SOLVIS

Installation

SolvisBen (Gas/Oil/Hybrid)

Solar and heating buffer storage tank

- Including gas or oil burner
- Hybrid-Option
  with Solvis heating pump

Wärme. Leben. Zukunft.

1 Information About These Instructions

These instructions are intended for you as a technician from an installation company. You will find the specifications for installation, start-up and maintenance of the system here.
Please keep these instructions with the system so they can be referred to when necessary.
We recommend that you participate in a Solvis training course to ensure safe and proper installation.
As we are interested in improving our technical documentation, we appreciate feedback of any kind.

Copyright

A list of our international representatives is provided at www.solvis.com.
Please understand that the telephone numbers are reserved for use by our installers.
Interested system operators should contact their installer.

Symbols used

DANGER
Immediate danger, with serious health consequences and even death.

WARNING
Danger, with potentially serious health consequences.

CAUTION
Possible risk of moderate or light injury.

CAUTION
Risk of damage to unit or system.

Useful information, notes and work tips.

Change of document, referring to another document.

Energy-saving tip with suggestions on how to save energy. This reduces costs and helps protect the environment.

Contents

2 Safety Notes

DANGER

Observe the safety notes

This is primarily for your own safety.

- Make sure that you are familiar with the safety notes before beginning work.
- Observe and adhere to the applicable safety regulations and accident prevention regulations.

2.1 General Information

Work to be performed by qualified technicians

- Only trained specialist companies may install or maintain the system.
- Only qualified electricians may work on electrical equipment.

CAUTION

Observe instructions

Solvis is not liable for any damage resulting from non-observance of these instructions.

- Read the instructions carefully before operating or installing the system.
- Contact our Technical Sales department if you have any questions.

CAUTION

Do not make any unauthorised modifications

Otherwise, there is no guarantee that the system will function correctly.

- You must not make any changes to the components of the unit.
- Only use original spare parts.

DANGER

Make sure that the intake chamber is air-tight.

Risk of suffocation

- For the cable routing from the intake chamber, use only its designated opening.
- Ensure that the cover is seated correctly, the sealing gap must be closed.
- Ensure that the sealing sleeve for the cable bushing is seated correctly.
- Any measures taken by the customer must not impinge the leak tightness of the intake chambers.

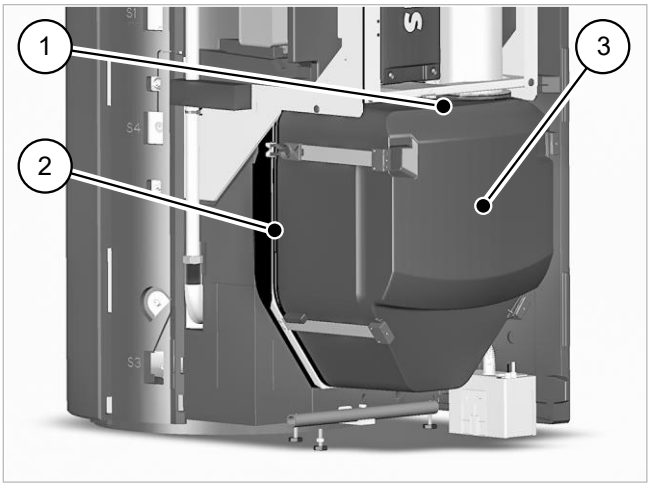


Fig. 1: SolvisBen intake chamber

1 *Sealing sleeve*
2 *Sealing gap*
3 *Suction chamber cover*

2.2 Regulations

Observe the following regulations

- DIN EN 12828 Heating systems in buildings
- DIN EN 1717 Protection of drinking water
- DIN 1988-100 Technical rules for drinking water installations (TRWI)
- DIN EN 806 Technical rules for drinking water installations
- VDI 2035 Sheet 1 Prevention of damage in hot water heating systems - stone formation and water-side corrosion
- Guidelines of the German Institute for Building Technology
- State building regulations (LBO)
- VDE 0100/IEC 60364 Installation of low-voltage systems
- Low Voltage Directive 2006/95/EC.
- DIN EN 13384-1: Chimneys – thermal and fluid dynamic calculation methods
- German State Firing Ordinance (FeuVO)
- DIN EN 13384-1: Chimneys – thermal and fluid dynamic calculation methods
- Local discharge regulations
- ATV A 115 Notes for discharging waste water
- ATV M 251 Discharging condensate water

Only SolvisBen Oil

- Technical Regulations for Oil Systems (“Technische Regeln Ölanlagen” - TRÖl)

Only SolvisBen Gas

- German technical rules for gas installation (TRGI) and, if necessary, technical rules for liquid gas (TRF)
- Gas appliances directive 2009/142/EC (until 20 Apr 2018)
- Gas appliances directive 2016/426/EU (from 21 Apr 2018).

3 System Versions

These instructions describe the following versions of the SolvisBen:

- as a gas condensing boiler SolvisBen Gas in 4 output levels: 10, 18, 25 or 30 kW
- as an oil condensing boiler SolvisBen oil in 2 output levels: 17 and 23 kW
- as a combined heat pump/gas condensing boiler SolvisBen Hybrid Gas with heat pump SolvisLea, SolvisLea 8.3 Premium, SolvisLea Pro or SolvisPia (or SolvisBen Hybrid-VSG with heat pump SolvisLea Eco or SolvisMia) and gas burner in 4 output levels: 10, 18, 25 or 30 kW
- as a combined heat pump/oil condensing boiler SolvisBen Hybrid Oil with heat pump SolvisLea, SolvisLea 8.3 Premium, SolvisLea Pro or SolvisPia (or SolvisBen Hybrid-VSG with heat pump SolvisLea Eco or SolvisMia) and oil burner in 2 output levels: 17 and 23 kW

The following versions are also available:

- as SolvisBen Solo for connecting external heat generators (various gas or oil burners can be retrofitted at a later date)
- as SolvisBen WP for connecting the SolvisLea or SolvisLea 8.3 Premium air-to-water heat pump
- as SolvisBen WP-HPT-VSG with integrated heating cartridge for connecting the SolvisLea Eco, SolvisLea Pro, SolvisMia or SolvisPia 13/SolvisPia 17 air-to-water heat pumps
- as SolvisBen WP PIA with integrated heating cartridge for connecting the SolvisPia 12 air-to-water heat pump.

see ➔ *Installation SolvisBen WP / Solo (MAL-BEN-LI-SL-WP)*

The WWS-30 is used as an integrated hot water station.

Further combination options are available:

- with integrated heating circuit station HKS-G-4.0 for a mixed heating circuit with the Wilo PARA 15/6 heating circuit pump
- without integrated heating circuit station, for combination with our wall-mounted heating circuit stations, HKS-xx, for up to 3 heating circuits

4 Scope of Delivery

SolvisBen Gas / Oil / Hybrid

Pre-assembled:

- Storage tank with:
  - Integrated combustion chamber,
  - Intake chamber,
  - Solar stratified charger (self-regulating, maintenance-free)
  - Charging lance for the heating circuit return flows
  - Socket for the optional installation of an electrical heating element
  - Lower transport handle
  - Adjustable container feet to compensate for uneven flooring
- Hot water station,
  WWS-30 (number of plates of the heat exchanger: 40 plates and an adapted version of the thermal mixing valve)
- Integrated heating safety valve, reaction pressure of 3 bar
- SolvisControl 3 system controller with mains circuit board and main switch
- **SolvisBen with integrated heating circuit stations plus**: HKS-G-4.0 mixed heating circuit station with pump, three-way mixing valve and thermometer ball valve
- **SolvisBen Hybrid and Hybrid VSG plus**:
  - Integrated three-way switching valve for heating/HW operation with Solvis heating pumps
  - Piping for connecting the flow and return flow of Solvis heating pumps
  - SmartGrid connection box
  - Modbus connection box *(only if PLAS-WP-WM with Allengra sensor and integrated Modbus connection box is not installed)*
  - Buffer charging station *(included)*
  - Sludge separator *(included)*
  - *Only Hybrid VSG:* combined volume flow/temperature sensor in heating pump flow.

Included:

- Multi-part removable heat insulation casing
- Storage tank sensor cable tree
- Corrugated pipe and connection group with cap valve, boiler filling and emptying valve and gauge for a heating expansion vessel
- Assembly pack (with seals, outdoor sensor, attachment material, etc.)
- Systems folder including commissioning and maintenance book, SC-3 operation (customer), product data sheets
- Installation instructions

SolvisBen Gas and Hybrid Gas plus:

- Modulating gas condensing system with flexible gas connection, burner cable, fixing nuts, burner sealing cord and safety temperature limiter (eSTL)
- Accessories for condensing boiler: flue gas connection elbow with siphon and condensate hose, gas pipe, gas appliance tap and boiler brush.

SolvisBen Oil and Hybrid Oil plus:

- Two-level oil condensing system with flexible oil line, burner plug, fixing nuts, burner sealing cord and safety temperature limiter (eSTL)
- Condensing boiler accessories: flue gas connection elbow with siphon and condensate hose, fine oil filter with vacuum gauge, installation pack (seals, fixing materials, socket strips etc.), reflection silencer and boiler brush.


All accessories are listed in the ➔ *Solvis price list*.

5 Installation Conditions and Transport

CAUTION

Prevent corrosive particles in the air

Otherwise, they may cause damage to or even the total failure of the system

- Keep the combustion air and the air in the installation room free from dust and corrosive particles such as those found in propellants, solvents, cleaning agents, and so on.

CAUTION

Risk due to the heavy weight of the system

Risk of damage to the system and building

- Make sure that the floor has sufficient load bearing capacity to support the operating weight of the system (approx. 350 kg).

WARNING

Danger due to heavy transport weight (> 100 kg)

Personal injury or damage to property.

- **Carry the device only using the two transport handles!**
- Protect the attached frame panel with the control and stations from damage during transport.
- Do not lift the device at the attached frame panel.

Fig. 2: Carrying the SolvisBen

In particularly narrow spaces, you can remove the attached frame panel (for more information, see ➔ TNF-EST-BEN (exploded drawing).

Maintain the following conditions:

Storage

- as delivered on pallet with outer packaging
- Store in a dry environment that is free of dust and frost
- Protect against damage caused by external influences.

Transport and installation site

- Carefully remove the outer packaging – do not use sharp objects
- Remove EPP insulation parts (front, side parts, cover parts, both rear container insulation sections, front and rear base section) and store temporarily in an environment protected against dust until installation
- Mount the transport handle (please order separately if necessary) on the upper, rear container eyelet
- A second transport handle is pre-fitted on the front container foot and is **not** removed following the installation
- Unscrew the container from the pallet.

Installation

- Floors must be level at the installation site (+/-1 cm).
- The system must only be installed and operated in a frost-proof room inside a building.
- The system must not be installed in damp rooms such as kitchens, bathrooms or laundry rooms.
- For ambient air-dependent operation, you require:
  - An adequately sized intake opening, with an open cross-section of at least 150 cm².
  - Air vents must not be obstructed or blocked.
  - The flow area and air connection for the combustion air must not be obstructed.

To prevent fluids from spilling (leakages), we recommend using a suitable draining option (floor drain). If the design makes this impossible, we recommend using a collecting tray; see the price list.

Observe the clearances.

- 0.5 m at the front (for operating and performing maintenance work)
- 15 cm on the side and to the rear (for removing the side insulation during maintenance)
- Based on the container (without insulation): ≥ 22 cm.
- 35 cm on the top from the cover

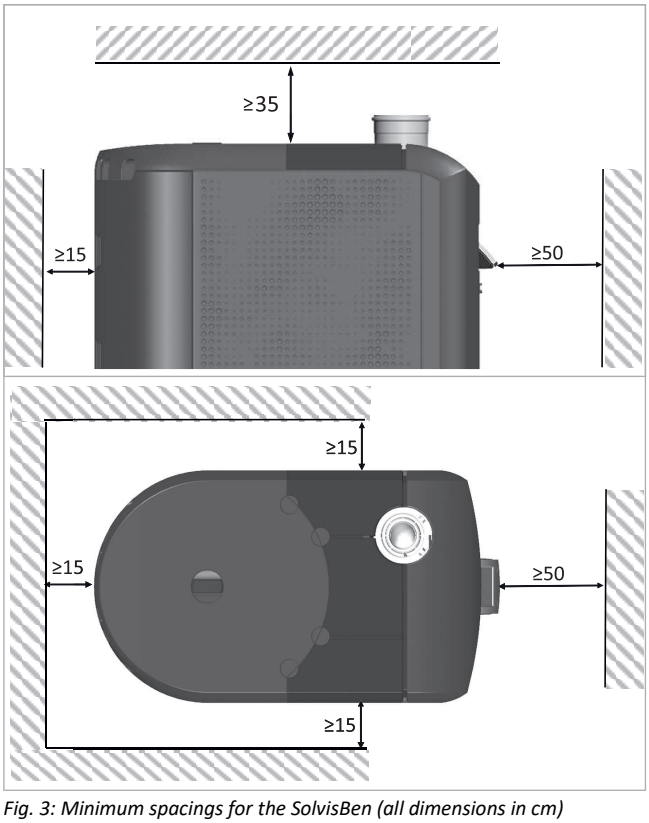


Fig. 3: Minimum spacings for the SolvisBen (all dimensions in cm)

6 Installation

6.1 Heating expansion vessel

IMPORTANT

Expansion vessel required for heating systems

- Depending on the heating water volume (incl. storage tank volume), the design must be selected generously in accordance with DIN EN 12828.
- The SolvisLea 8.3 Premium, SolvisLea Pro and SolvisPia heat pumps have an integrated safety valve with a response pressure of 2.5 bar. The heating expansion vessel (MAG) should always be designed with this value.
- When retrofitting, the design of an existing heating expansion vessel must be checked and changed if necessary.

CAUTION

Observe the admission pressure on the expansion vessel

- The admission pressure of the membrane expansion vessel must be set carefully in order to ensure safe and fault-free operation.
- Make sure no counterpressure can build up when setting the admission pressure (depressurise the system or open the cap and drain valve).

Set the expansion vessel admission pressure (MEV)

1. Determine the pre-pressure of the expansion vessel using the following formula: minimum 1.3 bar, maximum 1.7 bar.
2. Release the admission pressure on the expansion vessel valve or refill with nitrogen if necessary.

- Admission pressure too low:
  Risk of steam build-up and air intake increases.
- Admission pressure too high:
  Blow out via the safety valve when the maximum operating temperature is reached causes a risk of water loss and consequent pressure loss.

$$p_o = \frac{H_{Hk} - H_{Sp}}{10} + 0{,}3 \text{ [bar]} \qquad \text{(min. 1,3 bar)}$$

P_0 *Expansion vessel admission pressure [bar]*
H_R *Height of the highest point of the radiator [m]*
H_{St} *Height of the lower edge of the storage tank [m]*

Installing the expansion vessel

The selected membrane expansion vessel (**1**) (abbreviated as MEV) can be attached to the central connection on the underside of the container using the supplied corrugated pipe (**3**) and the MEV connection group (**2**).

1. Mount the supplied corrugated pipe and seal on the central bottom container connection and guide it backwards.
2. Bend the corrugated pipe 90° to the left or right to the MEV installation location.
3. Install the supplied MEV connection group and seal on the MEV connection.

The MEV connection group includes:
- Cap valve for MEV maintenance
- Boiler filling and emptying valve for filling and draining the system
- Manometer for monitoring system pressure

4. Connect the MEV connection group to the corrugated pipe and fasten the MEV.

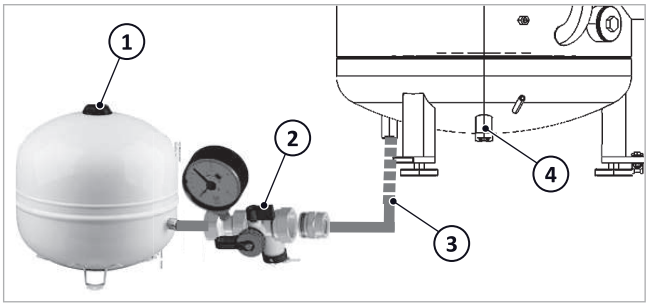


Fig. 4: MEV with connection group on the SolvisBen

1 *Membrane expansion vessel (MEV)*
2 *MEV connection group*
3 *Corrugated pipe*
4 *Solar flow (solar stratified charger)*

When installing the system:
- Install the MEV connection group in such a way that the manometer is easy to read and the group is easily accessible for maintenance work.
- If the MEV connection group cannot be positioned close to the ground, fit an additional boiler filling and emptying valve close to ground level for draining the storage tank.

6.2 Solar expansion (optional)

The SolvisBen can be enhanced with a thermal solar system. It already includes a solar stratified charger ➔ *fig. 4* (**4**) for optimal stratification of solar heat in the storage tank and all the control functions for solar operation in the system controller.
The SÜS-5.5 solar heat transfer station that is available as an accessory part can easily be connected to the SolvisBen together with our Solvis collectors and the appropriate assembly material.

A particularly simple and quick retrofit that does not require storage tank drainage is available with the “SR/SV Ben connection pipe set” (accessory part, please order separately).

For information about installing the solar heat transfer station, see ➔ *chapter “Installation” in the installation instructions (MAL-SUES-5.5).*

6.3 Storage tank

Installing and aligning the storage tank

1. Install the storage tank and use the three pre-fitted adjustable storage tank feet (**1**) to vertically align the storage tank (spirit level).
2. Screw the two support feet (**2**) on the transport handle on the front container foot down to the floor.
3. Remove the top transport handle. **Leave the bottom transport handle attached to the device**.

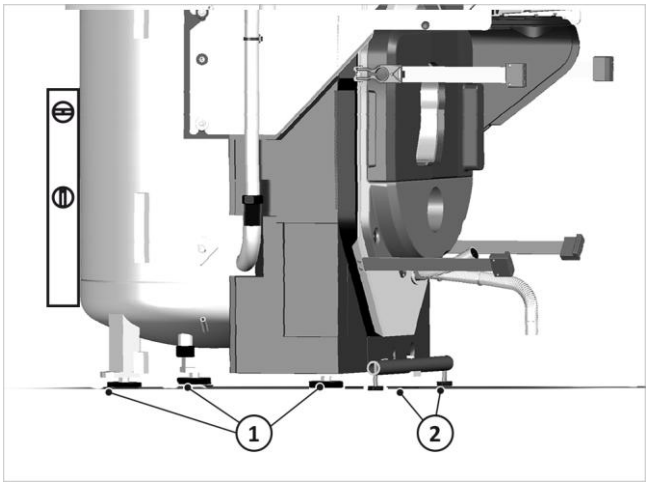


Fig. 5: Installing the storage tank

6.4 Electrical heating element (optional)

WARNING
Container without support feet – risk of overturning
Risk of injury due to overturning container.
- Secure the container against overturning.

Optional: Installing the electrical heating element

The EHS-3-230 electrical heating element that is available as an accessory part can be inserted into the socket on the SolvisBen to store surplus electricity from a photovoltaic system, for example, in the SolvisBen in the form of heat using suitable control devices.

1. Remove the exhaust pipe. To do this, loosen 4 screws (**2**) at the bottom of the intake chamber bracket and one M8x35 screw (**1**) at the top of the frame.

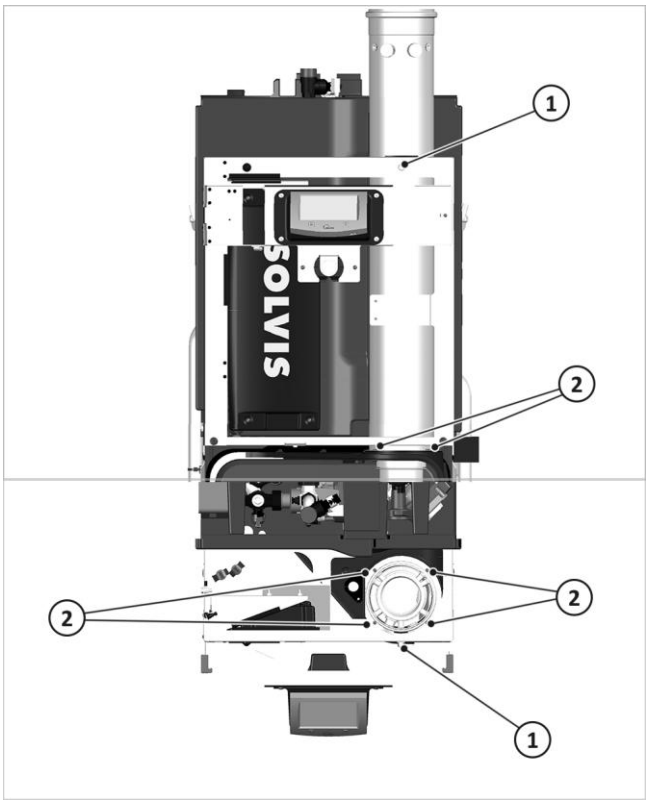


Fig. 6: Loosen screws, remove exhaust pipe

2. Dismantle the front flange insulation (consisting of parts I to III) and set aside for later use. To do this, grasp the parts behind the edge and pull them forwards (**1**) so that the catch springs fall out of the groove. They can then be removed (**2**).

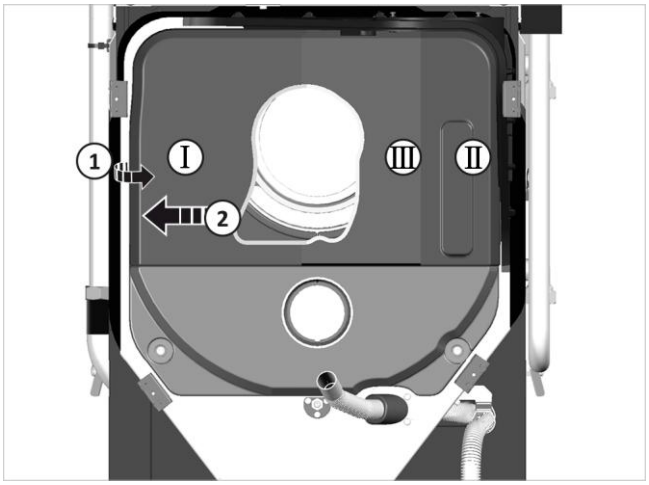


Fig. 7: Removing the front flange insulation

3. Remove the rear panel of the intake chamber (**1**). To do this, loosen 3 screws (**2**).

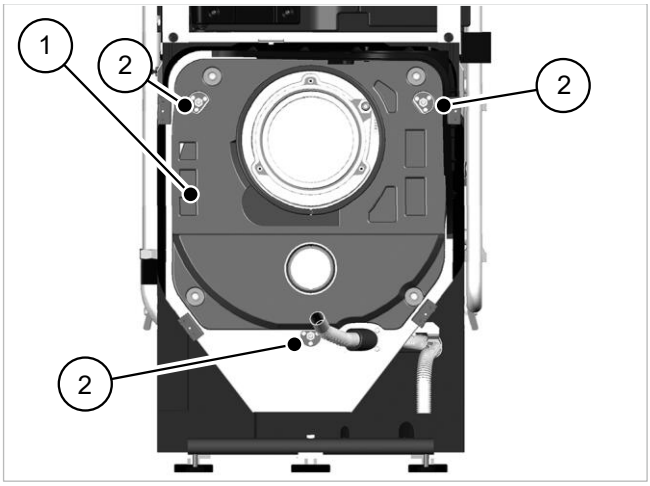


Fig. 8: Removing the rear panel of the intake chamber

4. Unscrew the fixing bracket (**2**) and carry handle (**3**) from the bottom container foot.
5. First pull the rear flange insulation (**1**) forwards and then pull it down diagonally.

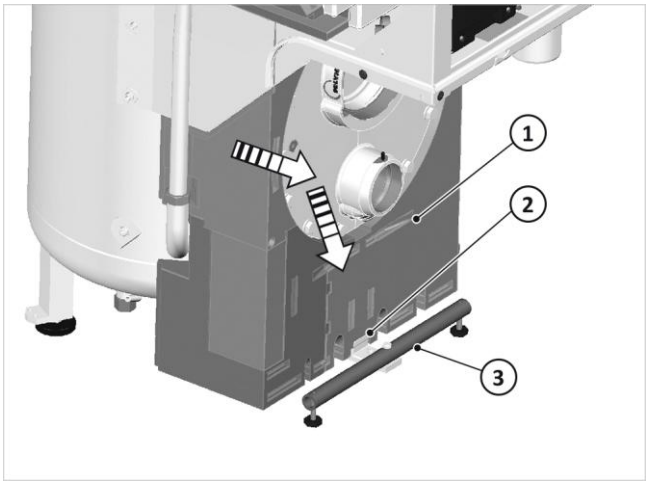


Fig. 9: Removing the rear flange insulation

6. Remove the plug for the socket (**1**).

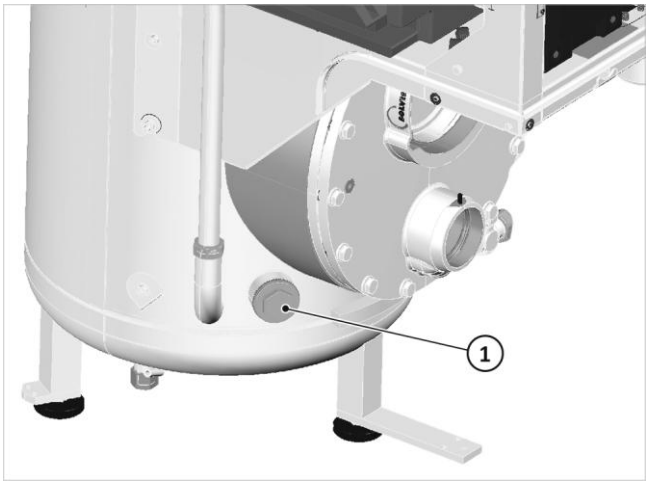


Fig. 10: Socket for electrical heating element

7. Install and establish an electrical connection to the electrical heating element according to the instructions.

CAUTION

Note for start-up

Potential damage to the electrical heating element

- Do not put the electrical heating element into operation until the start-up of the SolvisBen is complete.

Adjusting the rear flange insulation

The rear flange insulation consists of two individual sections. The installation space for the electrical heating element is provided by cutting a neck section. Proceed as follows:

1. Release the vertical catch (**1**) between the two individual sections. To do so, move the sections approx. 1 cm apart.
2. Pull the smaller section downwards (**2**).

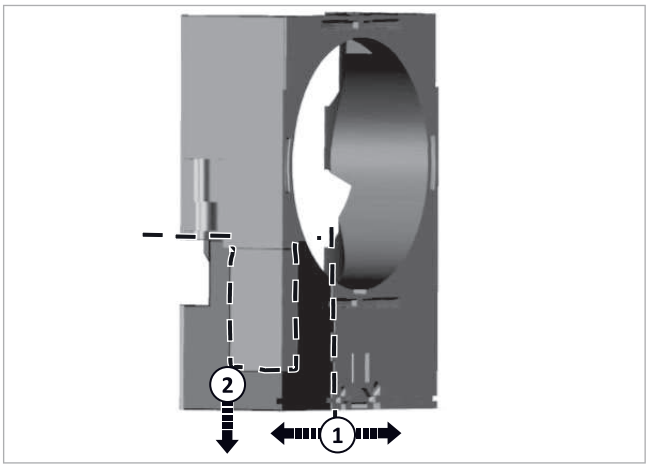


Fig. 11: Separating the flange insulation

3. Cut the neck (**2**) of the larger main section (**1**) along the marked groove.

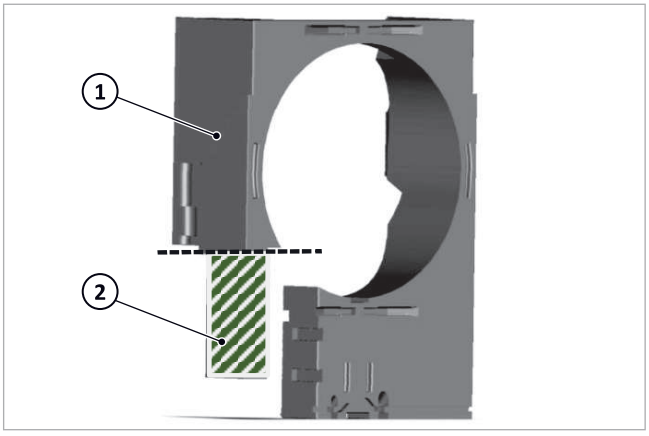


Fig. 12: Cutting the flange insulation

4. Move the main section back over the SolvisBen flange in reverse order. Make sure that the flange insulation remains in position and does not become wedged.
5. Now push the smaller section of the flange insulation over the electrical heating element connection box from below and then re-engage it with the main

section of the flange insulation, first on the top and then on the side.

6. Screw the fixing bracket and carry handle with the support feet onto the container foot again.

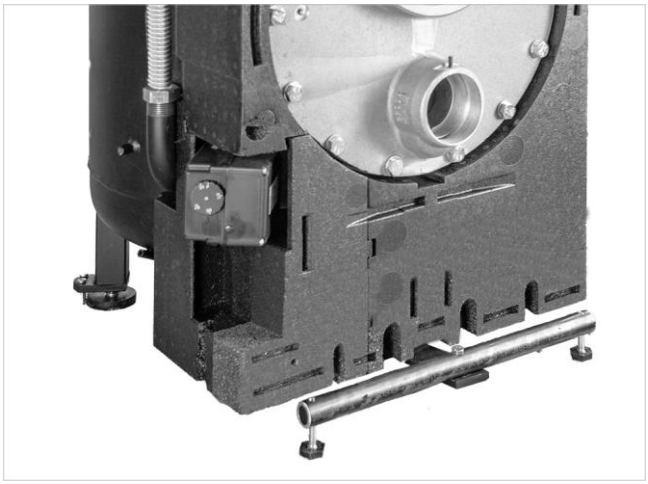


Fig. 13: Installed electrical heating element

7. Fit the rear panel of the intake chamber (**1**) and screw hand-tight with 3 nuts (**2**) as far as they will go.

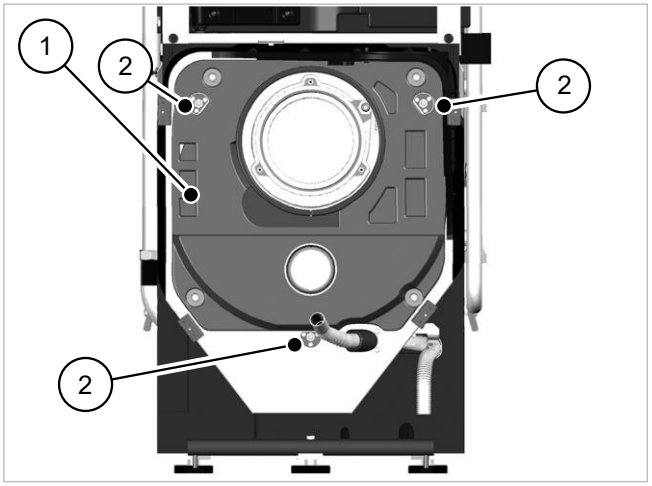


Fig. 14: Fitting the intake chamber back plate

6.5 Installing the insulation

Insulating the base

1. Position the floor disc (**1**) below the storage tank.

Fig. 15: Placing the floor disk under the storage tank

6.5.1 Rear tank insulation

Installing the rear tank insulation

The rear tank insulation consists of two similar insulating components that engage with each other in the rear area of the tank and that are screwed onto the tank in the front area. Turn the insulating component for the left side so that the recess for the sensor S3 (**1**) is positioned at the bottom.

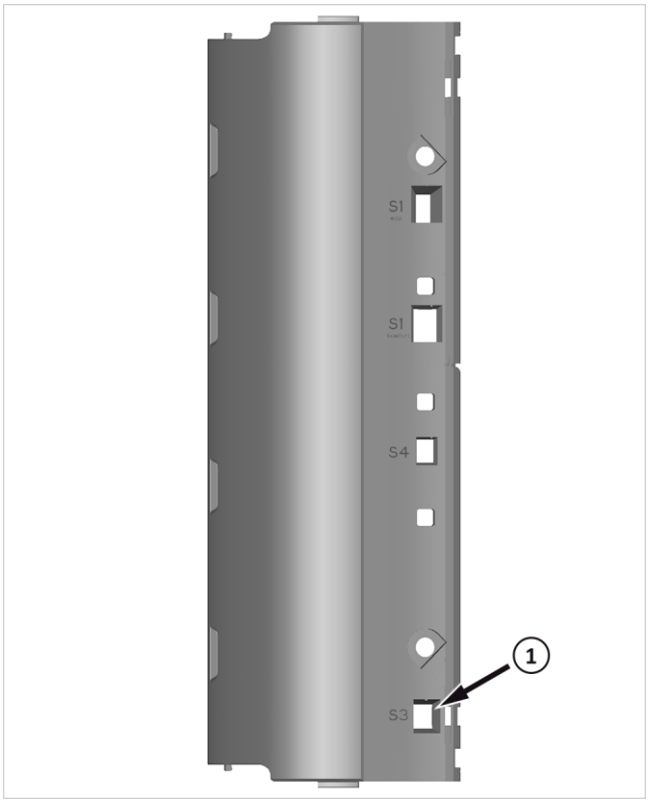


Fig. 16: Rear tank insulation, left side

1. Fit together the two individual sections and engage them with each other. When doing so, start in a diagonal position (**1**) and fit the side sections together in a turning motion (**2**).

Close the connection flush along the entire length (**3**) to avoid heat loss through the joints.

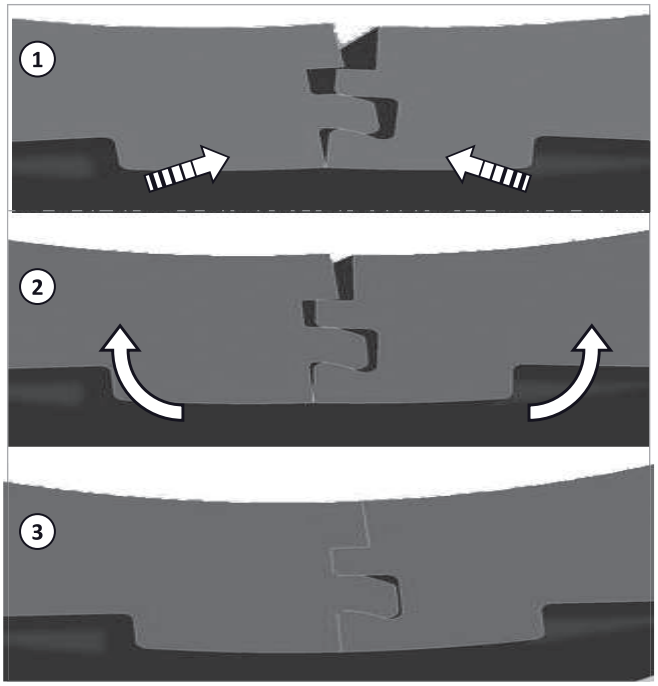


Fig. 17: Fitting together the individual sections

2. On one side of the SolvisBen, place the rear tank insulation (**1**) onto the station insulation (**2**).

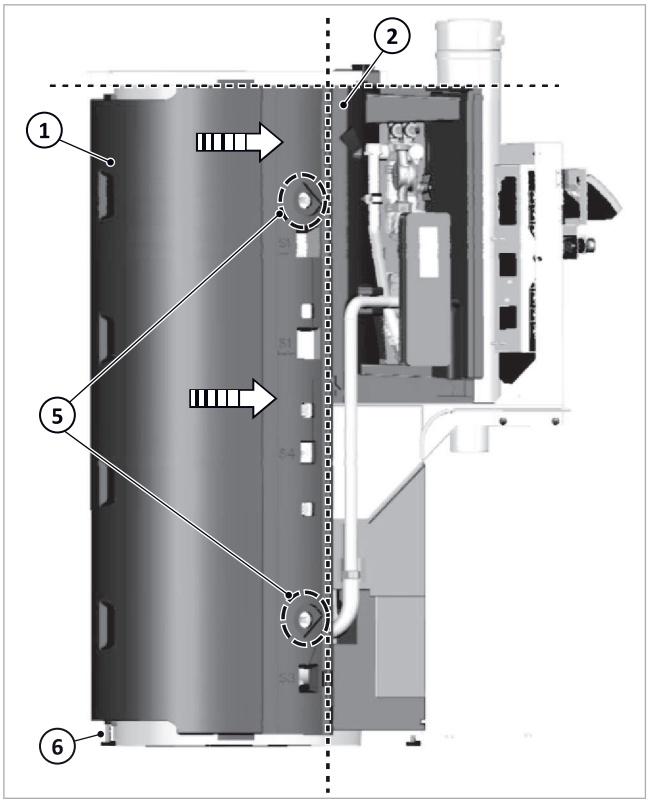


Fig. 18: Positioning the rear tank insulation

3. Use the angled washer (**3**) and screw (**4**) to fasten the tank insulation onto the tank at the top and bottom ➔ *fig. 18* (**5**).

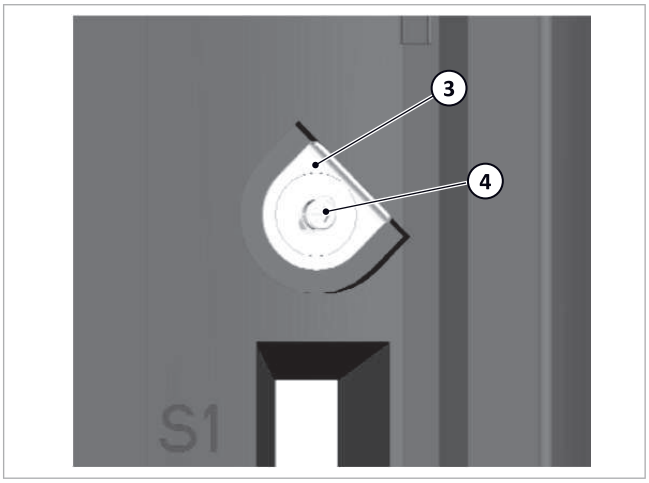


Fig. 19: Top screw connection for the tank insulation

You must:
- Align the straight top end of the rear tank insulation ➔ *fig. 18* (**1**) with the station insulation (**2**)
– level on the vertical to the station insulation ➔ *fig. 18* (**2**) and to the flange insulation.

4. Repeat steps 2 and 3 on the other side of the SolvisBen.

5. Check that the floor disc is positioned correctly.

6. Turn out the foot ➔ *fig. 18* (**6**) until it reaches the floor.

The rounded fleece sections should rest tightly against the surrounding insulation sections all the way around.

