel, suitable for potable water (not CH)
Ⓣ Automatic thermostatic mixing valve (on site, for DHW temperatures > 60 °C)

The safety assembly to DIN 1988 is available as an accessory. The safety assembly contains the following components:
- Shut-off valve
- Diaphragm safety valve
- Non-return valve and test connector
- Pressure gauge connector

Information on drinking water filter

According to DIN 1988-2, a drinking water filter must be installed in systems with metal pipework. We also recommend the installation of a drinking water filter when using plastic pipes to DIN 1988, to prevent contaminants entering the DHW system.

Information on the automatic thermostatic mixing valve

The DHW heat pump can heat drinking water to above 60 °C. Therefore, an automatic thermostatic mixing valve must be fitted in the DHW pipe to protect against scalding.

Information on the safety valve

Install a safety assembly to DIN 1988 (DN 15 (R ¾)/ 1 MPa) at the cold water connection.

If no safety assembly to DIN 1988 is installed, equip the system with a type-tested diaphragm safety valve as protection against excess pressure.

Installation information:
- Install the safety valve in the cold water line. Ensure it cannot be shut off from the DHW cylinder.
- There must be no constrictions in the pipework between the safety valve and the DHW cylinder.
- Never seal off the safety valve discharge pipe. Ensure that any expelled water is safely and visibly drained into a drainage system. Position a sign close to the safety valve discharge pipe, or ideally on the safety valve itself, with the following inscription: "For safety reasons, water may be discharged from the discharge pipe during heating! Never seal off!"
- Install the safety valve above the top edge of the DHW heat pump.
- Install the safety valve so it is free from the risk of frost and connect it to an outlet pipe with a continuous fall.

Technical requirements:
- Permissible temperature: 3 to 65 °C
- Permissible operating pressure: 1 to 8 bar (0.1 to 0,8 MPa)

ENHMV-E: Solar thermal system

Maximum collector area and sizing information

DHW heat pump technical guide

Connecting the solar collectors

Solar collector installation instructions

For connections to the DHW heat pump, see pages 10 and 25.

Note
- *The cylinder temperature sensor is fitted at the factory.*
- *A high limit safety cut-out (accessories) for stopping the solar circuit pump **must** be fitted.*

  High limit safety cut-out (accessories) installation instructions

Note
In outdoor air mode, the immersion heater EHT (accessories) is essential.

ENHMV-E: External heat generator

For connections to the DHW heat pump, see pages 10 and 25.

Fitting the temperature sensor

Please note
Damage to the connecting cables and sensor leads (capillaries) causes malfunctions.
- The connecting cables and sensor leads must not come into contact with hot components. When routing and securing connecting cables and sensor leads, ensure that the maximum permissible temperatures for these cables/ leads are not exceeded.
- Do not kink the capillary tubes.

ENHMV-E: External heat generator (cont.)

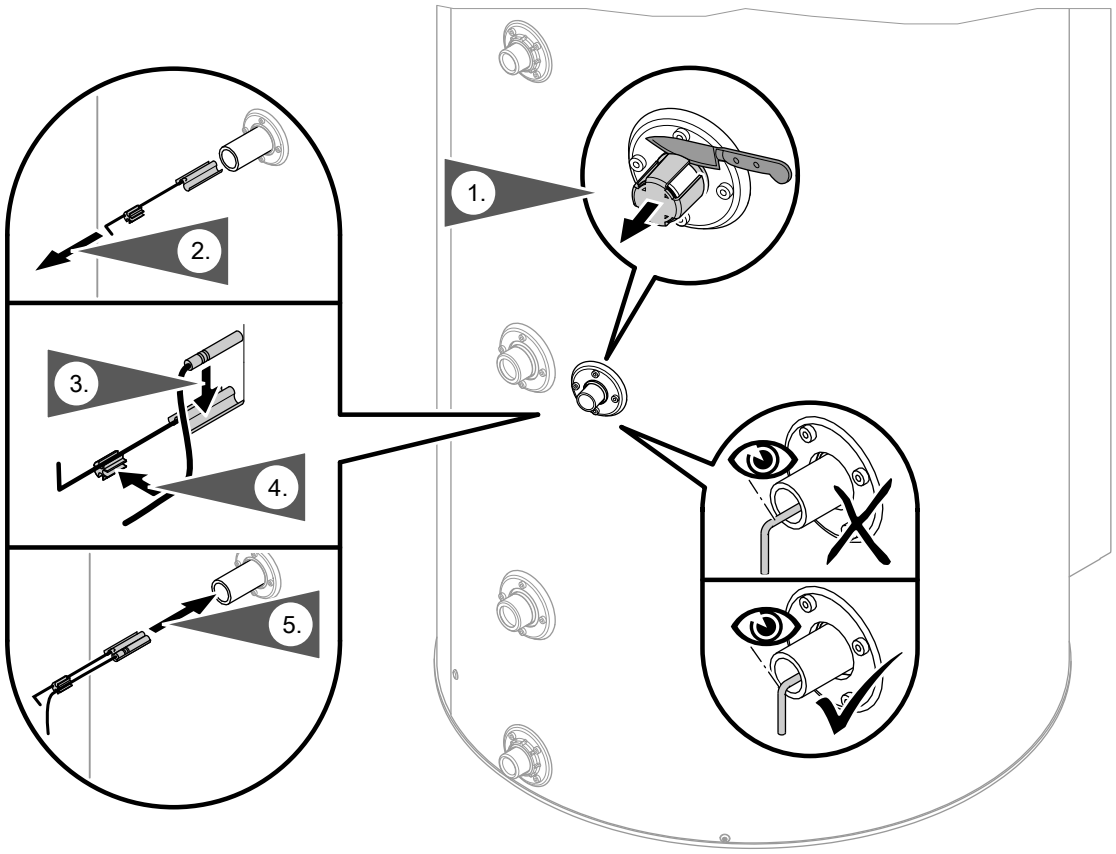

Fig. 18

Adjusting the draw-off rate

If there is high demand for DHW, it is possible to change the draw-off profile from L to XL. To do this, the cylinder temperature sensor fitted at the factory is removed from sensor well Ⓐ and fitted in sensor well Ⓑ; see Fig. 19

Note
The high limit safety cut-out for the DHW heat pump must also be refitted.

Adjusting the draw-off rate (cont.)

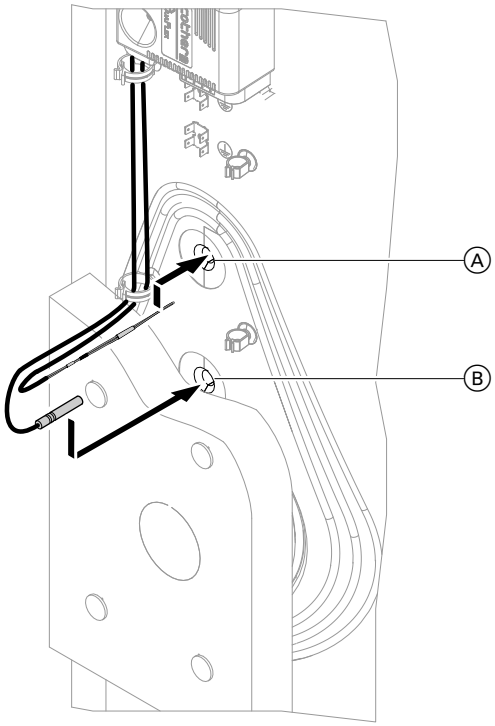

Fig. 19

Ⓐ Sensor well for draw-off profile L
Ⓑ Sensor well for draw-off profile XL

Electrical connections

⚠ **Danger**
Damaged cable insulation can cause injury and damage to the appliance.
Route cables so that the cables cannot touch very hot, vibrating or sharp-edged components.

ENHMV-E with external heat generator

The external heat generator is activated either manually or via the switching contact of the heat pump control unit.

If an immersion heater (accessories) is also installed, it must be controlled via the switching contact of the heat pump control unit. In this case, the external heat generator is controlled manually, e.g. via the contactor relay (accessories). This means the cylinder temperature can also be influenced by the external heat generator.

Operating mode	Electrical connection of the external heat generator	
	System with immersion heater	System without immersion heater
Recirculation air mode	Manual	Switching contact or Manual
Recirculation air mode with air discharge to the outside	Manual	Switching contact or Manual
Outdoor air mode	Manual	Switching contact

Electrical connections (cont.)

Connection to the switching contact on the heat pump control unit

If the external heat generator is connected directly to switching contact Ⓐ on the heat pump control unit, the 230 V signal must be converted.

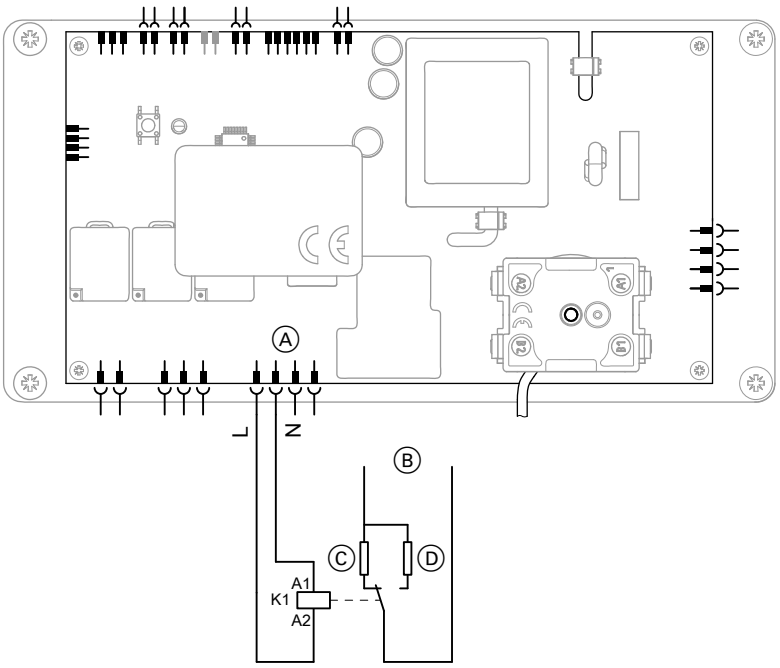

Fig. 20

Ⓐ Connection to heat pump control unit
Ⓑ Connection to external heat generator control unit
Ⓒ Temperature sensor, external heat generator
Ⓓ Resistance

Resistance subject to external heat generator temperature sensor

External heat generator temperature sensor Ⓒ	Resistor Ⓓ
NTC 10 kΩ	2.2 kΩ
Pt500	680 Ω
Pt1000	1.3 kΩ

Connecting to the power supply

Isolators for non-earthed conductors

- Install an isolator in the power cable to provide omnipolar separation from the mains for all active conductors, corresponding to overvoltage category III (3 mm) for full isolation. This isolator must be fitted in the permanent electrical installation in line with installation requirements, e.g. mains isolator or upstream circuit breaker.
- We additionally recommend installing an AC/DC-sensitive RCD (RCD class B) for DC (fault) currents that can occur with energy efficient equipment.
- Select and size residual current devices to DIN VDE 0100-530.
  RCD with a differential current that does not exceed 30 mA.
- Implement the mains connection as a permanent connection (3-core cable NYM). If the power supply is connected with a flexible cable, ensure that the live conductors are pulled taut before the earth conductor in the event of strain relief failure. The length of the earth conductor wire will depend on the design.