Insulating the cover

1. Position the cover disc (**1**) on the storage tank with the firm side facing upwards.

2. Fit the cable routing duct (**2**).

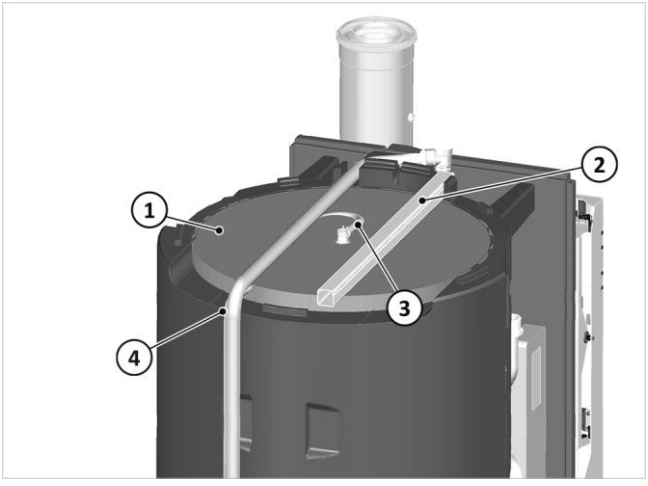


Fig. 20: Positioning the cover disc and cable ducts

3. Venting hose (**3**) in a loop to the rear over the cover round.

4. Above this, the blow-off line (**4**) of the safety valve also to the rear.

WARNING

Hot vapours or liquids

Risk of scalding

- Install the blow out tube in a way that rules out personal injuries or material damage due to any escaping liquid.

In systems with burners, air/water escaping via the air vent must not be discharged via the condensate pump.

5. Lay the blow-off line with a gradient and max. 2 bends, do not extend it.
6. If necessary, secure with pipe clamps and preferably route via a funnel into a drainage outlet.
7. The venting hose can also be routed into the drainage outlet or into a suitable container.

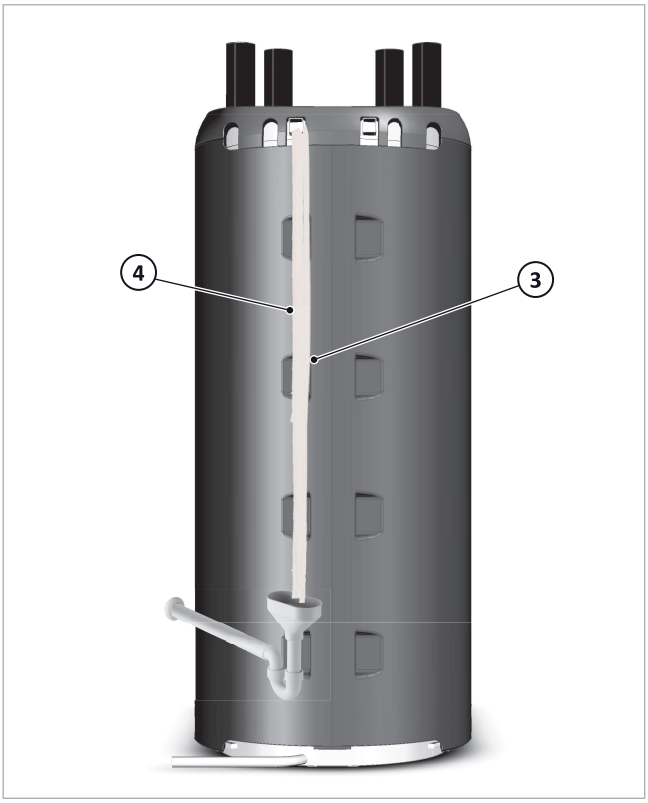


Fig. 21: Installing the blow out tube and bleeder hose

6.5.2 Positioning the sensor cable harness

The sensor cable harness with the three storage tank sensors is already connected to the mains circuit board. The sensors must now be placed into the corresponding storage tank sensor sleeves on the left-hand side of the tank.

Use heat conducting paste when inserting the sensors.

The three sensor cables are bundled up with a spiral cable in places.

Starting from behind, press the spiral cable (**1**) runs from the rear in the side groove of the insulating shell above the base plate.

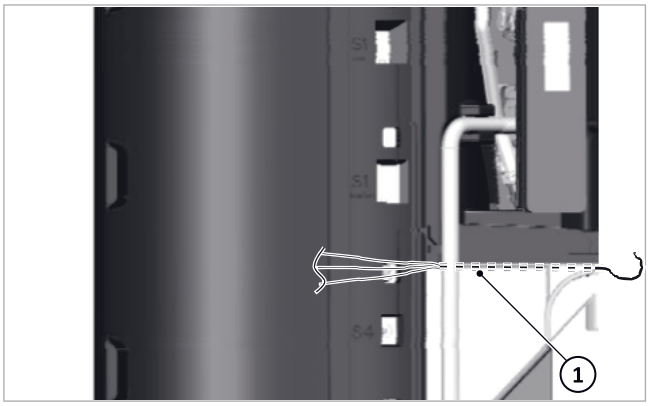


Fig. 22: Route of the sensor cable harness

Fitting sensor S3 “Storage tank reference”

1. Take the sensor cable with the imprint “S3” and insert sensor S3 into the lower sensor sleeve on the storage tank (“S3” imprint on the tank insulation) using heat conducting paste.
2. Push the sensor cable down into the slot on the rear container insulation from the top.

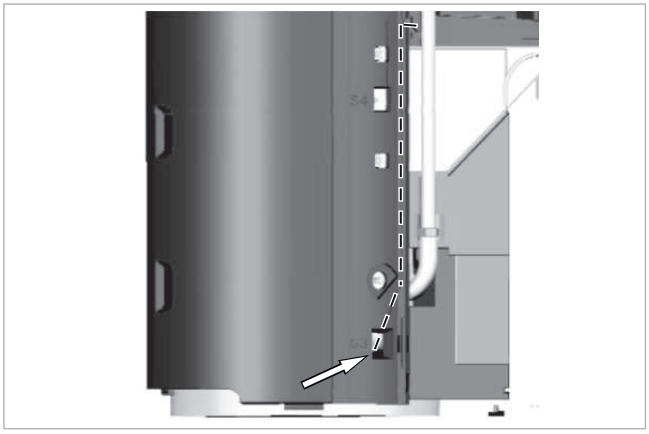


Fig. 23: Installing sensor S3

Installing sensor S4 “Upper heating buffer”

1. Take the sensor cable with the imprint “S4” and insert sensor S4 into the middle sensor immersion tube on the storage tank (“S4” imprint on the tank insulation) using heat conducting paste.
2. Push the sensor cable down into the slot on the rear container insulation from the top.

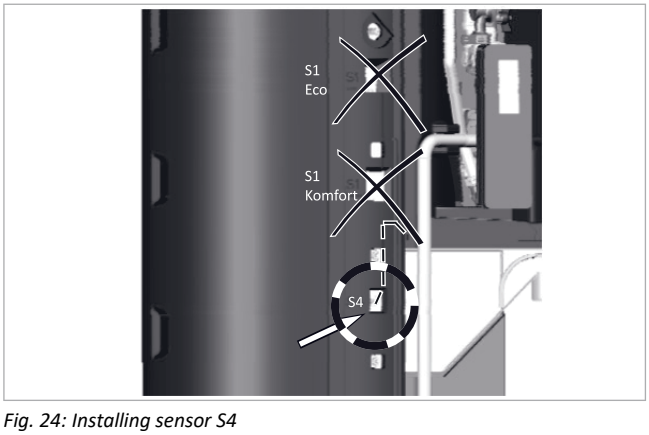


Fig. 24: Installing sensor S4

Selecting the sensor position for S1 “Storage tank, top”

There is a choice of two positions for positioning sensor S1. The position determines the buffer volume to be maintained at the target temperature for water heating in the storage tank. It therefore has an effect on the achievable hot water delivery volume (that is, the quantity of drinking water that can be heated without interruption).

Other relevant parameters in this regard are the burner performance and the delivery. On the other hand, however, the position of sensor S1 also has effects on heat loss and the system energy requirements.

Reference values for selecting the appropriate position

Heat generator output in [kW]	Achievable delivery volume in litres for S1 to ...	
	Eco position	Comfort position
10	≈ 85	≈ 150
18	≈ 110	≈ 200
30	≈ 200	≈ 350

Boundary conditions:
- Delivery volume flow: 15 l/min
- TWK/TWW temperature: 10/50 °C,
- Delivery: 37 kW
- Storage tank temperature at S1: 65 °C.

E To operate the system as energy-efficiently as possible, we recommend choosing position “**S1 Eco**”. This is particularly necessary in the case of heating pumps, because costs may be increased otherwise. The position can be changed later without any issue; see ➔ *chapter “Water” in the operating instructions BAL-SBSX-3-I-EN*.

Fitting sensor S1 at position “S1 Eco”

1. Take the sensor cable with the imprint “S1” and insert sensor S1 into the top sensor sleeve on the storage tank (“S1 Eco” imprint on the tank insulation) using heat conducting paste.
2. Push the sensor cable up into the slot on the rear container insulation from the bottom.

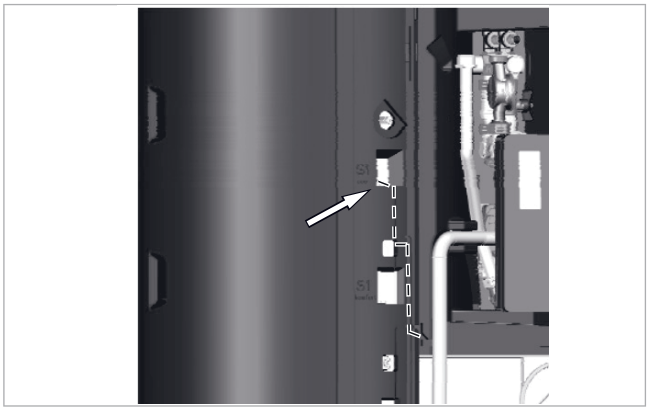


Fig. 25: Fitting sensor S1 in position “S1 Eco”

Fitting sensor S1 at position “S1 Comfort”

1. Take the sensor cable with the imprint “S1” and insert sensor S1 into the second sensor sleeve from the top (“S1 Comfort” imprint on the tank insulation) using heat conducting paste.
2. Push the sensor cable up into the slot on the rear container insulation from the bottom.

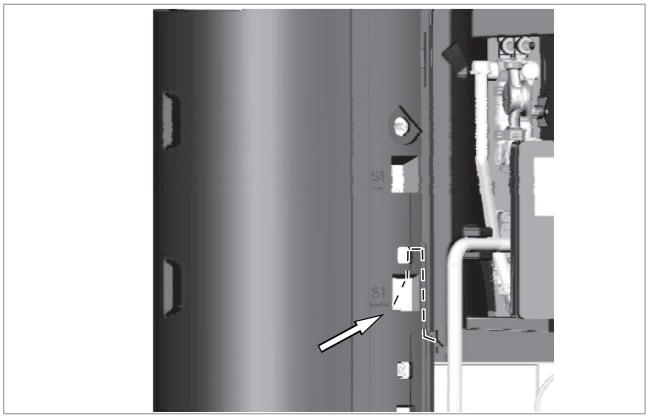


Fig. 26: Fitting sensor S1 in position “S1 Comfort”

6.6 Hot water station

CAUTION

Pressure fluctuations due to the hot water device

Overpressure may damage the system.

- Secure the drinking water installation in accordance with DIN 1988 and DIN 4753.
- We also recommend installing a drinking water expansion vessel.

A drinking water safety group (SIG-TW) with a DVGW-tested membrane expansion vessel is available as an accessory.

The hot water station (WWS) for heating the drinking water is located in the top left section of the attached frame panel of the SolvisBen. It is already hydraulically and electrically connected at the factory.

Preparing the drinking water connection

For the drinking water-side connection:

1. For easier access to the hot water station, remove the front insulation cover (**1**).

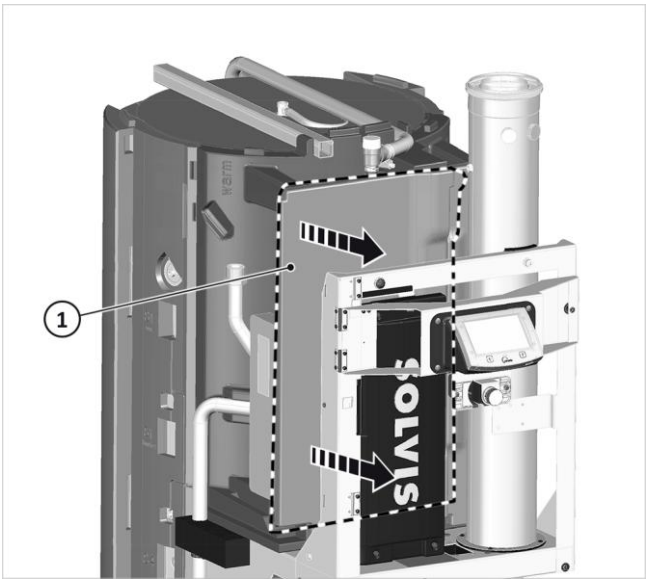


Fig. 27: Removing the front insulation cover on the hot water station (WWS)

Re-tightening the storage tank connections

Connections may have become loose during transport.

1. Check that the union nut on the return connector from the hot water station to the bottom storage tank (**1**) is fitted tightly and retighten it if necessary (while holding it).
2. Check that the union nut on the flow connector from the hot water station (**2**) to the top storage tank (rear connector for the fitting between the safety valve and ball valve) is fitted tightly and retighten it if necessary.

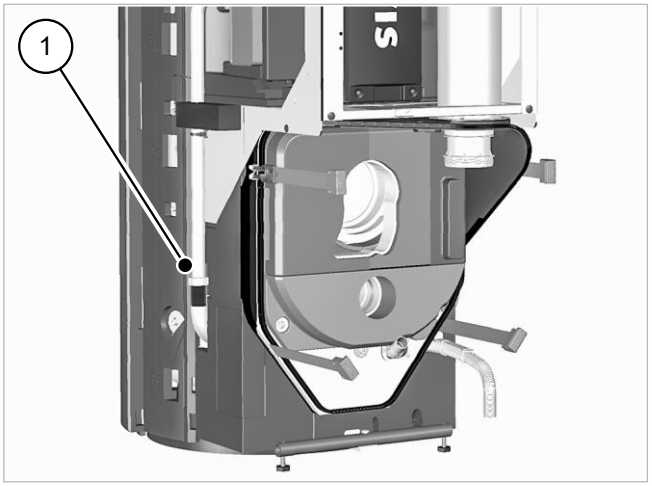


Fig. 28: Checking/retightening the return screw connection

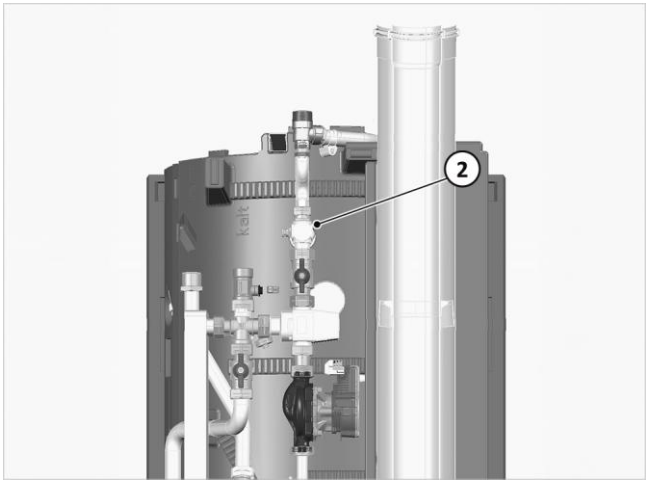


Fig. 29: Checking/retightening the flow screw connection

Fitting the connection from the top (standard)

1. Connect the cold drinking water (**2**) and hot drinking water (**1**) vertically from above.

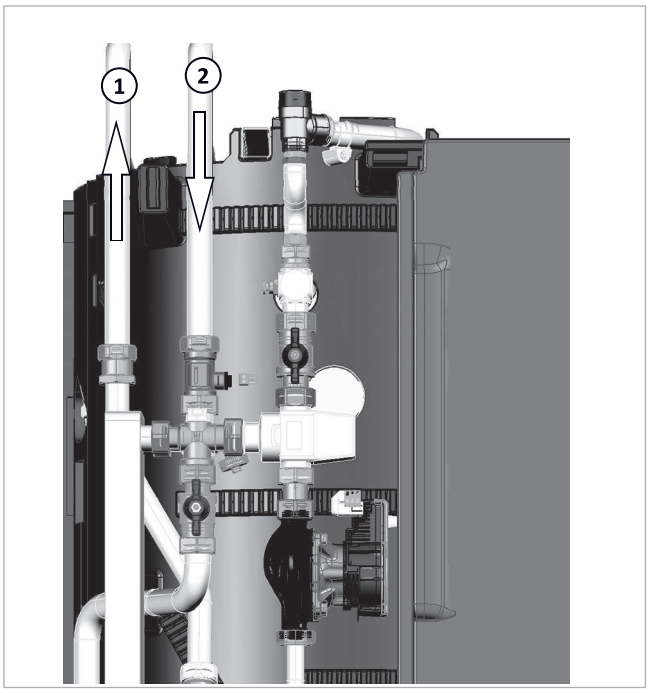


Fig. 30: Connecting the TWK/TWW connection from above

1 *Drinking water, hot (TWW)*
2 *Drinking water, cold (TWK)*

Be aware of changes in length.

- Take expansion elbows into consideration.

Optional: Fitting the connector from the rear

The connection set that is available as an accessory part can be used to install the connection pipes at the rear inside the SolvisBen insulation cover.

1. Fit a longer pipe elbow from the connection set on the TWK connection (**2**) for the hot water station.
2. Fit a shorter pipe elbow on the TWW connection (**1**) for the hot water station.
3. Connecting customer-supplied lines to the pipe elbows:

- TWW (**1**): on the outside
- TWK (**2**): on the inside

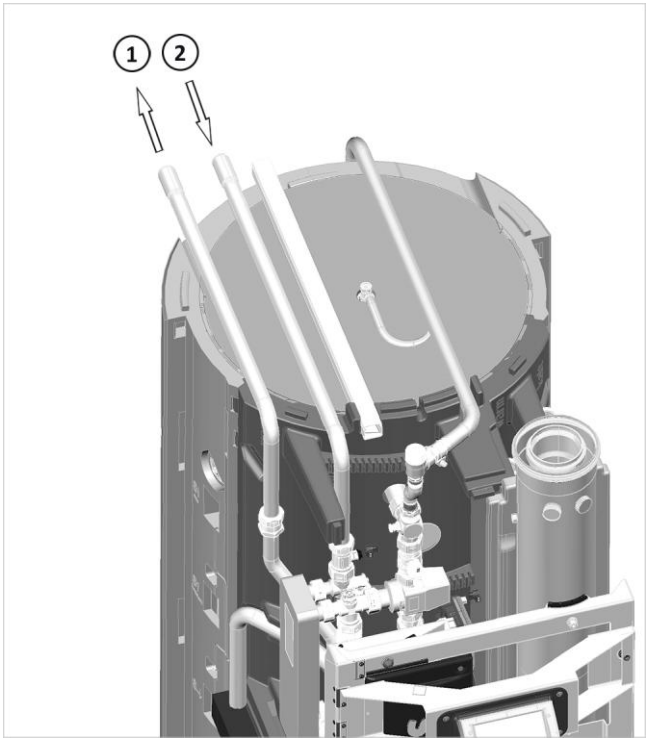


Fig. 31: Rear TWK/TWW connection

1 *Drinking water, hot (TWW)*
2 *Drinking water, cold (TWK)*

Connect the circulation line according to the system diagram in the appendix.

6.7 Heating circuits

Note on unmixed heating circuits

- With unmixed heating circuits, a sensor must be used on the heating circuit flow and connected to the appropriate input (S12, S13 or S16).
- The item SEN-T105-KTY, for example, is available for this purpose.

6.7.1 With integrated heating circuit station

With the SolvisBen with HKS-G-4.0, the heating circuit station (HKS) is integrated into the upper right section of the attached frame panel. It is already hydraulically and electrically connected at the factory.

Preparing the hot water connection

For the hot water-side connection:

1. Remove the front insulation cover (**1**) of the heating circuit station.

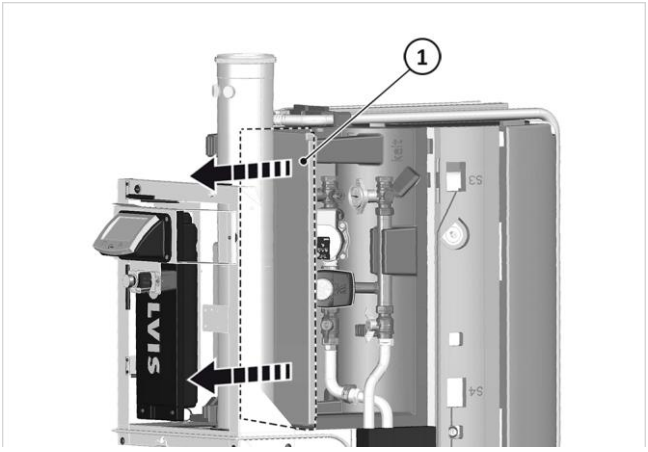


Fig. 32: Removing the front insulation cover for the heating circuit station

Re-tightening the storage tank connections

Connections may have become loose during transport.

1. Check that the union nuts on the flow and return brackets on the storage tank (**1**) are fitted tightly and retighten them if necessary.

2. Check that the union nuts on the corrugated pipe for the flow and below the check valve on the heating circuit station (**2**) are fitted tightly and retighten them if necessary.

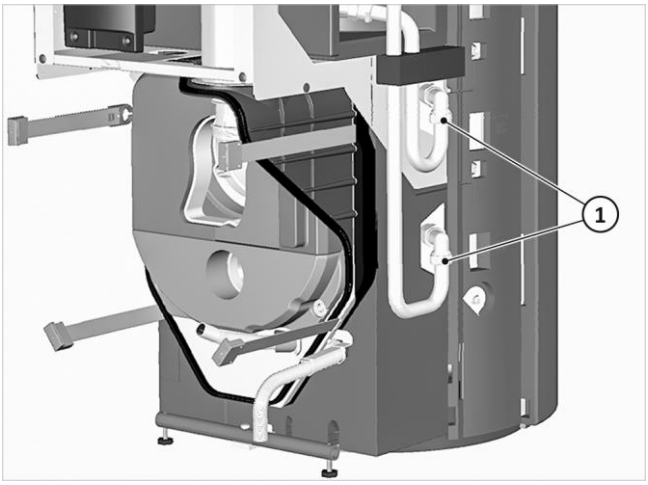


Fig. 33: Checking/retightening the heating circuit station connections

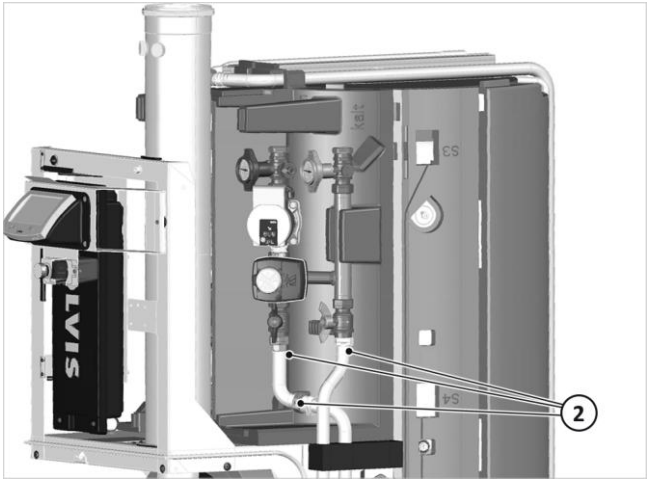


Fig. 34: Check / retighten VL / RL angle connections

Fitting the connection from the top (standard)

1. Connect the heating flow (H-VL) and heating return (H-RL) vertically from above:
   - H-VL: inner ball valve above the pump
   - H-RL: outer ball valve
2. Put the front insulation cover back in place and engage it with the rear insulation at the bottom and top.

Fitting the connection from the top (standard)

1. Connect the heating flow (H-VL) and heating return (H-RL) vertically from above:
   - H-VL: inner ball valve above the pump
   - H-RL: outer ball valve
2. Put the front insulation cover back in place and engage it with the rear insulation at the bottom and top.

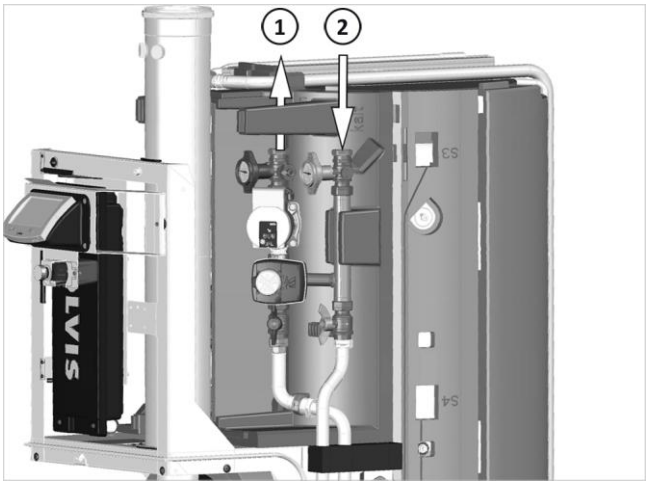


Fig. 35: H-VL/H-RL connection from above

1 *Heating flow (H-VL)*
2 *Heating return (H-RL)*

Optional: Fitting the connection at the rear

The connection set that is available as an accessory part can be used to install the connection pipes at the rear inside the SolvisBen insulation cover.

1. Fit a longer pipe elbow from the connection set on the H-VL connection (check valve above the pump) for the heating circuit station.
2. Fit a shorter pipe elbow on the H-RL connection (on the outside) for the hot heating circuit station.
3. Put the front insulation cover back in place and engage it with the rear insulation at the bottom and top.

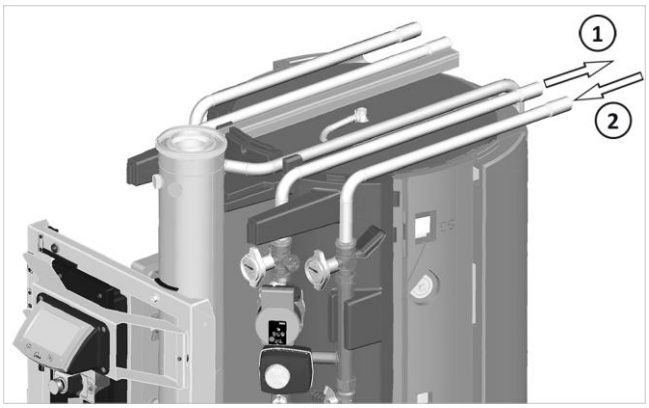


Fig. 36: H-VL/H-RL connection from the rear

1 *Heating flow (H-VL)*
2 *Heating return (H-RL)*

6.7.2 With external heating circuit stations

SolvisBen Gas and SolvisBen Oil only

Connecting an external heating circuit station from below

External heating circuit stations can be connected to these versions without internal heating circuit stations. Pipe elbows are pre-fitted for this purpose on the heating flow and -return; the pipes are guided out from the bottom of the SolvisBen as standard.

1. Extend the pipes (**1**) and (**2**) protruding from the casing at the bottom right to the customer-supplied heating circuit station.

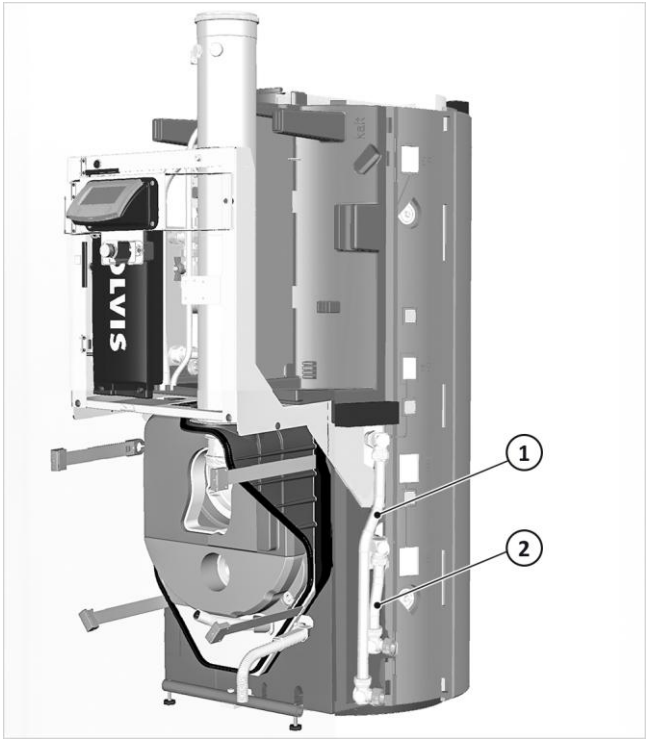


*Fig. 37: H-VL (**1**)/H-RL connection (**2**) for external heating circuit stations*

2. For the right-hand side section of the outer insulation, an internal piece in the lower area must be cut out along the marking prior to the installation.

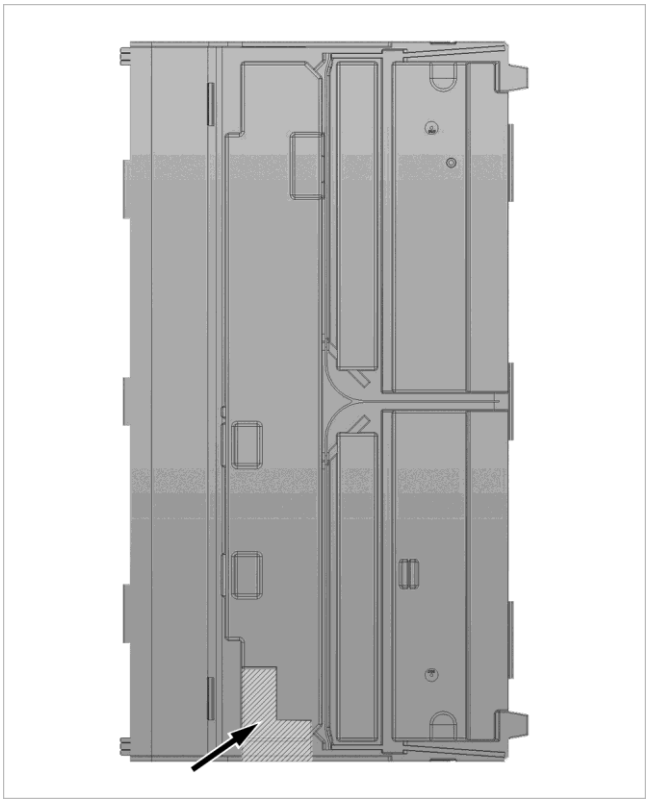


Fig. 38: Cutting the right-hand side part

Connecting an external heating circuit station from above

Alternatively, the pipes can also be routed from the top; to do so, the HZ pipe set (accessory part – please order separately) must be fitted.

1. Connect pipes (**1**) and (**2**) instead of the existing pipes.

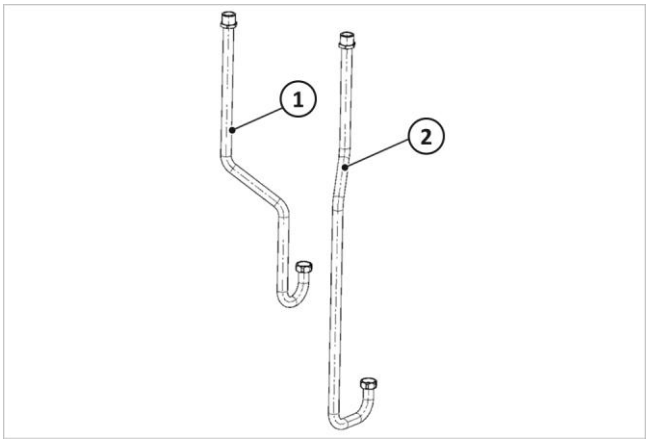


*Fig. 39: H-VL (**1**)/H-RL connection (**2**) for external heating circuit stations*

2. Fasten the pipes at the designated points and route them to the customer-supplied external heating circuit station from the top.
3. Alternatively, the connection pipes can be routed inside the SolvisBen insulation shell at the rear using the connection set (**1**) that is available as an accessory part.

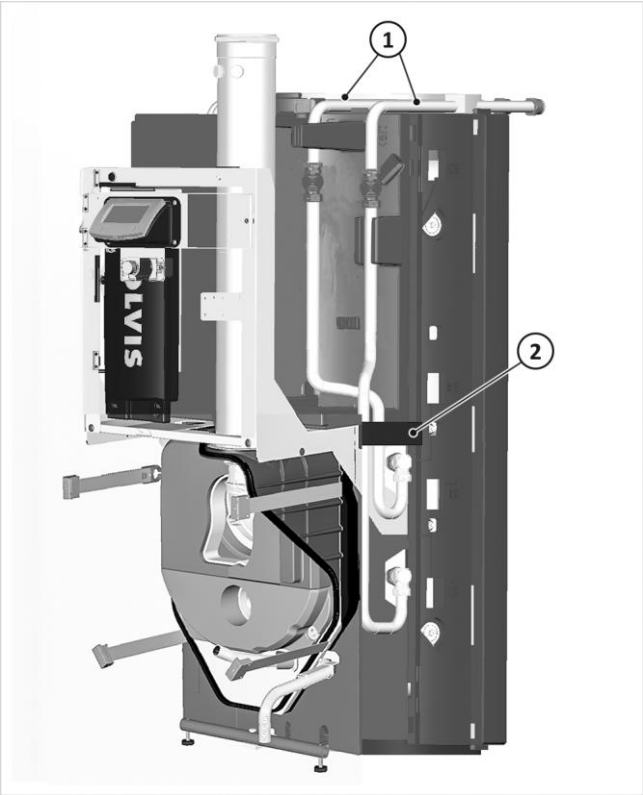


Fig. 40: Pipes routed at the rear

1 *Connection set (please order separately)*
2 *Side insulation fleece strips*

Hybrid Gas and Hybrid Oil only

The connection to external heating circuit stations is always performed from above, as described in the ➔ *"With integrated heating circuit station" section, page 18*. In this case, pipes are installed instead of an integrated heating circuit station.

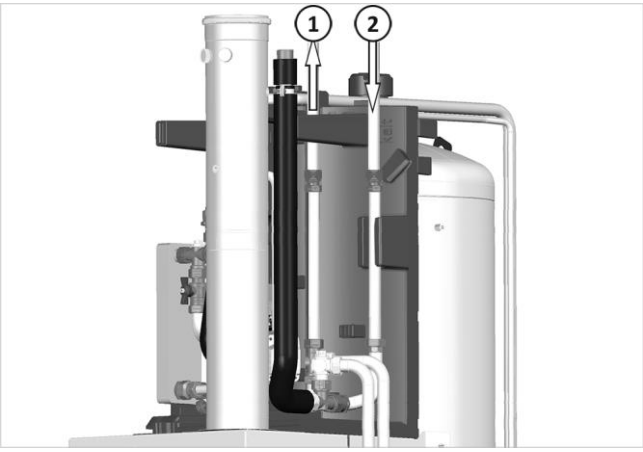


Fig. 41: H-VL/H-RL connection from above

1 *Heating flow (H-VL)*
2 *Heating return (H-RL)*

6.7.3 Without heating circuits

Sealing heating connections

1. Remove the two elbows on the heating flow and heating return connections (see ➔ *fig. 37, page 19*).
2. Seal both connections with caps and seals.

6.8 Heating Pumps

SolvisBen Hybrid Gas and Hybrid Oil only

The hybrid versions of the SolvisBen include the three-way switching valve required to connect the heating pump. The scope of delivery also includes the wall-mounted WP buffer charging station and sludge separator, both of which must be installed in the connection pipes between the SolvisBen and the heating pump connection.

6.8.1 Heating pump connection

Setting up the heating pump

1. Set up the heat pump in accordance with the relevant installation instructions and route the connection lines to the SolvisBen.

Connecting the heating pump to SolvisBen

1. Connect the flow and return lines of the heating pump from above to the two connection pipes of the SolvisBen located behind the exhaust connection.

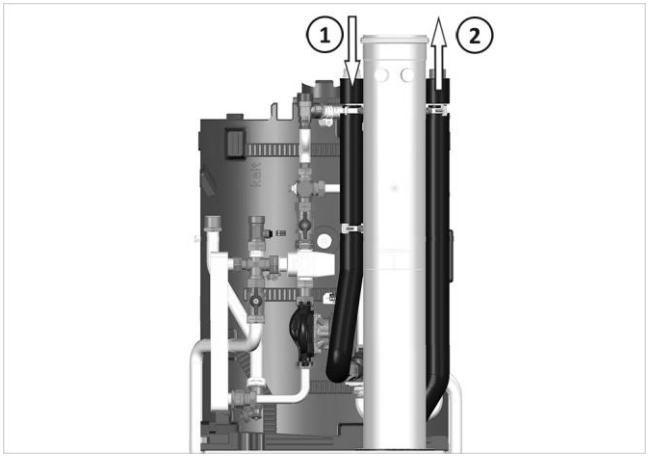


Fig. 42: WP-VL/WP-RL connection from above

1 *Heating pump flow (WP-VL)*
2 *Heating pump return (WP-RL)*

6.8.2 Wall-mounted WP buffer charging station

Installing the wall-mounted WP buffer charging station

1. Attach the supplied PLAS-WP-WM with suitable attachment material to the wall or alternatively directly in the pipe line near the SolvisBen. Installation should be performed in the return flow, either horizontally or in the direction of flow from bottom to top (note the direction of flow of the pump).

6.8.3 Sludge separator

Installing the sludge separator

1. Install the supplied sludge separator at a suitable location in the return line between the SolvisBen and heating pump.

6.9 Gas burner

SolvisBen Gas and SolvisBen Hybrid Gas only

6.9.1 Gas supply

DANGER

Observe the gas connection rules

- The gas connection must only be performed by installers who are authorised by the gas supply company.
- Observe the DVGW worksheet G 600 (TRGI) and "Technical regulations for liquid gases" (TRF) when making a gas connection.
- According to heating regulations, a thermally triggered shut-off valve (TAE) must be added directly before the unit shut-off valve, see ➔ *sec. "Installing the gas burner", P. 23.*

- To protect the gas solenoid valves in the burner, we recommend installing a gas filter in accordance with DIN 3386 in the supply line to the unit.
- SolvisMax/SolvisBen Gas can be operated with fuel gases from gas categories 2 and 3.
- The refitting set for liquid gas (accessories, please order separately) must be installed when using gases from gas category 3 (liquid gases), see the section on ➔ *"Conversion to liquid gas" on Page 21.*

6.9.2 Conversion to liquid gas

Refitting set for liquid gas (if required)

The burner is preset for operation with natural gas "H". Order the appropriate refitting set for conversion to liquid gas:

- Burner 1.9 – 10 kW: UB-SX-LN-3-10-FG
- Burner 2.9 – 18 kW: UB-SX-LN-3-18-FG
- Burner 4.8 – 25 kW: UB-SX-LN-3-25-FG
- Burner 4.8 – 30 kW: UB-SX-LN-3-30-FG

CAUTION

- The flow pressure of the liquid gas at the input of the gas combination valve must not exceed 60 mbar.

Installing a liquid gas nozzle for burners

1. Remove gas combination valve with two screws (**1**).

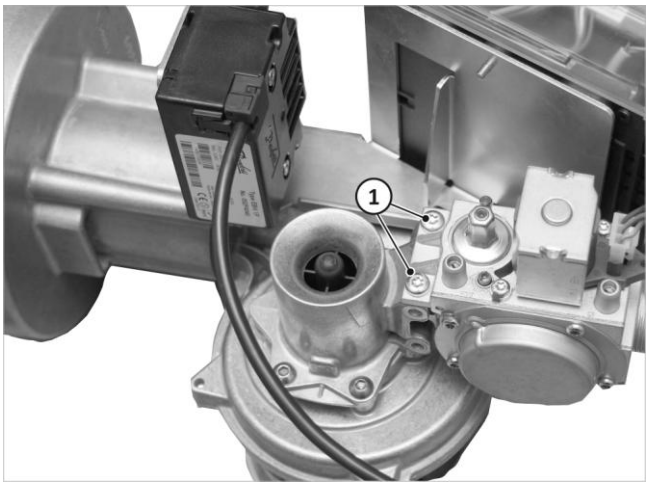


Fig. 43: Removing the gas combination valve

2. Pull the built-in seal (**2**) off of the gas combination valve.
3. Insert the liquid gas nozzle (ø 4.4 mm, **3**) into the removed seal and then into the gas combination valve.

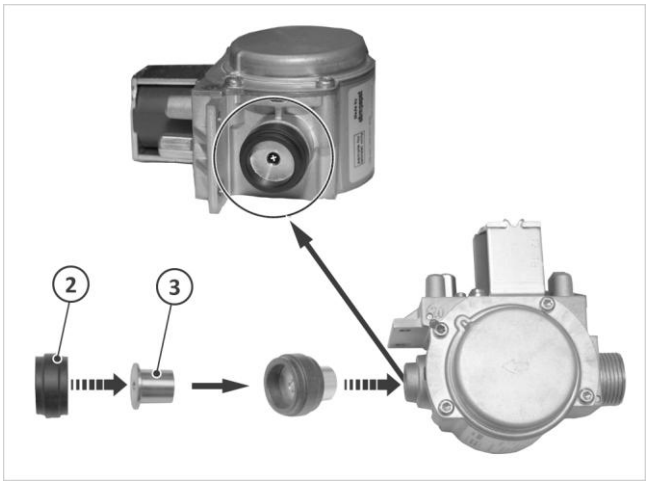


Fig. 44: Installing the liquid gas nozzle

4. Install the gas combination valve with the screws (**1**).

Presetting the burner for liquid gas

1. Turn the CO_2 adjusting screw (**1**) by 1¼ rotations in the minus direction (clockwise).

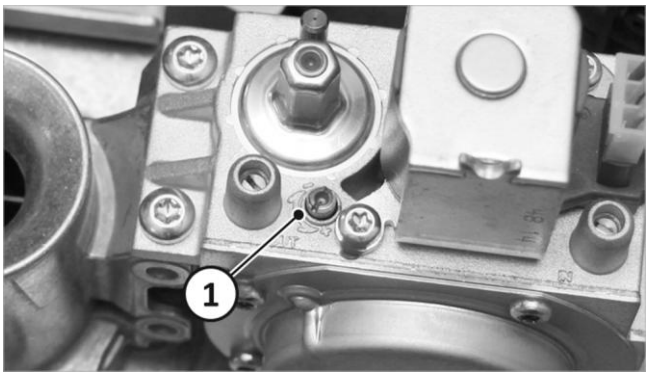


Fig. 45: Setting the burner

Installing the burner chip card

Install the burner chip card for operation with liquid gas.

1. Unscrew the housing cover from the automatic firing system.
2. Make the opening for the memory card at the predetermined breaking point.
3. Insert the burner chip card and screw the housing cover closed again.

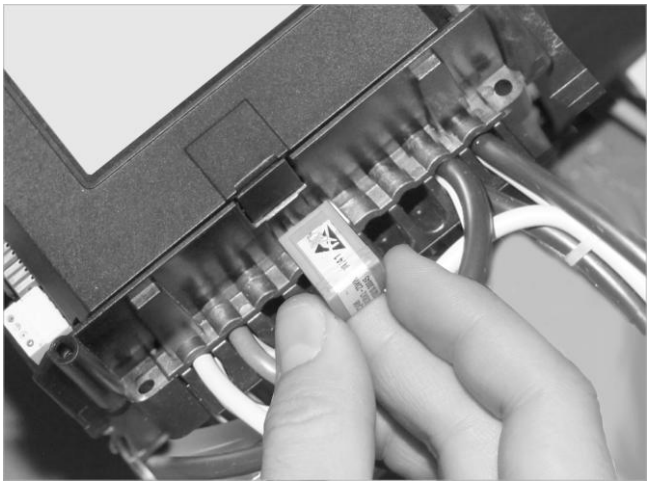


Fig. 46: Installing the burner chip card

Perform a program update following conversion to liquid gas!

- Observe DVGW-TRGI 2008.
- For systems with fluid gas: Observe DVGW-TRF 2012.
- After the conversion, it is essential to check the CO_2 levels. See ➔ *"Setting the CO2 value (max. burner performance)", section "Settings", P. 46*.

6.9.3 Program update gas burner

When handling the Burner Chip Card (BCC), observe the following:

- The BCC may **never** be inserted or removed while the system is switched on.
- Reversing the BCC update to reinstate the original parametrisation is not possible.
- An additional update using a new BCC (new BCC ID) is possible.
- If the BCC is activated in the automatic firing system, then it must always remain in the automatic firing system. Otherwise the system will go into safety shut-down (error message "**F163**") until the original BCC is inserted or another update is performed using a new BCC (new BCC ID).

Updating the burner

When updating the burner using the burner chip card, you must always follow the steps below:

1. Switch off the system.
2. Remove the old chip card or panel.
3. Connect the new chip card.
4. Switch on the system.

Malfunction message (burner malfunction) "**F050**" appears.

5. Acknowledge the malfunction message via the SC-3.

Programming running (blower starts).

Malfunction message “**F051**” (burner malfunction) appears briefly and disappears again.

After error “**F051**” has disappeared automatically and the blower has switched off, the burner switches to normal mode and the update was successful.

Readout automatic firing system

After a successful update the automatic firing system must be read out by the SC-3.

1. On the SC-3, call up "**Other**" → "**Continue**" → "**Change user**".

2. Choose the user "**Factory service**" (Code 0128).

3. Call up the menu "**Heating**" → "**Burner performance**".

4. Confirm "**Query performance**" (choose right arrow).

6.9.4 Installing the gas burner

Dismantling the front flange insulation

1. Dismantle the front flange insulation (consisting of 3 parts) and set aside for later use. To do this, grasp the parts behind the edge and pull them forwards so that they fall out of the groove. They can then be removed.

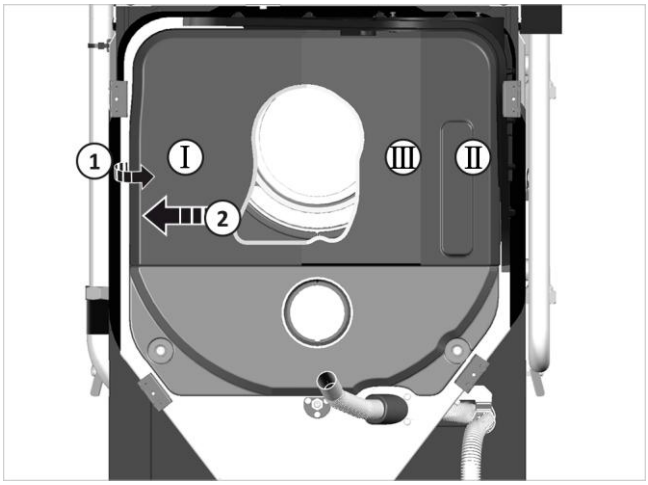


Fig. 47: Removing the front flange insulation

Burner installation

1. Insert the entire burner sealing cable into the groove of the heat exchanger insertion flange. To do this, start with the center of the sealing cord at 7 o'clock and insert it to the left and right. Compress the cord slightly so that the ends meet at 1 o'clock, shorten the cord slightly if necessary.

WARNING

Prevent leaks on the burner seal

Risk of toxic gas leakage.

- Never operate the burner if the burner sealing cable is not inserted.
- The joint must be at 1 o'clock.
- Shorten the burner sealing cord carefully!

Fig. 48: Inserting the burner sealing cord, joint at 1 o'clock

2. Check the spacing of the ionisation electrodes with the aid of an electrode gauge ➔ *Fig. 50* (**2**) (correct them, if necessary, by carefully bending them).

Distance to burner fleece:

- Ionisation electrode ➔ *Fig. 49* (**1**): 7.25 mm
- Ignition electrode ➔ *Fig. 49* (**2**): 6.9 mm
- Between the electrodes ➔ *Fig. 50* (**1**): 3.5 mm

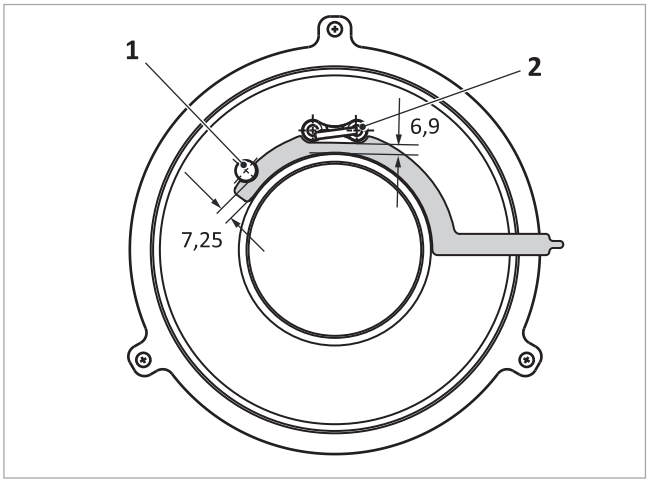


Fig. 49: Clearance from ionisation electrode and ignition electrode to burner tile

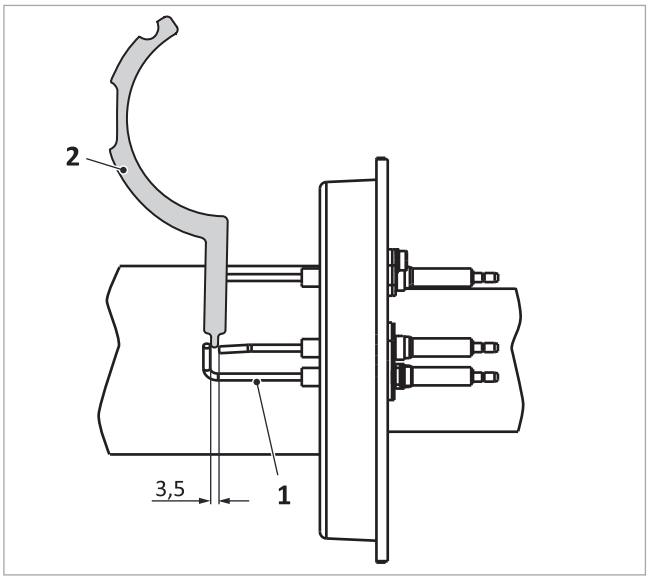


Fig. 50: Clearance from electrode to gauges on the ignition electrode

3. Slide on the door firebrick (**1**).

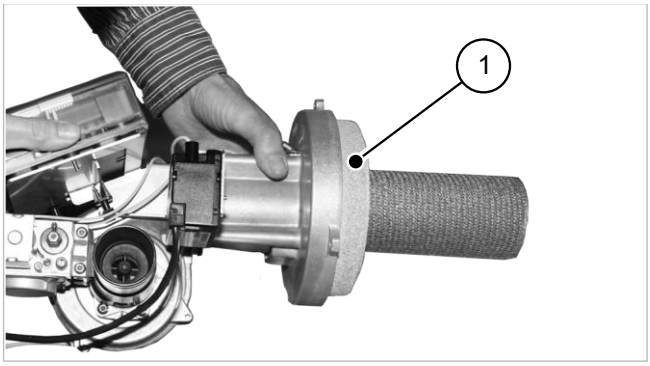


Fig. 51: Slide on the door firebrick.

4. Attach the burner to the pre-fitted threaded bolts with the “Top” marking facing up.
5. Fix the burner flange at 3 positions (**1**, none visible here) using the long nuts supplied.

Fig. 52: Assemble the burner

6. Tighten the nuts evenly using an 8 mm socket spanner.

6.9.5 eSTL

Plug the electrical safety temperature limiter (eSTL) into the combustion chamber

The eSTL is connected to the burner by a red cable.

1. Push the screw connection and insert onto the cable.
2. Insert the eSTL into the immersion tube on the top right of the combustion chamber as far as it will go (front tip of the eSTL approx. 15 cm deep).
3. Tighten the screw fitting.

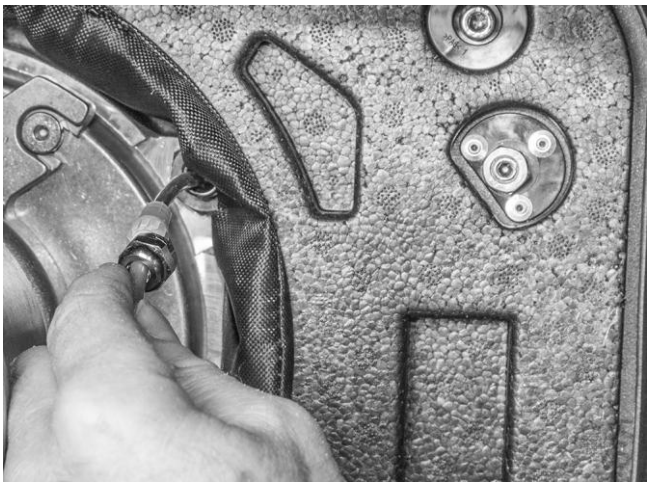


Fig. 53: Inserting the eSTL

6.9.6 Gas line

Laying the gas line

1. Route the gas line (**3**) upwards and insert it through the opening in the suction chamber (**2**).
2. Gas pipe straight up next to the exhaust pipe and attach to the exhaust pipe with pipe clamp (**1**) either on the left (**A**) or right (**B**).

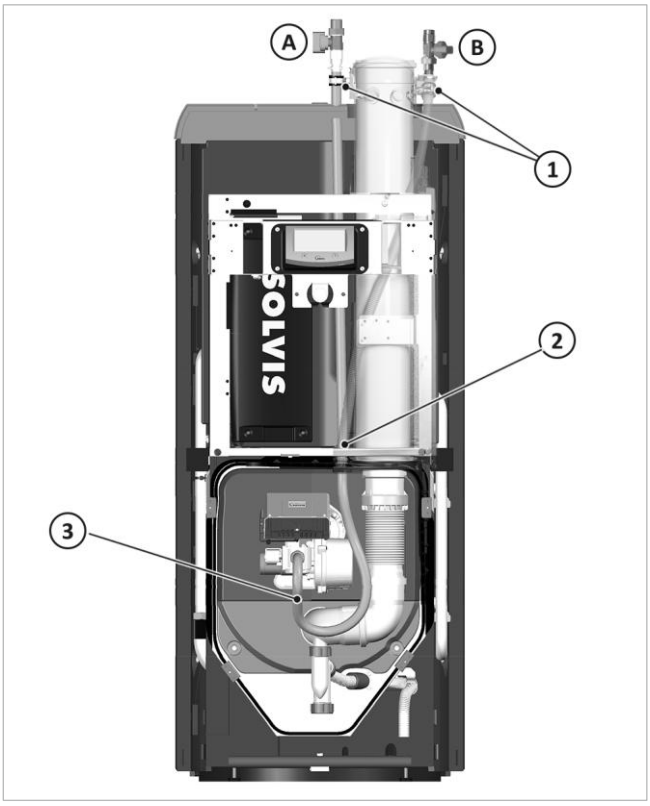


Fig. 54: Gas line routed above

A *Gas pipe on the left*
B *Alternatively: Gas pipe on the right*

Connecting the gas line to the burner

1. Install the corrugated hose onto the gas connection of the burner (flat seal → assembly pack).

Fig. 55: Connecting the gas line

CAUTION

When installing the system:

- When tightening the screw connection, hold the connection still using a second wrench.

6.9.7 Electrical connection for the gas burner

Laying the burner connection cable to the power board

1. Route the two burner connection cables (**1**) through the feed-through on the intake chamber, through which the gas line (**2**) already runs, up to the mains circuit board. Fit the lines with the molded rubber piece (**3**).

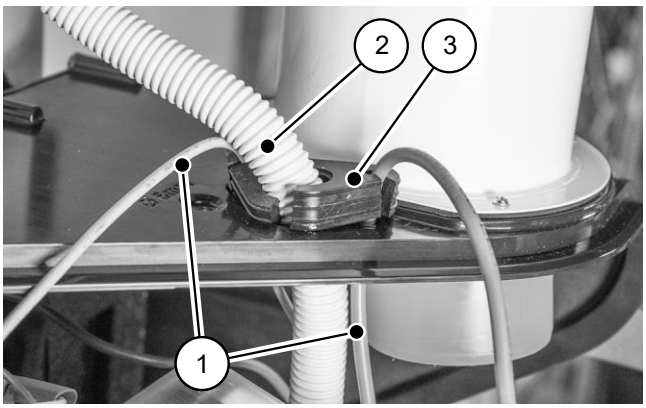


Fig. 56: Cable feed-through at the intake chamber

Connecting to the mains circuit board

Opening the mains circuit board housing

1. Open the mains circuit board housing cover.

Connecting the burner plug to the mains circuit board

1. Guide the connection pipe to the side through the strain relief device for the mains circuit board and attach it to the mains circuit board (observe the labelling).

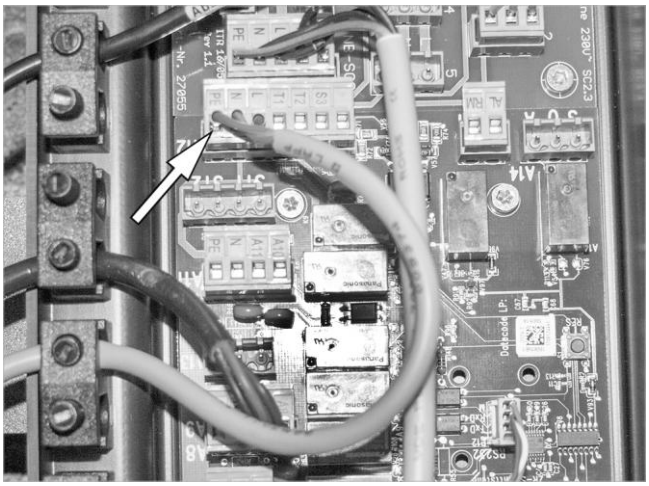


Fig. 57: Connecting the gas burner plug to A12

Connecting the bus plug to the mains circuit board

1. Connect the bus plug from the SX-LN-3 burner to the mains circuit board.

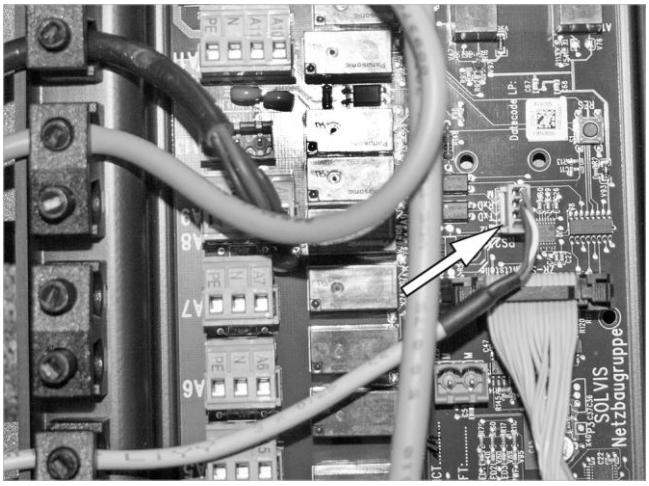


Fig. 58: Connecting the bus plug

Securing the connection lines

1. Lead all the lines on the side through the strain relief devices of the control console.
2. Secure the lines with the strain relief devices.

Attaching socket boards ST/1/ST/2

1. Attach the supplied socket boards ST/1/ST/2 to the mains circuit board (observe the labelling).

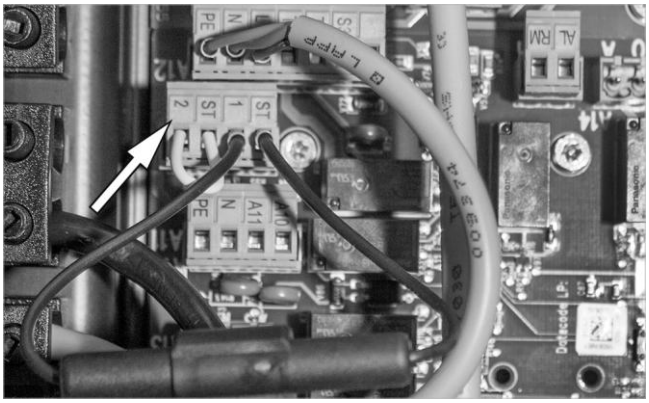


Fig. 59: Attaching a socket board

6.9.8 Sealing the line lead-through

DANGER

Make sure that the intake chambers are air-tight.

Risk of suffocation

- The airtight sealing of the pipe penetration with the molded rubber piece is mandatory for room air-independent operation.

Close the feed-through

1. Press the fuel lines and connection cable into the molded rubber piece (**1**) to close the feed-through.

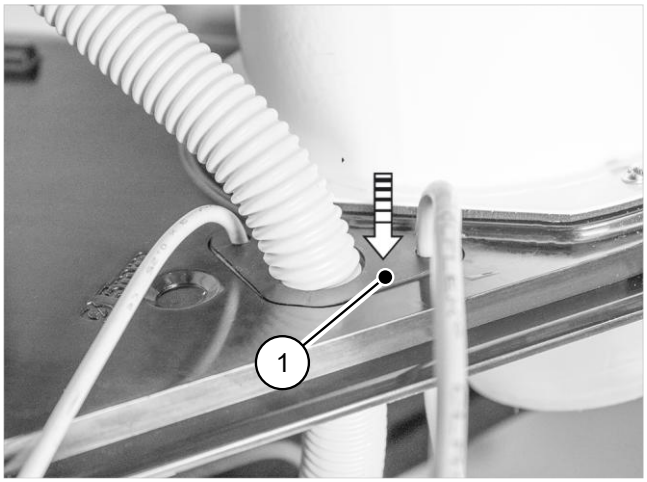


Fig. 60: Close the feed-through

6.10 Oil burner

SolvisBen Oil and Hybrid Oil only

6.10.1 Installing the oil burner

Dismantling the front flange insulation

1. Dismantle the front flange insulation (consisting of 3 parts) and set aside for later use. To do this, grasp the parts behind the edge and pull them forwards so that they fall out of the groove. They can then be removed.

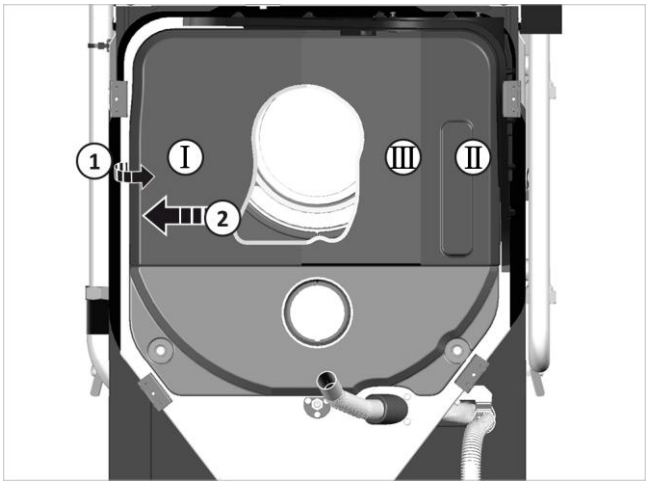


Fig. 61: Removing the front flange insulation

2. Remove the burner from the box.
3. Release the quick-release screws and remove the burner from the housing.
4. Check the electrodes as shown in the ➔ *Fig. 62* and correct them by carefully bending them, if necessary.

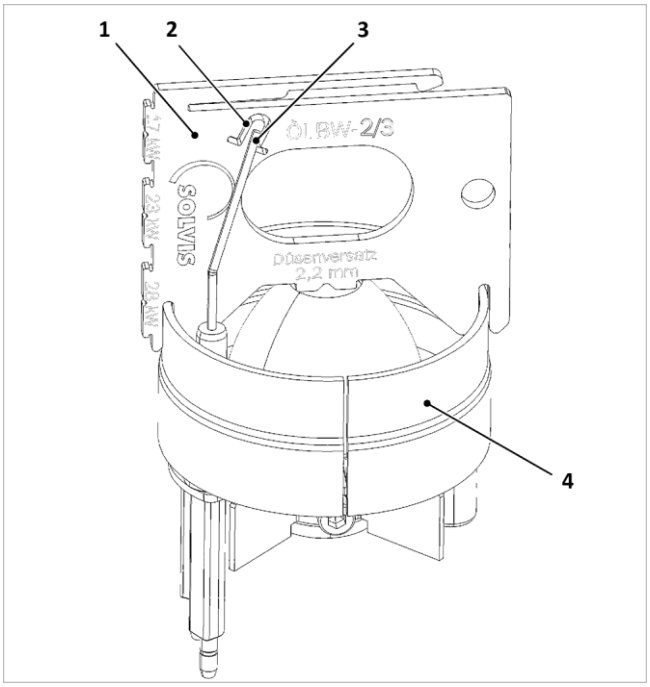


Fig. 62: Checking the position of the ignition electrodes

1	*Setting gauge*	3	*Ignition electrodes*
2	*Control window*	4	*Mixer head*

5. Check the electrode gaps as shown in the ➔ *Fig. 63* and correct them by carefully bending them, if necessary.

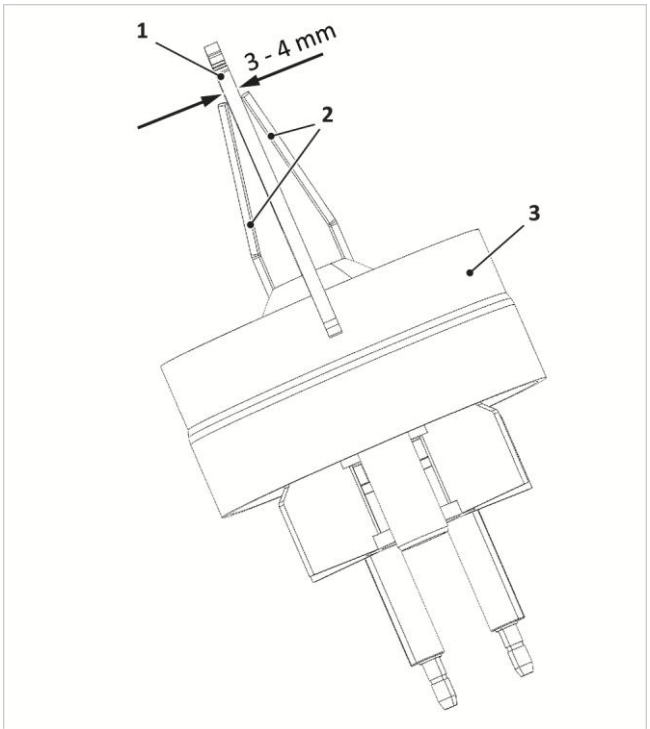


Fig. 63: Checking the ignition electrode gaps

1	*Setting gauge*	3	*Mixer head*
2	*Ignition electrodes*		

6. Reinsert the burner.
7. Put the door firebrick in place as shown.

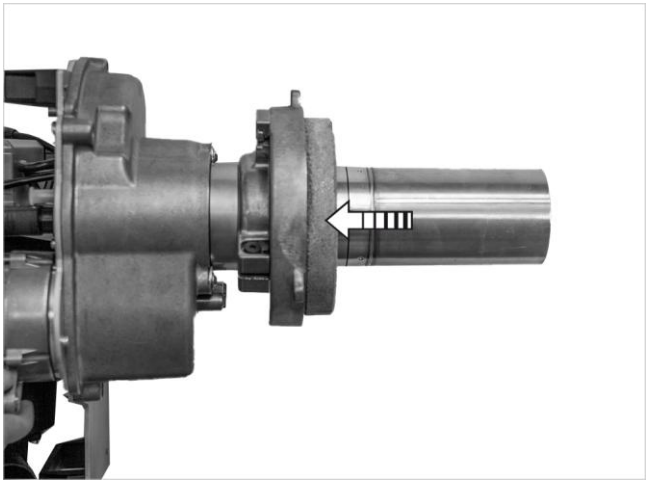


Fig. 64: Putting the door firebrick in place

8. Place the burner onto the pre-fitted threaded bolts.
9. Fasten the burner flange with the three nuts supplied.
10. Tighten the nuts evenly using an 8 mm socket spanner.

Fig. 65: Fitting the burner

6.10.2 eSTL

Plug the electrical safety temperature limiter (eSTL) into the combustion chamber

The eSTL is connected to the burner by a red cable.

1. Push the screw connection and insert onto the cable.
2. Insert the eSTL into the immersion tube on the top right of the combustion chamber as far as it will go (front tip of the eSTL approx. 15 cm deep).
3. Tighten the screw fitting.

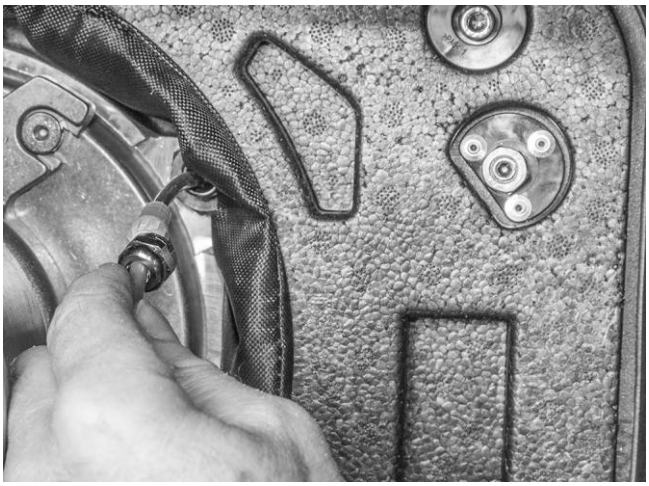


Fig. 66: Inserting the eSTL

6.10.3 Oil pipe

Fitting the oil vapor nipple

1. Drill a hole at the intended location using a 5 mm drill bit.

Fig. 67: Drill hole

2. Insert the oil vapor nipple, screw tight and connect to the oil vapor line.

Fig. 68: Oil vapor nipple fitted

Installing the oil filter and oil pipes

1. Fasten the oil filter bracket (**1**) to the frame panel using the Allen screws and nuts (→ installation pack).

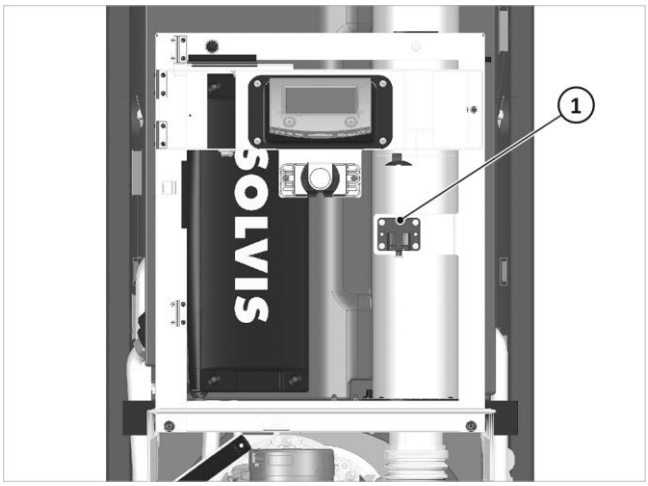


Fig. 69: Attaching the oil filter bracket

2. Position the oil filter (**1**) on the bracket.

CAUTION

Do not suck the oil with the oil pump.

The oil pump will become damaged if it runs dry.

- Suck the oil into the filter using a hand pump.
- Never use an automatic bleeder to suck the oil.

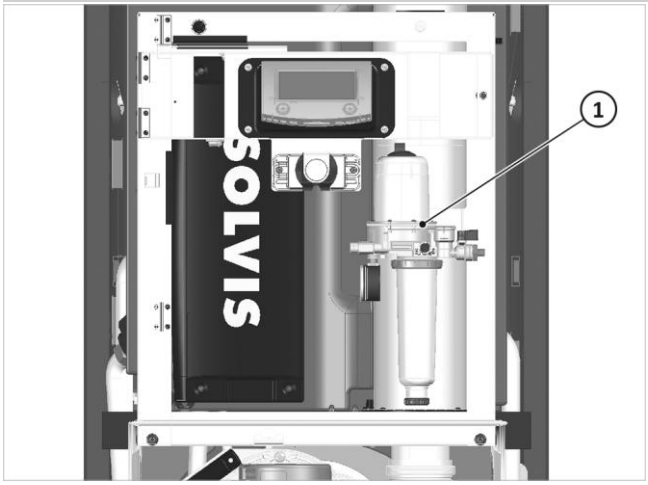


Fig. 70: Oil filter positioned on the bracket

3. Guide and connect the oil lines from the burner to the filter through the cutout section (**1**) in the intake chamber and connect.

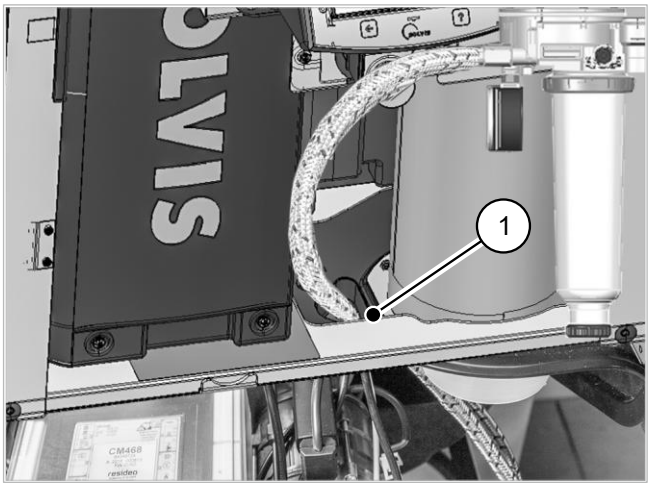


Fig. 71: Oil line feedthrough at the intake chamber

4. Tightly screw on the flow and return according to the labels that show the direction of flow on the filter connections.

5. The oil supply line (**1**) can be routed from above behind the flue gas pipe into the stem of the SolvisBen.

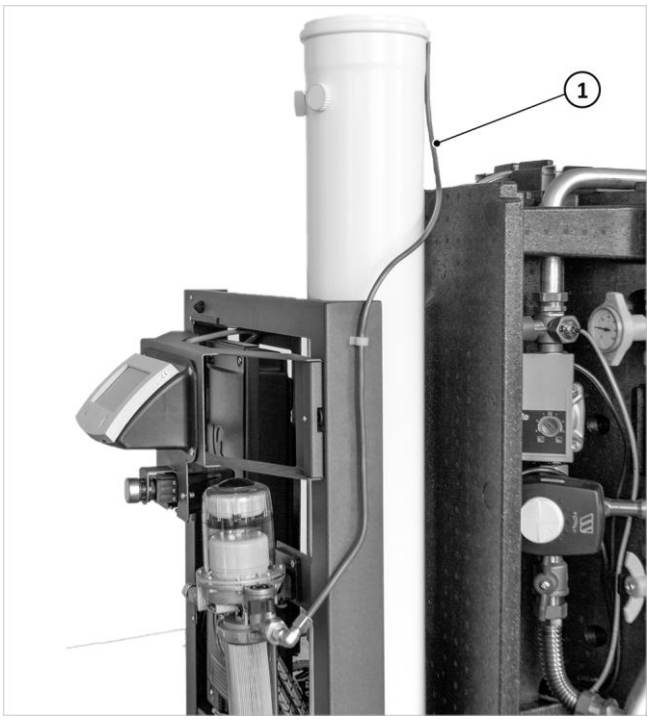


Fig. 72: Connecting the oil supply lines

6. Route the oil supply line along the side from the frame panel to the oil filter and connect it to the filter (**2**).

Fig. 73: Connecting the oil supply line to the filter

7. Fasten the oil line to the frame panel using a plastic clamp (installation pack) (**3**).

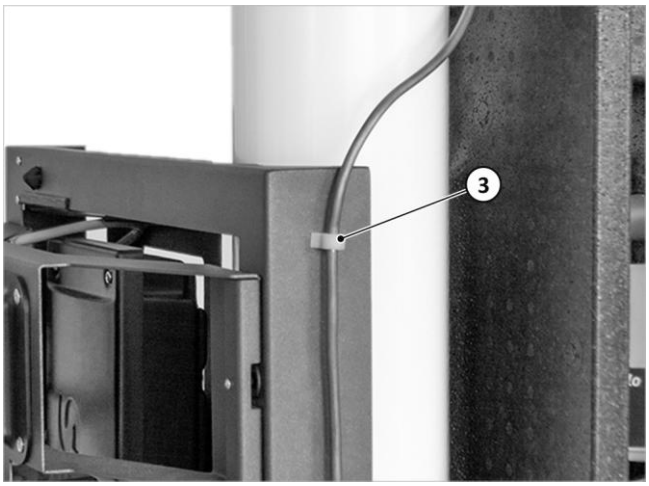


Fig. 74: Fastening the oil supply line to the frame

6.10.4 Electrical connection for the oil burner

Route the burner connection cable to the power board

1. Route both burner connection cables (**1**) to the mains circuit board through the feed-through on the intake chamber, through which the two oil lines (**2**) already run.

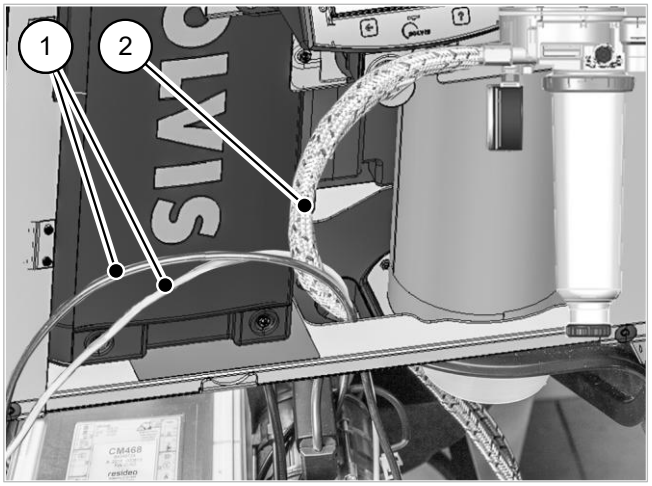


Fig. 75: Pipe feed-through on the intake chamber

Connecting to the mains circuit board

Opening the mains circuit board housing

1. Open the mains circuit board housing cover.

Connecting the burner plug to the mains circuit board

1. Guide the connection pipe to the side through the strain relief device for the mains circuit board and attach it to the mains circuit board (observe the labelling).