Connecting to the power supply (cont.)

Danger
Incorrectly executed electrical installations can result in injuries from electrical current and damage to the appliance.

Connect the power supply and implement all safety measures (e.g. RCD circuit) in accordance with the following regulations:
- IEC 60364-4-41
- VDE regulations
- TAR medium voltage VDE-AR-N-4100
- Protect the power cable to the heat pump control unit with a fuse of max. 16 A.

Danger
The absence of system component earthing can lead to serious injury from electric current if an electrical fault occurs.
The appliance and pipework must be connected to the equipotential bonding of the building.

Danger
Incorrect wiring can lead to serious injury from electrical current and result in appliance damage.
- Route extra low voltage (ELV) leads < 42 V separately from cables > 42 V/230 V~.
- Strip as little of the insulation as possible, directly before the terminals, and bundle close to the corresponding terminals.
- Secure cables with cable ties.

Power cable

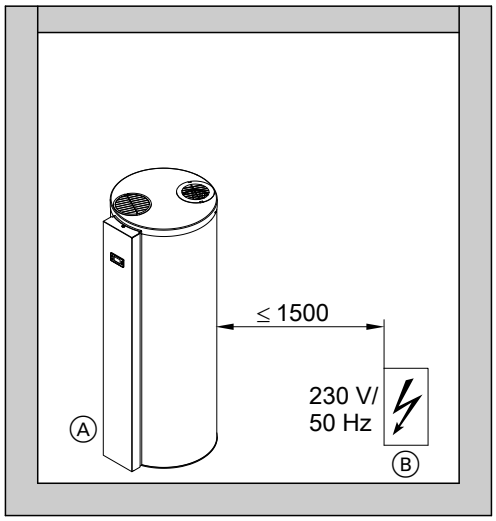

Fig. 21

Ⓐ DHW heat pump
Ⓑ Power supply

The DHW heat pump is fully wired with a 3-core power cable:
- H05VV-F 3G 1.5
- Colour: White
- Cores:
  L1: Brown
  N: Blue
  PE: Green/yellow

A separately fused **standard socket** is required for connection to the mains:
- 230 V/50 Hz
- Max. fuse rating 16 A

Damaged connecting cables

If connecting cables for the appliance or accessories are damaged, these cables must be replaced with rele-vant special connecting cables. Use only Toshiba cables as replacements.

Steps - commissioning, inspection and maintenance

Commissioning steps
Inspection steps
Maintenance steps

Shutting down the DHW heat pump

Danger
Contact with live components can lead to serious injury from electric current.
Isolate the appliance from the power supply prior to starting work.
Be aware that the fan may run on.

Opening the DHW heat pump

Danger
Hot surfaces can cause burns.
- Switch off the appliance before carrying out maintenance and service work. Allow the appliance to cool down.
- Do not touch hot surfaces on the appliance, fittings or pipework.

Opening the DHW heat pump (cont.)

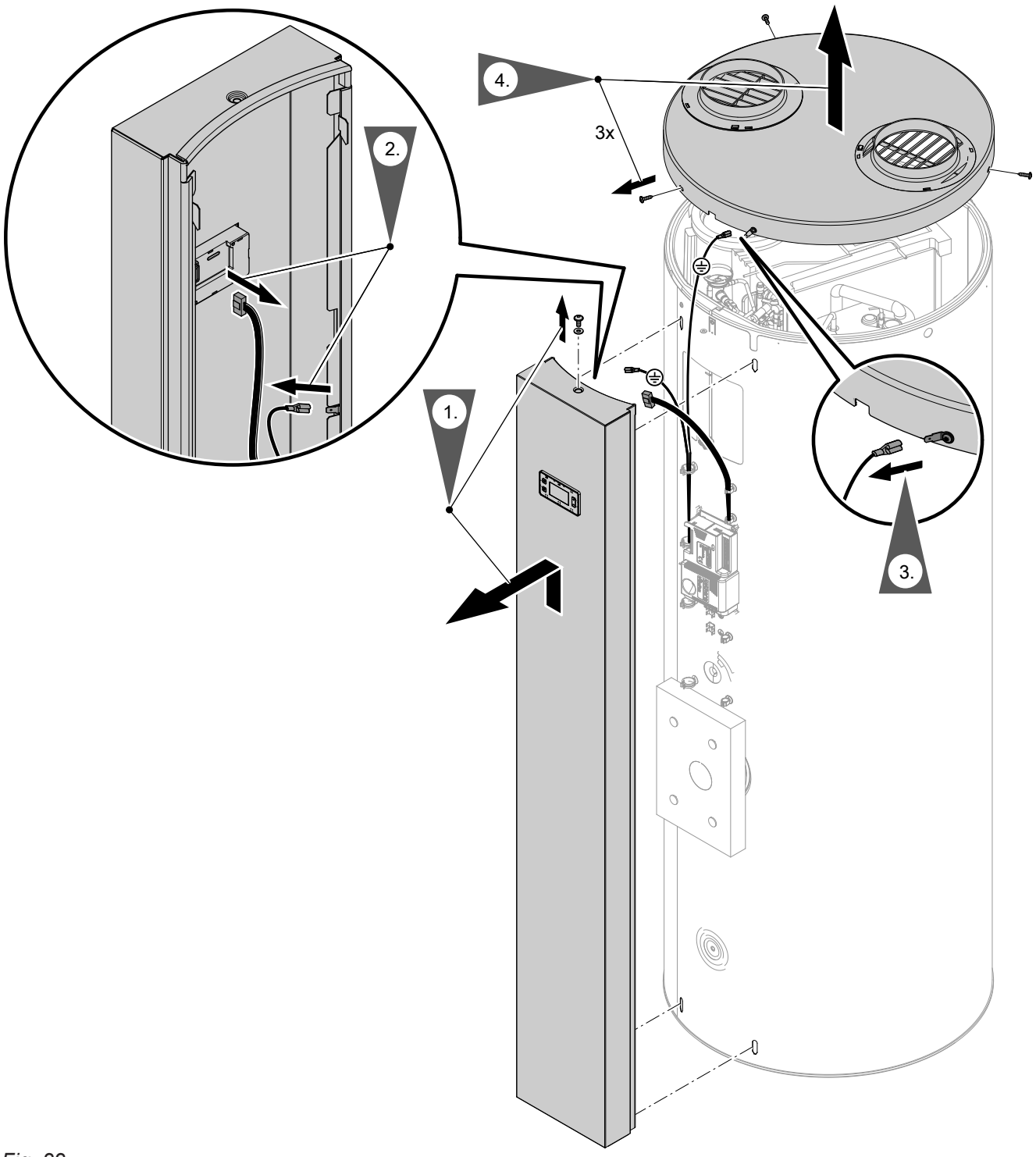

Fig. 22

Filling the DHW cylinder on the DHW side

1. **Completely** fill the DHW cylinder.
   Open the highest hot water draw-off point. Leave it open (under supervision) until only water is flowing out.
2. Check the fittings for leaks and tighten if necessary.

ENHMV-E: Filling the solar thermal system

Solar collector service instructions

Checking the safety valve function

Check the function of the safety valve according to the manufacturer's instructions.

Note
The safety valve must be operated regularly for the following purposes:
- *To remove deposits.*
- *To check whether it has become jammed.*

Please note
A jammed safety valve can cause leaks.
Never seal off the safety valve discharge pipe.
Ensure that any expelled water is safely and visibly drained into a drainage system.
Position a sign on the safety valve or near the discharge pipe, as appropriate, with the following inscription: "For safety reasons, water may be discharged from the discharge pipe during heating! Never seal off!"

Checking the condensate drain

1. Check the drain hose is seated correctly on the condensate drain.

Please note
Mechanical stress will damage the condensate connection and may cause leaks.
Do not twist the condensate drain connector on the appliance.

2. If necessary, clean the condensate pan (PP base with fitted hose nozzle).
3. Check that the condensate can drain freely. Flush the condensate drain if necessary.
4. Check for leaks.

Checking the refrigerant circuit for leaks

Danger
The refrigerant is a non-poisonous gas that displaces air. Unregulated escape of refrigerant in enclosed spaces can lead to breathing difficulties and suffocation.
- Ensure adequate ventilation in enclosed spaces.
- Always observe regulations and guidelines on handling this type of refrigerant.

Danger
Direct contact with refrigerant can be harmful to the skin.
Wear safety goggles and protective gloves when working on the refrigerant circuit.

Please note
Refrigerant can escape when working on the refrigerant circuit.
Work on the refrigerant circuit must **only** be carried out by a certified contractor (in accordance with Regulations EU 517/2014 and EU 2015/2067).