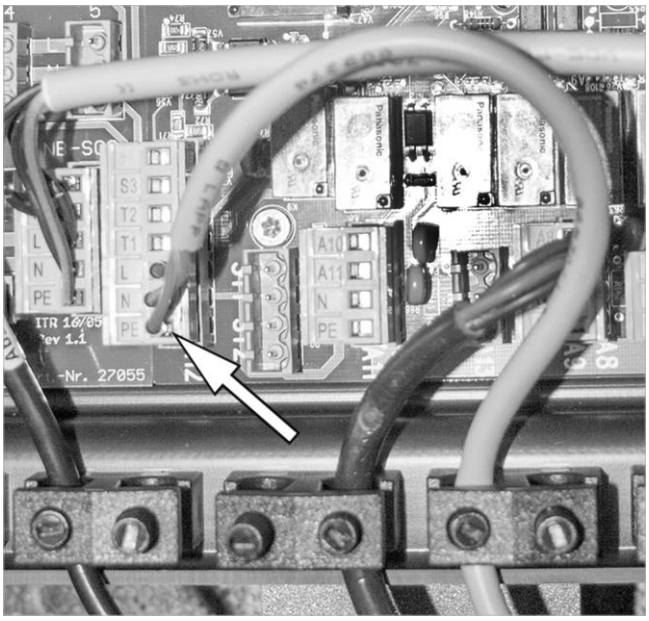


Fig. 76: Connecting the oil burner plug to A12

Attaching the socket boards to the mains circuit board

1. Attach the socket boards included in the assembly pack onto any free slots of the mains circuit board according to the labelling.

For system diagrams and connection diagrams, see ➔ *chapter "Appendix", page 75* and the ➔ *SolvisBen system diagrams (ALS-BEN-EN)*.

Securing the connection lines

1. Lead all the lines on the side through the strain relief devices of the control console.
2. Secure the lines with the strain relief devices.

6.10.5 Sealing the line lead-through

DANGER

Make sure that the intake chambers are air-tight.

Risk of suffocation

- The airtight sealing of the pipe penetration with the molded rubber piece is mandatory for room air-independent operation.

Close the feed-through

1. Press the fuel lines and connection cable into the molded rubber piece (**1**) to close the feed-through.

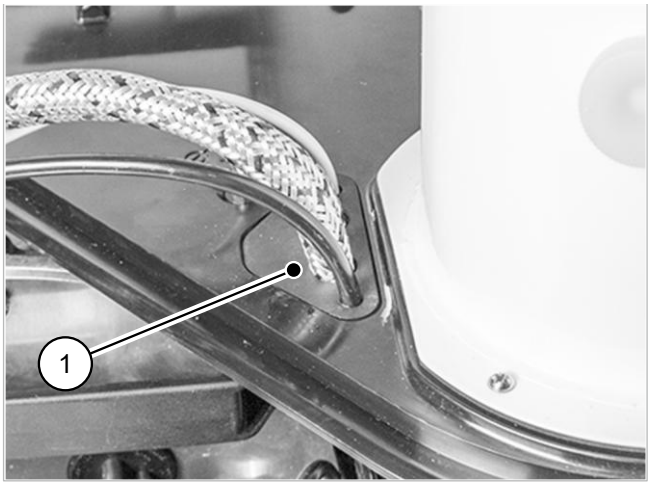


Fig. 77: Closing the feed-through (symbolic photo)

6.10.6 Oil supply

CAUTION

Permitted fuel

To fulfil the terms of the warranty

- The SolvisMax / Ben Oil BW may only be operated with low-sulphur heating oil (max. 50 ppm sulphur). This also applies during start-up.
- We strongly recommend using premium-quality, low-sulphur heating oil, as per DIN 51603-1.
- In addition, all oil heating boilers for (low-sulphur) heating oils with an organic content of up to 10 % are approved, as per DIN SPEC 51603-6.

CAUTION

Observe the following information regarding the oil connection

- The oil pipes must always be routed in a single pipe system using 6 x 1 mm copper pipes.
- Always use oil filters with a filter mesh < 20 µm.
- During start-up, do not suck the heating oil into the burner with the oil pump. The oil pump will be damaged if it runs dry.

Fuel storage

We require that the on-site tank system be constructed according to the applicable local regulations, especially the TRÖl in Germany.

Cleaning the tank

When switching to low-sulphur heating oil, we require that the tank system be cleaned by a specialty firm according to the applicable regulations so that no residual sulphur-containing oil or sludge remains in the tank. We recommend that you replace the tank valves when you refurbish a boiler.

Fuel delivery

The boiler must be switched off (main switch) while oil is being delivered. After the tank has been filled, the boiler must not be switched on for at least another 2 to 4 hours. It is not possible to run the solar system and the hot water production during this time.

CAUTION

Vacuum on the oil manometer (vacuum gauge) below -0.35 bar

Loud running noise of the oil pump

Disruption of the oil supply

Potential damage to the pump

- Switch off the burner when the pressure drops below -0.35 bar.
- Do not switch the burner back on until the fault has been rectified.

Connecting an oil supply system

If an oil supply system is required due to structural factors, we recommend that you install a burner-independent suction supply system on-site.

For connecting and installing the oil supply system, see ➔ *Operating instructions of the oil supply system.*

Oil pipe

The pipe diameter and length and the leak tightness of the heating oil pipe are extremely important for the proper functioning of the oil supply from the tank system to the boiler.

The maximum pipe length for ø 6 x 1 mm copper pipe as a function of the height difference of the tank system is shown in the diagram, (see example).

The diagram applies under the following conditions:

- Copper pipe: ø 6 x 1 mm
- Oil temperature >10°C
- EL heating oil up to 700 m above sea level
- 1 filter, 1 check valve, and 6 x 90° elbows are included in the diagram.

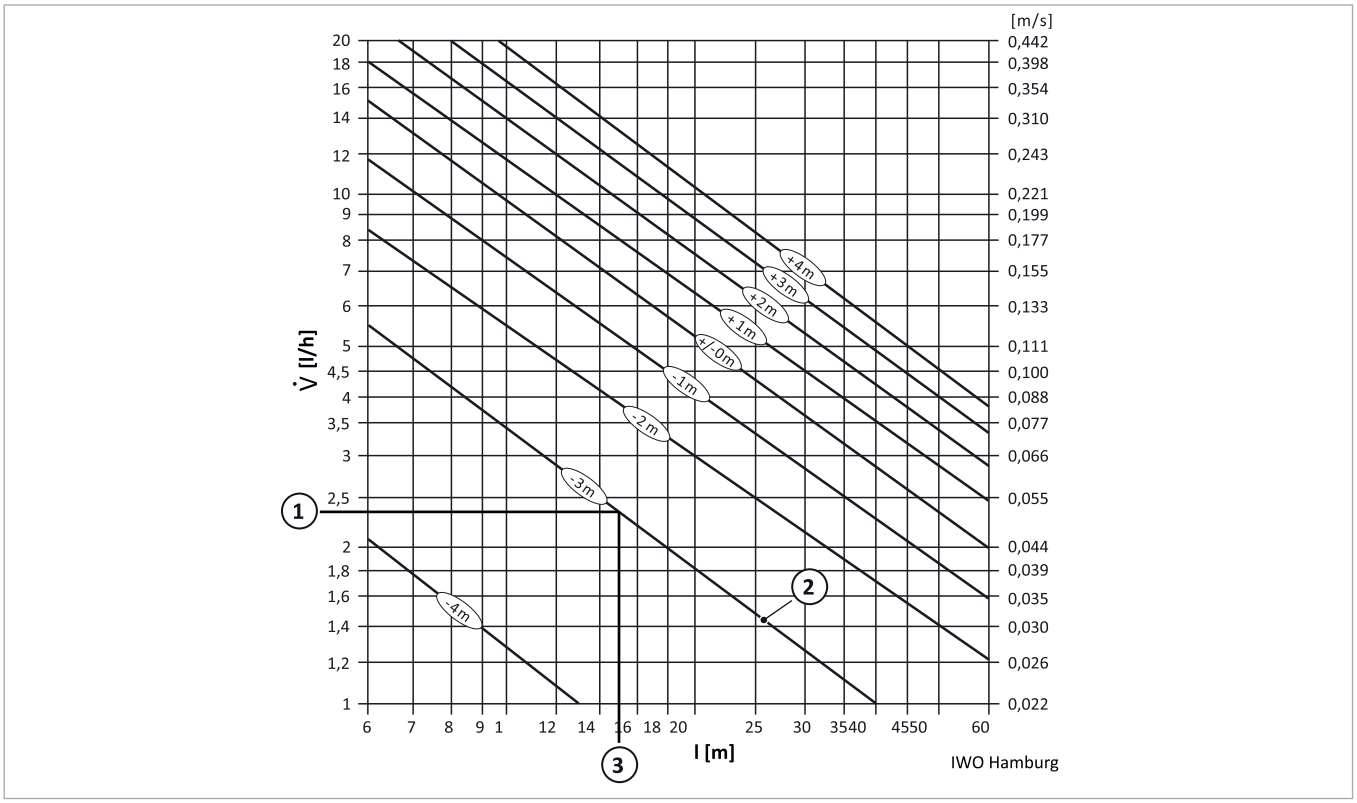


Fig. 78: Maximum pipe length in the single pipe system as a function of delivery height

- **V̇** *Oil throughput*
- **l** *Max. suction pipe length*
- **(+)** *Inflow height*
- **(–)** *Suction height*

Example for SÖ-BW with 23 kW burner performance:

According to the table, a performance of 23 kW results in an oil throughput of 1.95 kg/h. For EL heating oil with a specific gravity of ρ = 0.86, the oil throughput (l/h) is calculated as follows:

$$\frac{1{,}95\ \text{kg/h}}{0{,}86\ \text{kg/l}} = 2{,}3\ \text{[l/h]}$$

*Horizontal line in diagram (**1**)*

For example, the oil pump on the burner must overcome a maximum suction height of –3 m to the external underground tank (diagonal line on diagram (**2**)). The vertical line (**3**) from the intersection of the two other lines shows the maximum permitted pipe length. The result in this example is a maximum permitted suction pipe length of **15 m**.

6.11 Exhaust system

6.11.1 Air supply line

A concentric flue duct is pre-fitted in the SolvisBen. Supply air enters through the outer annular gap.

6.11.2 Internal exhaust routing

Installing the flue pipe

1. Connect the flue pipe coupling (**1**) on the top of the flue pipe connection piece on the intake chamber.

Fig. 79: Attach the flue pipe coupling to the flue pipe connection piece.

2. Connect the coupling with the flexible flue pipe pre-assembled flue gas elbow (**1**) into the lower opening of

the flue gas heat exchanger until the spring pin in the flue gas elbow locks into place.

3. Then insert the flexible pipe (**2**) in the flue pipe coupling (**3**) and align it straight (**2**).

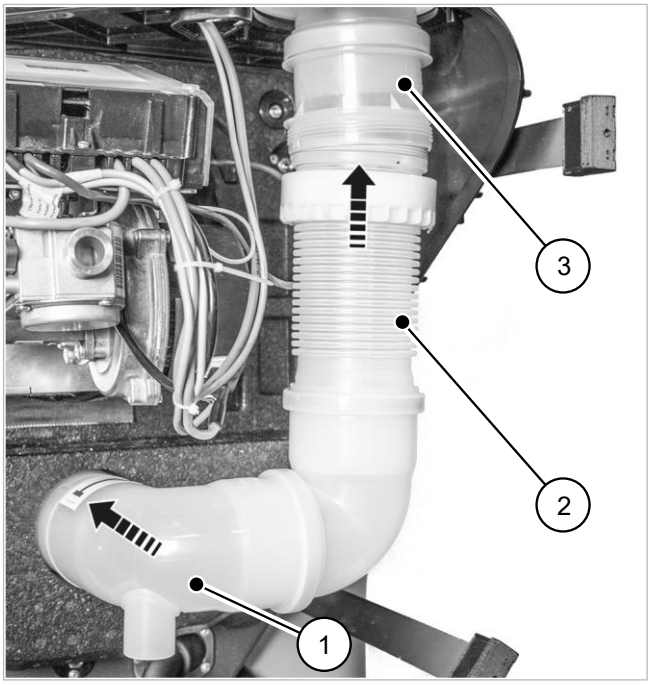


Fig. 80: Flue pipe bend fitted

The following **steps 4 - 6 only apply for oil and hybrid oil:**

4. First, connect the short inner pipe silencer in the flue pipe coupling and slide it into the exhaust connection piece.

Fig. 81: Insert the short silencer at the top

5. Then push the long inner pipe silencer into the flexible flue pipe at the bottom.

Fig. 82: Insert the long silencer at the bottom

6. Press the star ring into the first two grooves.

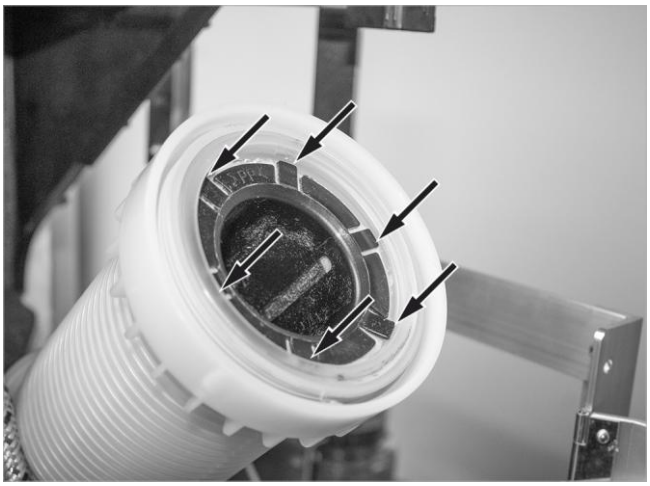


Fig. 83: Lock the star ring

7. If necessary, grease the seal with Centrotherm lubricant from the CAS basic kits.
8. Fit the union nut (**1**), the snap ring (**2**) and the seal (**3**) on the upper pipe end of the flexible flue pipe as shown in the illustrations.

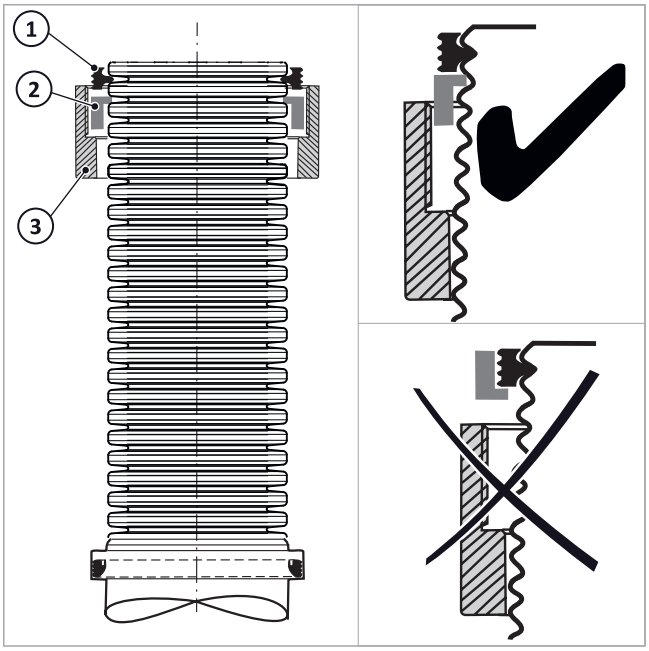


Fig. 84: Screw connection fitted onto the flexible pipe

9. Fit the upper end of the flexible flue pipe with the union nut on the flue pipe coupling at the top of the intake chamber. Ensure that the sealing ring and the snap ring are seated straight in the union nut.
10. Pull the union nut (**3**) upwards and screw it to the flue pipe coupling.

Fig. 85: Screw the flexible pipe to the flue pipe coupling

CAUTION

Observe the following information.

- Local regulations must be observed when delivering the accumulated condensate in public sewage systems.
- Acid-resistant condensate discharge lines must be used. The condensate discharge line must be laid on a gradient for run off.

6.11.3 Condensate discharge

Installing the condensate siphon

1. Condensate siphon (**1**) to the condensate hose (**2**) in the intake chamber. Tighten the union nut hand-tight.

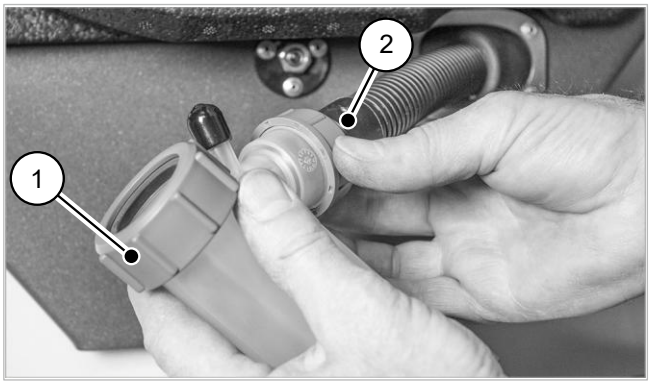


Fig. 86: Connecting the condensate siphon to the condensate hose

2. Attach union nut (**1**) with snap ring (**2**) to the connection on the flue gas elbow.

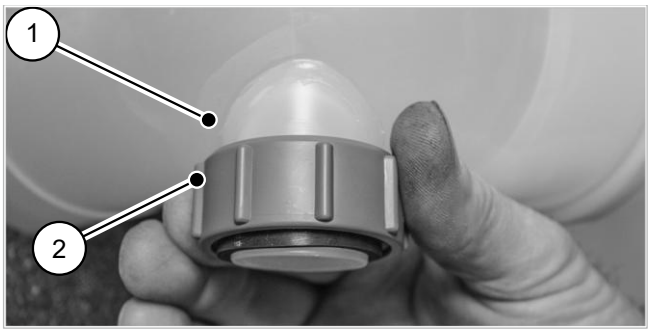


Fig. 87: Attach union nut and snap ring

3. Fill condensate siphon with water, insert and screw hand-tight with union nut.

Fig. 88: Screw on condensate siphon hand-tight

Fitting the mounting bracket

1. Mounting bracket (**1**) for the condensate hose. The bracket must have a slope.

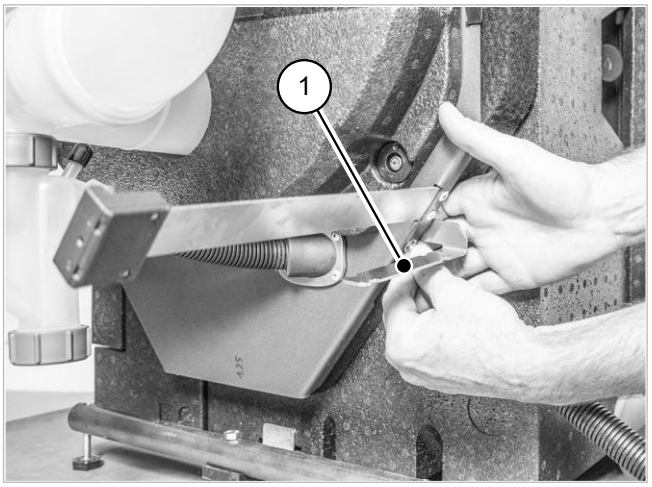


Fig. 89: Fitting the retaining bracket

2. Fasten the condensate hose with cable ties (**1**).

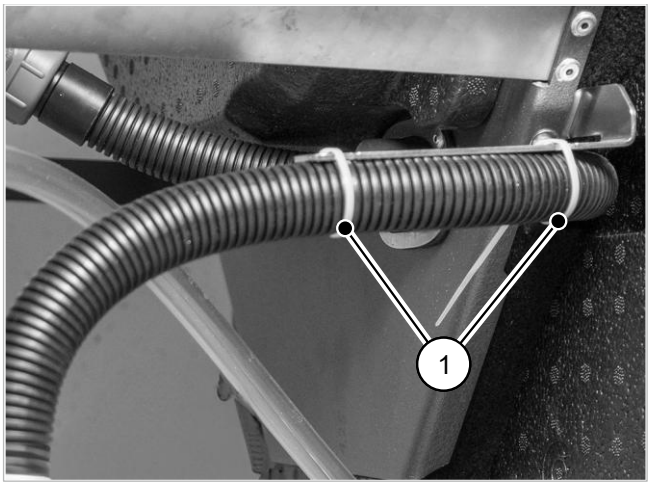


Fig. 90: Fastening the condensate hose

Without condensate pump:

Establishing the condensate connection

1. Insert the condensate hose protruding from the suction chamber into the feed-through (**3**) below the container floor disc and then either to the left or right; ensure that there is a sufficient incline.
2. Guide the condensate hose to the discharge.

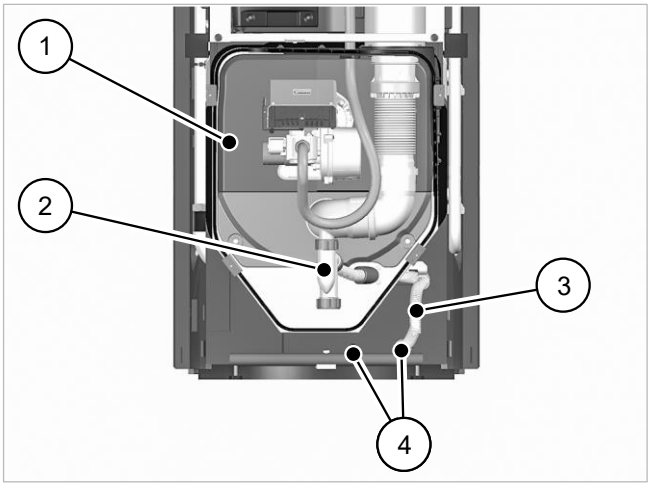


Fig. 91: Condensate drain line without condensate pump

1 *Suction chamber*
1 *Condensate syphon*
2 *Condensate hose*
3 *Feedthroughs*

CAUTION

Prevent condensate back-up

Condensate may leak.

- Ensure that there are no bends (“second siphon”) when laying the condensate hose.
- Always lay the condensate hose on an incline.

Using a condensate lifting pump

- If the use of a condensate lifting pump is required due to structural factors, you can order it as an accessory.
- Observe the pump connection and installation instructions.
- When using the Oil and Hybrid Oil, the **dirt trap tray from the installation accessory pack** should be installed on the siphon.

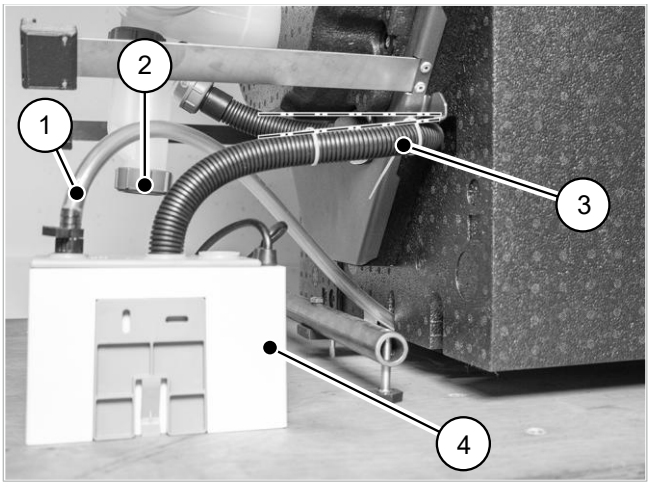


Fig. 92: Condensate pump, connected

1 *Pressure hose*
2 *Dirt trap connection on siphon*
3 *Condensate hose with gradient*
4 *Condensate lifting pump*

For information about installing a condensate pump, see ➔ *Installing a condensate pump (MAL-PUKD).*

6.11.4 Silencer

SolvisBen Oil and Hybrid Oil only

Reflective silencer

1. Remove the black exhaust end pipe from the chimney cap.
2. Insert the reflective silencer into the chimney cap from above.

The screw connection for the silencer (**1**) must be located above the chimney cap.

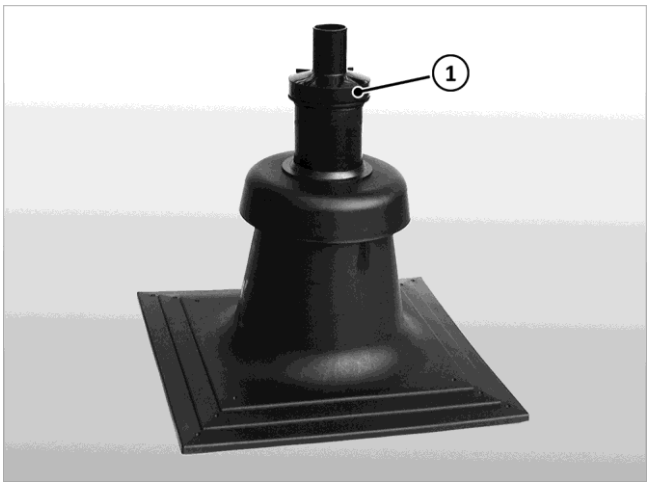


Fig. 93: Inserted reflective silencer

Acoustic emissions

If an excessive amount of noise develops in the exhaust system, a supplemental absorption-type silencer can be installed to reduce the noise.

6.11.5 External exhaust duct

General information on the exhaust system

The following information is authoritative for installing exhaust systems offered by Solvis.

Standards and regulations

As well as the recognised technical regulations, the following points must be observed in particular:

- Regulations from the approval certificate (supplied with the assembly pack).
- German federal state building regulations.
- The regulations for the exhaust routing can differ depending on the country and region.
- The responsible chimney sweep authority must therefore be included during system planning.

Application area of the CAS exhaust system

The pipes and fitting pieces of the CAS exhaust system are made of polypropylene. The concentric outer pipes are made of white, powder-coated metal. Plug connections are used to fabricate the entire exhaust line out of pipes, fittings and seals. The exhaust lines can be installed in or on buildings. The maximum permitted exhaust temperature for the Centrotherm exhaust system (CES) is 120 °C.

The number of maximum lengths are to be taken from the tables below (see ➔ *chapter "Permitted lengths of the exhaust paths", p. 35*).

Shaft requirements

The flue gas pipes must be arranged outside the installation room of the fireplace in separate, adequately ventilated shafts (see ➔ *table "Required minimum internal dimensions").* The shafts must be made of non-combustible, dimensionally stable building materials and have a fire resistance duration of 90 min. For buildings of low height, a fire resistance duration of 30 min is sufficient.

Required minimum internal dimensions

Shaft type	DN 60	DN 80
rectangular	110 x 110	135 x 135
round	ø 110	ø 135

All dimensions in mm

Smaller distances can also be selected between the pipe and the shaft for ambient air-independent fireplaces. In this case, an individual design is required for the system. Please contact the customer center (telephone number, see page 2).

Shortening the flue duct

All flue ducts can be shortened.

The flue must protrude at least 100 mm out of the shaft cover when laid in a shaft.

Cleaning old flues

The flue must be thoroughly cleaned by a specialist company if combustion air is drawn from an existing flue shaft. This applies particularly when fireplaces for oil or solid fuel were previously connected. If dust from crumbling flue mortar is likely to be present again after cleaning, suitable countermeasures must be taken (e.g. centrifuge).

Spacers

Spacers must be mounted in the shaft at least every 2 m and at every elbow or T-piece. With a flexible flue duct, an additional spacer is required before and after each offset. The maximum shaft dimensions should not exceed a diameter or edge length of 240 mm to ensure that the spacers function properly.

Attachment of the exhaust lines

The exhaust lines must be attached with clamps every 1 m in the room.

Minimum gradient for exhaust lines

The exhaust line must be laid on a gradient toward the fireplace so that condensate water can run off the exhaust line to the central condensate water collector.

Minimum gradient:

• Horizontal exhaust line > 5% (5 cm per 1 m)

Cleaning and inspection openings

Exhaust systems must be easy and safe to clean and it must be possible to inspect the open cross section and check for leaks. To do this, at least one cleaning opening must be provided in the exhaust line in the installation room, and an additional one is required for each redirector. Exhaust systems that cannot be inspected and cleaned by accessing the mouth must have an additional cleaning opening in the attic. Shafts for the exhaust lines must not have any openings except the required cleaning and inspection openings as well as openings for the exhaust line rear ventilator.

Clearance to combustible parts

Maintain proper clearance to combustible components when installing the exhaust system. This is specified in the approval for the exhaust systems (clearance category), which can be found in the documentation that is included with the exhaust system.

Surface temperatures on the unit casing and exhaust line will be below 85 °C when the system is running properly.

Approval

The individual components for the exhaust system are approved for construction by the German Institute for Building Technologies ("Deutsches Institut für Bautechnik" – "DIBT") in Berlin.

Installing the exhaust line

1. Connect the exhaust line to the pre-fitted exhaust measuring element.

CAUTION

- Only use approved components for the exhaust line.
- Only use the Centrocerin lubricant supplied with the basic kits for exhaust systems CAS-1 to CAS-8.

6.11.6 Permitted lengths of the exhaust paths

The following tables give an overview of the permitted lengths of the individual exhaust systems.

The maximum exhaust lengths stated relate to:

- DN 60: SolvisMax Gas/SolvisBen Gas with 10 and 18 kW
- DN 80: SolvisMax Gas/SolvisBen Gas with 10, 18, 25 and 30 kW
- DN 80: SolvisMax Oil/SolvisBen Oil with 17, 23 and 28 kW

The minimum exhaust length is 1 m.

If the exhaust lengths given do not suffice, then inquire with us for individualised calculations (see telephone number ➔ *p. 2*).

Complete Solvis exhaust systems (system certified)

CAS-1 (B_{23}) ambient air-dependent	
Shaft design	
Max. permissible length	20 m
Maximum horizontal length	4 m
CAS-2 (B_{33}) ambient air-dependent	
Shaft designx	
Max. permissible length	20 m
Maximum horizontal length	4 m
CAS-2 (C_{93x}) ambient air-independent	
Shaft design	
Max. permissible length	16 m
Maximum horizontal length	4 m
CAS-5-R/CAS-5-S (C_{33x}) ambient air-independent	
Concentric outlet turret	
Max. permissible length	15 m
Maximum horizontal length	4 m
CAS-7 (C_{33x}) ambient air-independent	
Concentric shaft outlet	
Max. permissible length	16 m
Maximum horizontal length	4 m
CAS-8 (C_{33x}) ambient air-independent	
External wall (not in DN 60)	
Max. permissible length	20 m
Maximum horizontal length	4 m
CAS-6 (C_{13x}) ambient air-independent	
Horizontal external wall mouth	
Max. permissible length	10 m

- This type of installation is only permitted in some German States under certain conditions. Observe the relevant regional building regulations.
- The installer can limit the rated heat output.

Solvis exhaust systems in conjunction with approved flues (system certified)

The maximum effective length is calculated using the data from the exhaust gas mass flow and exhaust temperature at partial and full load in relation to the shaft/exhaust gas flue used. For burner and exhaust properties for the flue calculation, see the ➔ *table "Technical combustion data", chapter "Gas burner", page 68.*

CAS-3 (B_{23}) ambient air-dependent
Fireplace manufacturer performs calculation
Connection only to a flue approved for the heating technology that is not sensitive to moisture
CAS-4 (C_{43x}) ambient air-independent
Fireplace manufacturer performs calculation
Connection only to a flue approved for the heating technology that is not sensitive to moisture

Offset measurements of the flue ducts

Angle/Diameter	Offset V	Length L
15° Bend: DN 60 / DN 80	22 / 20.0	167.1 / 150.0
30° Bend: DN 60 / DN 80	46.5 / 43.0	173.6 / 161.5
45° Bend: DN 60 / DN 80	74.9 / 69.5	175.9 / 168.0
87° Bend: DN 60 / DN 80	179.9 / 142.0	189.3 / 150.0

All dimension specifications in mm

The measurements apply for the ambient air-dependent system and ambient air-independent system. Due to differences in the shank, the offset and length measurements for DN 60 are larger than those for DN 80.

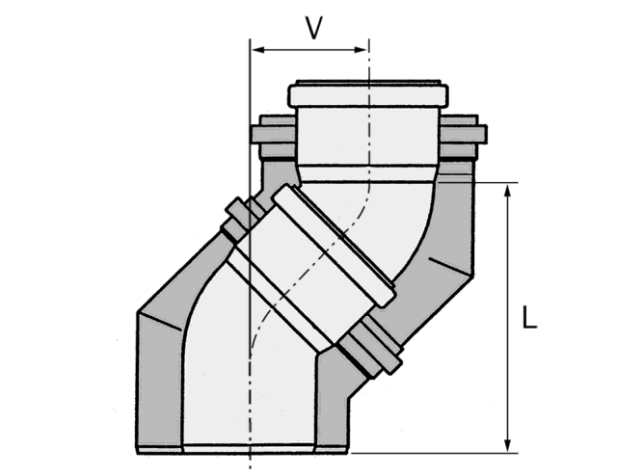


Fig. 94: Offset and length

6.12 Front flange insulation

The front flange insulation, which is initially disassembled during the burner installation (see ➔ *chapter "Installing the gas burner", page 23* or ➔ *chapter "Installing the oil burner", page 26*) initially disassembled front flange insulation consists of one left and two right parts.

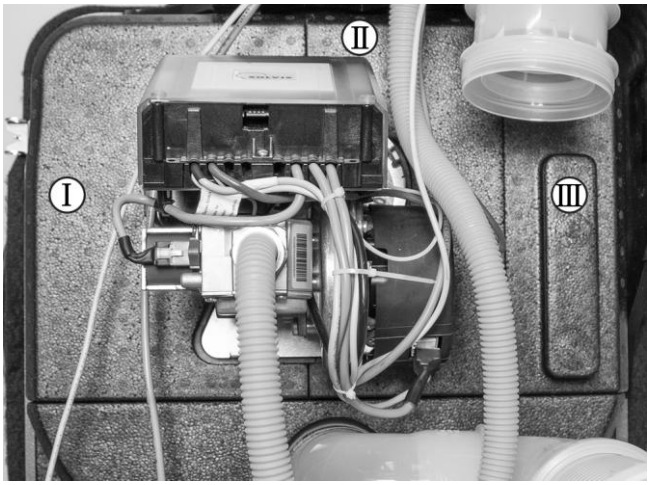


Fig. 95: Front flange insulation (3-part)

With the rear locking springs (**2**), which are provided for each part, the parts of the front flange insulation to the rear flange insulation already fitted to the appliance.

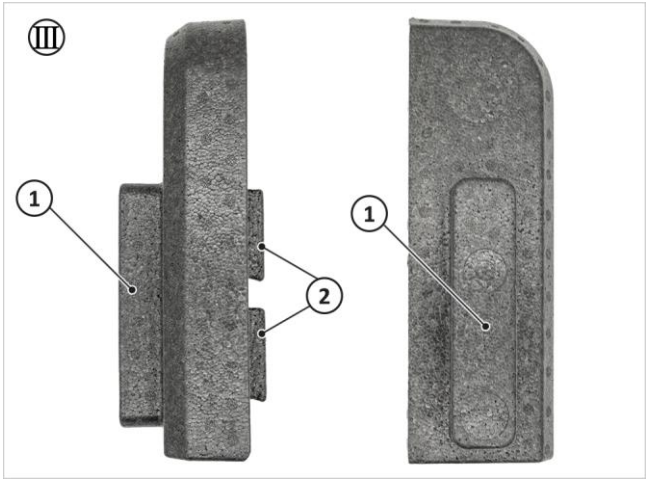


*Fig. 96: Front flange insulation (**III**) with locking springs*

1 *Handle*
2 *Locking spring*

Installing the front flange insulation

1. Fold down the exhaust pipe

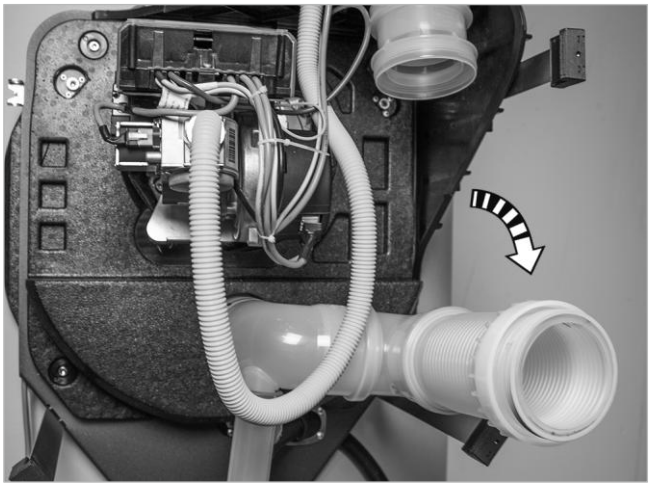


Fig. 97: Folding down the exhaust pipe

2. Insert the larger of the two right-hand parts into the front flange insulation with the spring clips in the grooves of the rear flange insulation.

3. Now push the front flange insulation sideways inwards to the middle and press it into the grooves.

The front flange insulation should lie flush to the rear flange insulation.

Fig. 98: Installing the right-hand front flange insulation (part II)

4. Insert the second part of the front right flange insulation, press it into the groove and push both halves flush together.

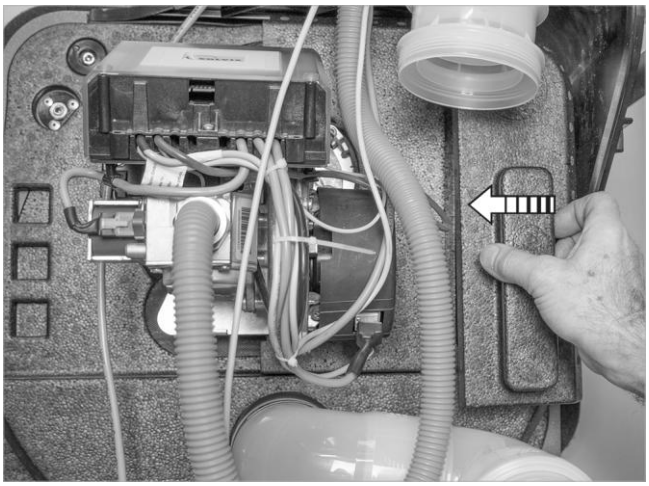


Fig. 99: Fitting the right-hand front flange insulation (part III)

5. Insert the left-hand part of the front flange insulation from the left, press it into the groove and push both halves flush together.

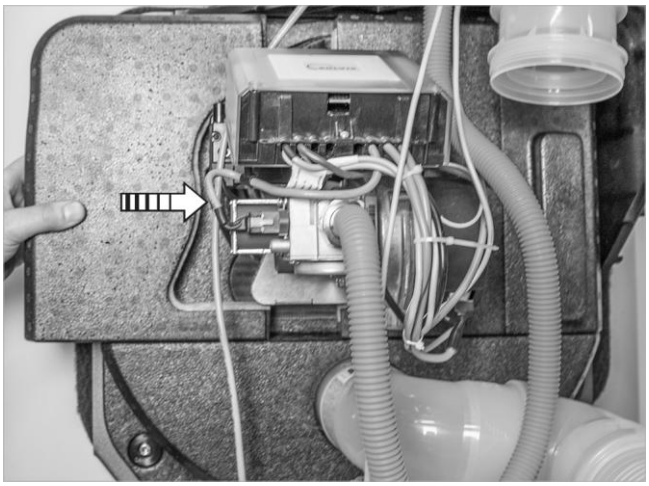


Fig. 100: Fitting the right-hand front flange insulation (part I)

CAUTION

Ensure correct positioning

Possible damage to neighbouring components

- The front flange insulation must lie flush to the rear flange insulation all around.
- The two halves should engage flush with each other.

Close the intake chamber

1. Insert the guide strut into the holder and fold the closing rail forwards.

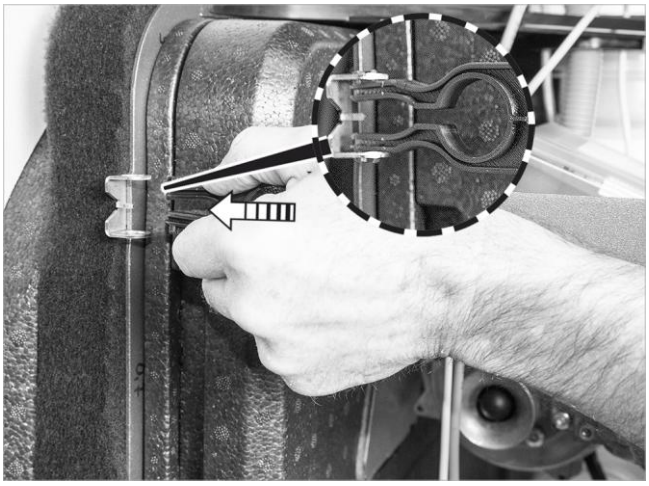


Fig. 101: Fitting the guide rail

2. Fit the cover of the suction chamber and engage the locking rails in the cover. Press against the hood from the front.

Fig. 102: Fitting the hood

3. If the holding force is too low, readjust the locking rails if necessary to close the sealing gap.

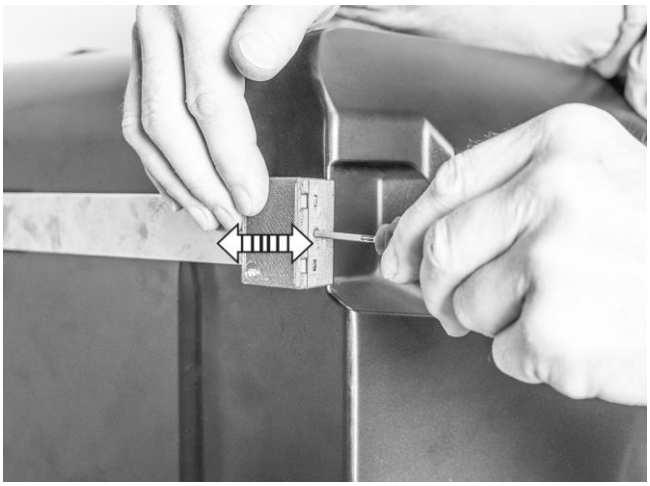


Fig. 103: Readjust the locking rails if necessary

DANGER

Make sure that the intake chamber is air-tight.

Risk of suffocation

- For the cable routing from the intake chamber, use only its designated opening.
- Ensure that the cover is seated correctly, the sealing gap must be closed.
- Ensure that the sealing sleeve for the cable bushing is seated correctly.
- Any measures taken by the customer must not impinge the leak tightness of the intake chambers.

6.13 Electrical connection

6.13.1 General information

DANGER

Risk of electrical shock

Damage to health, cardiac arrest possible.

- Disconnect the system from the mains before carrying out work on it and ensure that it cannot be turned on again

CAUTION

Observe ambient conditions

Malfunction or failure of system possible.

- Avoid ambient temperatures outside of the permitted range of 5 °C to +50 °C.
- Avoid dew condensation and an annual mean relative humidity higher than 75 % (briefly 95 %).

CAUTION

Country-specific regulations

Regulations can differ depending on the country and the region.

- These are to be observed and adhered to in order to ensure safe and faultless operation.
- If certain laws and regulations do not apply in a particular country, they are to be replaced by the country's own specific laws and regulations.

WARNING

In the event of incorrect mains connection

Contact voltages can be extremely hazardous.

- All mains connection work must be performed by authorised technicians.
- Work must be done in compliance with relevant regulations, especially DIN VDE 0100/IEC 60364 (Erection of power installations), accident prevention regulations and the guidelines of the responsible power supply company.
- Before connection, the current type and the mains voltage must be compared with the specifications on the unit nameplate.
- The minimum cross section of all connection lines must be designed in accordance with the power consumption of the unit.
- Only operate the unit while observing the prescribed safety measures and information in these instructions.
- Incorporate the unit into the local equipotential bonding while observing the minimum cross section.
- Ensure that the phase is correct during multiphase mains connection.

CAUTION

Criteria for line installation

Malfunction or failure of heating system possible.

- Check that all cable and plug connections are connected correctly.
- The bus and sensor lines must be routed separately from lines over 50 V to prevent the controller from being influenced by electromagnetic fields.
- Do not install control devices directly adjacent to control cabinets or electrical devices.
- The electrical lines must not come into contact with hot parts.
- If possible, run all lines in a cable channel and, if necessary, secure with strain relief devices.

CAUTION

Criteria for line length

Risk of heating system fault or failure.

- The total cable resistance for the sensor cables must not exceed 2.5 ohms. For cables with a cross section of 0.25 mm², this corresponds to a length of up to 5 m.
- For cross sections of 0.5 or 0.75 mm², the maximum cable length is 15 or 50 m.
- Sensor cables for temperature sensors should not be unnecessarily long. For very long cables, sensor correction can be performed to minimise the systematic variance errors.

6.13.2 Line routing in the SolvisBen

Routing and connecting the pipes

External connection pipes can be routed through the cover area and the WWS area to the mains circuit board housing and connected there accordingly.

1. Insert the connection pipes through the cable routing duct (**1**) in the cover area.

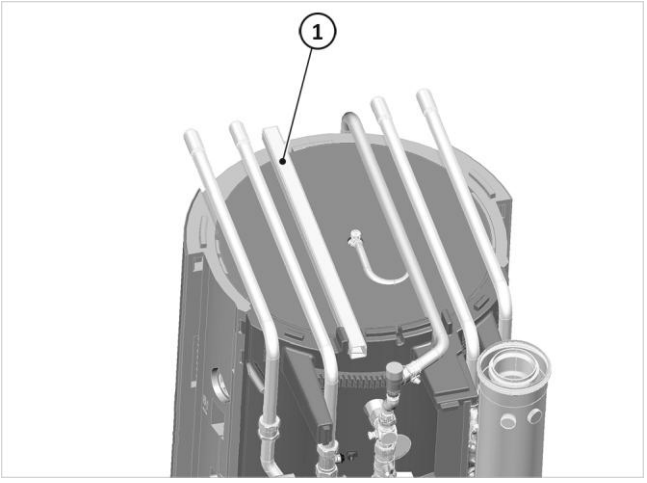


Fig. 104: Cable routing duct

2. Now guide the lines in the area of the hot water station behind the hot water station to the bottom left.
3. The lines exit from the front of the hot water station insulation in the bottom left corner.
4. The lines can be pushed into the slots of the rear insulation shell (**2**) to fix their course in place.

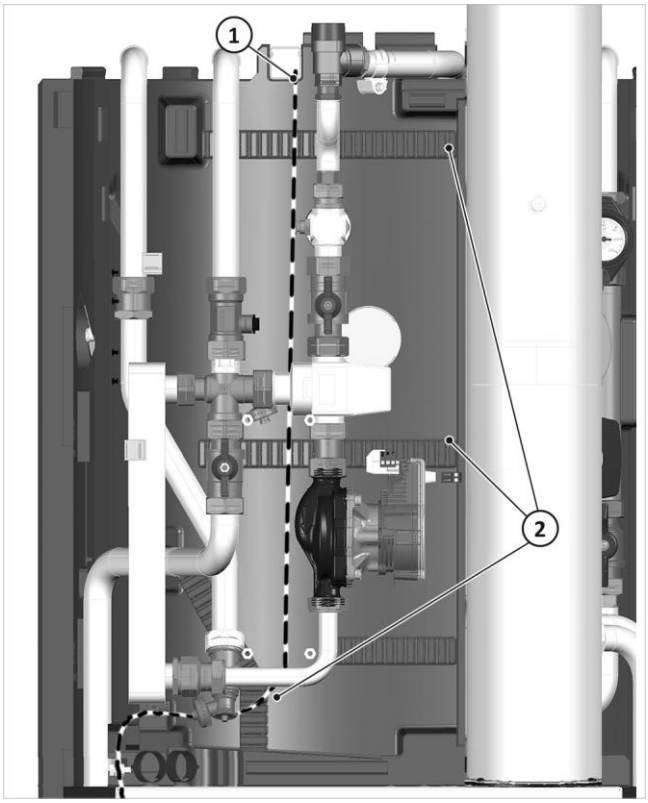


Fig. 105: Cable routing through the hot water station insulation

1 *Low voltage lines (bus and sensor lines)*
2 *Slots in the insulation shell*

5. Route the low-voltage lines (**1**) into the mains circuit board from below and apply them.
6. Route the remaining lines (**2**) from the top side, apply them to the mains circuit board and secure them with strain relief devices (**3**). Lay all lines in the area between the hot water station insulation and mains circuit board in a loop to ensure sufficient room for opening the mains circuit board door.

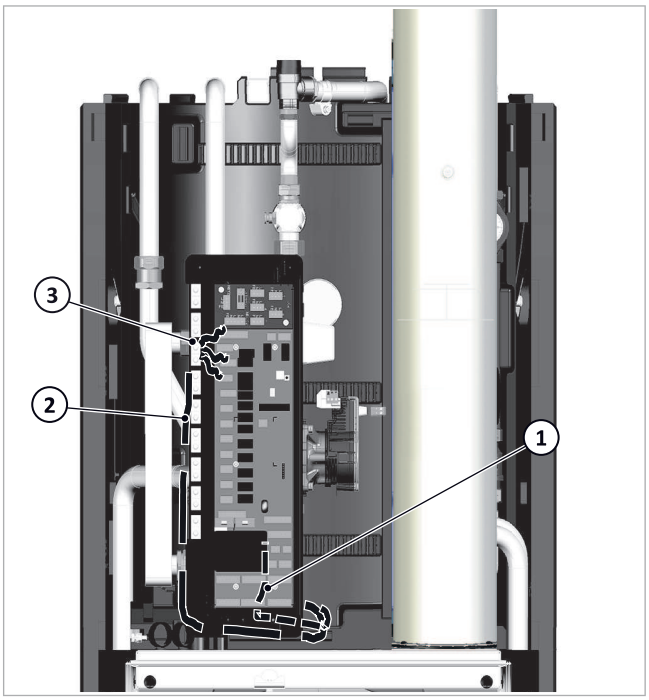


Fig. 106: Connecting to the mains circuit board

1 *Low voltage lines (bus and sensor lines)*
2 *Lines over 50 V*
3 *Strain relief devices*

6.13.3 Equipotential bonding

DANGER

Be careful of electrically conductive parts

Overvoltages may result in injury or even cardiac arrest (electric shock).

- Equipotential bonding must always be carried out according to DIN VDE 0100.

Each building has a main earthing terminal for equipotential bonding in the building connection room. All of the conductive parts of a building, such as the gas, heating or water pipes, are connected to this main earthing terminal using a equipotential bonding conductor.

Connect the equipotential bonding

Incorporate the unit into the local equipotential bonding.

1. Lay an equipotential bonding conductor with green and yellow marking and a cable width of at least 6 mm² from the main earthing terminal in the building connection room to the boiler.
2. Fasten the equipotential bonding conductor to the frame as shown in the figure.

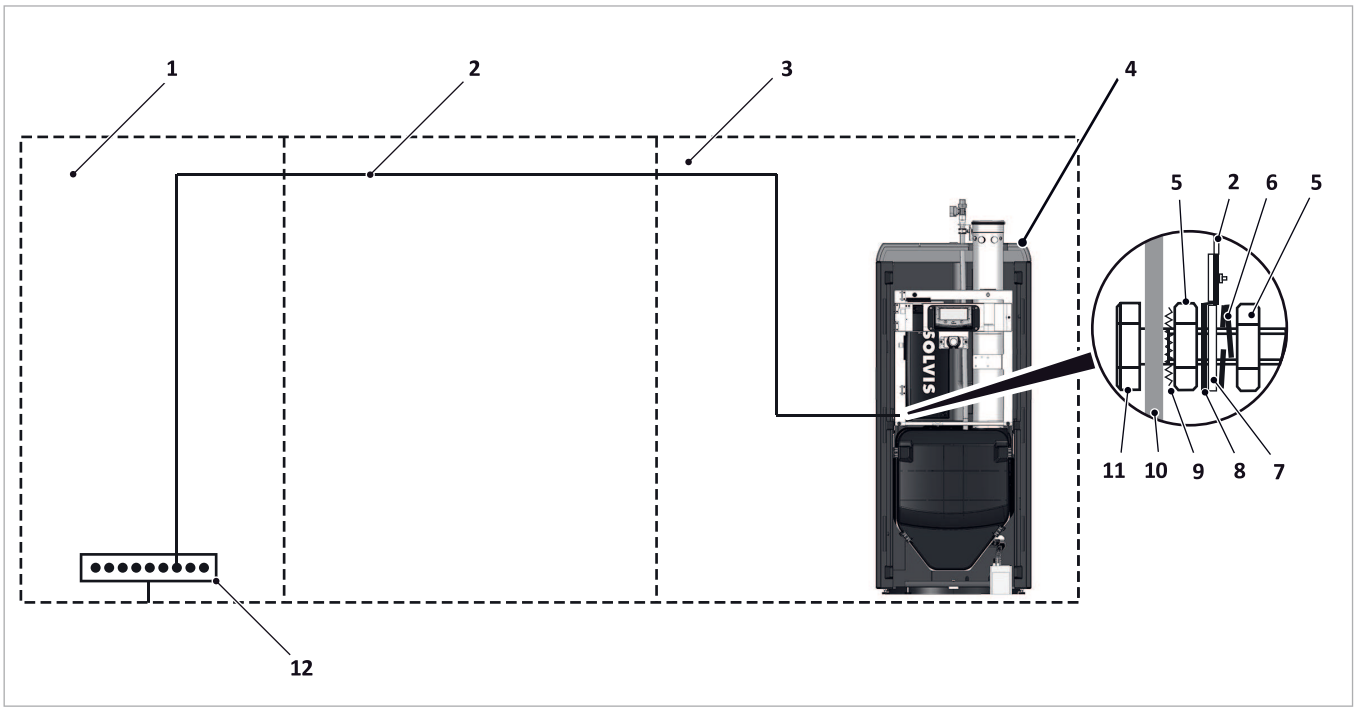


Fig. 107: Equipotential bonding for the SolvisBen

1	*Building connection room*	7	*Cable lug*
2	*Equipotential bonding conductor*	8	*Washer*
3	*Installation site*	9	*Toothed washer*
4	*SolvisBen*	10	*SolvisBen console*
5	*Nut*	11	*Screw*
6	*Spring washer*	12	*Main earthing terminal*

6.13.4 Connecting the outdoor sensor

Fitting the outdoor sensor

The outdoor sensor (S10) measures the temperature on the outdoor wall.

- It is preferable to position the outdoor sensor on the north or north-east side of the building.
- Half way up the facade, however at a height of at least 2.5 m (see f. fig.).

1. Lay a suitable sensor line on site.
2. Connect the outdoor sensor (polarity is not important). To do so, use socket board “S10” from the installation pack.

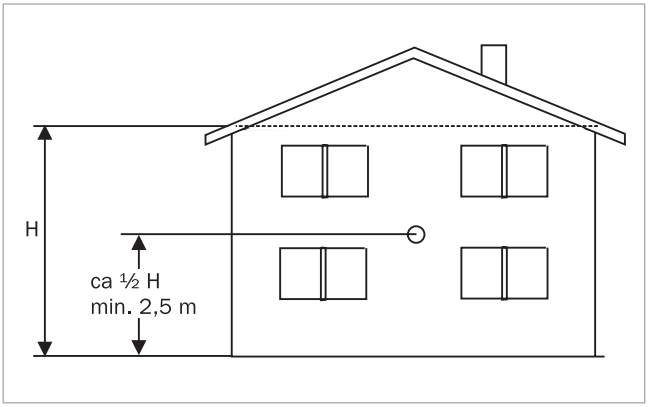


Fig. 108: Position of the outdoor sensor

6.13.5 Connecting the room controller

Fit the housing

DANGER

Risk of electrical shock

Damage to health, cardiac arrest possible.

- Disconnect the system from the mains before carrying out work on it and ensure that it cannot be turned on again

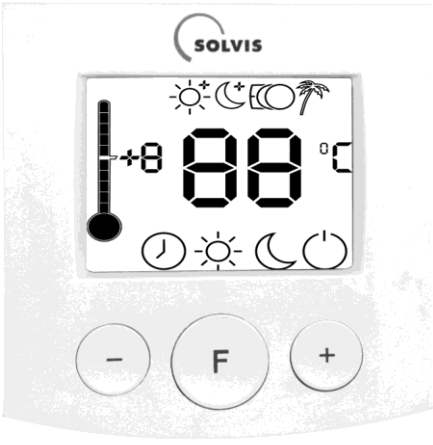


Fig. 109: Room controller BE-SC-2

- Install the room controller in the coldest room to be heated.
- It must not be installed in close proximity to a heat source or by a window.
- No thermostat valves should be used in this room.

1. Lift the front cover on the lower side with a screw driver.
2. Swing the front plate forward slightly and pull upwards to remove it (see ➔ *fig. 110*).
3. Fix the housing to the wall with the supplied plugs and screws.

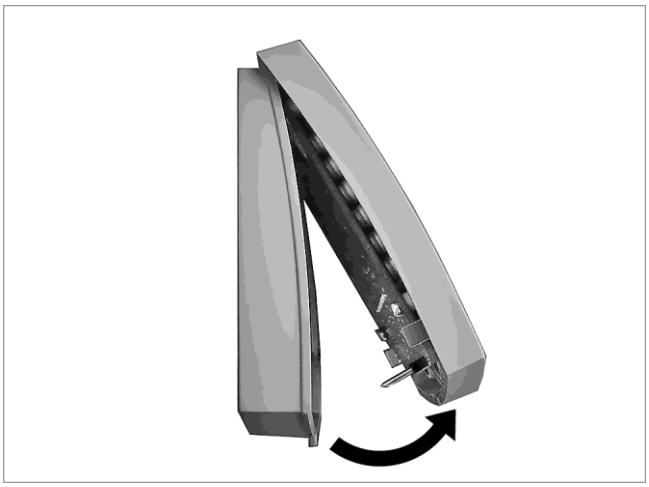


Fig. 110: Opening the housing

Connect the room controller

It is connected via a two-wire line. The line is used for both the voltage supply and data transfer from the mains module.

1. Connect the connection line to the two-pole terminal of the room controller, observing the polarity (see ➔ *fig. 111*).

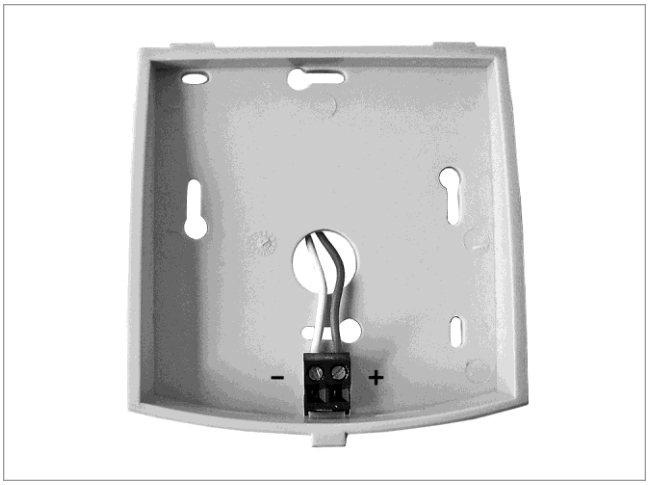


Fig. 111: Connect the room controller

Connect to the mains module

1. Connect the two-wire line to one of the terminal pairs (“R 1” to “R 3”) on the mains module (observing the polarity).

The room controller has polarity reversal protection to ensure that it is not damaged if the polarity is incorrect.

Close the housing

1. Before closing, ensure that the plug and the socket board of the plug connection are aligned.

If nothing is shown on the display after switching the system on, the poles of the connection lines may be reversed.

2. Close the housing.

6.13.6 Connecting Modbus

Only SolvisBen Hybrid Gas/Oil, if PLAS-WP-WM (with Allengra sensor and integrated Modbus box) has not been installed

The SolvisControl 3 system controller and the internal heating pump controller communicate via a Modbus connection. The connection must be established via shielded cables to avoid interference.
The Modbus interface was already routed in the factory from the SC-3 to a junction box loosely positioned in the cover area and must now be attached outside the SolvisBen.

Installing the Modbus junction box

1. Route the Modbus line of the junction box through the cable routing duct ➔ *fig. 104* (**1**) in the cover area.
2. Install the junction box at a suitable location.

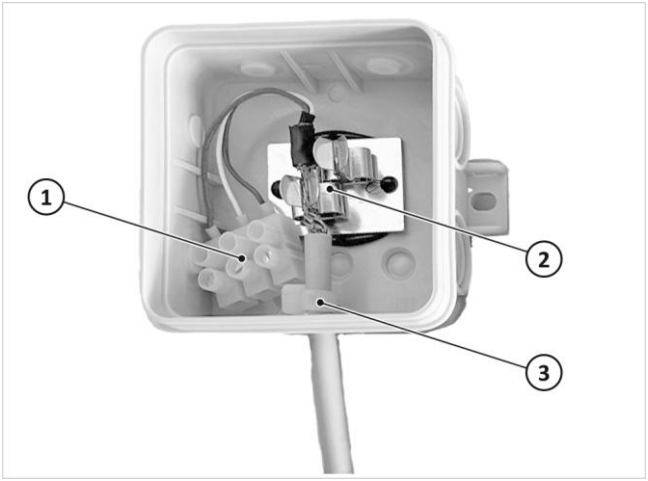


Fig. 112: Attaching the Modbus junction box

1 *Connection terminals*
2 *Shield clamps*
3 *Strain relief device*

Connecting the Modbus cable from the heating pump

1. Open the junction box.
2. Open the cable entry with a knife or something similar.
3. Insert the shielded Modbus cable from the heating pump in the junction box.
4. Strip the cable, expose the shielding and fix it in the shield clamp.
5. Strip the insulation from the wires and fit wire end sleeves on them.
6. Connect the wires according to the colour coding, brown (GND) / white (Modbus A) / green (Modbus B) to the pre-assembled terminals.

Observe the label on the cover of the junction box when completing the connections!

7. Use the cable ties supplied for strain relief of the cables to the heating pump as illustrated in *fig. 112* (**3**).


See also the ➔ *installation instructions (MAL)* for the respective heat pump.

6.13.7 Connecting the PLAS-WP-WM pump

SolvisBen Hybrid Gas and Hybrid Oil only

Connecting the pump

The pump has two connection cables.

1. Route the power and signal cable of the pump to the mains circuit board of the SolvisControl 3.
2. Connect the power cable to output A2 and secure the cable via the strain relief device.
3. Connect the signal cable to output LP as follows:
   • Blue: "LP -"
   • Brown: "LP +"

6.13.8 Connecting external heating circuit pumps

Only for external heating circuit stations

Connecting heating circuit pumps

1. Connect the pump cables as follows:
   - Heating circuit 1 on output A3
   - Heating circuit 2 on output A4
   - Heating circuit 3 on output A5

Installing the flow sensor

1. Slide the flow sensor into the sensor immersion tube on the ball valve of the heating circuit station and secure it using the screw.
2. Connect the cable to terminal S12 (heating circuit 1), S13 (heating circuit 2), or S16 (heating circuit 3). This must be a "heating circuit match": that is, if the pump has been connected to A3 (= heat. circuit 1), then the sensor must be connected to S12 (= heating circuit 1).

Connecting the actuator drives of the heating circuit mixer

Connection	Colour of the wires		
	Brown	Black	Blue
A8/A9 (heating circuit 1)	Pin A8	Pin A9	Pin N
A10/A11 (heating circuit 2)	Pin A10	Pin A11	Pin N
A6 and A7 (heating circuit 3)	Pin A6	Pin A7	Pin N (A6 or A7)

Checking the heating circuit mixer

The terminals "open" and "close" from terminal strips (SM 1) and (SM 2) specify the run direction of the servomotor.

1. If the mixer runs in the incorrect direction: Swap the connections at these terminals.

Following start-up, proceed as described below to check that the heating circuit mixer is connected correctly:

2. Switch output A8 (or A10) to "**Manual on**" for at least 150 s.
3. Check the sensor setting; the temperature at S12 (or S13) must correspond to the temperature at S4.


The check is temporarily carried out in manual mode, see ➔ *"Testing the outputs" in the operating instructions (BAL-SBSX-3-I-EN).*

6.13.9 Connecting a solar station (optional)


Connect a solar station as per the installation instructions (see ➔ *Installing a solar station (MAL-SUES-5.5).*

Connection of the collector sensor


Sensor S8 can only be connected when the quick-fit duct and collectors are installed, see ➔ *sec. "Sensor installation" in the installation instructions of the collector.*

6.13.10 Connecting SmartGrid (optional)

SolvisBen Hybrid Gas and Hybrid Oil only

The following operating states can be implemented via the SmartGrid connection board according to the "SG-ready" label.

- Heating pump lock (e.g. idle period of utility supply company)
- Increased heating pump operation
- External requirement by the utility supply company or heating pump operation, e.g. via energy management system

If not in use, heating pump runs in normal mode.

Connecting the SmartGrid

1. Route the control line(s) of the SmartGrid device to the connection board of the SolvisBen and connect according to the connection diagram (→ document *ALS-BEN-EN*).

6.13.11 Connecting the power supply for the heating pump control unit

only SolvisBen hybrid gas and hybrid oil with SolvisLea / SolvisLea 8,3 Premium / SolvisLea Eco / SolvisMia MJ24

The power supply for the internal control of the SolvisLea / SolvisLea 8.3 Premium / SolvisLea Eco heat pumps and the SEC of the SolvisMia MJ24 is provided via the mains board of the SolvisBen Hybrid-Gas or SolvisBen Hybrid-Oil.

The SolvisLea Pro, SolvisMia and SolvisPia heat pumps do not require a power supply from the SolvisBen.

Connecting the voltage supply

1. Route the three-wire supply line from the SolvisLea / SolvisLea 8.3 Premium / SolvisLea Eco to the mains circuit board and connect it to an available area on the expansion board with the PE/N/L terminals.
2. Lead the supply line through the strain relief device and secure.

The power supply to the compressor itself is provided separately and not via the SolvisBen, see ➔ *chapter "Electrical connection" in the installation instructions (MAL-LEA, MAL-LEA-8P, MAL-LEA-E, MAL-PIA/MAL-PIA-1317 or MAL-MIA).*

6.13.12 Mains connection

Checking the connections on the mains module

1. Connect the sensors, servomotors, and pumps according to the connection diagram and check their connections.

For connection diagrams, see ➔ *Chapter "Appendix", P.75*.

Connecting the power supply

1. Route the supply line to the mains module and connect it to the "Mains PE/N/L" terminals on the expansion board.
2. Lead the supply line through the strain relief device and secure.

Check that the wiring is correct to prevent unit malfunctions:
- L=L, N=N, etc.
- 230 V must be applied on L.

6.13.13 Completing the connection tasks

Closing the front WWS insulation cover

1. Put on the front insulation cover (**1**) for the hot water station (WWS) again and engage it with the rear insulation at the top and bottom.

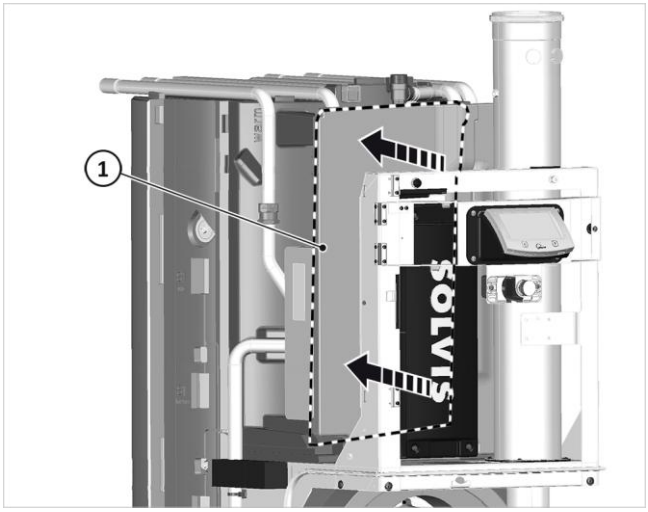


Fig. 113: Inserting the front insulation cover on the hot water station (WWS)

Closing the front HKS insulation cover if necessary

1. Put on the front insulation cover (**1**) for the heating circuit station (HKS) again and engage it with the rear insulation at the top and bottom.

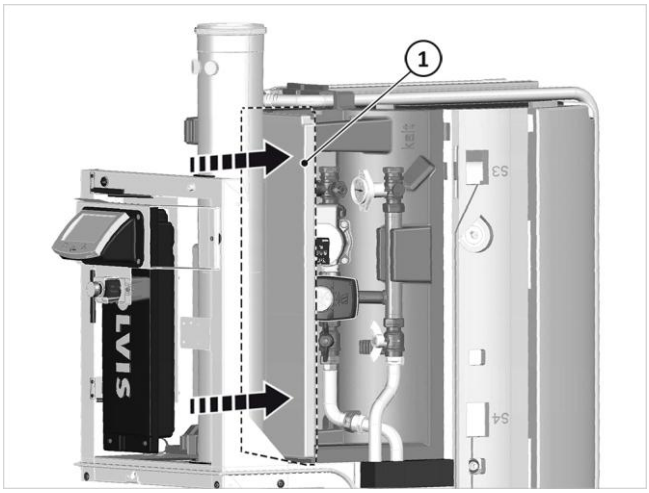


Fig. 114: Attaching the HKS front insulation cover

Close the protective housing for the mains module

1. Check that all lines have been routed correctly and were not caught while the cover was being closed.
2. Carefully put on the strain relief devices.
3. Check that all the socket boards have been plugged into the mains module.
4. Fasten the cover (**1**) using 4 screws (**2**).

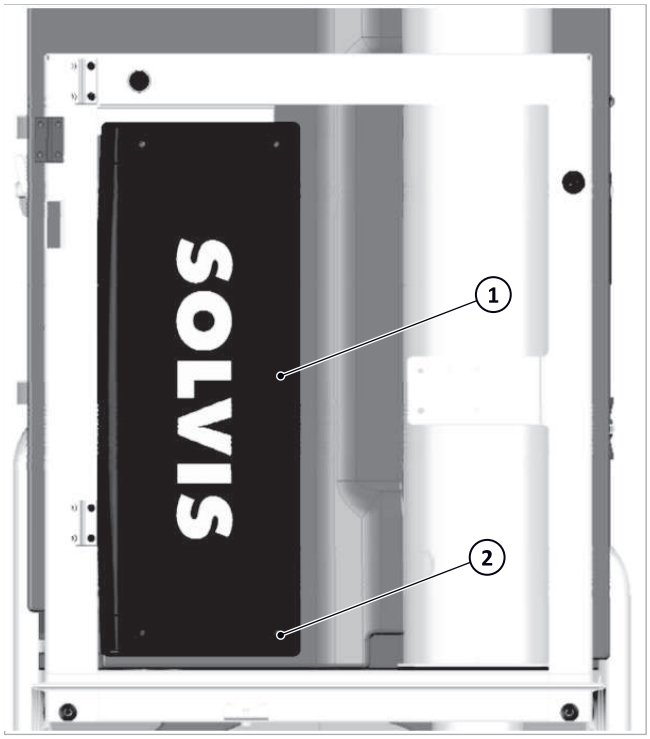


Fig. 115: Fastening the mains module cover

7 Start-Up

Start-up takes place in the prescribed order:

The systems folder includes a start-up report that must be filled out completely when starting up the system and kept together with the system.

7.1 Storage tank

CAUTION

Observe the quality of the filling water

Damage to the heating system due to stone formation / water-side corrosion possible.

- The filling water must meet the requirements of VDI 2035, Sheet 1

If water treatment is required for the raw water, we recommend the "Permasoft-ALU" system from Permatrade-Wassertechnik GmbH.

For detailed information on water treatment, see the ➔ *system log for filling heating water in Solvis systems (BRO-AO-ALH).*

Filling the system (pressure test)

1. Fill the system via the KFE tap (**1**).

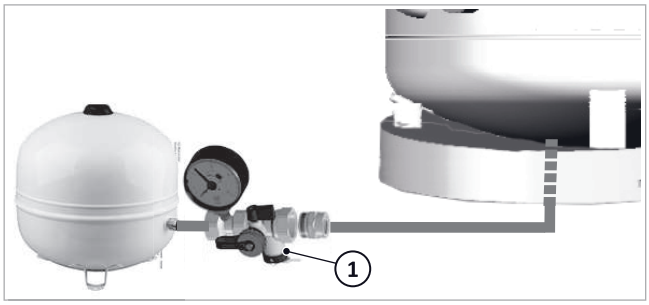


Fig. 116: KFE tap on MAG connection group

2. Vent the system incl. storage tank.
3. Carry out a leak test.

Only for SolvisPia, SolvisLea 8.3 Premium and SolvisLea Pro

CAUTION

Observe the maximum system pressure

The safety valve on the SolvisPia, SolvisLea 8.3 Premium and SolvisLea Pro responds at 2.5 bar

- Do not exceed the maximum system pressure of 2.2 bar.
- Safety valves with at least 3.0 bar are prescribed for heating circuit components inside the building.

All other systems

CAUTION

Observe the pressure in the heating system

Blowing off the safety valve is possible.

- The maximum permissible pressure is 3.0 bar.
- External devices such as heat pumps may be designed for lower maximum system pressures.

See ➔ *Installation instructions (MAL)* for the respective heat pump.

4. Set the filling pressure to 0.3 bar above the inlet pressure, i.e. between 1.7 and 2.0 bar.

The bleeder is located on the top of the storage tank.

7.2 SolvisControl

Configuring the SolvisControl

SolvisControl must be configured.

1. Configure the SolvisControl.

Carry out all the steps described, see ➔ *sec. "Configuration of the SolvisControl" in the operating instructions (BAL-SBSX-3-I-EN).*

2. Perform the SolvisControl basic settings.

Perform all of the described steps in accordance with ➔ *"Basic settings: Heating, water and circulation, if required" in the operating instructions (BAL-SBSX-3-I-EN).*

For a basic introduction to operat. the system controller, see ➔ *Chapter "Operating the SolvisControl" in the operating instructions (BAL-SBSX-3-K-EN).*

7.3 Thermal mixing valve

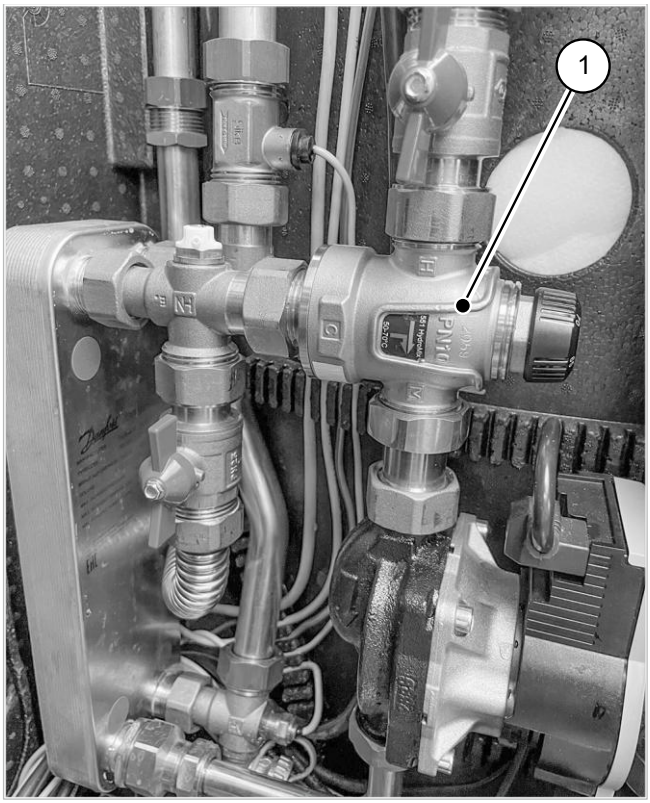


*Fig. 117: Thermal mixing valve (**1**) in the SolvisBen hot water station*

TMV factory default

The thermal mixing valve (TMV) on the hot water station has a factory setting of 60 °C.

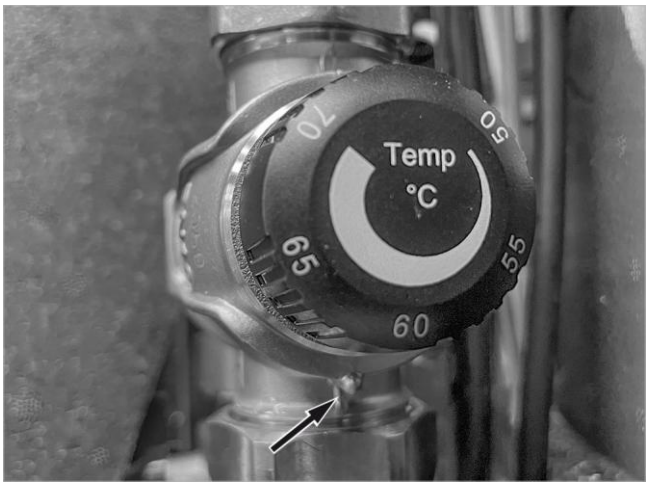


Fig. 118: Setting the TMV

To reach the rated output, the TMV setting has to be changed.

- WWS-30: "**65 °C**"

If the drinking water is hard, this higher setting may cause increased lime deposits and energy consumption.

7.4 Heat generator design

Correct design of the burner performance is vital for cost-effective, low-emission and durable operation of the burner. In the case of renovation, a simple and practical estimate of the boiler performance can be made based on fuel consumption (Swiss Formula).

When designing the heating load using the Swiss Formula, be aware of the following:

- The formula generally provides good results with practical relevance.
- For buildings with a very high proportion of glass and/or new buildings (new construction insulation standard), the calculation is only applicable to a limited extent.
- The method may only be used with constant boundary conditions (heated building area, user behaviour).