1. Check the fittings and visible solder joints for traces of oil.

Note
Traces of oil indicate a leak in the refrigerant circuit. Have the DHW heat pump checked by a refrigeration engineer.

2. Check the DHW heat pump interior for refrigerant leaks with a refrigerant leak detector or leak detection spray.

Observe the following when working on the refrigerant circuit

- Prevent scale when brazing.
- Braze fittings using an inert gas (nitrogen).

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Checking the refrigerant circuit for leaks (cont.)

- Always evacuate to 0.25 mbar. Break vacuum with nitrogen.
- Prevent water and moisture getting into the refrigerant circuit.
- Always close off conduits and components immediately. In combination with oxygen, refrigerant R1234ze degrades within a few days.

Cleaning the interior of the DHW cylinder

1. Drain the DHW cylinder via the drain outlet (see page 42).
2. Disconnect the DHW cylinder from the pipework to prevent cleaning agents and contaminants from entering the pipework.
3. Open the DHW heat pump (see page 28).

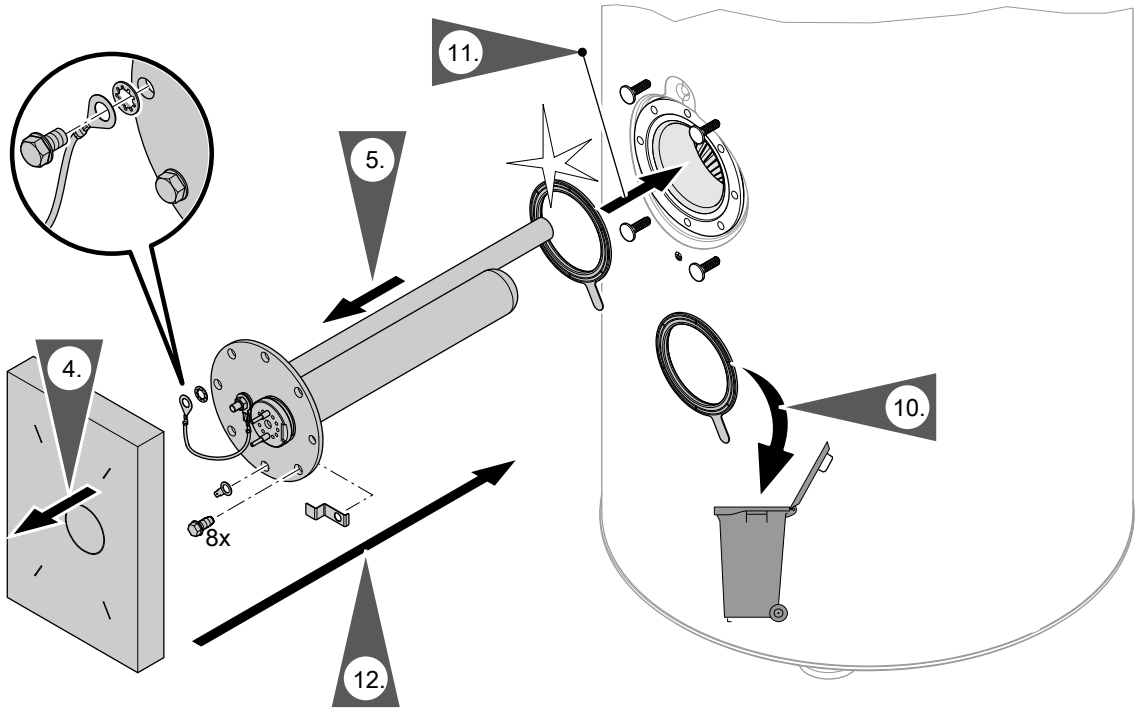

Fig. 23

6. Remove loose deposits manually or use a high pressure cleaner.

   Please note
   Pointed, sharp and hard objects can damage the interior.
   Only use plastic cleaning equipment for manual cleaning.

7. Use a chemical cleaning agent to remove hard deposits that cannot be removed with a high pressure cleaner.

   Danger
   Cleaning agent residues can lead to **poisoning**.
   Observe the cleaning agent manufacturer's instructions.

   Please note
   Cleaning agents containing hydrochloric acid can cause material damage.
   Never use cleaning agents containing hydrochloric acid.

8. **Fully** drain all cleaning agent.

Cleaning the interior of the DHW cylinder (cont.)

9. Flush the DHW cylinder **thoroughly** after cleaning.
10. Connect the DHW cylinder to the pipework and fill (see page 29).

Checking and replacing the protective magnesium anode

- We recommend checking the function of the protective magnesium anode annually. This check can be carried out without interrupting operation. The earth current is tested with an anode tester.
- A maintenance-free impressed current anode is available as an accessory.

Testing the anode earth current with an anode tester

Open the DHW heat pump (see page 28).

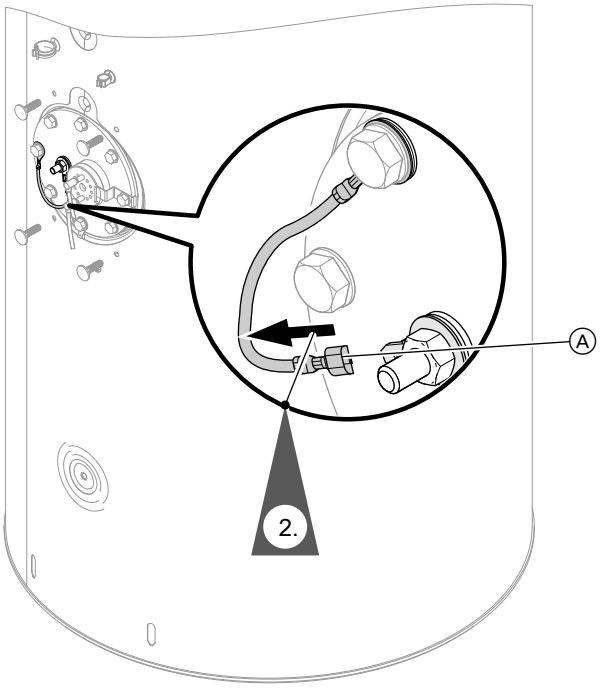

Fig. 24

3. Connect the tester in series between the tab and earth cable and measure the current:
   - > 0.3 mA:
     Protective magnesium anode is in working order.
   - < 0.3 mA:
     Carry out a visual inspection of the protective magnesium anode.
4. If a visual inspection is necessary, drain the DHW cylinder via the drain outlet down to the installation height of the protective magnesium anode (see page 42).
   Note
   Replace the protective magnesium anode if the visual inspection indicates that it has been reduced to a diameter of 10 to 15 mm.
   New protective magnesium anodes are 500 mm long and have a diameter of 26 mm.

ENHMV-E: Checking the connections on the heat generator or the solar thermal system for leaks

Checking the fan for free rotation

Danger
Contact with the fans while they are operating can result in serious cutting injuries.
- Isolate the appliance from the power supply and check that it is no longer live. Safeguard against unauthorised reconnection.
- Do not open the appliance until the fan has come to a stop.

Checking the fan for free rotation (cont.)

Cleaning the fan

Clean the fan with a brush or bottle brush, for example.

Please note
Removing counterweights from the impeller causes imbalance, a higher level of noise and wear on the fan.
Do **not** remove counterweights from the impeller.

Please note
Opening the volute casing causes leaks.
Do **not** open the volute casing.

Cleaning the evaporator

Danger
Contact with live components can cause serious injury from electric current.
Isolate the appliance from the power supply prior to starting work and check that it is no longer live. Safeguard against unauthorised reconnection.

Danger
Hot surfaces can cause burns.
- Switch off the appliance before carrying out maintenance and service work. Allow the appliance to cool down.
- Do not touch hot surfaces on the appliance, fittings or pipework.

Check that the evaporator fins are clean.

Danger
Sharp-edged fins can cause injury.
If necessary, clean the fins carefully.

Please note
Incorrect cleaning of the fins can cause damage to the fins.
Do **not** clean the fins with compressed air.

Closing the DHW heat pump

See page 28 (reverse order).

Starting the DHW heat pump

Please note
Starting the DHW heat pump when the DHW cylinder has not been completely filled may damage the appliance.
Completely fill the DHW cylinder **before** starting the DHW heat pump (commissioning).

1. Insert the mains plug into a standard socket (230 V/50 Hz) with separate fuse protection.
2. Switch on the separate fuse or mains isolator (if used).

Commissioning the DHW heat pump

Setting parameters

See page 35.

Commissioning the DHW heat pump (cont.)

ENHMV-E: Selecting a set flow temperature for the external heat generator

The external heat generator is controlled via the switching contact in the heat pump control unit	Outdoor air mode and the external heat generator are controlled manually
Set the flow temperature to 70 °C.	▪ Outside temperature < 7 °C: Set the flow temperature higher than the set DHW temperature of the DHW heat pump. ▪ Outside temperature > 7 °C: Set the flow temperature lower than the set DHW temperature of the DHW heat pump.

Selecting the set flow temperature:
External heat generator installation and service instructions

Installation menu

Programming unit

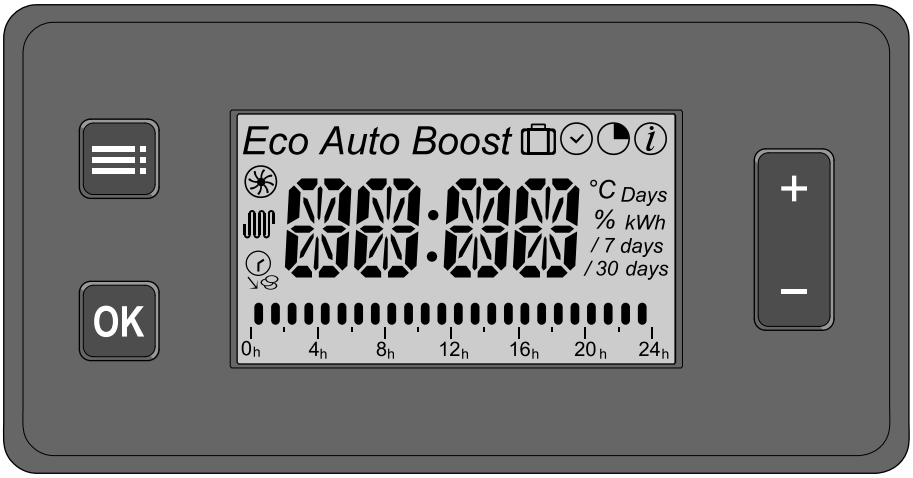

Fig. 25

Setting parameters in the installation menu "INST"

1. ☰ and **–**: Press and hold simultaneously for 3 s.
   "INST" appears on the display.
2. Use ☰ to select:
   - Parameters **"I1"** to **"I6"**
   - Test functions **"T1"** to **"T5"**
   - Actual temperature values **"t1'"** to **"t4'"**
3. Use **+/–** to select parameter, function or temperature.
4. Confirm with **OK**.
5. Use **+/–** to change values.
6. Confirm with **OK**.