Design based on the Swiss Formula

To estimate the heating load required for an existing building, the Swiss Formula is applied as follows:

$$øHL = \frac{øConsumption \cdot H_o \cdot \eta}{t_{voll}}$$

øHL	*Heating load in [kW]*
øConsumption	*Average annual consumption in [l] heating oil / [m³] gas*
H_o	*Upper heating value (calorific value), see table*
η	*Annual efficiency (condensing boiler approx. 0.95)*
t_{voll}	*Full load hours in [h] (for residential buildings with heating and hot water, approx. 2300 h)*

The use of heating oil EL or natural gas H results in the following simple correlation:

$$øHL = \frac{ø\ Consumption\ per\ year}{230}$$

Upper heating value (calorific value)

Fuel	Lower heating value (H_o)
Heating oil EL	10.6 kWh/l
Natural gas H	10.5 kWh/m³
Natural gas L	9.5 kWh/m³
Liquid gas	7.4 kWh/m³

Example:

The annual consumption in a single-family home with oil heating is approx. 3500 l (EL heating oil). Thus, the average heating load is: ØHL = 3500 / 230 = 15.2 kW.
Result: A17 kW burner is sufficient to heat the single-family home.

For information about the design of hybrid systems, see ➔ *chapter "System planning" in the relevant planning document (PUL-LEA or PUL-MIA).*

7.5 Gas burner

SolvisBen Gas and SolvisBen Hybrid Gas only

- The burner is preset for operation with natural gas "H" and can also be operated with natural gas "L".
- In order to use liquid gas, it is necessary to install the refitting set first, see ➔ *"Installing the refitting set for liquid gas" in the section on "Conversion to liquid gas", on page 21.*

7.5.1 Burner activation

Switching the A12 output has no effect on the SX-LN-3 burner.
You can control the burner manually in the "**Installer**" main menu by going to the "**Burner**" or "**Heating**" menu and selecting "**Maintenance function**".

Switching on the burner

Logging on to the SolvisControl as the installer:

1. Open the maintenance function ("Installer" menu → "Heating" → "Maintenance function"); refer also to the ➔ *Chapter "Maintenance" in the operating instructions (BAL-SBSX-3-I-EN).*

7.5.2 Settings

Setting the CO_2 value (max. burner performance)

The CO_2 value is set at full load. Please refer to the following table for the CO_2 value to be set for the maximum burner output:

Burner performance	CO_2 value at max. burner output
10 kW / 18 kW / 25 kW / 30 kW	9.9 - 10.5% (natural gas)
	12.0 - 12.6% (liquid gas)

2. Set the CO_2 value using the adjusting screw (**2**).
3. Start in maintenance function "Max. burner output".
   - Screw in the adjusting screw = CO_2 value decreases
   - Unscrew the adjusting screw = CO_2 value increases

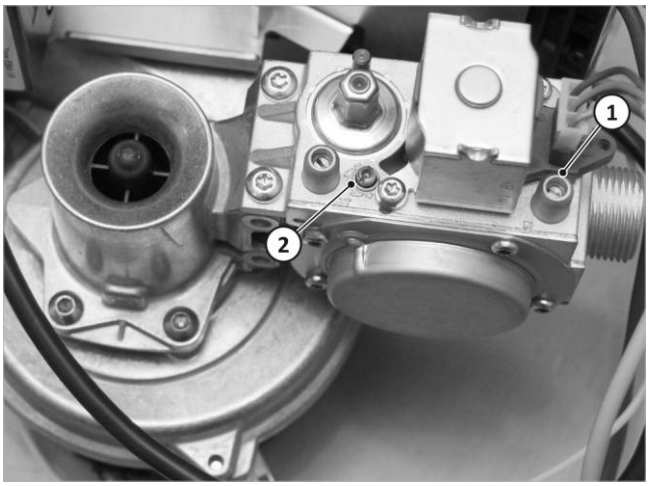


Fig. 119: Setting the burner

1 *Measuring socket*
2 *CO_2 adjustment screw*

Only when moved: presetting the burner

If the adjusting screw for the CO_2 value was roughly displaced during start-up, proceed as follows:

1. Screw in the adjusting screw in the direction of the minus sign (clockwise) until it stops. Then, screw it out in an anticlockwise direction according to the table below:

Burner performance	Turns in an anticlockwise direction with	
	Natural gas	Liquid gas
10 kW	4	3
18 kW	4½	3¼
25 kW	7¼	6
30 kW	7¼	6

Checking the CO_2 value (max. burner performance)

After setting the CO_2 value at full load, check the CO_2 value at minimum load

1. Start "Min. burner performance" in the maintenance function.

The CO_2 value must not drop below the following limit values when operating at minimum burner performance:

Burner performance	CO_2 value at minimum burner performance
10 kW	up to 2% less CO_2 than at max. burner performance
18 kW / 25 kW / 30 kW	up to 1% less CO_2 than at max. burner performance

For the CO_2 value at maximum burner output, see ➔ work instructions "Setting the CO_2 value (max. burner output)", p. 46.

- If minimum burner performance drops below these limit values, contact Solvis customer service.
- CO_2 value must not be corrected at minimum burner performance.

- Nitrogen is often still in the tank for liquid gas systems when first filling the liquid gas tank.
- The composition of the fuel gas can therefore change again after the second filling.
- The setting of the burner must be checked after filling the tank for a second time (CO_2 content in the exhaust).

- If the burner does not ignite at the first attempt at start-up, it may be due to the air still contained in the gas line.
- The ignition process can be repeated several times. After the fifth attempt, a malfunction message will appear on the display of the SolvisControl system controller; see ➔ *"Unlocking the automatic firing system", "Troubleshooting" section, page 60.*
- In case of burner malfunctions, the flow pressure is checked and should be between 20 and 60 mbar.
- The measurement connection is used to check the gas' flow pressure when the burner is in operation ➔ *fig. 119* (**1**).

7.6 Oil burner

SolvisBen Oil and Hybrid Oil only

CAUTION

Permitted fuel

To fulfil the terms of the warranty

- The SolvisMax / Ben Oil BW may only be operated with low-sulphur heating oil (max. 50 ppm sulphur). This also applies during start-up.
- We strongly recommend using premium-quality, low-sulphur heating oil, as per DIN 51603-1.
- In addition, all oil heating boilers for (low-sulphur) heating oils with an organic content of up to 10 % are approved, as per DIN SPEC 51603-6.

CAUTION

Observe the following information regarding the oil connection

- The oil pipes must always be routed in a single pipe system using 6 x 1 mm copper pipes.
- Always use oil filters with a filter mesh < 20 µm.
- During start-up, do not suck the heating oil into the burner with the oil pump. The oil pump will be damaged if it runs dry.

CAUTION

Use prescribed parts only

Otherwise, failure or damage to the burner is possible.

- For a list of prescribed parts, see the ➔ *"Components used" table, p. 69*
- Other components are not permitted.

Output ranges for the burner

Within the specified output ranges, (see ➔ *"Burner performance setting values" table, p. 69*) the burner can be adapted to the building heat requirements. The burners are set to the following oil pressures in the factory:

- 10/17 kW burner: 8/18 bar
- 14/23 kW burner: 8/20 bar.

Check the prerequisites for setting the burner:

1. Burner must run for at least 10 min. before taking the measurement.
2. Operating temperature reached at the top of the heating buffer (sensor S4).

Flue gas values to be aimed for:

- CO_2 13.3%
- NO_X 30 - 38 ppm (fuel-related)

Set up the burner in the following order

For the set values for burner performance, see ➔ *table "Burner performance setting values", p. 69*

1. Switch to the installer menu.
2. Switch the burner to manual operation with: "**Burner**" → "**Adjust blower – start**".
3. Under "**Adjust fanspeed for**", switch to **Level 2**.
4. Set the pump pressure for level 2 (see the ➔ *work instructions "Setting the pump pressure"*).
5. Set the fan speed for level 2 (see the ➔ *"Setting the fan speed" work instructions*).
6. Under "**Adjust fanspeed for**", go to **Level 1**.
7. Set the pump pressure to level 1.
8. Set the fan speed to level 1.

Setting the pump pressure

1. Use the pressure adjusting screw to set the pump pressure to the appropriate level.

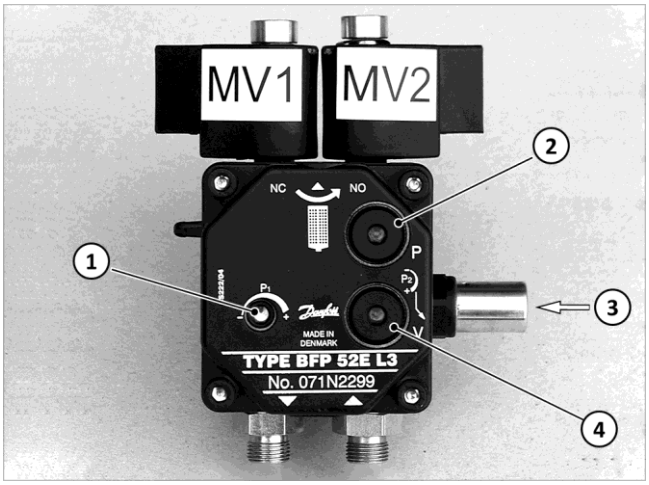


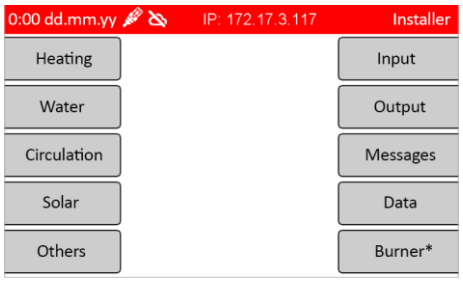
Fig. 120: Setting the pump pressure on the oil pump

1 *Pressure setting for level 1*
2 *Pressure measurement connection*
3 *Pressure setting for level 2*
4 *Vacuum measurement connection*

Setting the blower speed

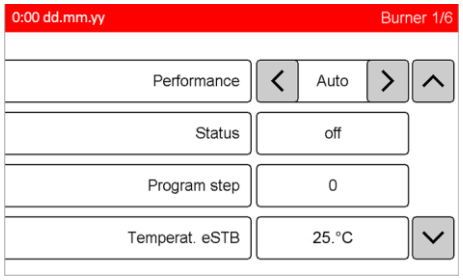
You configure the setting in the menu "**Installer**" → "**Burner**" → "**Adjust blower – start**" in the SolvisControl.

1. In the installer menu, choose "**Burner**".

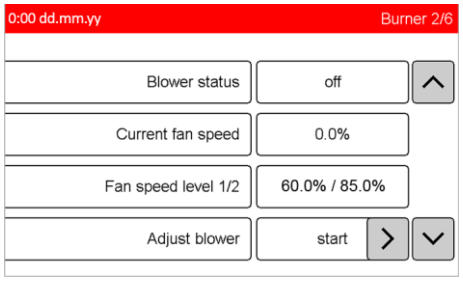


Depending on the system used, the menu option displayed changes from "**Burner**" to "**Heating pump**" or "**Heat generator**". The last choice opens an overview of the heat generators installed.

2. Use the navigation button to move to the next page.



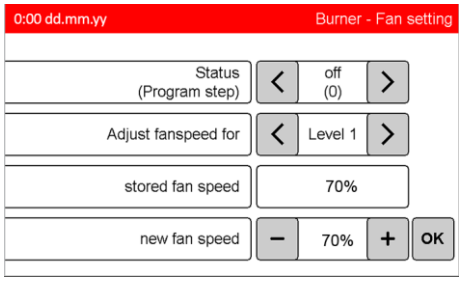
3. Select "**start**" next to "**Adjust blower**".



Changes to the blower settings can be made only in
- A: standby (program step 0) or
- B: modulation enable mode (program step 8)

A: setting the blower speed in standby mode

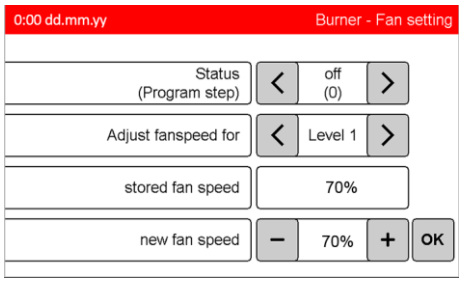
1. Use the rocker switch to set the burner status to "**Off**".
2. If necessary, wait until the burner switches to standby mode (program step 0).
3. Use the "**Adjust blower speed for**" rocker switch to select the burner level to be set (here, level 1).



4. Set the new blower speed and choose "**OK**" to confirm.
5. Wait until the changes have been transferred to "**stored blower speed**".
6. If necessary, proceed in the same way for the other burner level.
7. Use the "Back" button to leave the menu.

B: setting the blower speed during burner operation

1. Use the rocker switch to set the burner status to "**On**".
2. If necessary, wait until the burner switches to modulation enable mode (program step 8).
3. Use the "**Adjust blower speed for**" rocker switch to select the burner level to be set (here, level 2).



4. Set the new blower speed and choose "**OK**" to confirm.
5. Wait until the changes have been transferred to "**stored blower speed**".
6. Check and log the blower pressure using a pressure gauge. (Observe the minimum pressures and setting data; see ➔ *tab. "Burner performance setting values", Page 69*).
7. If necessary, proceed in the same way for the other burner level.
8. Use the "Back" button to leave the menu.

7.7 Heating system

Recommendation: Heat up the whole heating system to approximately 60 °C (observe the permitted temperatures!)

"Thermally inhibit" the heating water

1. To circulate the storage tank volume, switch the hot water pump (output PWM, W) to "**Manual**" on the SolvisControl while heating up ("**Installer**" menu → "**Outputs**" → "**More**" → "**Analogue/PWM**" → "**HW Pump**" → status: "**Manual**").
2. Set the heat generator to maximum power; see the ➔ *chapter "Switching the heat generator on and off for maintenance" in the (installer) operating instructions for the heat generator*.
3. If possible, activate the heating circuits (pump, mixer, and thermostat valves).
4. When the target value is reached at S4, the heating process can be finished.
5. Then, check the filling pressure. It should be within a range of 1.5 to 2.5 bar.

7.8 Buffer charging station pump – SolvisBen Hybrid

7.8.1 Adjustment options

The load pump is speed-controlled by a PWM signal from the SC-3. The pumps do not need to be set.

7.8.2 Bleeding

Bleeding the pump

If the pump does not bleed automatically, operate the pump manually for a few minutes alternating between high speed and low speed to convey the accumulated air from the pump into the system. Proceed as follows:

1. Go to the "**Installer**" menu on the SC-3.
2. Select "**Outputs**" → "**More**" → "**Analogue/PWM**" → "**Load pump**" from the menu.
3. Set "**Manual specification**" to "**100 %** ".
   → Pump is running at maximum speed
4. After approx. 20 seconds, press "**+**" and set to "**0%**".
   → Pump is not running
5. After approx. 10 seconds, press "**–**" and set to "**100%**".
   → Pump is running at maximum speed
6. Repeat the procedure for a few minutes.
7. Set "**Manual specification**" to "**Auto**".

7.9 Wilo PARA heating circuit pump (integrated HKS)

If the pump does not bleed automatically:

1. Activate the bleeding function via the operating button, press for 3 seconds and then release.

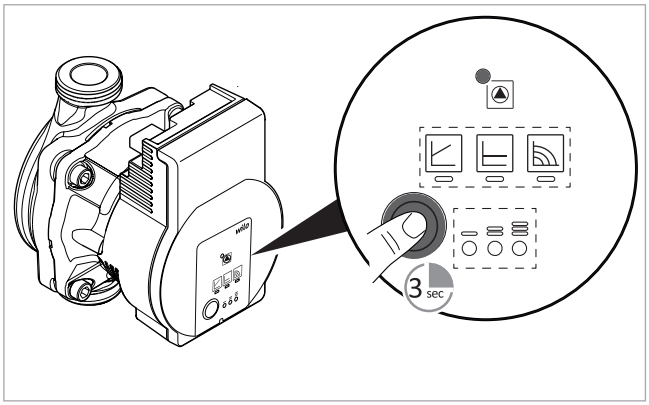


Fig. 121: Starting bleeding

The bleeding function starts and lasts for 10 minutes.

The upper and lower LEDs flash alternately every second.

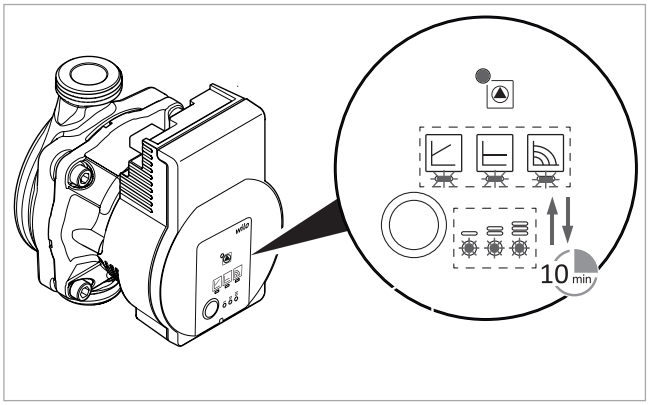


Fig. 122: Bleeding activated display

2. To cancel, press the operating button for 3 seconds.

After bleeding, the LED display shows the previously set values of the pump.

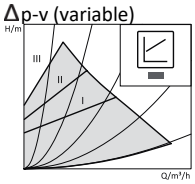
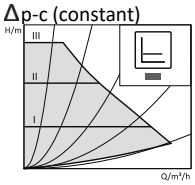
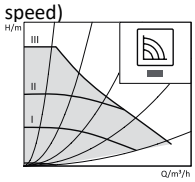
Setting the delivery height and control type

Information about the delivery height:
The characteristic curve settings correspond approximately to the following max. delivery height for the "Δp-v (variable)" control type:

- I: approx. 2.0 mWS
- II: approx. 3.4 mWS
- III: approx. 4.4 mWS

For detailed pump characteristic curves, see ➔ *chapter "Heating circuit distribution", page 73*.

Note on the control types

Control type*	Description	Recommendation
Δp-v (variable) 	The pump reduces the delivery height by half when the volume flow in the pipe network decreases. Saving electrical energy by adjusting the delivery height to the volume flow demand and lower flow speeds	Recommended standard setting for reducing the noise of flowing water at the thermostatic valves in two-pipe heating systems with radiators.
Δp-c (constant) 	The control keeps the set delivery height constant regardless of the conveyed volume flow.	For underfloor heating, pipe lines with large dimensions or any applications without a variable pump characteristic curve (e.g. storage charging pumps), as well as single-pipe heating systems with radiators.
n = c (constant speed) 	The pump runs at three preset fixed speed levels (I, II, III).	Recommendation for systems with unchangeable system resistance, which require a constant volume flow.

** Three preset characteristic curves (I, II, III) are available.*

Setting the control type

LED selection of the control types and corresponding characteristic curves occurs clockwise.

1. Press the operating button (approx. 1 second).

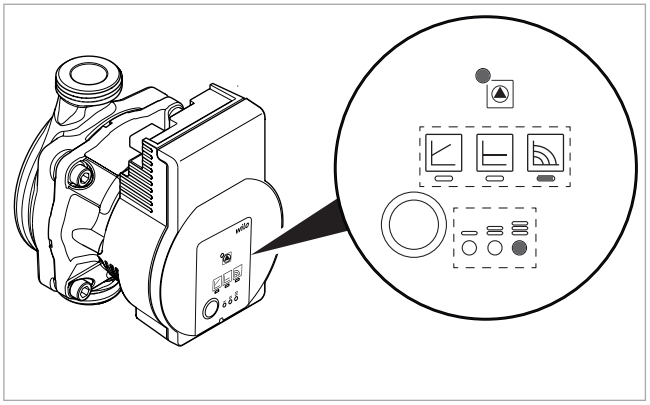


Fig. 123: Basic setting (constant speed, characteristic curve III)

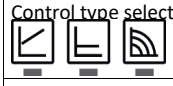
The LEDs indicate the set control type and characteristic curve.

Navigating through the menu

Press operating button	LED display	Control type	Characteristic curve
1.		Constant speed (n = c)	II
2.			I
3.		Differential pressure variable (Δp-v)	III
4.			II
5.*			I
6.		Constant differential pressure (Δp-c)	III
7.			II
8.			I
9.**		Constant speed (n = c)	III

** Recommended setting if additional details unknown.*
*** Press the 9th button to return to the basic setting (constant speed, characteristic curve III, see* ➔ Fig. 123*).*

Overview of setting the pump

Control element	Operation	Setting/function
	Press briefly several times	Control type selection 
		Characteristic curve selection 
	Press 3 seconds	Bleeding function (pump only)
	Press 5 seconds	Manual restart
	Press 8 seconds	Lock/unlock button

7.10 Basic settings

Carrying out the basic settings

Final basic settings and checks are required before starting up the system. Start-up can continue once these settings have been made.

1. Perform the SolvisControl basic settings.

- ➔ *Chapter "Skid control"*
- ➔ *Chapter "Plausibility check" and*
- ➔ *Chapter "Saving the data" in the operating instructions (BAL-SBSX-3-I-EN).*

7.11 Final Tasks

7.11.1 Check

Testing the hot water temperature

1. Test the hot water temperature of a tap.

If the water is not warm enough, see also ➔ *chapter "Troubleshooting" in the operating instructions (BAL-SBSX-3-I-EN).*

7.11.2 Top tank insulation

The top insulation comprises four individual sections: the top tank insulation (**1**) with the removable bleeder cover (**2**) and the top insulation sections for the heating circuit station (**3**) and hot water station (**4**).

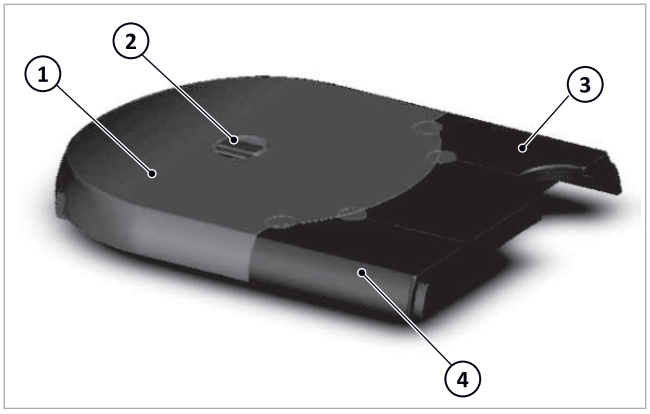


Fig. 124: Top SolvisBen insulation

Fitting the insulation for connections from above

If the drinking water-side and heating system-side connections have been run from above, proceed as follows:

1. Take off the top insulation sections for the hot water station ➔ *fig. 124* (**4**) and heating circuit station ➔ *fig. 124* (**3**) from the top.
2. Take the tank insulation ➔ *fig. 124* (**1**) and carefully cut off the four foam plugs along the grooved slot (6) on the hot water station (**5**) using a sharp knife.
3. **Only with an integrated heating circuit station**: Cut off the plugs for the heating circuit station (**7**) along the slots (**8**).

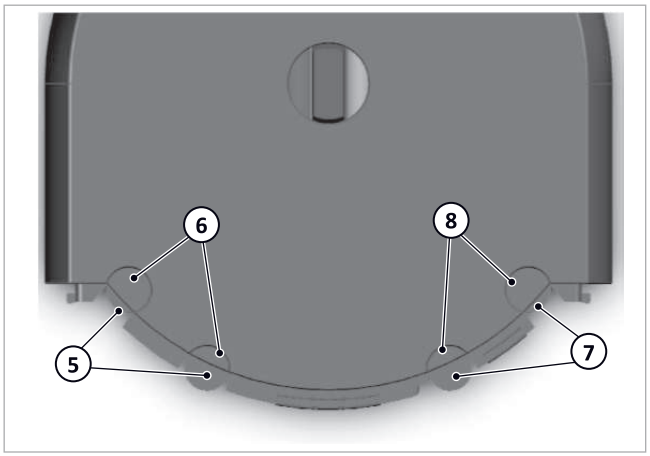


Fig. 125: Cutting the pipe lead-throughs

4. Place the top tank insulation ➔ *fig. 124* (**1**) on the tank.
5. Engage the top tank insulation with the tank insulation. There are four catching points:
   - On the left and right side (**1**)
   - In the middle at the rear (**2**)
   - In the middle at the front (**3**)

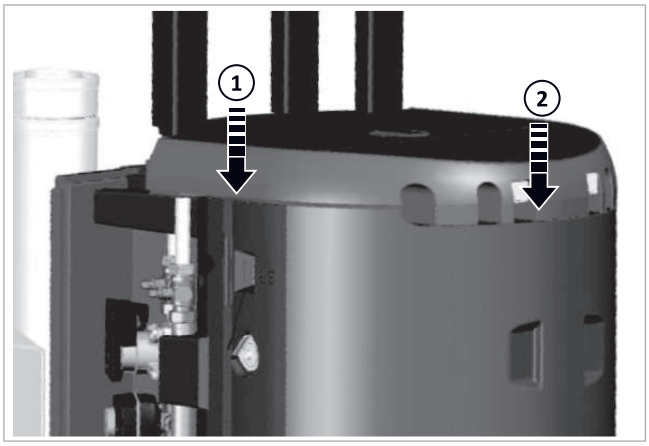


Fig. 126: Right and rear catch

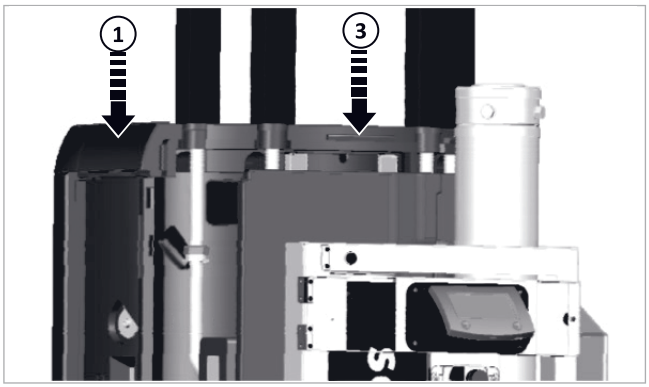


Fig. 127: Left and front catch

6. Attach the top insulation for the hot water station ➔ *fig. 124* (**3**).
7. When routing the gas line at the top, cut the top insulation for the hot water station (**1**, see also ➔ *fig. 124* (**4**)) as shown in ➔ *fig. 128* (or in the supplied template) before attaching it.

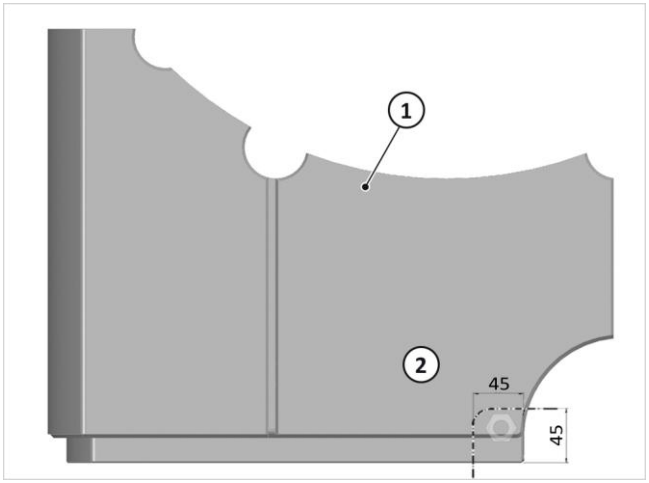


Fig. 128: Cutting the inlet for the gas line if necessary

8. To ensure minimal heat loss, fit the pipe insulation (**1**) flush with the top insulation.

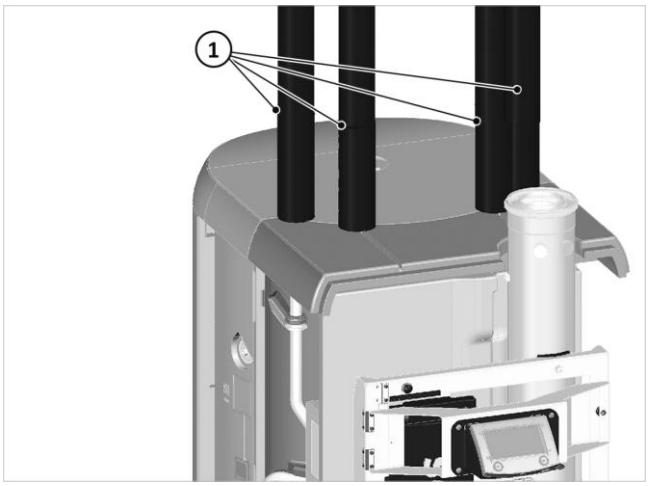


Fig. 129: Top insulation with connections from above

Fitting the insulation for connections from the rear

If the drinking water-side and heating system-side connections are routed from the rear using the additional connection pipe set, proceed as follows:

1. Completely install the assembled top insulation ➔ *fig. 124* (1+2+3+4) on the tank.
2. Engage the top tank insulation with the tank insulation. There are four catching points:
   - On the left and right side (**1**)
   - In the middle at the rear (**2**)
   - In the middle at the front (**3**)

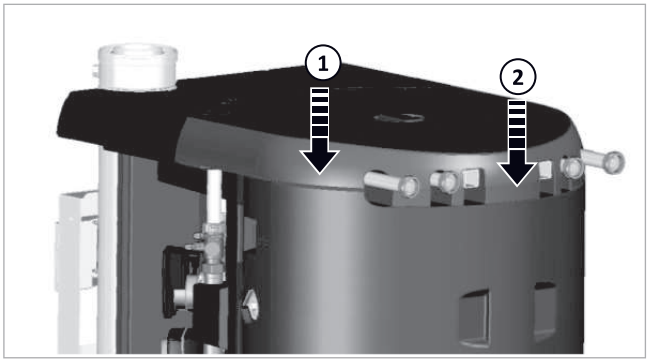


Fig. 130: Right and rear catch

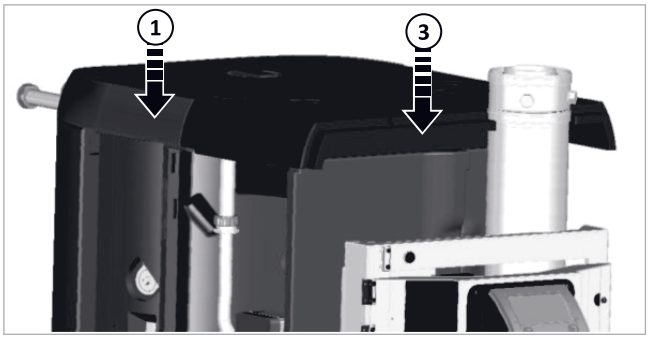


Fig. 131: Left and front catch

3. Fit the pipe insulation for the connection pipes flush with the tank insulation to minimise heat loss.
4. Seal the openings with fleece plugs.

7.11.3 Side tank insulation

Completing the work

1. Take the bag with the fleece plugs and seal the cut-out sections in the rear tank insulation using the fleece plugs (see the arrows in ➔ *fig. 132*, *fig. 133 and fig. 134*).

Fig. 132: Fleece plugs on the rear side

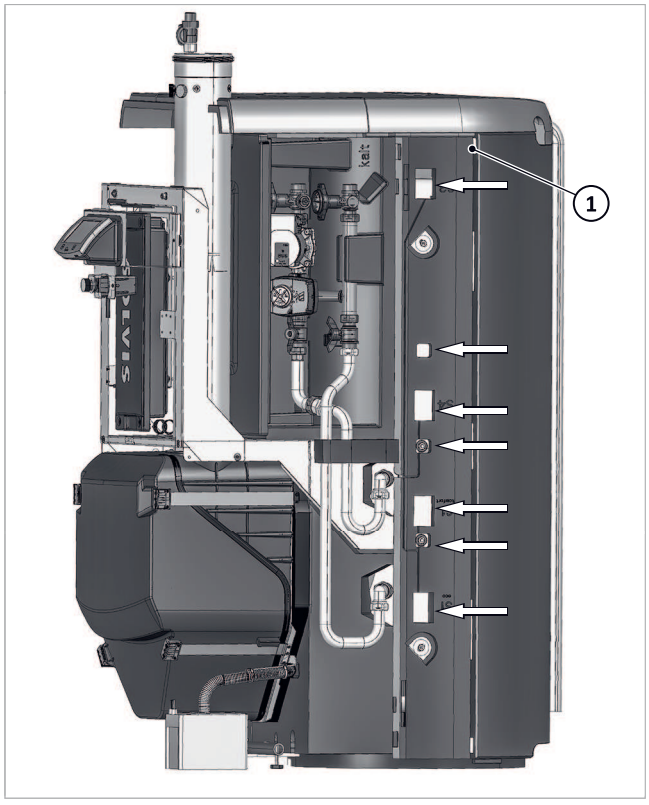


Fig. 133: Fleece plugs on the right side

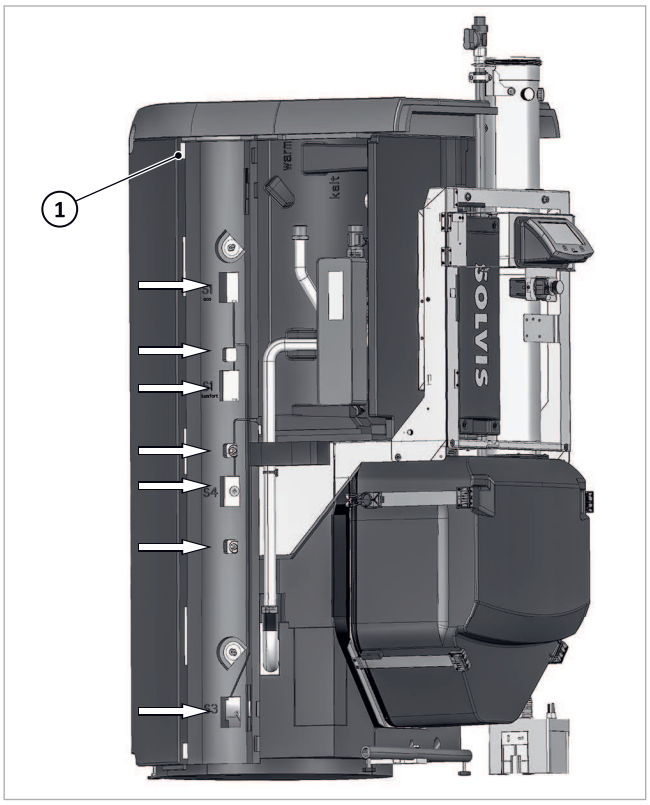


Fig. 134: Fleece plugs on the left side

2. Take one side section and position it at an angle of approx. 15° to the vertical top groove (**1**) on the rear tank insulation.

3. Press the side section into the groove of the rear tank insulation along its whole length.

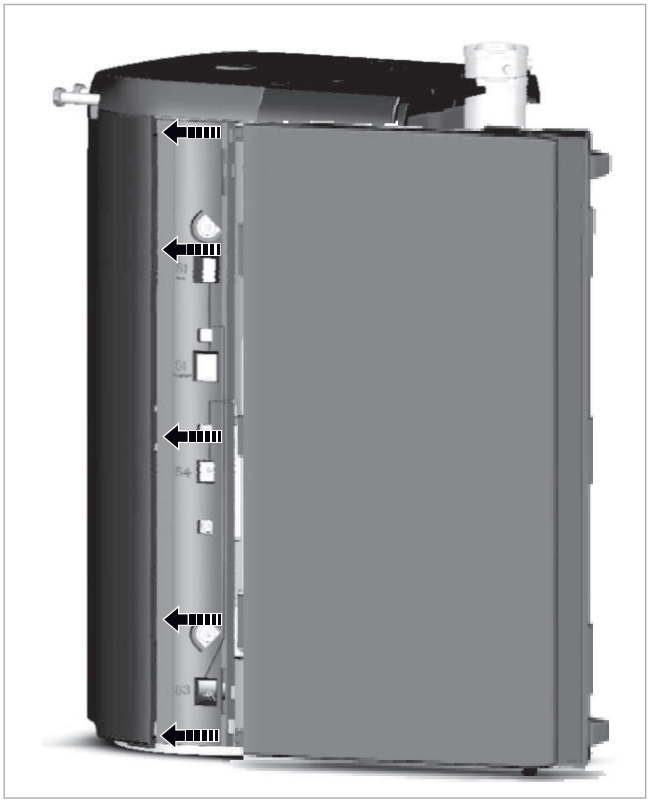


Fig. 135: Adding the side section

4. Fold in the side panel.

Fig. 136: Pushing in the side panel

5. Now attach the second side panel. To do so, repeat steps 2 to 4.

6. Turn the feet of the two side sections down to the floor but do not raise the side sections while doing so.

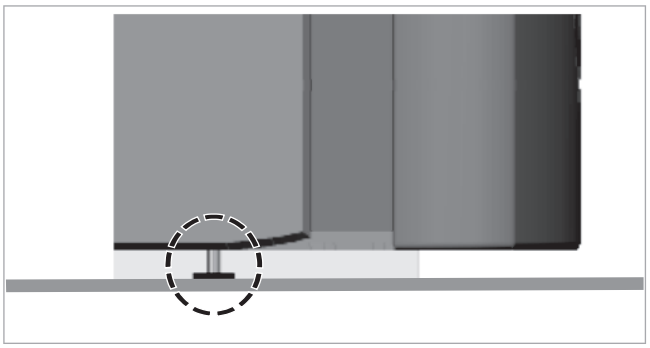


Fig. 137: Turn out the feet on the side sections

7. Finally, fit the front cover from the front. For guidance, first move the front cutout sections over the central controller and main switch (**3**).

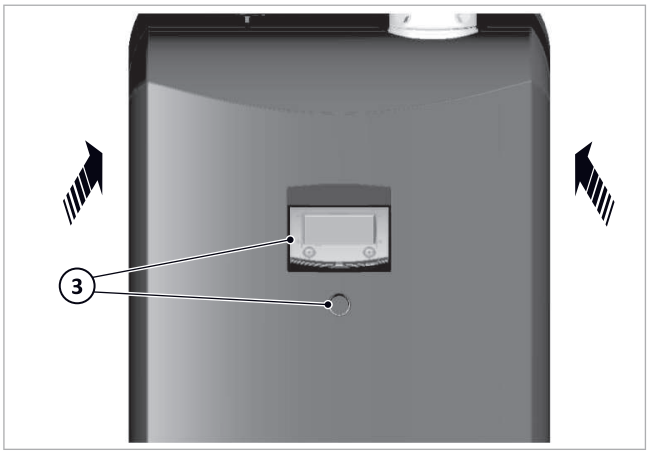


Fig. 138: Fitting the front cover

8. Then continue sliding it over the two side sections (**6**) and the top insulation (**5**). The front cover closes flush with the red strips on the side sections (**6**).
9. Attach the copy of the nameplate (**4**) and energy label to the unit casing in a clearly visible position.

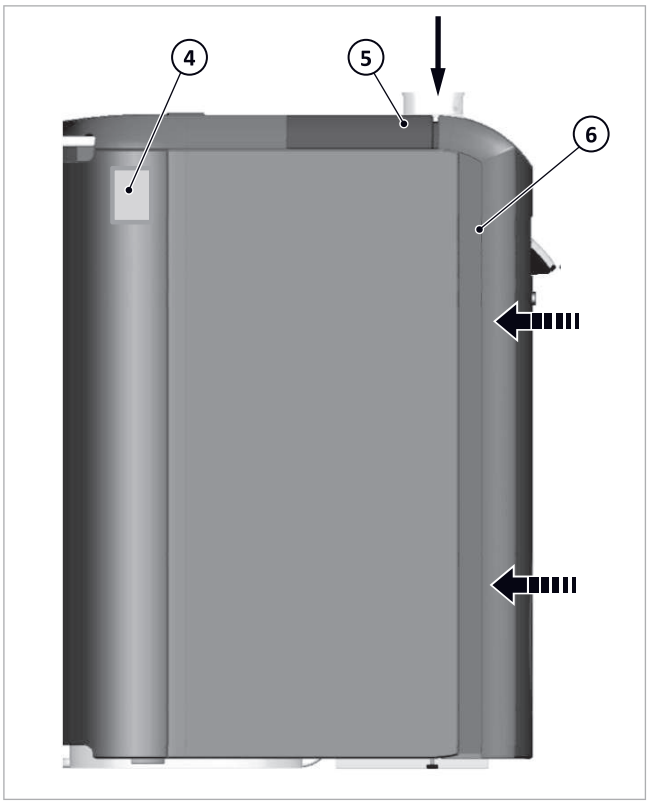


Fig. 139: Side view

10. Label pipes and cables.
11. Store the instructions in the systems folder.

7.11.4 Handover

Handing the system over to the operator

1. Instruct the system operator in the specialist operation of the control.
2. Explain the settings for heating, hot water and circulation.
3. Explain how to work with the room control module.
4. Notify the system operator of the annual maintenance obligation.
5. Hand over the systems folder.

8 Maintenance

WARNING

Hot surface

Possibility of severe burns!

- Prior to the work, always switch off the system and allow it to cool down.
- Do not touch any surfaces or components that may be hot.

CAUTION

Handle the system surfaces carefully.

Cleaners can damage the surface.

- Do not use caustic or solvent-based cleaners to clean the outer cover.
- Remove dirt with a soft, damp cloth.

Maintenance and cleaning work must be performed once a year in accordance with German Energy Conservation Regulations (EnEV) and to maintain warranty claims.

- Maintenance must be performed by a specialist and documented in the maintenance report.
- Store the maintenance report in the systems folder in the vicinity of the system.

8.1 General maintenance

Checking the general condition (annually)

1. Check the general condition. Remove dirt with a damp cloth. Do not use caustic or solvent-based cleaners.
2. Check that the system controller functions flawlessly (sensor values, operating modes and set values).
3. Check that hot water production and the circulation controller function properly.
4. Check to ensure that mixer motors and mixers are functioning flawlessly (plausible sensor values, correct opening direction and operating modes in automatic).
5. Check that the pumps function flawlessly (heating circuit pumps, hot water pump, solar pump).

Checking the condensate siphon

1. Remove the front.
2. Remove the upper screw connection of the siphon on the flue duct elbow and pull down the siphon.
3. Check and flush the condensate siphon.
4. Check whether fluid can be discharged without hindrance. The condensate hose must be at a steady incline downward from the siphon to the discharge.

Bleed the storage tank

1. Securely route the bleeder hose to a collecting container or drain outlet.
2. Remove the bleeder cover (**1**) from the top insulation.

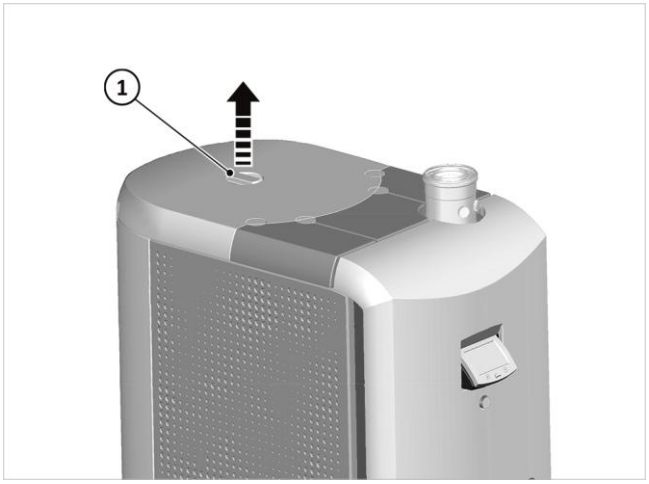


Fig. 140: Removing the bleeder cover

3. Open the manual bleeder on the tank.

The escaping mix of air and water is guided into the collecting container or drainage outlet through the bleeder hose.

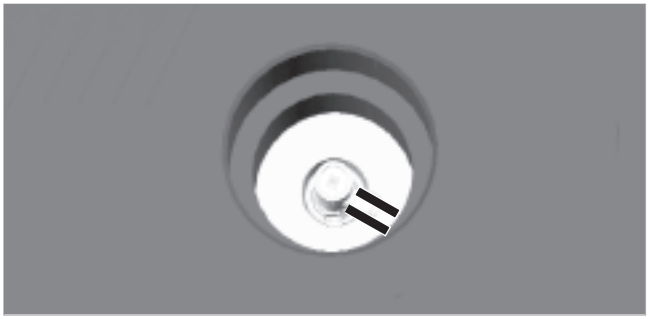


Fig. 141: Bleeder hose on the bleeder

4. Bleed the storage tank until you can hear no more escaping air Observe the flow of fluid in the hose; there must be no more visible air bubbles.
5. Close the manual bleeder and attach the bleeder cover.

Checking the safety functions

1. Check the safety valves for leaks and correct functioning in the drinking water and heating circuits, and in the solar circuit, if necessary.

Testing the admission pressure on the expansion vessel (MEV)

1. Shut off the MEV at the cap valve.
2. Open the boiler filling and emptying valve at the MEV connection group and depressurise the MEV.

The heating water that is discharged from the MEV can be collected for the subsequent pH value measurement.

3. Check the filling pressure at the MEV air valve using a test manometer.

Depending on the system height, the filling pressure should be 1.5 to 2.0 bar (see the start-up report); if necessary, correct the container pressure.

4. Close the boiler filling and emptying valve and open the cap valve.

Checking the pH value of the heating water

1. Check the pH value of the heating water; it must be within a range of 8.2 to 8.5.
2. If it is not within the pH value range, treat the heating water appropriately.

Checking the filling pressure on the heating system

1. If necessary, readjust the filling pressure of the heating system.

The system pressure should be within a range of 2.0 to 2.5 bar.

2. Check all connections for leak tightness (visual inspection).

Flushing the hot water heat exchanger, if necessary

Only flush if contamination or calcification leads to an interruption in the hot water supply. Disconnect the heat exchanger from the mains before flushing it.

1. Flush the hot water heat exchanger on the drinking water side in the opposite direction of operation using 20% formic acid.
2. Check the aerators on the taps and clean if necessary.
3. Carefully flush the taps after cleaning.

WARNING
Handling acids and alkalis can be hazardous.
Risk of acid burns on hands and face.
- Observe the safety data sheet.
- Observe the specified safety measures.
- Wear work clothing that covers the body and safety boots.
- Use personal protective equipment (PPE).

8.2 Gas burner maintenance

8.2.1 Condensate siphon

Check the condensate siphon

1. Remove front and side casing.
2. Remove the upper screw connection of the siphon on the flue duct elbow and pull down the siphon.
3. Check and flush the condensate siphon.
4. Fill the siphon with water.
5. Check whether fluid can be discharged without hindrance. The condensate hose must be at a steady incline downward from the siphon to the discharge.

8.2.2 Gas burner

SolvisBen Gas and SolvisBen Hybrid Gas only

DANGER
Risk of electrical shock
Damage to health, cardiac arrest possible.
- Disconnect the system from the mains before carrying out work on it and ensure that it cannot be turned on again

Removing the burner

1. Shut off the fuel supply.
2. Completely remove the front and side casing.
3. Remove the front flange insulation.
4. Loosen the 3 nuts.
5. Remove the burner and attach it to the mounting bracket on the console.

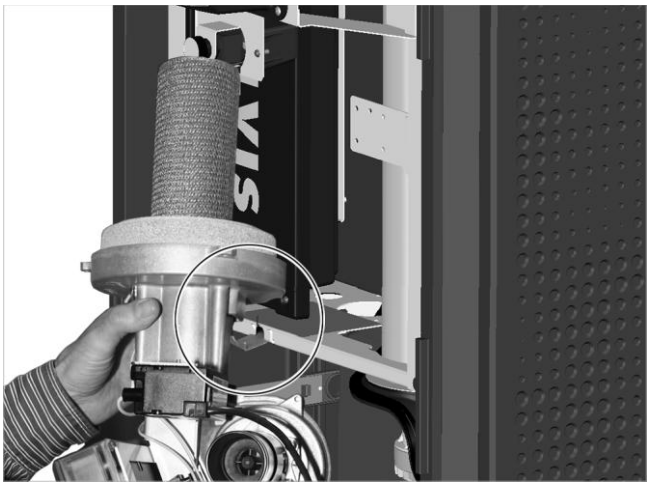


Fig. 142: Attaching the burner to the console (maintenance position)

Cleaning the combustion chamber and condensation channel

1. Wipe out the combustion chamber without using liquids, or vacuum it.

Cleaning with liquids is not recommended.

2. Clean the condensation channel with a brush.

The brush is stored in the side insulation.

Checking the ignition and ionisation electrodes

1. Check the clearance of the ionisation electrode using an electrode gauge → *fig. 144* (**2**) (if necessary, correct it through careful bending).
   Distance to burner fleece:
   • Ionisation electrode → *fig. 143* (**1**): 7.25 mm
   • Ignition electrode → *fig. 143* (**2**): 6.9 mm
   • Electrodes below one another → *fig. 144* (**1**): 3.5 mm
2. Assemble the burner in the reverse order as described above.
3. Switch on the voltage supply.

To carry out the following steps, log on to the SolvisControl as the installer.

4. Open the maintenance function. ("**Installer**" menu → "**Heating**" → "**Maintenance function**"); see ➔ on *section "Maintenance" in the BAL-SBSX-3-I-EN operating instructions*.
5. Start "**Min. burner performance**" in maintenance function.

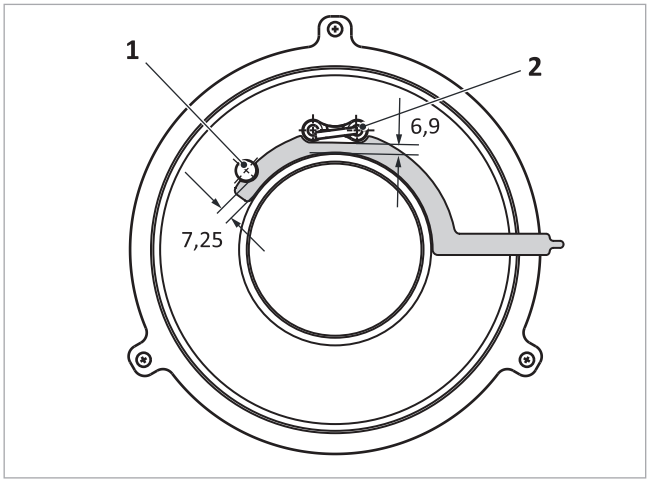


Fig. 143: Clearance from ionisation electrode and ignition electrode to burner tile

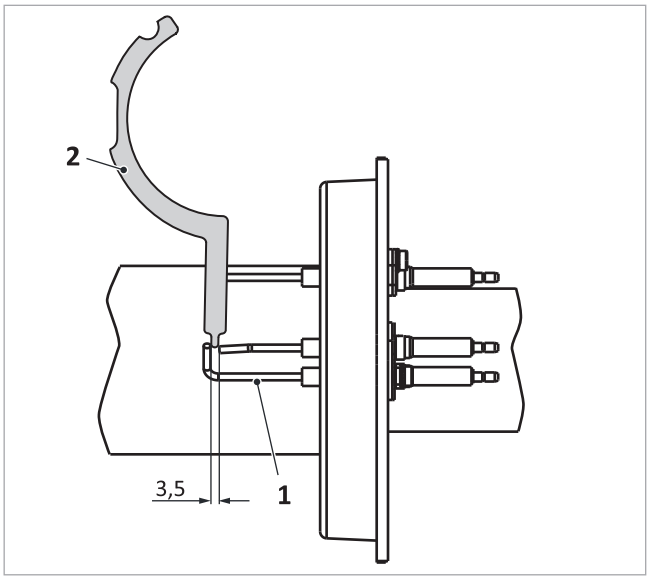


Fig. 144: Clearance from electrode to gauges on the ignition electrode

When installing the burner, note:
- Attach the burner to the pre-fitted threaded bolts with the "Top" marking facing up.
- Tighten the nuts evenly using an 8 mm socket spanner.

Checking exhaust values

1. Check the exhaust values for the minimum and maximum performance level and adjust, if necessary, see ➔ *chapter "Start-Up", p. 45* or ➔ *tab. "Burner performance setting values", p. 69*.

Checking the gas supply line

1. Check the gas supply line for leaks.

Checking the exhaust system

1. Check the exhaust system for leak tightness and correct positioning (with the housing closed, measure the annular gap for concentric exhaust systems).
2. Replace the seal on the exhaust connection of the combustion chamber.

8.3 Oil burner maintenance

8.3.1 Condensate siphon

Check the condensate siphon

1. Remove front and side casing.
2. Remove the upper screw connection of the siphon on the flue duct elbow and pull down the siphon.
3. Check and flush the condensate siphon.
4. Fill the siphon with water.
5. Check whether fluid can be discharged without hindrance. The condensate hose must be at a steady incline downward from the siphon to the discharge.

8.3.2 Oil burner

SolvisBen Oil and Hybrid Oil only

DANGER
Risk of electrical shock
Damage to health, cardiac arrest possible.
- Disconnect the system from the mains before carrying out work on it and ensure that it cannot be turned on again

Removing the burner at the burner insert

1. Shut off the fuel supply.
2. Completely remove the front and side casing.
3. Remove the front flange insulation.
4. Remove the 5 quick release screws on the burner insert.
5. Remove the burner and attach it to the mounting bracket on the console.

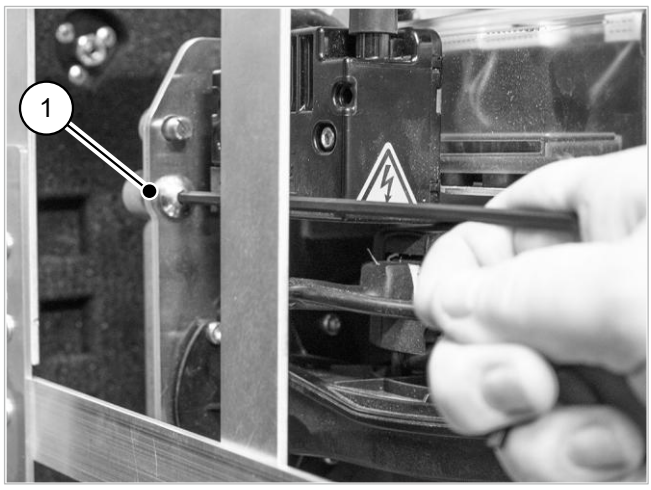


Fig. 145: Quick release screws on the burner insert

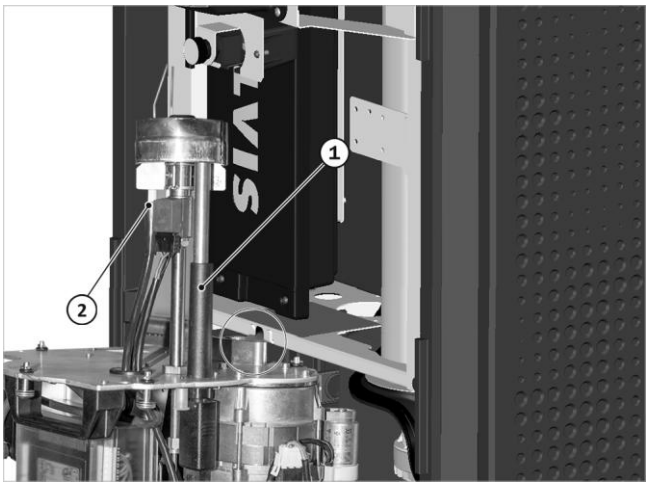


Fig. 146: Attaching the burner to the console

1 *Viewing sleeve for the flame monitor*
2 *Ignition cable*

Replacing the oil nozzle

- Replace the oil nozzle once a year.
- Only use the specified oil nozzle.

1. Loosen the Allen screw (**1**) on the mixing head.
2. Pull both ignition cables off of the ignition electrodes.
3. Remove the mixing head (**2**).
4. Use an open-end wrench to secure the nozzle fitting and prevent it from turning. Use a size 16 **ring spanner** to loosen the oil nozzle.
5. Replace the oil nozzle.

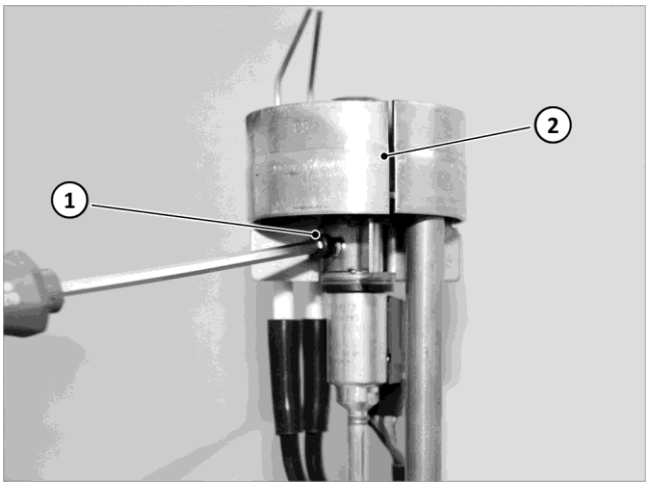


Fig. 147: Mixing head on nozzle fitting

Check the viewing sleeve

1. Remove the viewing sleeve; see ➔ *fig. 146* (**1**).
2. Check window for contamination; clean if necessary.
3. Attach the sleeve.

Setting the nozzle offset

- Adjust the spacing between the oil nozzle and the front edge of the air nozzle (nozzle offset) to 2.2 mm using the setting gauge.

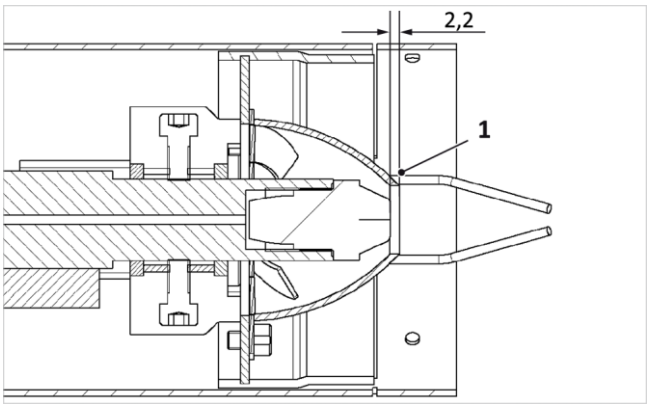


Fig. 148: Cross section of mixer head

1 *Nozzle offset (2.2 mm)*

1. Attach the setting gauge to the air nozzle.
2. Push the mixer head, including the attached setting gauge, against the oil nozzle and secure it with screws.
3. Afterwards, check the nozzle spacing using the setting gauge.

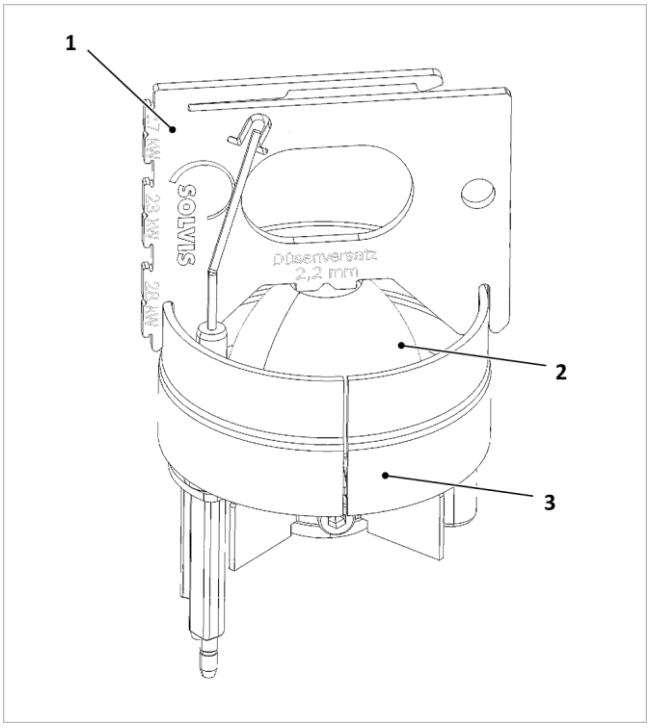


Fig. 149: Mixer head with the setting gauge attached

1 *Setting gauge*
2 *Air nozzle*
3 *Mixer head*

4. Reassemble the nozzle fitting in the reverse order.
5. Remount all the elements in the reverse order.

Check the ignition electrodes

1. Check the position of the electrodes (**3**) as shown in ➔ *fig. 150* and correct by bending them, if necessary.
2. Check the minimum length. The lower end of the control window (**2**) of the setting gauge specifies the minimum length of the ignition electrodes. If the electrodes are only slightly longer, they should be replaced.

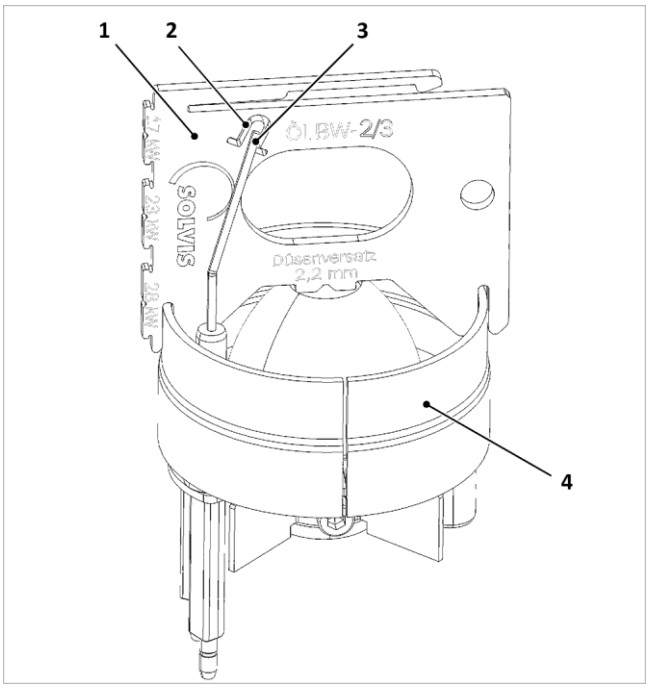


Fig. 150: Check the ignition electrodes

1	*Setting gauge*	3	*Ignition electrodes*
2	*Control window*	4	*Mixer head*

3. Check the electrode gaps as shown in ➔ *fig. 151* and correct by bending them, if necessary.

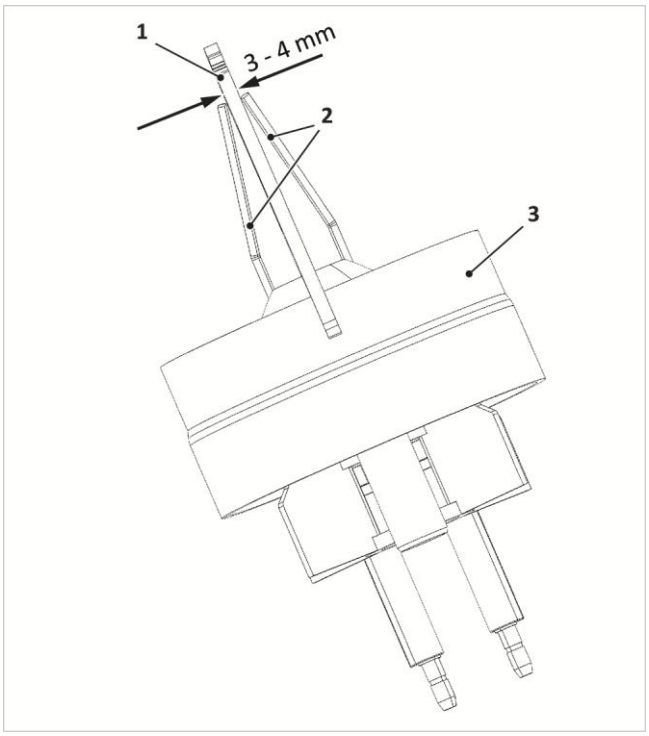


Fig. 151: Checking the ignition electrode gaps

1	*Setting gauge*	3	*Mixer head*
2	*Ignition electrodes*		

Checking the flame tube

1. Check the flame tube for contamination and damage, and clean or replace as necessary.

Fitting the burner

1. Slide the burner insert into the combustion chamber.

2. Secure the burner insert with the quick release screws.

3. If the eSTL was removed during maintenance, refit it.

Replacing the oil filter insert

CAUTION

Pay attention to the oil filter mesh.

- Only use oil filters with a filter mesh < 20 µm.

1. Remove the old oil filter insert.

2. Screw the new oil filter insert in tightly.

3. Before closing, fill the oil filter container with oil.

Check the ignition behaviour of the burner.

1. Open the oil supply and switch on the system.

2. Check that the burner ignites flawlessly.

Checking the oil supply line

1. Check the entire oil supply line for leaks.

Checking exhaust values

1. Check the exhaust values for the minimum and maximum performance level and adjust, if necessary, see ➔ *chapter "Start-Up", p. 45* or ➔ *tab. "Burner performance setting values", p. 69*.

Checking the exhaust system

1. Check the exhaust system for leak tightness and correct positioning (with the housing closed, measure the annular gap for concentric exhaust systems).

2. Replace the seal on the exhaust connection of the combustion chamber.

9 Troubleshooting

9.1 Heating circuit pump

9.1.1 Malfunction, cause and remedy

Work to be performed only by qualified technicians

- Troubleshooting must be performed only by qualified specialists.
- Work on the electrical connection must be performed only by qualified electricians.

Fault	Causes	Remedy
The pump does not run even though the power supply is switched on	Faulty electrical fuse	Check fuses
	Pump has no voltage	Correct the interruption to the voltage supply
Pump is making noises	Cavitation due to insufficient flow pressure	Increase the system pressure within the permitted range
		Check the delivery height setting and adjust it to a lower height if necessary
The building is not warming up	The heat output of the heating surfaces is too	Check hydraulic balancing, increase the setpoint if necessary

9.1.2 Wilo PARA malfunction messages

- The malfunction report LED indicates a malfunction

LED	Faults	Causes	Remedy
Lights up red	Blocking	Rotor blocked	Activate manual restart or contact customer service
	Contact / winding fault	Winding faulty	
Flashing red	Undervoltage/ overvoltage	Mains voltage supply too low/high	Check the mains voltage and operating conditions; contact customer service.
	Module overheated	The inside of the module is too warm	
	Short circuit	Motor current too high	
Flashing red/ green	Generator operation	Flowthrough of pump hydraulics; pump has no mains voltage	Check mains voltage, water quantity/ -pressure and ambient conditions
	Dry run	Air in the pump	
	Overload	Sluggish motor; pump is operated outside the specification (e.g. high module temperature) The speed is lower than in normal mode.	

9.2 Gas burner

If the system is behaving illogically, reinitialise the system by switching it off and then back on again at the main switch.

Burner does not start

If the burner does not start despite a heating requirement, a malfunction message appears:

- "**F090 Bus timeout**": The voltage supply is interrupted. Check whether A12, L and N are connected or whether the fuse between 1 and ST is blown.
- "**F004 No flame**" or: "**F132 No flame formation, lockout**": No flame formation at burner start. L and N are reversed on A12 or directly in the main supply.

If the burner does not start, the automatic firing system may be in the malfunction state.

- The automatic firing system must be unlocked to operate the burner again.
- The malfunction is not only displayed on the system controller but also on the automatic firing system (green flashing LED).

Unlocking the automatic firing system

1. Press the "Reset" button on the SolvisControl.
   - If the malfunction is unlocked: continue with ➔ *tab. "Troubleshooting" at the end of this section.*
   - If the malfunction is not unlocked: Briefly switch the main switch off and on again.
   - If the malfunction is not unlocked, there is a communication error (malfunction message F090):
2. Is communication cable (between mains circuit board and SC-3) connected?
3. Load the factory settings in SolvisControl ("**Installer**" menu → "**Data**"); see also the ➔ *"Data" section in the BAL-SBSX-3-I operating instructions.*
4. If this does not correct the problem, please contact our customer service department; see ➔ *tel. no. on page 2.*

Individual system settings are reset to the delivery state when the factory setting is loaded.

Additional fault tables for room heating can be found in ➔ *"Malfunctions with heating and hot water" section in the BAL-SBSX-3-I-EN operating instructions.*

9.3 Gas burner error codes

Brief reason	Error	Description	Cause	Action by mechanic
Overheating flow	E1 / E129	E1 Safety shutdown temperature exceeded. Automatic firing system blocked for at least 60 s, automatic acknowledgement after cooling E129 Over-temperature switch-off triggered due to overheating. The safety shut-down temperature of the eSTL was exceeded.	Boiler temperature >105°C due to water shortage	Check reason
			eSTL defective or positioned incorrectly	Fully insert eSTL and check whether it works
No flame	E4 / E132	E4 Blower starts, gas solenoid valve opens (clicking), ignition, no flame or only popping	Gas valve is closed or liquid gas tank is empty	Open gas valve or fill up tank
			Gas supply flow pressure is too low	Check admission pressure at "IN" fittings of gas combination valve: must be 20 to 60 mbar
			CO2 value is not set correctly	Correct the setting (see the ➔ *"Burner settings" section in the MAL-SX-LN-3 installation instructions*)
			Ignition electrode	Incorrect position ➔ *"Burner maintenance" section in the MAL-SX-LN-3 installation instructions*
			Faulty ignition cable	Check cable
			Ionisation current too low	Ionisation current (➔ *"Burner maintenance" section in the MAL-SX-LN-3 installation instructions*) Check cable and phase direction (L+N reversed), replace ionisation electrode
			Air supply or exhaust gas path blocked	Check the air supply and exhaust gas path, as well as the Venturi nozzle, and clean if necessary
			Condensate discharge not secured	Check the syphon, condensate pump and pipe (water bag)
			Contact between the ignition electrode and the burner head (e.g. fibre from fabric)	Ensure there is no contact
No flame	E4 / E132	E4 Blower starts, gas solenoid valve does not open (no clicking), ignition, no flame or only popping	Faulty gas solenoid valve	Check/replace gas solenoid valve
			Automatic firing system defective	Check/replace automatic firing system
Flame goes out	E5 / E133	Flame goes out during stabilisation phase or operation. Malfunction message issued during forced ventilation.	Deposit on ionisation electrode	Check the ionisation electrode and clean or replace it if necessary
			Condensate discharge not secured	Check the syphon, condensate pump and pipe (water bag)
			Air supply or exhaust gas path blocked	Check the air supply and exhaust gas path, as well as the Venturi nozzle, and clean if necessary
			Gas supply flow pressure is too low	Check admission pressure at "IN" fittings of gas combination valve: must be between 20 and 60 mbar
			Gas flow controller too small or faulty	Replace gas flow controller
			Flame extinguishes due to CO in the supply air. Exhaust system leaky.	Annular gap measurement, pressure test the exhaust gas path
Defective sensor	E12 / E140	Temperature sensor eSTL faulty.	Defective sensor	Replace eSTL
Premature flame formation	E139	A flame signal was registered before the burner was started.	Short circuit of the ionisation electrode	Check the cable and ionisation electrode

Gas burner error codes (continued)

Brief reason	Error	Description	Cause	Action by mechanic
Fan speed not achieved	E24	Fan speed not achieved in step 6 (control release)	Faulty blower or automatic firing system	Check/replace cable, plug, blower, automatic firing system
	E152	Automatic firing system locked if blower speed is not reached in steps 2, 3, 8.		
Implausible fan speed	E154	Blower did not come to a stop.	Faulty blower or automatic firing system	Check/replace cable, plug, blower, automatic firing system
Defective relay	E198	Defective relay	Defective relay	Replace automatic firing system
Incorrect mains voltage	E32	230 V voltage supply lies outside the permissible range.	Mains voltage is not 230 V or automatic firing system is faulty	If it is not possible to acknowledge the error or if it occurs with the normal mains voltage, replace the automatic firing system. Disconnect the automatic firing system from the mains – error message in message logging with "**Installer**" → "**Messages**" → "**Heat generator**" → "**Unlock malfunction – start**"
Parameter CRC error	E158, 159	Invalid EEprom parameter for CM4 settings.	Automatic firing system defective	Replace chip card or automatic firing system
Device error	E89	CM424 did not pass the internal check.	Automatic firing system defective	Disconnect the automatic firing system from the mains, SC-3 factory reset, replace automatic firing system
Bus timeout	E90	Time-out (10s) for the cyclic bus telegram.	Automatic firing system blocked	F90 goes out automatically if communication is present. Check the status LED on the automatic firing system. Illuminated green: Voltage supply and communication present. Flashing green: Voltage supply present but no communication. Not illuminated: no voltage at the automatic firing system.
Programming mode	E95	Automatic firing system is in programming mode.	Automatic firing system blocked	Wait
Reset exceeded	E96	Too many modifications in the 0 to 1 Chipcom K1 mode bit 7 address (remote reset) within a certain period (15 min). Remote unlock deactivated.	Automatic firing system blocked	Disconnect the automatic firing system from the mains, error message in message logging with "**Installer**" → "**Messages**" → "**Unlock burner malfunction**" and replace automatic firing system
Internal error	E99, E227	Internal electronic error	Automatic firing system defective	
Activate burner chip card	E50	To activate the burner chip card, the reset button must be pushed.	Automatic firing system locked	Automatic firing system Reset
Activating burner chip card	E51	Please wait until the burner chip card has been fully activated.	Automatic firing system blocked	Wait
Cannot read burner chip card	E162, E164	The internal data of the EEPROM or the chip card is not correct.	Cannot read chip card	Replace chip card, reset automatic firing system
Burner chip card missing	E163	The activated burner chip card is no longer inserted in the automatic firing system.	Chip card missing	Insert chip card, reset automatic firing system
Burner chip card incompatible	F165	The firmware for the burner chip card and the automatic firing system are not compatible.	Incorrect chip card	Replace chip card, reset automatic firing system
Updating error	F38	Error during update.	Automatic firing system blocked	Reinitialise the system, leaving the burner disconnected from the mains. Initialise LN-3 manually. Then connect the burner to the power supply, reset the error in message logging and restart programming
Burner chip card could not be activated	E167	Error while activating the burner chip card	Automatic firing system locked	
Communication error	E48	Communication between the automatic firing system and the interface is faulty	Automatic firing system locked	Check the cable and connector between the automatic firing system and the interface, replace if necessary, reset automatic firing system

9.4 Oil burner

If the system is behaving illogically, reinitialise the system by switching it off and then back on again at the main switch.

Additional fault tables for room heating can be found in ➔ *"Malfunctions with heating and hot water" section in the BAL-SBSX-3-I-EN operating instructions.*

If you would like to receive a comprehensive checklist for systematic troubleshooting, please contact Solvis customer service (extension: 222).

The program sequence is displayed next to "**Program step**" in "**Installer**" → "**Burner**" in the menu.