Restoring factory settings (reset)

Note
*Not possible when a fault message is active, with "Increased DHW hygiene" or in the **"PROGRAM"** ◔ operating program.*

1. ☰ and **OK**: Press and hold simultaneously for 3 s.
   "RST?" is displayed.
2. Confirm with **OK**.
   "dONE" appears.
   The factory settings have been restored.

   Note
   Time and date need to be set again.
3. Exit **"RST?"** with ☰.

Overview of parameters

Parameter	Delivered condition	Setting range	Unit	Function
"I1"	1	1 or 2	—	1 Operating mode recirculation air mode 2 Operating mode outdoor air mode or recirculation air mode with air discharge to the outside
"I2"	0	0 or 1	—	0 No premium/economy tariff 1 Signal line (230 V) for premium/economy tariff connected (see page 52).

Installation menu (cont.)

Parameter	Delivered condition	Setting range	Unit	Function
"I3"	OFF	OFF to 20	min	OFF No photovoltaic system 1 to 20 Floating switching contact of the photovoltaic system is connected (see page 51 52). The set temperature is raised after the floating switching contact of the photovoltaic system has been closed for between 1 and 20 minutes. ***Note*** *The minimum start-up capacity of the multifunctional relay must be set to 750 W at the inverter.*
"I4"	OFF	OFF to 30	Days	OFF "Increased DHW hygiene" function inactive 1 to 30 "Increased DHW hygiene" function active The DHW cylinder is automatically heated to 60 °C at an interval of 1 to 30 days. ***Note*** *Activate the function only if an immersion heater EHT or external heat generator with a control relay is available.*
"I5"	OFF	OFF or 55 to 65	°C	OFF Emergency mode not active 55 to 65 Emergency mode active The set temperature is 55 to 65 °C. ***Note*** *In emergency mode, DHW is heated solely by the immersion heater EHT.*
"I6"	OFF	OFF or ON	—	Option for the PROGRAM operating program ◔ OFF Standard: DHW heating within the set time program ON NIGHT mode: Optimised DHW heating between 23:00 h and 5:00 h The start is delayed such that the set DHW temperature is achieved at 5:00 h.

Checking the actuators

Parameter	Delivered condition	Setting range	Unit	Function at parameter setting "1"
"T1"	0	0 or 1	—	Compressor and fan run for 30 s.
"T2"	0	0 or 1	—	Immersion heater EHT operates for 30 s.
"T3"	0	0 or 1	—	Fan runs for 30 s at speed setting 1 (slow).
"T4"	0	0 or 1	—	Fan runs for 30 s at speed setting 2 (fast). Only visible if **"I1"** = 2
"T5"	0	0 or 1	—	Diverter valve for defrosting opens for 30 s.

Actual temperatures

Connecting the temperature sensors: See page 52.

Parameter	Display range	Unit	Information
"t'1"	0 to 99	°C	Bottom cylinder temperature sensor
"t'2"	-20 to 99	°C	Air intake temperature sensor

Installation menu (cont.)

Parameter	Display range	Unit	Information
"t'3"	0 to 99	°C	Top cylinder temperature sensor
"t'4"	0 to 99	°C	Evaporator temperature sensor

Safety high pressure switch

Connecting the safety high pressure switch: See page 52.

Parameter	Display range	Unit	Information
"PR"	0 or 1	—	0 Safety high pressure switch not connected 1 Safety high pressure switch connected

Messages

Red LED on the heat pump control unit

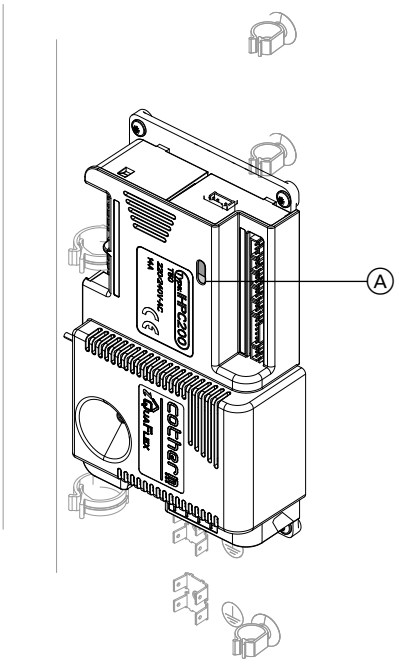

Fig. 26

Ⓐ Red LED

Red LED	Cause	Measure
Flashes briefly every 10 s.	No fault	No action required
Flashes in a different sequence.	Fault	See message on the programming unit
Constantly off	No power supply	Restore power supply.

Messages on the programming unit

Message	Cause	Measure
"ER 0"	Programming unit faulty	Replace programming unit.
"ER 1"	Safety high pressure switch has responded. Overpressure in the heat pump circuit.	Switch power supply off and on again. **Or** Acknowledge message. See the following chapter.
"ER 2"	High limit safety cut-out has responded. Overheating of the DHW cylinder.	Ensure DHW is drawn off. Reset high limit safety cut-out (see page 41).
"ER 3"	Short circuit/lead break, top cylinder temperature sensor (NTC1)	Check resistance value and replace sensor if necessary (see page 50).
"ER 4"	Short circuit/lead break, air intake temperature sensor (NTC2)	
"ER 5"	Short circuit/lead break, evaporator temperature sensor (NTC4)	
"ER 6"	Short circuit/lead break, bottom cylinder temperature sensor (NTC3)	

Messages (cont.)

Message	Cause	Measure
"ER 8"	Communication problem between programming unit and heat pump control unit	Check connections and cable.
"ER 9"	DHW heating takes unusually long	Check heat pump and immersion heater EHT, and test for leaks.
"ER 10"	No changeover between premium and economy tariff during past 24 hours	Check input for premium/economy tariff (see page 52).

Acknowledging messages

Press and hold ☰ and **OK** simultaneously for 3 s to clear a message and resume standard operation.

Maintenance

Removing the front cover

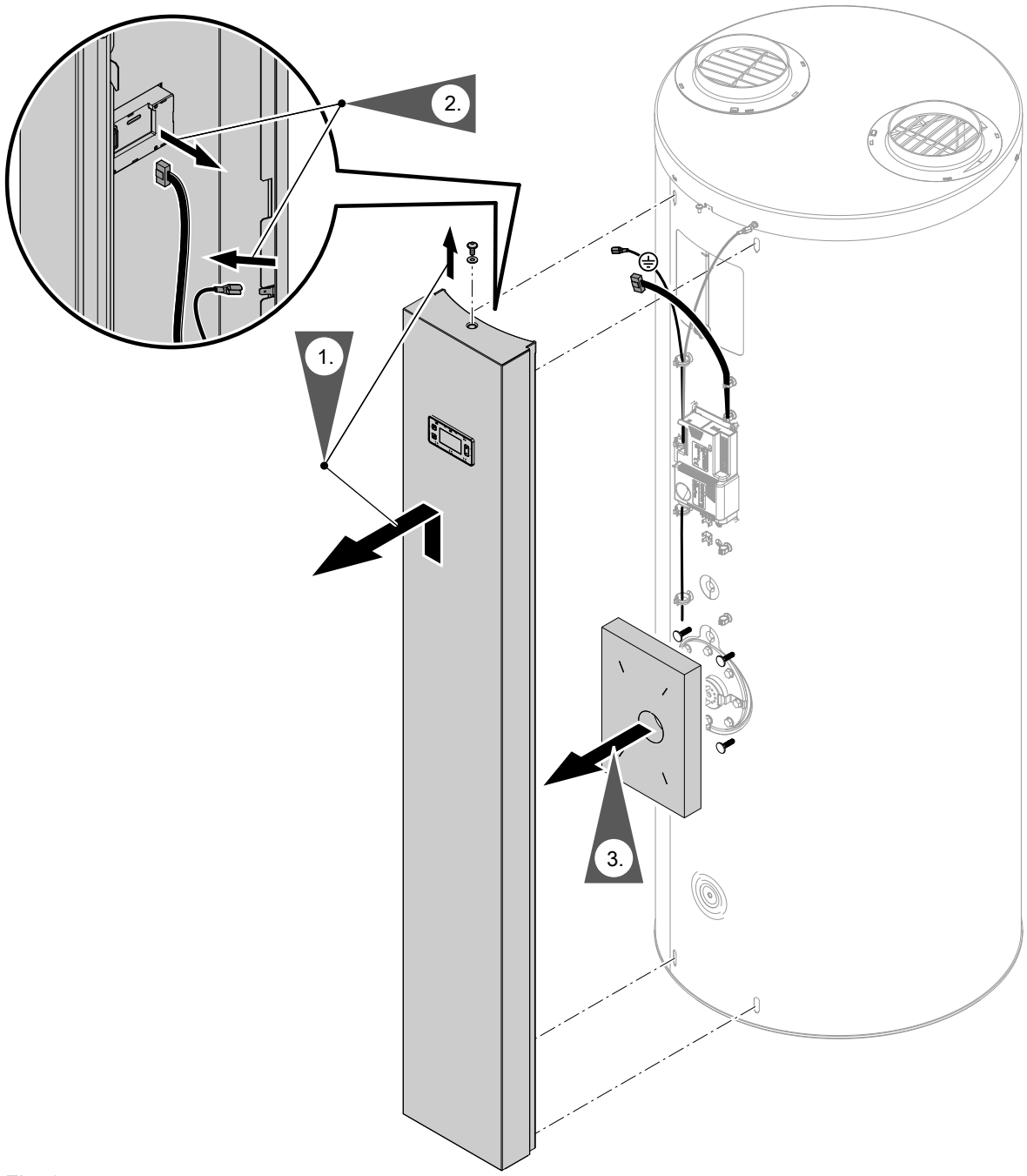

Fig. 27

Replacing the heating element in the immersion heater EHT

1. Switch off the power supply to the system (e.g. at a separate fuse or mains isolator).
2. Shut off the water supply.
3. Remove the front cover. See Fig. 27.
4. Remove the thermal insulation from the immersion heater EHT.

Maintenance (cont.)

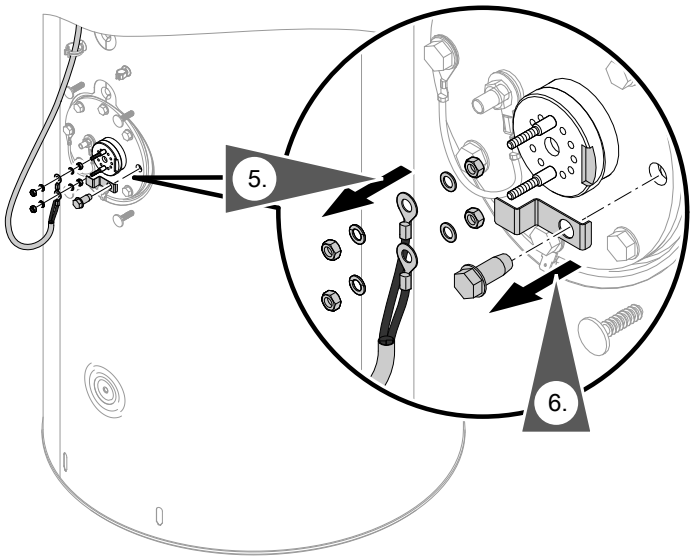

Fig. 28

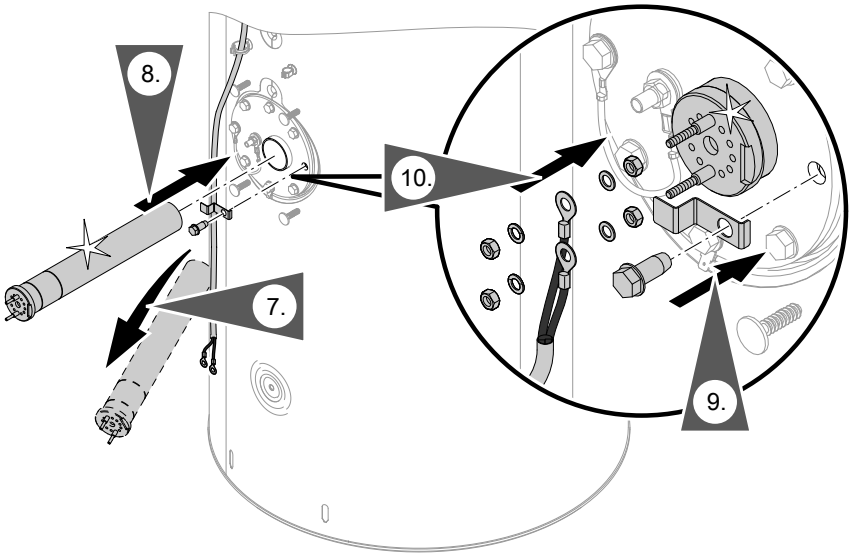

Fig. 29

8. When inserting the new heating element, ensure the recess at the head of the element is correctly positioned.

9. Torque: 25 Nm.

11. Open the shut-off valve.

12. Fit the thermal insulation.

13. Fit the front cover with an earth cable.

14. Switch on the power supply.

Resetting the DHW heat pump high limit safety cut-out

The DHW heat pump high limit safety cut-out shuts the appliance down at a temperature of $90^{+/-5}$ °C.
For this reason, select a maximum value of 85 °C for the set temperature of the external heat generator.
If an immersion heater has been installed, this is also shut down.

Maintenance (cont.)

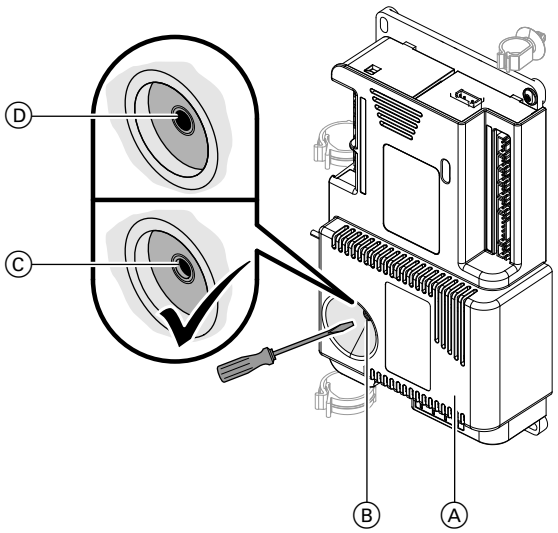

Fig. 30

Ⓐ Heat pump control unit
Ⓑ Reset button:
  Ⓒ Button shown at bottom: Reset
  Ⓓ Button shown at top: Locked out

1. Switch off the power supply to the system (e.g. at a separate fuse or mains isolator).
2. Remove the front cover. See Fig. 27, page 40.
3. Press the button with a screwdriver to reset.
4. Fit the front cover with an earth cable.
5. Switch on the power supply.
   Note
   If the DHW heat pump high limit safety cut-out locks out several times in a row, replace heat pump control unit Ⓐ.

Replacing the heat pump control unit

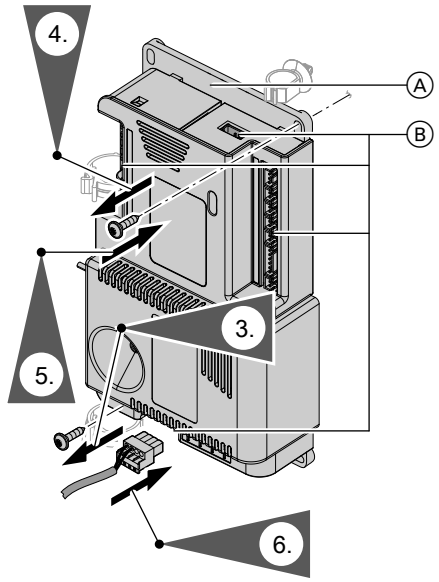

Fig. 31

1. Switch off the power supply to the system (e.g. at a separate fuse or mains isolator).
2. Remove the front cover. See Fig. 27, page 40.
3. Disconnect all cables Ⓑ from heat pump control unit Ⓐ.
5. Fit the new heat pump control unit.
6. Connect the cables to the heat pump control unit.
7. Fit the front cover with an earth cable.
8. Switch on the power supply.
9. Set the parameters again.

Draining the DHW cylinder from the DHW side

1. Shut off the cold water supply. See page 9.
2. Open the DHW draw-off points to release pres-sure.
3. Drain the DHW cylinder from the drain valve in the cold water supply.

Maintenance (cont.)

Overview of internal components

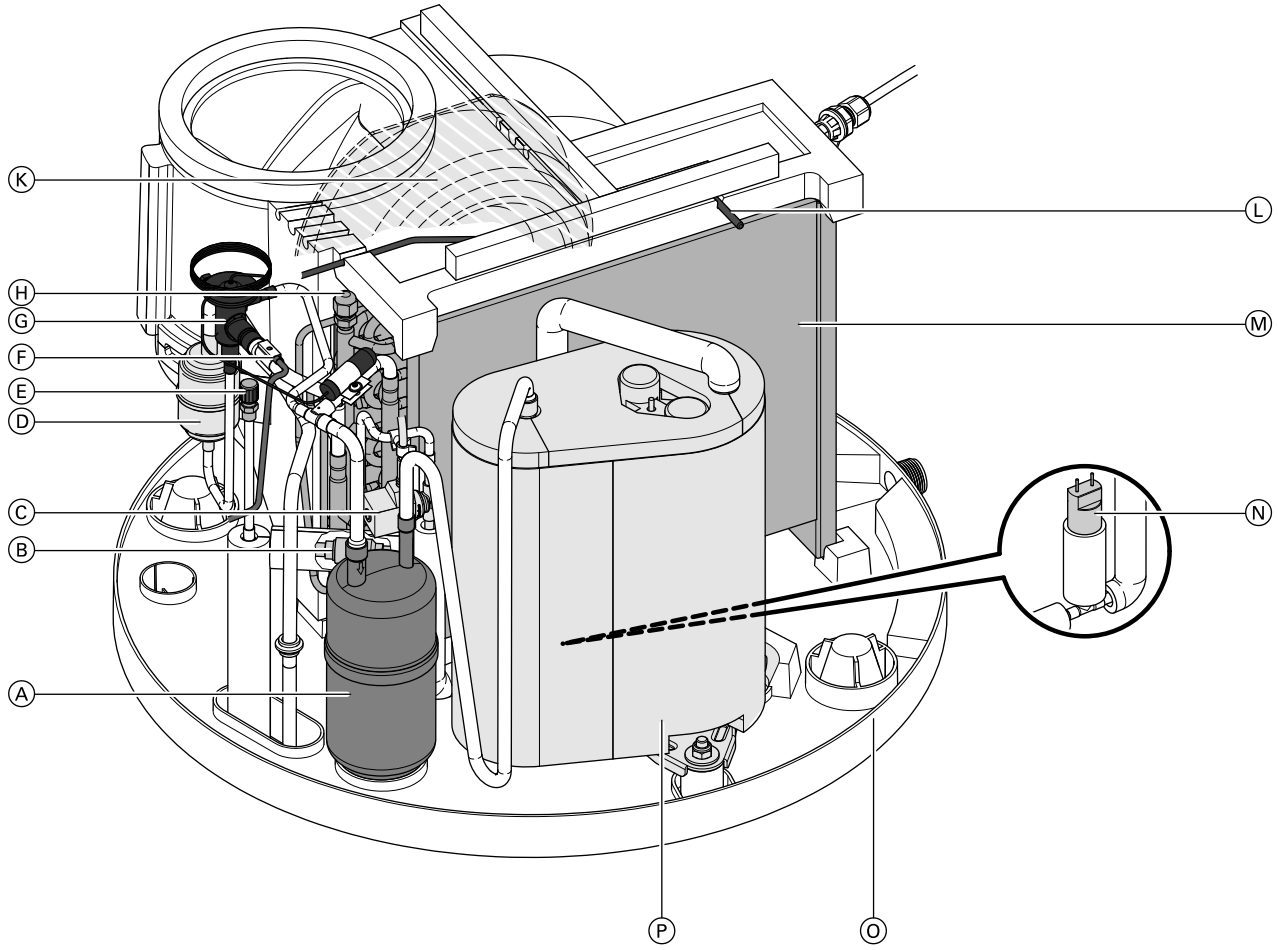

Fig. 32

Ⓐ Liquid separator
Ⓑ Non-return valve
Ⓒ Diverter valve, defrosting
Ⓓ Filter dryer
Ⓔ Schrader valve, high pressure side
Ⓕ Evaporator temperature sensor
Ⓖ Thermostatic expansion valve
Ⓗ Schrader valve, low pressure side
Ⓚ Fan
Ⓛ Air intake temperature sensor
Ⓜ Evaporator
Ⓝ Safety high pressure switch
Ⓞ Condensate pan (PP base with fitted hose nozzle)
Ⓟ Compressor

Note
For cylinder temperature sensor positioning, see "Overview of connections" on page 9.

Maintenance (cont.)

Checklist for maintenance work

Note

- *When working on the refrigerant circuit, contractors must be able to present a certificate of competence from the accreditation body for industry. This certificate confirms the safe handling of refrigerants by means of a standard industry procedure.*
- *Service work must be carried out in accordance with the manufacturer's instructions. If maintenance or servicing work requires the assistance of additional personnel, all work must be supervised by the trained contractor.*
- *Before working on the appliance with flammable refrigerants, the following safety checks must be carried out:*

	Measure	Completed	Comments
1	**General working environment** Inform the following persons of the type of work to be carried out: ▪ All maintenance personnel ▪ All persons in the vicinity of the system. ▪ Shut off the area surrounding the heat pump. ▪ Survey the immediate surroundings of the heat pump for flammable materials and sources of ignition. Remove all flammable materials and sources of ignition.	☐	
2	**Checking for the presence of refrigerant** In order to recognise a flammable atmosphere in time: ▪ Before, during and after the work, check the surrounding area for any escaping refrigerant, using a refrigerant detector suitable for R1234ze. This refrigerant detector must not generate any sparks and must be suitably sealed.	☐	
3	**Fire extinguisher** A CO_2 or powder extinguisher must be to hand in the following cases: ▪ Refrigerant is being topped up. ▪ Welding or brazing/soldering work is being carried out.	☐	

Maintenance (cont.)

	Measure	Completed	Comments
4	**Sources of ignition** ▪ When carrying out work on a refrigerant circuit that contains or previously contained flammable refrigerant, never use sources of ignition that could ignite the refrigerant. Remove all possible sources of ignition, including cigarettes, from the area where installation, repair, dismantling or disposal work is taking place that may result in refrigerant escaping. ▪ Before starting work, survey the immediate surroundings of the DHW heat pump for flammable materials and sources of ignition: Remove all flammable materials and sources of ignition. ***Note*** *The refrigerant R1234ze is considered to be mildly flammable and is **not** flammable at ambient temperatures of < 30 °C. It requires a large amount of energy for ignition and combustion.* *Example: For the refrigerant R1234ze, ignition energy of > 61000 MJ is required at 54 °C. With the refrigerant propane, the ignition energy is 0.25 MJ at 20 °C.*	☐	
5	**Ventilating the work location** ▪ Carry out repairs outdoors, or provide adequate ventilation for the work location before interfering with the refrigerant circuit or commencing any welding or brazing/soldering work. ▪ The ventilation must be maintained for the entire duration of the work. The ventilation should dilute any refrigerant that may escape and should ideally discharge it to atmosphere.	☐	
6	**Checking the refrigeration system** ▪ Any replacement electrical components must be suitable for the application and must correspond to the manufacturer's specification. Only replace faulty components with genuine Toshiba spare parts. ▪ Carry out all component replacements in accordance with Toshiba guidelines. If necessary, consult Toshiba Werke Technical Service. Perform the following checks: ▪ The refrigerant charge must not be greater than permitted for the installation room. ▪ Check the function of the ventilation system. The ventilation apertures must not be blocked or obstructed. ▪ If a hydraulically separated system is used, check the secondary circuit for the presence of any refrigerant. ▪ Labels and symbols must always be clearly visible and legible. Replace any illegible information. ▪ Refrigerant lines and components must be installed in such a manner that they do not come into contact with substances that can cause corrosion. Exception: The refrigerant lines are made from corrosion-resistant materials or are reliably protected against corrosion.	☐	

Maintenance (cont.)

	Measure	Completed	Comments
7	**Checks on electrical components** ▪ Safety checks must be carried out for maintenance and repair work on electrical components: See below. ▪ In the event of a safety-related fault, do not connect the system until the fault has been remedied. If it is not possible to remove the fault immediately, provide a suitable interim solution for the system's operation if required. Inform the system operator. Carry out the following safety checks: ▪ Discharge the capacitors: Ensure no sparks are created when discharging. ▪ Do not position any live electrical components or cables in the immediate vicinity of the appliance when filling or extracting refrigerant or when flushing the refrigerant circuit. ▪ Check the earth connection.	☐	
8	**Repairs to sealed enclosures** ▪ When carrying out work on sealed components, fully isolate the appliance from the power supply, also before removing sealed covers. ▪ Pay special attention to ensuring that any work on electrical components does not lead to any changes to the enclosures that would affect their protective properties. This includes damage to leads, too many connections on a single terminal, connections that do not correspond to the manufacturer's specification, damage to seals, as well as incorrect installation of cable entries. ▪ Ensure the appliance is correctly installed. ▪ Check that the seals have settled. Ensure by checking that the seals reliably prevent the ingress of a flammable atmosphere. Replace faults gaskets. ! **Please note** Silicone as a sealant can affect the function of leak detection devices. Do not use silicone as a sealant. ▪ Spare parts must correspond to the manufacturer's specifications. ▪ Work on components which are suitable for flammable atmospheres: It is not imperative that these components are isolated from the power supply.	☐	
9	**Repairs on components that are suitable for flammable atmospheres** ▪ Do not connect any continuous capacitive or inductive loads to the appliance, unless it has been ensured that the permissible voltages and currents are not exceeded. ▪ In areas where flammable atmospheres exist, only apply voltage to components which are suitable for flammable atmospheres. ▪ Only use original or approved parts. Other parts may result in refrigerant becoming ignited in the event of a leak.	☐	

Maintenance (cont.)

	Measure	Completed	Comments
10	**Check wiring** ▪ Check whether the wiring is subject to wear, corrosion, tension, vibration, sharp edges or other unfavourable environmental influences. ▪ When checking, also take into account the effects of ageing and continuous vibration on the compressor and fans.	☐	
11	**Refrigerant detectors** ▪ On no account use possible sources of ignition for refrigerant detection or leak detection. ▪ Flame leak detectors or other detectors with open flames must not be used.	☐	
	Leak detection The following leak detection processes are suitable for systems with flammable refrigerants: Leak detection with electronic refrigerant detectors: ▪ Electronic refrigerant detectors may not have the required sensitivity or may need to be calibrated to the relevant range. Carry out the calibration in refrigerant-free surroundings. ▪ The refrigerant detector must be suitable for the R1234-ze refrigerant to be detected. ▪ The refrigerant detector must not contain any potential sources of ignition. Calibrate the refrigerant detector to the refrigerant used. Set the response threshold to < 3 g/a. Leak detection with liquid leak detectors: ▪ Liquid leak detectors are suitable for use with most refrigerants. ! **Please note** Liquid leak detectors containing chlorine may react with the refrigerant. This could result in corrosion. Do not use liquid leak detectors that contain chlorine. Measures to take if a leak in the refrigerant circuit occurs: ▪ Immediately extinguish all open flames in the vicinity of the heat pump. ▪ If brazing/soldering work needs to be undertaken to remedy the leak, always extract all the refrigerant from the refrigerant circuit. ▪ Purge the site to be brazed/soldered before and during the brazing/soldering work with oxygen-free nitrogen.	☐	

Maintenance (cont.)

	Measure	Completed	Comments
13	**Refrigerant extraction and evacuation** If work is carried out on the refrigerant circuit for repair or other reasons, standard procedures should be followed. In general, special care must be taken with regard to the flammability of the refrigerant. The following procedure should always be followed: 1. Extract refrigerant. 2. Purge refrigerant circuit with inert gas. 3. Evacuate. 4. Purge again with inert gas. 5. Open the refrigerant circuit by cutting or soldering/ brazing. The refrigerant must be extracted into a suitable recovery bottle. The refrigerant circuit must be purged with nitrogen to ensure safety. This process may have to be repeated several times. Compressed air or oxygen must never be used for this purpose. The purging process should be carried out by breaking the vacuum with oxygen-free nitrogen and increasing the pressure up to operating pressure. Afterwards the overpressure is released and evacuated. This process must be repeated until there is no more refrigerant in the circuit. After the last purging process, the pressure in the system must be released down to atmospheric pressure. This is especially important if brazing/soldering work is to be carried out on the refrigerant circuit. It must be ensured that the vacuum pump outlet is routed into a well ventilated area and that there is no ignition source nearby.	☐	
14	**Refilling the refrigerant circuit** In addition to the usual filling procedure, the following requirements must be met: ▪ Ensure that the filling valves are not used for different refrigerants. Hoses should be as short as possible to minimise the amount of refrigerant they contain. ▪ Refrigerant bottles must remain in an upright position. ▪ Ensure that the refrigerant circuit is earthed before filling. ▪ The appliance must be labelled (if it was not already labelled) when the filling process is finished. ▪ Special care must be taken not to overfill the appliance. Before filling the appliance, carry out a pressure test with nitrogen. The leak test can be performed on the filled appliance, but must be carried out before commissioning. Before leaving the system, a final leak test must be carried out	☐	

Maintenance (cont.)

	Measure	Completed	Comments
15	**Shutdown** For a shutdown, it is particularly important that the technician is well acquainted with all the details of the disposal equipment. It is recommended that all refrigerants are recovered. Before disposal, oil and refrigerant samples must be taken if the refrigerant is to be treated. It is important that electricity is available where the work is to be carried out. 1. Familiarise yourself with the equipment and how it works. 2. Disconnect the system from the power supply. 3. Before starting the disposal procedure, ensure that: ▪ Mechanical aids are available for the transport of refrigerant bottles, if necessary. ▪ Personal protective equipment is available and is used correctly. ▪ The extraction process is constantly monitored by a trained person. ▪ The disposal station and refrigerant bottles comply with the relevant regulations 4. Perform a pump-down cycle if possible. 5. If a vacuum cannot be achieved, use a manifold to remove refrigerant from all parts of the system. 6. Ensure that the refrigerant bottle is on the scales before starting extraction. 7. Switch on the disposal equipment and proceed according to the manufacturer's instructions. 8. Ensure that recovery bottles are not overfilled (not more than 80 % of the liquid level). 9. Never exceed the permissible operating pressure of the recovery bottle, even for a short time. 10. When the recovery bottles have been correctly filled and the process is complete, ensure that the bottles and equipment are removed from the system immediately and that all shut-off valves are closed. 11. Recovered refrigerant must not be used in other systems before it has been cleaned and inspected.	☐	

Maintenance (cont.)

	Measure	Completed	Comments
16	**Identification (labelling the heat pump)** If the heat pump has been taken out of use, affix a clearly visible identification label to the heat pump, showing the date, signature and the following information: ▪ Refrigerant is flammable (A2L). ▪ System has been taken out of use. ▪ Refrigerant has been extracted.	☐	
17	**Recovering refrigerant and compressor oil** To ensure the safe extraction of refrigerant during repairs or shutdown, observe the following points: ▪ If the refrigerant is put into bottles, ensure that only suitable refrigerant bottles are used. Ensure that sufficient refrigerant bottles are available for the charge of the system. All refrigerant bottles used must be designed for the refrigerant to be extracted and labelled accordingly (i.e. special recovery bottles for the recovery of refrigerant). ▪ The refrigerant bottles must have a safety valve and permanently mounted shut-off valves, and be in good condition. ▪ Empty recovery bottles are evacuated and should be cooled before the extraction process if possible. ▪ The disposal equipment must be suitable for the recovery of flammable refrigerants. ▪ Instructions on the individual steps of the recovery procedure must be included with the equipment. In addition, calibrated scales must be available. The hoses must be equipped with leak-free couplings. ▪ Before the disposal equipment is used, check that the maintenance intervals have been observed and that associated electrical equipment is sealed to prevent ignition in the event of a refrigerant leak. In case of doubt, consult the manufacturer. ▪ The recovered refrigerant must be returned to the supplier in a proper recovery bottle. Refrigerants must not be mixed in refrigerant bottles. ▪ If compressors or compressor oil are to be disposed of, ensure that they have been evacuated with sufficient negative pressure. This process may only be accelerated by electrical heating of the compressor housing.	☐	

Checking the temperature sensors

Sensor	Test element
Top cylinder temperature sensor (L or XL profile)	NTC 50 kΩ
Cylinder temperature sensor (external heat generator, only for ENHMV-E)	NTC 10 kΩ
Bottom cylinder temperature sensor	NTC 50 kΩ
Air intake temperature sensor	NTC 50 kΩ
Evaporator temperature sensor	NTC 50 kΩ

1. Disconnect the sensor. Measure the resistance.

Maintenance (cont.)

2. Compare the test result with the actual temperature. See page 36.
If there is considerable deviation, check the installation. Replace sensor if necessary.

NTC 10 kΩ (marked blue)

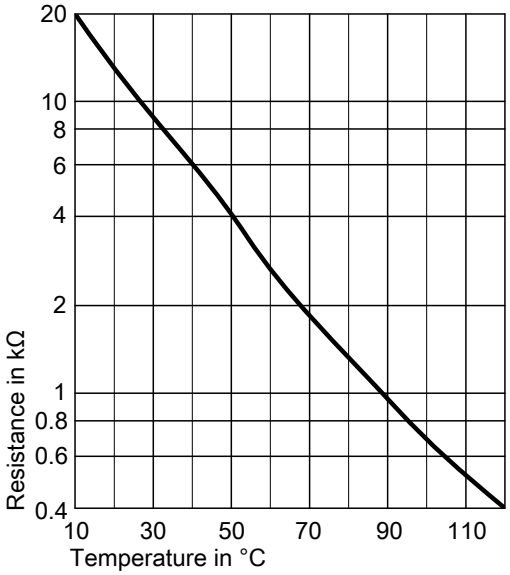

Fig. 33

NTC 50 kΩ

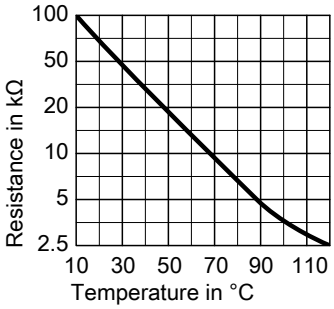

Fig. 34

Connection and wiring diagram

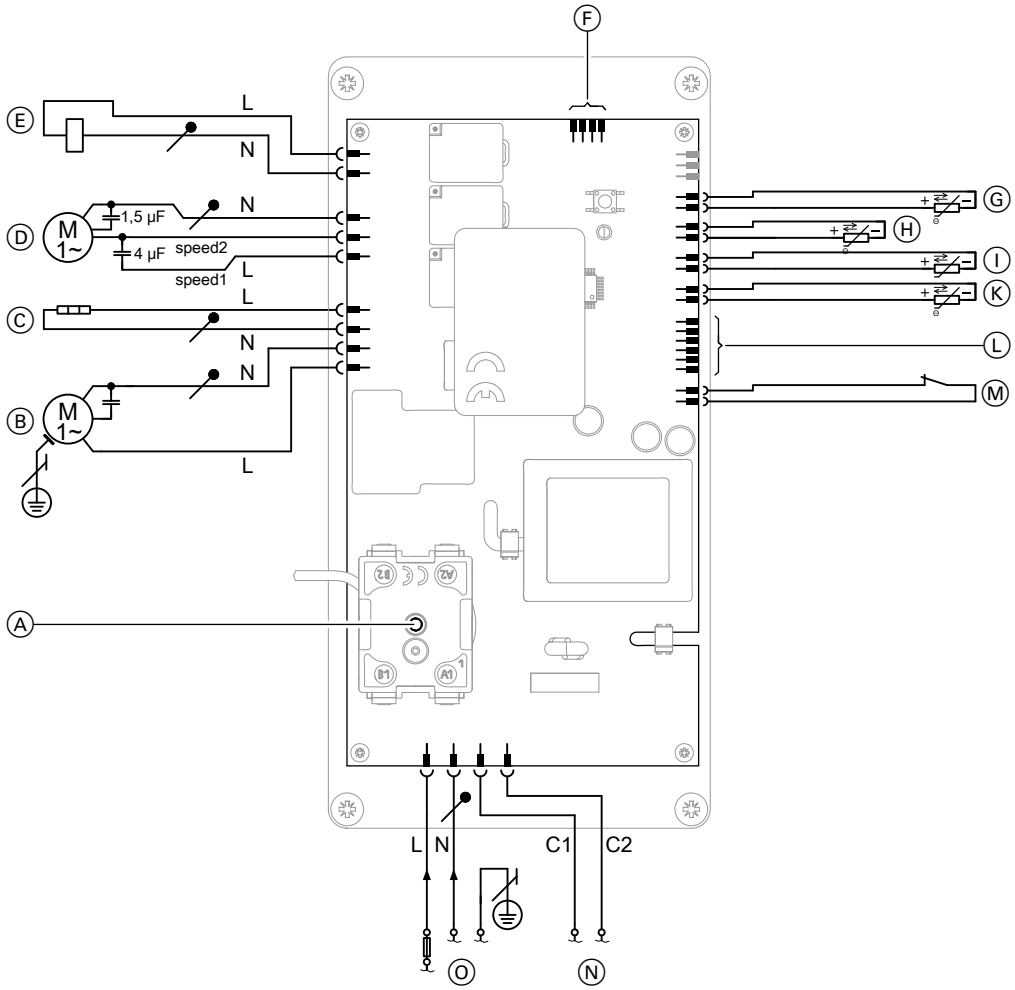

Fig. 35

Ⓐ High limit safety cut-out reset button, DHW heat pump
Ⓑ Compressor
Ⓒ Immersion heater EHT
or
External heat generator with switching relay
Ⓓ Switching output for fan
Speed 1 Slow (speed 1)
Speed 2 Fast (speed 2)
Ⓔ Diverter valve, defrosting
Ⓕ Connection for floating switching contact of a photovoltaic system (accessory – "Smart Grid connection set" connecting cable with plug)
Ⓖ Top cylinder temperature sensor (NTC 50 kΩ), L = 750 mm (NTC1)
Ⓗ Air intake temperature sensor (NTC 50 kΩ), L = 1500 mm (NTC2)
Ⓘ Bottom cylinder temperature sensor (NTC 50 kΩ, L= 1150 mm (NTC3)
Ⓚ Evaporator temperature sensor (NTC 50 kΩ), L = 1000 mm (NTC4)
Ⓛ Programming unit connection
Ⓜ Switching output for safety high pressure switch
Ⓝ Premium/economy tariff
230 V~ Economy tariff
0 V~ Premium tariff
Ⓞ Internal power supply

Connection and wiring diagram (cont.)

Power supply with premium/economy tariff signal

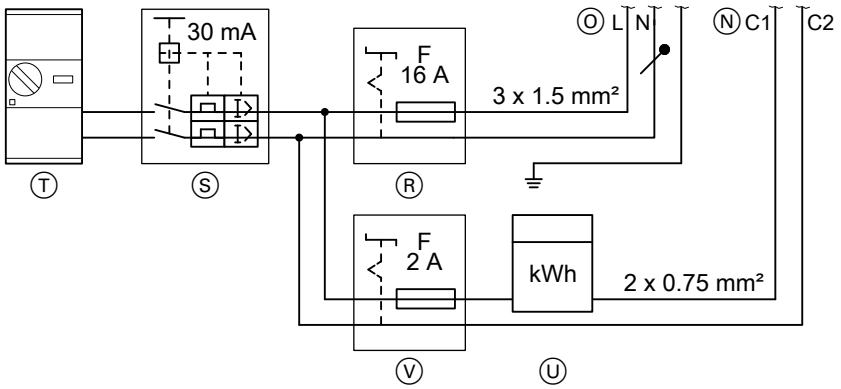

Fig. 36

Ⓞ Internal power supply
Ⓡ MCB 16 A
Ⓢ RCD
Ⓣ Mains isolator
Ⓤ Connection for tariff changeover on electricity meter
Ⓥ MCB 2 A

Power supply without premium/economy tariff signal

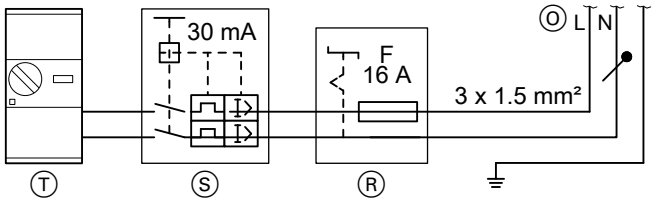

Fig. 37

Ⓞ Internal power supply
Ⓡ MCB 16 A
Ⓢ RCD
Ⓣ Mains isolator

Reports

	Commissioning	Maintenance/service	Maintenance/service
Date:			
By:			

	Maintenance/service	Maintenance/service	Maintenance/service
Date:			
By:			

	Maintenance/service	Maintenance/service	Maintenance/service
Date:			
By:			

	Maintenance/service	Maintenance/service	Maintenance/service
Date:			
By:			

	Maintenance/service	Maintenance/service	Maintenance/service
Date:			
By:			

Specification

HWS-G2501		CNHMV-E		ENHMV-E	
Draw-off profile		**L**	**XL**[*1]	**L**	**XL**[*1]
Performance data for outdoor air mode to EN 16147:2011 at A7/W10-53 (air intake temperature 7 °C/room temperature 20 °C)					
Coefficient of performance ε (COP_{DHW})		3.23	3.37	3.23	3.37
Heat-up time	h:min	10:00	10:00	10:00	10:00
Standby loss (Pes)	W	23	25	23	25
Max. available amount of water (40 °C)	l	329.5	351.0	329.5	351.0
Performance data for recirculation air mode and recirculation air mode with air discharge to the outside to EN 16147:2011 at A7/W10-53 (air intake temperature 7 °C/room temperature 7 °C)					
Coefficient of performance ε (COP_{DHW})		2.88	3.00	2.88	3.00
Heat-up time	h:min	11:00	11:35	11:00	11:35
Standby loss (Pes)	W	33	35	33	35
Max. available amount of water (40 °C)	l	324.5	355.0	324.5	355.0
Performance data for recirculation air mode and recirculation air mode with air discharge to the outside to EN 16147:2011 at A15/W10-53 (air intake temperature 15 °C/room temperature 15 °C)					
Coefficient of performance ε (COP_{DHW})		3.33	3.50	3.33	3.50
Heat-up time	h:min	07:39	08:15	07:39	08:15
Standby loss (Pes)	W	22	24	22	24
Max. available amount of water (40 °C)	l	335.0	362.0	335.0	362.0
Application limits (air intake temperature)	°C	–5 to +35			
Continuous output for DHW heating from **10 to 45 °C** in conjunction with an external heat generator with corresponding output and a heating water flow rate of 3.0 m^3/h					
▪ **Heating water** flow temperature 90 °C	kW	—	—	40	40
	l/h	—	—	982	982
▪ **Heating water** flow temperature 80 °C	kW	—	—	32	32
	l/h	—	—	786	786
▪ **Heating water** flow temperature 70 °C	kW	—	—	25	25
	l/h	—	—	614	614
▪ **Heating water** flow temperature 60 °C	kW	—	—	17	17
	l/h	—	—	417	417
▪ **Heating water** flow temperature 50 °C	kW	—	—	9	9
	l/h	—	—	221	221

*[*1] Self-reported values.*

Specification (cont.)

HWS-G2501		CNHMV-E		ENHMV-E	
Draw-off profile		**L**	**XL**[*1]	**L**	**XL**[*1]
Electrical values					
Max. power consumption					
▪ With immersion heater EHT (accessory for ENHMV-E, standard delivery for CNHMV-E)	kW	2.25	2.25	2.25	2.25
▪ Without immersion heater EHT	kW	—	—	0.75	0.75
Power consumption of the heat pump	kW	0.425	0.425	0.425	0.425
Power consumption of immersion heater EHT (accessory for ENHMV-E, standard delivery for CNHMV-E	kW	1.5	1.5	1.5	1.5
Rated voltage (with and without immersion heater EHT)		1/N/PE 230 V/50 Hz			
Rated current					
▪ With immersion heater EHT	A	9.8	9.8	9.8	9.8
▪ Without immersion heater EHT	A	1.84	1.84	1.84	1.84
Fuse rating	A	16	16	16	16
Refrigerant circuit					
Refrigerant		R1234-ze (E)		R1234-ze (E)	
Refrigerant type		HFO (hydrofluoroolefins)		HFO (hydrofluoroolefins)	
Safety group		A2L		A2L	
▪ Refrigerant charge	kg	1.35		1.25	
▪ Global warming potential (GWP)		7		7	
▪ CO_2 equivalent	kg	9.45		8.75	
Permissible operating pressure	bar	25		25	
	MPa	2.5		2.5	
Heating mode					
Max. air flow rate, free-blowing					
▪ Speed 1 (slow)	m^3/h	331	331	331	331
▪ Speed 2 (fast)	m^3/h	375	375	375	375
Integral DHW cylinder					
Material		Enamelled steel			
Capacity	l	254	254	246	246
Capacity of lower indirect coil	l	—	—	6.5	6.5
Max. permissible DHW temperature	°C	65	65	65	65
Max. permissible DHW temperature with immersion heater EHT	°C	65	65	65	65
Max. achievable DHW temperature in conjunction with photovoltaic system	°C	62	62	62	62
Max. permiss. operating pressure	bar	8	8	8	8
	MPa	0,8	0,8	0,8	0,8
Heat exchanger					
Heat exchanger surface area	m^2	—	—	1	1
Capacity of lower indirect coil	l	—	—	6.5	6.5
Max. permiss. operating pressure	bar	—	—	6	6
	MPa	—	—	0.6	0.6
Max. connectible aperture area, flat-plate collectors	m^2	—	—	4.6	4.6
Max. connectible aperture area, tube collectors	m^2	—	—	3	3
Minimum room volume for recirculation air mode	m^3	20	20	20	20

[*1] *Self-reported values.*

Specification (cont.)

HWS-G2501		CNHMV-E		ENHMV-E	
Draw-off profile		**L**	**XL**[*1]	**L**	**XL**[*1]
Max. pressure drop in the air ductwork for recirculation air mode with air discharge to the outside and outdoor air mode	mbar kPa	1 0.1	1 0.1	1 0.1	1 0.1
Dimensions					
▪ Length	mm	734	734	734	734
▪ Width (∅)	mm	634	634	634	634
▪ Height	mm	1780	1780	1780	1780
Height when tilted	mm	1880	1880	1880	1880
Weight	kg	110	110	125	125
Connections (male thread)					
Cold water, DHW	R	¾	¾	¾	¾
DHW circulation	R	¾	¾	¾	¾
Flow/return of external heat generator/solar collector	G	—	—	1	1
Condensate drain (∅)	mm	20	20	20	20
Sound power level L_W in recirculation air mode and recirculation air mode with air discharge to the outside (tested with reference to EN 12102/EN ISO 9614-2, accuracy category 2) Maximum A-weighted total sound power level inside the installation room	dB(A)	56	56	56	56
Sound pressure level L_W in recirculation air mode and recirculation air mode with air discharge to the outside (with directivity Q = 2 and distance 3 m)	dB(A)	38	38	38	38
Sound power level L_W in outdoor air mode (tested with reference to EN 12102/EN ISO 9614-2, accuracy category 2) Maximum A-weighted total sound power level inside the installation room					
▪ Inside	dB(A)	50	50	50	50
▪ Outside	dB(A)	64	64	64	64
Sound pressure level L_W in outdoor air mode (with directivity Q = 2 and distance 3 m)					
▪ Inside	dB(A)	32	32	32	32
▪ Outside	dB(A)	46	46	46	46
Energy efficiency class to Commission Regulation (EU) No 812/2013					
DHW heating			A+		A+

Information on continuous output of internal indirect coil

When designing systems with the specified or calculated continuous output, allow for a matching circulation pump.

*[*1] Self-reported values.*

Final decommissioning and disposal

The products can be recycled. Components and substances from the system are not part of ordinary household waste.

For decommissioning, isolate the system from the power supply and allow components to cool down where appropriate.
Dispose of all components correctly.

Keyword index

Keyword index (cont.)