9.4.1 Program sequence display

Program sequence

Display	Program status	Explanation
0	Standby	Waiting for heating requirement
1	Preheating	Oil preheater is "on"; waiting for oil preheater thermostat
2	Operating contact check	Blower speed check for preaeration
3	Preflushing time	Blower runs at preflushing speed
4	Waiting for ignition speed	Blower speed check for ignition speed
5	Pre-ignition time	Ignition and oil pump motor are "on"; blower runs at ignition speed
6	Safety period	Solenoid valves 1 and 2 are "open"; blower runs at ignition speed
7	Flame stabilisation time	Blower runs at flame stabilisation speed
8	Controller enable	Blower runs at level 1 or 2; independent of the heating requirement
9	Waiting for the post purge	Fan speed check for post-purge speed
10	Post-purge	Fan runs at post-purge speed
11	Waiting for forced purge (only in malfunction mode)	Fan speed check for forced purge speed
12	Forced purge (only in malfunction mode)	Fan runs at forced purge speed

9.4.2 Table of malfunctions by symptom

Malfunction	Cause	Malfunction code	Remedy
Burner does not start	Power supply interrupted		Check fuse and plug
	No BUS communication	F90 | F255	Check BUS cable
	Safety thermostat (eSTL) has been triggered	F1 | F129	Unlocking the automatic firing system
	No burner requirement from controller		Check requirement signal or controller settings
	Defective oil preheater	F143	Check oil preheater; replace if necessary
Burner switches to fault during preaeration	Stray light / flame detected when there is no flame	F139	Check flame monitoring and solenoid valves
			White deposits on the flame tube. Clean.
	Blower defective / blower speed not achieved	F24 | F152 | F154	Check blower, power and signal cables, and replace if necessary
Burner starts but no flame is created	Ignition transformer switches off	F4 | F132	Check the ignition system and the position of the ignition electrodes, and replace any faulty parts
	Normal function sequence, no burner start		Check nozzle offset and adjust if necessary
			Defective oil nozzle; replace
	Exhaust gas path blocked, condensate does not drain		Check exhaust system for blockages, and clean if necessary
			Clean the syphon and condensate line; check condensate lifting pump
	Solenoid valve does not open		Replace the solenoid coil or the entire solenoid
	Air in the oil supply, flame pulses		Check oil supply, provide for bubble-free, clean oil
	No oil being supplied		Oil pump defective, coupling sheared off, capacitor defective; replace if needed
			Oil preheater blocked, replace if necessary
			Open/check oil valves (e.g. syphon protection valves)
			Filter or oil pipe blocked, clean or replace if necessary
			Check oil level in tank
	Ignition transformer switches off		Replace ignition transformer, check setting

Fault table (continued)

Malfunction	Cause	Malfunction code	Remedy
Burner starts but goes out after a short time (flame extinguished)	Incorrect combustion settings	F5 | F133	CO2 below 12.5%; calibrate burner according to setting table (see → *table "Burner performance setting values", p. 69*).
			Fan speed/oil pressure too high; calibrate burner in setting range according to setting table; see → *table "Burner performance setting values", p. 69*
	Burner does not seal to boiler door		Check fastening and seal on combustion chamber
	Solenoid valves falling off		Replace the solenoid coil or the entire solenoid
	Flame monitor defective or dirty		Clean or replace flicker detector and viewing tubes
Measured CO value too high	Nozzle dirty or sprays at an angle		Replace nozzle
	Air in the oil supply, flame pulses		Check oil supply, provide for bubble-free, clean oil
	Exhaust system leaky		Measure the annular gap
	Throughput in the nozzle too high (pump pressure too high)		Check the size of the oil nozzle/air nozzle as per the setting table (see → *table "Burner performance setting values", p. 69*)
	Incorrect combustion settings		CO2 too high, calibrate burner according to setting table, see → *table "Burner performance setting values", p. 69*
Mechanical noise	Air in the oil pump		Check oil line and filter; seal or replace if needed
	Bearing damage on blower/motor		Replace motor
Loud combustion noises	Silencers not fitted		Fit the supplied silencers according to the installation instructions
	Incorrect combustion settings		Oil pressure and blower compression in level 1 too low, observe minimum values according to setting table (see → *"Burner performance setting values", p. 69*)

9.4.3 Table of malfunctions by error message

Brief reason	Error	Description	Cause	Action by mechanic
Overheating flow	F1	Safety shutdown temperature exceeded. Automatic firing system blocked, automatic acknowledgement after cooling	Boiler temperature above 105 °C	Check reason
	F129	Safety shutdown temperature exceeded. Automatic firing system locked.		
			eSTL defective or positioned incorrectly	Fully insert eSTL and check whether it works
No flame	F4	Burner starts up but no flame is formed during safety period. Another attempt to start burner	Various	See the "Table of malfunctions by symptom"
	F132	Burner starts up but no flame is formed. Automatic firing system locked		
Flame loss	F5	Flame goes out during stabilisation phase or operation. Another attempt to start burner	Various	See the "Table of malfunctions by symptom"
	F133	Flame goes out during stabilisation phase or operation. Automatic firing system locked		
No sensor	F12, F170	eSTL defective, automatic firing system locked		Check/replace eSTL
Fan speed not achieved	F24	Fan speed was not reached in program step 7 or 8.	Faulty blower or automatic firing system	Check/replace cable, plug, blower, automatic firing system
	F152	Fan speed not reached in program steps 3, 4, 9, 10, 11, 12. Automatic firing system locked		
Inadmissible mains voltage	F32	230 V voltage supply lies outside the permissible range. Automatic firing system blocked	Mains voltage is not 230 V or automatic firing system is faulty	If it is not possible to acknowledge the error or if it occurs with the normal mains voltage, replace the automatic firing system.
Failure re-update	F38	Error during update. Automatic firing system blocked	Automatic firing system blocked	Power off the burner and then restart it
Product failure	F89	Internal error	Automatic firing system defective	Replace automatic firing system

Fault table (continued)

Brief reason	Error	Description	Cause	Action by mechanic
Bus timeout	F90	Communication between the automatic firing system and SolvisControl disrupted or interrupted. Automatic firing system blocked		extinguishes automatically if communication is present. Check status LED on the automatic firing system. Illuminated green: Voltage supply and communication present. Flashing green: Voltage supply present but no communication. Not illuminated: no voltage at the automatic firing system.
	F255	Communication between the automatic firing system and SolvisControl disrupted or interrupted.		Check BUS communication cable and initialisation
Programming mode	F95	Programming mode active		Wait
Reset exceeded	F96	Remote unlock error: more than 5 remote unlocks in 15 min; remote unlock is deactivated.		Power off the automatic firing system and unlock the malfunction if necessary
Flame simulation	F139	Stray light/flame detected when there is no flame. A flame signal was registered before the burner was started. Automatic firing system locked	Various	See the "Table of malfunctions by symptom"
Oil preheater timeout	F143	Oil preheater timeout	Faulty oil preheater or automatic firing system	Check/replace cable, oil preheater, automatic firing system
Defective relay	F148	Defective relay	Defective relay	Replace automatic firing system
Implausible fan speed	F154	Fan speed not reached in downtime	Faulty blower or automatic firing system	Check/replace cable, plug, blower, automatic firing system
Parameter CRC error	F158, F59	Invalid EEprom parameter for CM4 settings.	Automatic firing system defective	Replace chip card or automatic firing system
Programming mode	F95	Automatic firing system is in programming mode.	Automatic firing system blocked	Wait
Reset exceeded	F96	Too many modifications in the 0 to 1 Chipcom K1 mode bit 7 address (remote reset) within a certain period (15 min). Remote unlock deactivated.	Automatic firing system blocked	Power off the automatic firing system, unlock the error message in message logging by pressing "**start**" next to "**Unlock burner malfunction**" in the menu "**Installer**" → "**Messages**" → "**Heat generator**" and replace the automatic firing system
Internal error	F99, F216, F227	Internal electronic error, automatic firing system locked	Automatic firing system defective	
CRC failure BBC	F162, F164	The internal data of the EEPROM or the chip card is not correct. Automatic firing system locked	Cannot read chip card	Replace chip card, reset automatic firing system
Burner chip card missing	F163	The activated burner chip card is no longer inserted in the automatic firing system. Automatic firing system locked	Chip card missing	Insert chip card, reset automatic firing system
Burner chip card incompatible	F165	The firmware for the burner chip card and the automatic firing system are not compatible. Automatic firing system locked	Incorrect chip card	Replace chip card, reset automatic firing system
BCC system failure	F167	Error while activating the burner chip card	Automatic firing system locked	Power off the burner and reinsert the BCC. Perform a reset after the restart

9.5 Heating Pumps

For fault messages for the heat pumps, see ➔ *Installation instructions for the respective heat pump*:

- *Installation SolvisLea (MAL-LEA)*
- *Installation SolvisLea 8.3 Premium (MAL-LEA-8P)*
- *Installation SolvisLea Pro (MAL-LEA-PRO)*
- *Installation SolvisMia (MAL-MIA)*
- *Installation SolvisPia (MAL-PIA/MAL-PIA-1317)*

10 Technical Data

10.1 Dimensions and weights

Name	Unit	SolvisBen Gas/Gas Hybrid	SolvisBen Oil/Oil Hybrid
Product ID number	-	CE-0085CS0183	CE-0085CS0182
Rated volume	l	230	
Actual volume	l	229	
Approximate empty weight	kg	140	150
Approximate total weight	kg	375	385
Storage tank distribution*			
Hot water ready volume (OK – S4)	l	133	
Heating buffer volume (S4 – S9)	l	45	
Solar buffer volume (S4 – UK)	l	96	
Output data			
Tank material	–	S235JR, primed exterior, raw interior	
Heating flow/return connection	–	1" male thread, flat sealing	
Cold/hot drinking water connection	–	1" male thread, flat sealing	
SolvisLea connection – flow/return (SolvisBen Hybrid)	–	1" male thread, flat sealing	
Max. operating pressure	bar	3	
Max. operating temperature	°C	95	
Dimensions			
Max. width	mm	640	
Max. depth	mm	1150	
Max. height	mm	1550	
Storage tank tilt height without insulation	mm	1400	
Width without insulation	mm	550	
Depth without insulation and control	mm	920	
Minimum front spacing	mm	500	
Minimum side spacing	mm	150	

** Location on storage tank: OK = upper edge, UK = lower edge, S4 = top heating buffer sensor, S9 = lower heating buffer*

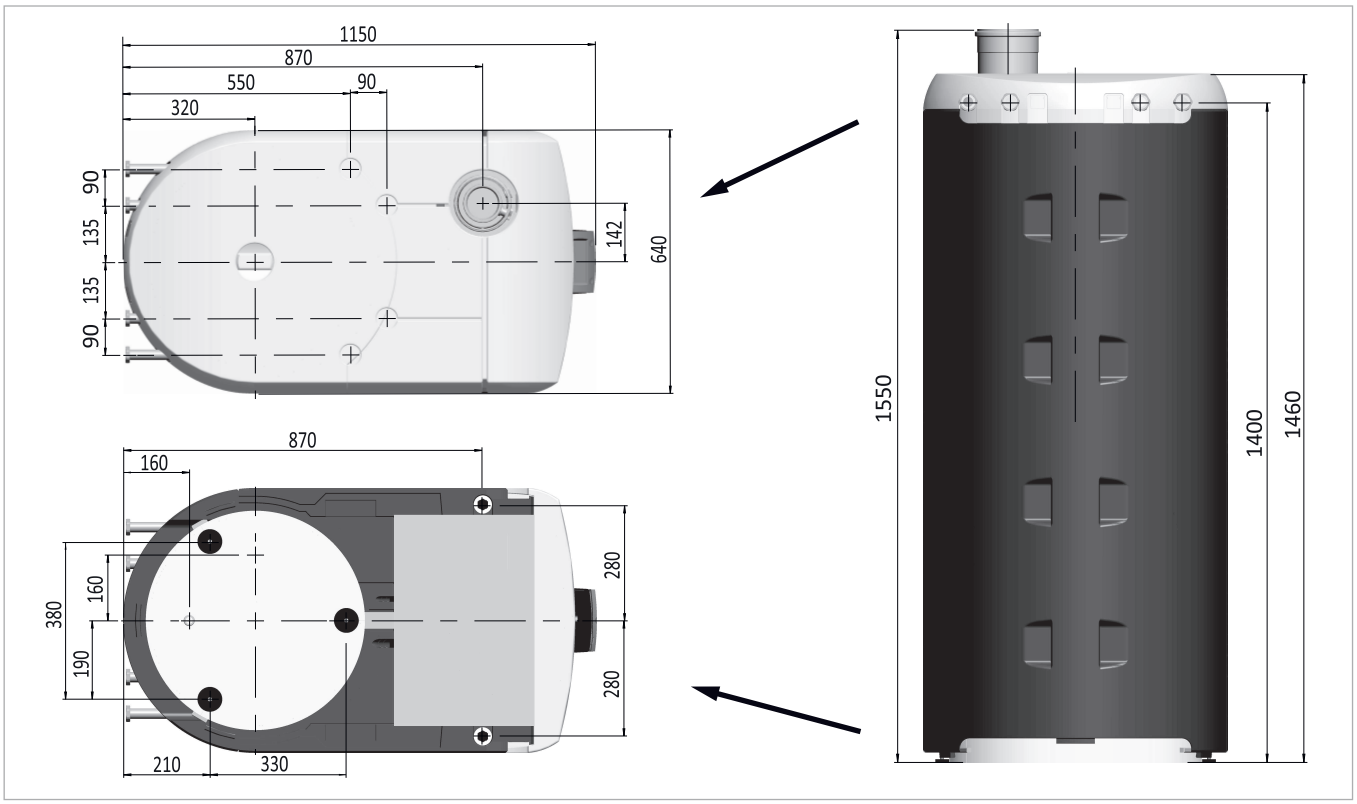


Fig. 152: Views of the SolvisBen (all dimensions in mm)

10.2 Burner

10.2.1 Gas burner

Combustion data

Burner performance	Unit	1.9 to 10 kW	2.9 to 18 kW	4.8 to 25 kW	4.8 to 30 kW
Product ID number	–	CE-0085AS0280			
Fuel	–	Natural gas/liquid gas(1)			
Burner type	–	Blower burner			
Rated heat load (burner performance)	kW	1.9 to 10	2.9 to 18	4.8 to 25	4.8 to 30
Rated heat output (boiler performance) P_n at 80/60°C	kW	1.9 to 9.9	2.9 to 17.8	4.7 to 24.4	4.7 to 29.2
Exhaust temperature at 80/60°C and max. performance	°C	56	67	74	60
Exhaust temperature at 80/60°C and min. performance	°C	51	58	60	60
Exhaust gas mass flow at 80/60°C and max. performance	g/s	4	8	11	13
Exhaust gas mass flow at 80/60°C and min. performance	g/s	1	1	2	2
Max. supply pressure at boiler end	Pa	84	135	125	158
Installation types according to TRGI	–	B_{23} / B_{33} / C_{13x} / C_{33x} / C_{43x} / C_{53} / C_{63x} / C_{83x} / C_{93x}			
CO_2 content with natural gas at max. performance	%	9,9 - 10,5			
CO_2 content with liquid gas at max. performance	%	12,0 - 12,6			
CO standard emission factor*	mg/kWh	21.8	6.9	7.4	4.4
NOx standard emission factor*	mg/kWh	52.3	46	35	42
NOx class	–	5	5	5	5
Burner noise indoors (distance of 1 m and max. performance**)	dB (A)	45	53	51	58
Burner noise indoors (distance of 1 m and min. performance**)	dB (A)	31	38	34	34
Exhaust support diameter	–	DN 80			
Electrical power consumption at min./max. performance(2)	W	18 / 27	17 / 49	19 / 43	19 / 58
Gas flow rate***	m^3/h	1,01	1,92	2.64	3,18

(1) The UBS-SX-LN-3-xx conversion kit is required for operation with liquid gas; (2) overall current consumption for burner including control (with concentric exhaust system), (*) weight in accordance with DIN 15502, (**) according to ISO 3744, (***) Data for natural gas H

10.2.2 Oil burner

Combustion data

Burner type	10/17 kW		14/23 kW	
	Level 1	Level 2	Level 1	Level 2
Product ID number	CE-0085CS0182			
Installation types according to TRGI	B_{23} / B_{33} / $C_{13(x)}$ / $C_{33(x)}$ / $C_{43(x)}$ / $C_{53(x)}$ / $C_{63(x)}$ / $C_{83(x)}$ / $C_{93(x)}$			
Rated heat output (boiler performance at (50/30 °C)	10.5 kW	17.0 kW	14.4 kW	23.4 kW
Rated heat output (boiler performance at (80/60 °C)	10.0 kW	16.0 kW	13.4 kW	21.7 kW
Rated heat load (burner performance)	10 kW	15 to 17 kW	14 kW	20 to 23 kW
Standard utilisation ratio (1)	104.6 %	104.6 %	104.1 %	104.1 %
Partial performance degree of efficiency at 23/21 °C	105.1 %	105.1 %	104.4 %	104.4 %
Boiler degree of efficiency at 80/60 °C (1)	97.4 %	96.3 %	–	95.8 %
Boiler degree of efficiency at 50/30 °C (1)	103.1 %	102.6 %	–	101.7 %
Exhaust temperature at 80/60 °C (2)	62 °C	63 °C	63 °C	64 °C
CO_2 for calculating the exhaust routing	13.5 %	13.5 %	13.5 %	13.5 %
CO	9 mg/kWh	10 mg/kWh	14 mg/kWh	15 mg/kWh
CO standard emission factor	3 mg/kWh	3 mg/kWh	5 mg/kWh	5 mg/kWh
NO_X	64 mg/kWh	56 mg/kWh	66 mg/kWh	66 mg/kWh
NO_X standard emission factor	60 mg/kWh	60 mg/kWh	63 mg/kWh	63 mg/kWh
Exhaust gas mass flow	15.7 kg/h	26.1 kg/h	21.5 kg/h	35.1 kg/h
Allowable remaining pump height	70 Pa			
Energy efficiency certification (2)	★★★★			
Soot value	0			
Fuel	EL heating oil (low-sulphur, max. 50 ppm)			
Burner type	with blower			
Exhaust support diameter	DN 80			

(Tab. 1) Results according to certification test based on DIN 303, 304, EC Energy Efficiency Directive 92/42 EEC, (1) degree of efficiency and utilisation ratio incl. losses for water heating, (2) the SolvisMax Oil BW fulfils EC Energy Efficiency Directive 92/42/EEC.

Burner performance setting values

Required rated heat output (boiler performance)		Rated heat load (burner performance)	Oil pressure	Oil throughput	Blower pressure (for checking)
at 80/60 °C	at 50/30 °C				
[kW]	[kW]	[kW]	[bar]	[kg/h]	[mbar]
Burner type 10/17 kW:					
2nd level:					
16.4	17.4	17.0	19	1.43	20
15.9	16.9	16.5	18	1.39	19
15.4	16.3	16.0	17	1.35	18
1st level:					
10.6	11.4	10.9	8	0.92	**10***
Burner type 14/23 kW:					
2nd level:					
21.7	23.4	23.0	23	1.95	28
21.3	22.9	22.5	22	1.91	26
20.6	22.1	21.9	21	1.85	25
20.3	21.8	21.5	20	1.82	24
1st level:					
13.4	14.4	13.8	8	1.20	**10***

*(Tab. 2) * Values must not fall below these minimum values for the blower pressure!*

Components used

Burner variant	Oil nozzle	Air nozzle	recirculation duct
10/17 kW:	Danfoss, OD 0.30 gph, 60° S	15.5 mm	1 mm
14/23 kW:	Danfoss, OD 0.40 gph, 60° S	17.0 mm	1 mm

(Tab. 3)

10.3 Heating Pumps

For technical data of the heat pumps, see ➔ *Installation instructions for the respective heat pump*:

- *Installation SolvisLea (MAL-LEA)*
- *Installation SolvisLea 8.3 Premium (MAL-LEA-8P)*
- *Installation SolvisLea Pro (MAL-LEA-PRO)*
- *Installation SolvisMia (MAL-MIA)*
- *Installation SolvisPia (MAL-PIA/MAL-PIA-1317)*

10.4 SolvisControl system controller

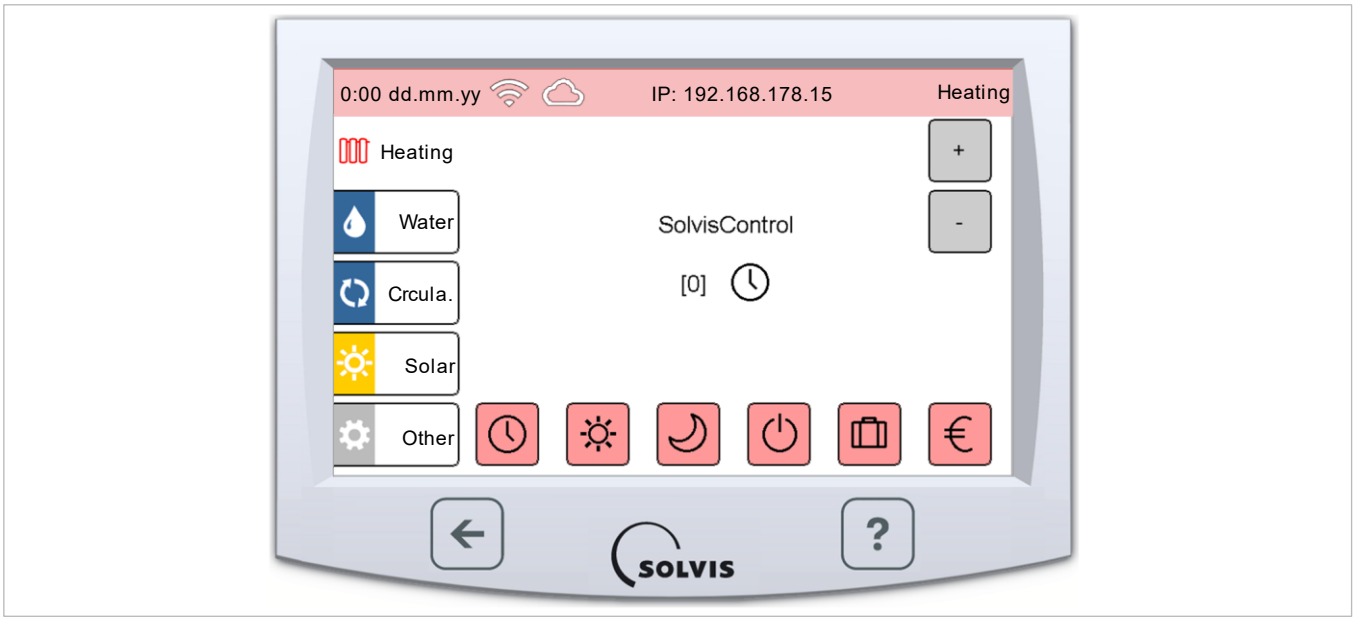


*Fig. 153: SolvisControl menu display "**Heating**" (single heating circuit)*

Connection, component, function	Features, values
Mains voltage	230 V~/50 - 60 Hz
Microfuse	M 6.3 A/230 V~ | T 1.0 A/230 V~
Ambient temperature	0 - 50 °C
Rated current load	Relay outputs, max. each 230 V~/3 A, sum of currents should not exceed 6.3 A
Power consumption	Approx. 5 W (in slumber mode, without pumps)
Timer function without power supply	Buffered with a battery
Housing protection class	IP 30
Sensor type of temperature sensors	KTY 2 kOhm (except the solar flow and return, collector sensor: Pt 1000)
Sensor type of volume flow encoders	With reed contact (S17) and Sika (open collector, S18)
Temperature display	-35 to +250 °C
Display resolution	0.1 K
Measurement accuracy	± 1 K in a range from 0 - 100 °C
"==] [==" displayed	Sensor not connected, sensor or cable breakage
"==X==" displayed	Sensor short circuit
PWM speed control	O-1, SP1 and SP2: PWM or 0–10 V; hot water (HW) and load pump (LP): PWM
Switch output 230 V~	A1 to A13: 230 V~, A14 and ALARM: floating contact
Analogue output 0 - 10 V =	O-1, Solar 1 (SP1) and Solar 2 (SP2)
Alarm output*	Floating contact
Skid control**	Heating circuit pumps (user-defined for A1 – A14, factory setting: off)

** The alarm output only operates if the warning tone has been activated and is triggered due to a malfunction.*
*** Skid control: the heating circuit pumps can be individually set on the SolvisControl in such a way that they run on specific days for a certain length of time. Time and duration can be changed.*

10.5 Hot water production

Hot water station technical data

Name	Unit	WWS-30
Dispensing volume flow		
TWK/TWW/flow = 10/50/65 °C	**[l/min]**	**30**
TWK/TWW/flow = 10/50/60 °C	[l/min]	25
TWK/TWW/flow = 10/60/70 °C	[l/min]	23
TWK/TWW/flow = 10/60/65 °C	[l/min]	18
Operating limits		
Maximum operating temperature	[°C]	95
Maximum operating pressure (drinking water side)	[bar]	10
Ambient temperature	[°C]	50
Pump		
Manufacturer WILO, type	[-]	PARA 15/7
Min. inflow pressure (heating side)	[mWS]	0,5
Power consumption	[W]	1,8 - 50
Power consumption	[A]	0,02 - 0,43
Energy efficiency index	EEI	≤ 0,20
Plate heat exchanger		
Manufacturer Danfoss, type	[-]	XB06H-1-40 StS
Number of plates	[pcs.]	40
Capacity per side	[l]	0.35

10.6 Heating circuit distribution

Technical data for the integrated heating circuit station*)

Dimensions	Unit	HKS-G-4.0
Distance flow/return line	[mm]	125
Pipe connections		1" male thread, flat sealing
Heating circuit pump		
Manufacturer/type	[–]	Wilo-Para 15-130/6 SCU
Installation length	[mm]	130
Speed control	[–]	Continuous speed control, Δp = variable or Δp = const.
Mains connection		230 V~/50 Hz to 60 Hz
Power consumption	[Watt]	3 to 43
Max. power consumption	[A]	0.03 to 0.44
EEI	[–]	≤0.20
Mixing valve		
Function	[–]	Three-way mixing valve
Kvs value	[m³/h]	4.0
Actuator drive		
Function	[–]	Three-point actuator drive
Mains connection		230 V~/50 Hz to 60 Hz
Run time for 90° course	[s]	120
Power consumption	[Watt]	5
Max. torque	[Nm]	6
Other components		
Flow temperature sensor	[–]	PT1000 sensor
Flow/return ball valve with thermometer handle	[–]	Display range 0 to 120 °C
Gravity brake in the flow ball valve	[–]	Opening pressure approx. 20 mbar
Application range		
Max. operating temperature	[°C]	95
Max. operating pressure	[bar]	3
Max. heating circuit volume flow	[m³/h]	1.7
Available external delivery height at 1.7 m³/h	[mWS]	1.8

*) *Depending on the SolvisBen version*

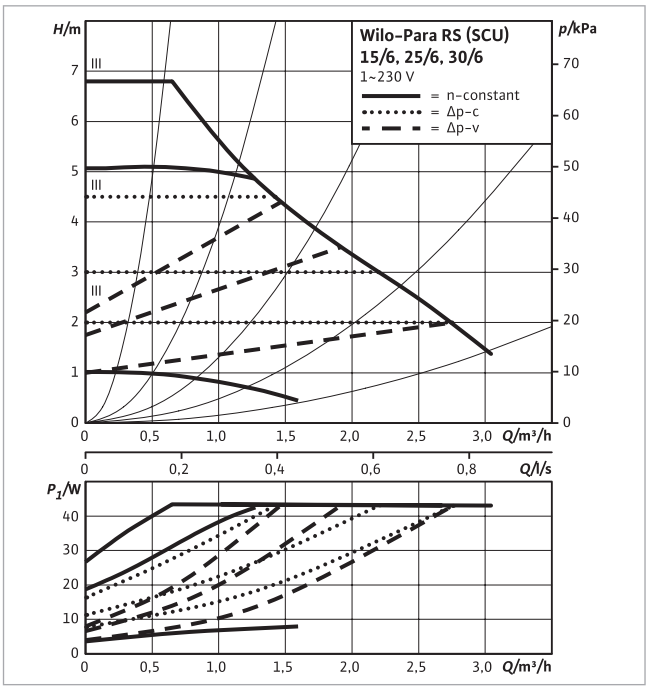


Fig. 154: Wilo-Para 15/6 SCU pump characteristic curve

H *Pump height [m]* Q *Volume flow [m³/h]*
P_1 *Power consumption [W]*

10.7 Wall-mounted WP buffer charging station

PLAS-WP

Dimensions	
PLAS tube connections	1" male thread, flat sealing
Insulation	Heat insulation shell made from EPP

PLAS-WP hydraulics

PLAS pump			
Manufacturer/type	Wilo PARA 15/8 iPWM1	Varios PICO-STG 15/1-7	IMP NMT Neo HL 15/90-130
Installation length	130 mm	130 mm	130 mm
Speed control	via PWM1	via PWM1	via PWM1
Permitted media temperature	2 °C to 95 °C	2 °C to 95 °C	-10 °C to 110 °C
Minimum inflow pressure/height	0.5 bar (at 95 °C)	0.5 m (at 50 °C)	0 m (at 40 °C)
Mains connection	230 V ~/ 50 Hz	230 V ~/ 50 Hz	230 V ~/ 50 Hz
Maximum power consumption	2 to 75 W	1 to 50 W	50 W
Power consumption	0.03 to 0.38 A	0.01 to 0.22 A	0.45 A
EEI	≤ 0,21	≤ 0,20	≤ 0,18

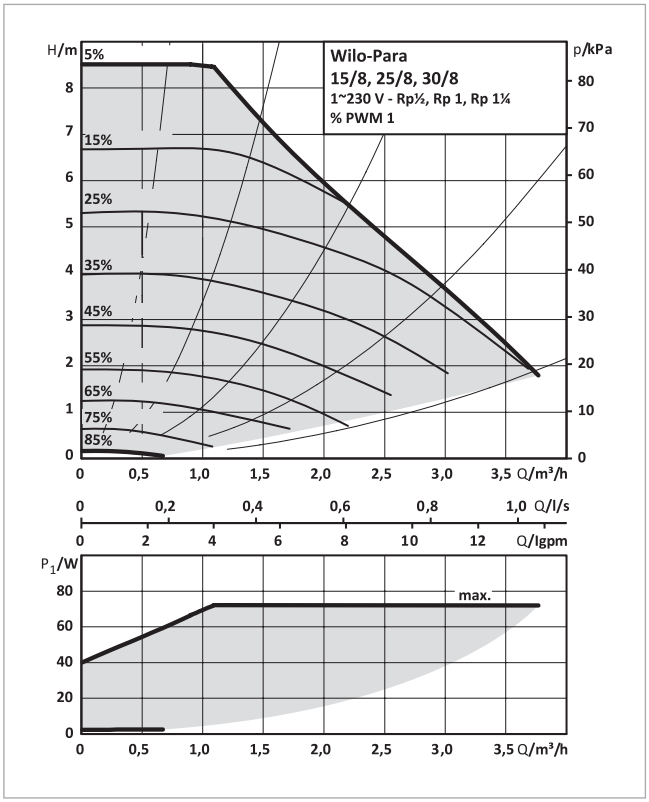


Fig. 155: Wilo PARA 15/8 pump characteristic curves

H *Pump height [m]*
P_1 *Power consumption [kW]*
Q *Volume flow [m³/h]*

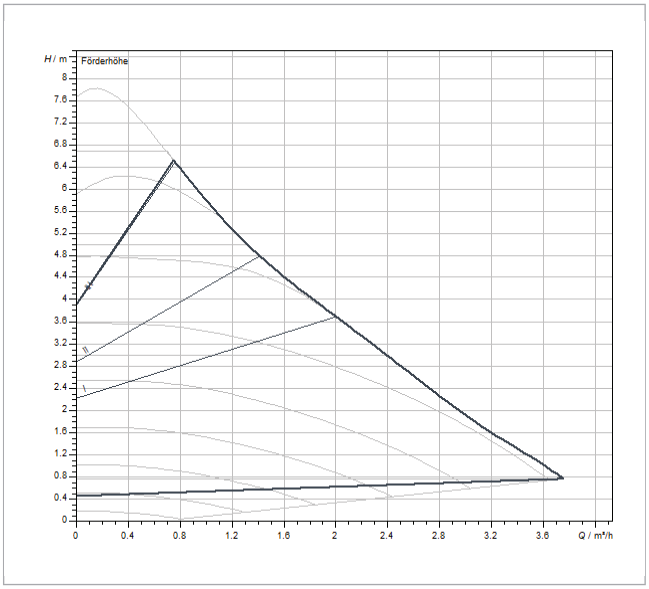


Fig. 156: Pump characteristic curves Varios PICO-STG 15/1-7

H *Pump height [m]*
P_1 *Power consumption [kW]*
Q *Volume flow [m³/h]*

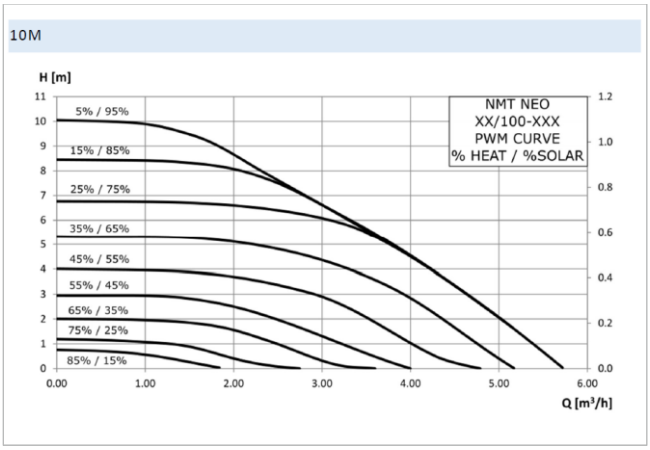


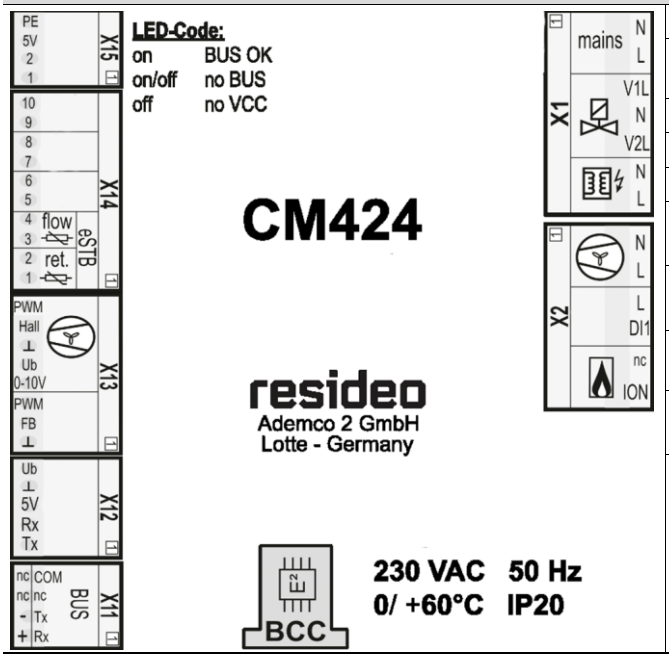
Abb. 157: Pump characteristic curve IMP NMT Neo Heat L 15/90-130

H *Pump height [m]*
Q *Volume flow [m³/h]*

11 Appendix

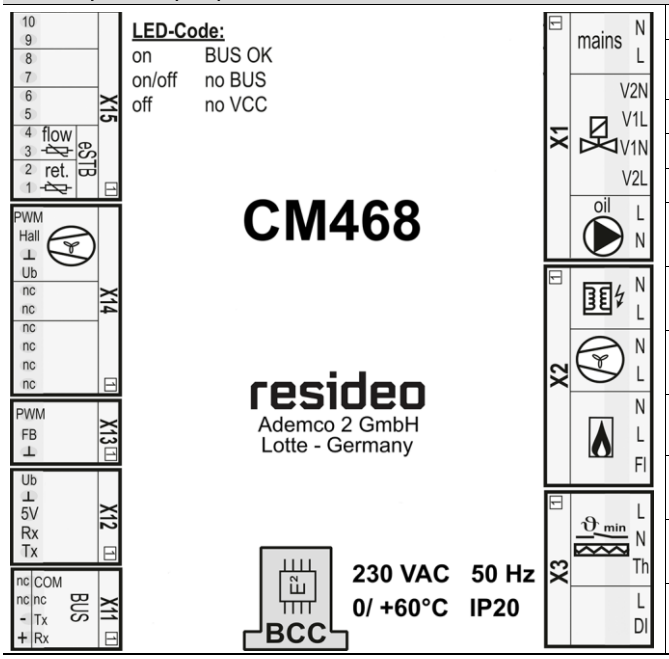
11.1 Burner connection diagram

Burner BR-xx-SX-LN-3



eSTB/eSTL	Electric safety temperature limiter
	Fan (PWM)
BUS	Bus (RS232/SC-3)
BCC	Burner chip card
Mains	230 V ~ (A12 - SC-3)
	Gas solenoid valve
	Ignition transformer
	Blower
	Ionisation electrode

Burner, xx kW, oil, BW-3



eSTB/eSTL	Electric safety temperature limiter
	Fan (PWM)
BUS	Bus (RS232/SC-3)
BCC	Burner chip card
Mains	230 V ~ (A12 - SC-3)
	Solenoid valve
	Oil pump
	Ignition transformer
	Blower
	Flame monitor
	Oil preheater

11.2 System diagrams

For detailed system diagrams, see document ➔ *"SolvisBen system diagram" (ALS-BEN-EN).*

11.3 Accessories

All accessories are listed in the ➔ *Solvis price list*.

11.4 Sensors and connections on the storage tank

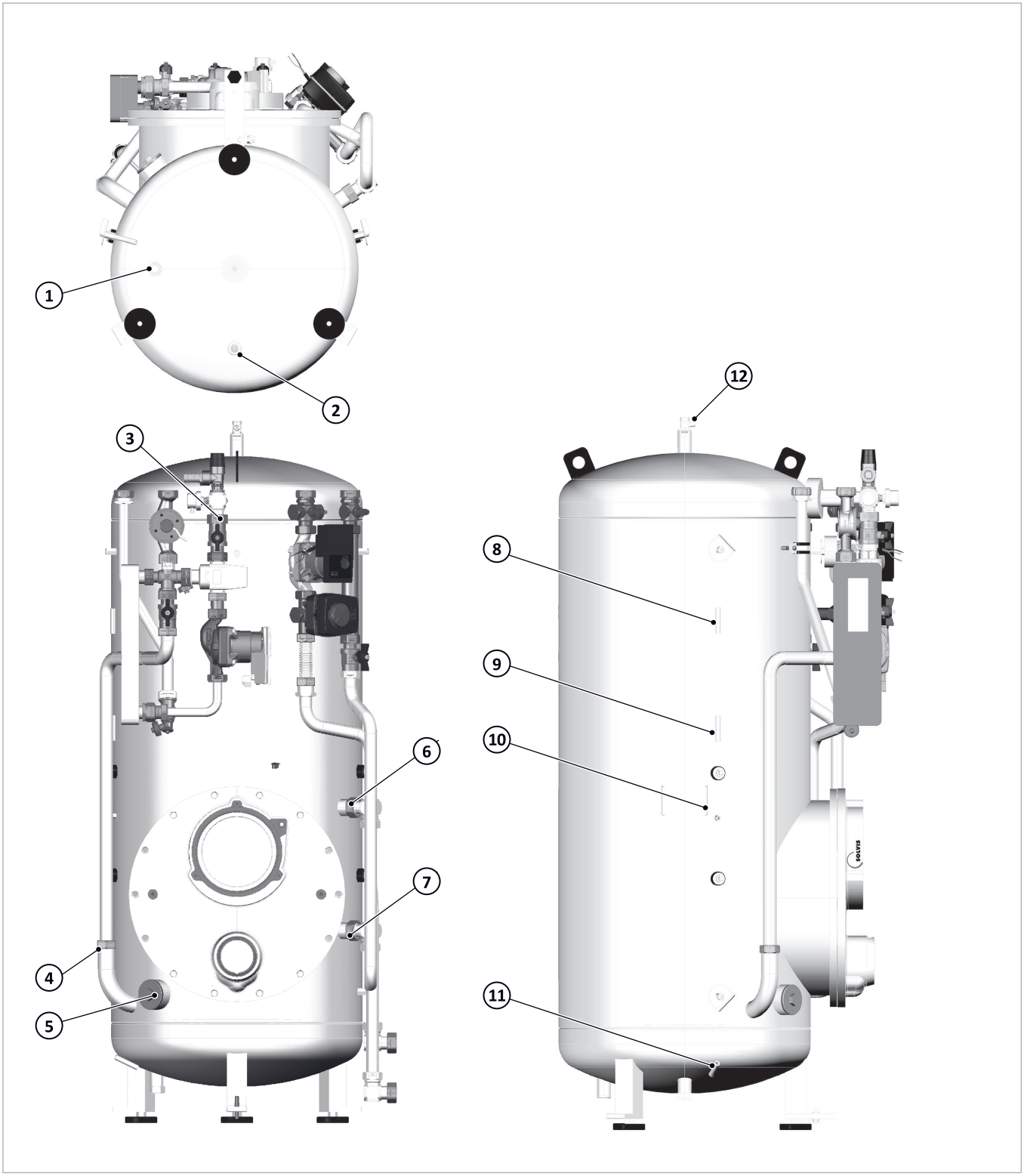


Fig. 158: Front view of the stratified storage tank

1	*Solar flow (SÜS)*	7	*Heating return*
2	*Solar return (SÜS)*	8	*Sensor S1, storage tank, top, Eco*
3	*Hot water flow (WWS)*	9	*Sensor S1, storage tank, top, Comfort*
4	*Hot water return (WWS)*	10	*Sensor S4, heating buffer, top*
5	*Socket for electrical heating element*	11	*Sensor S3, storage tank reference*
6	*Heating flow*	12	*Storage tank bleeder*

11.5 Nameplate

Each unit has a product-specific nameplate that indicates the most important parameters. The contents are explained using this example.

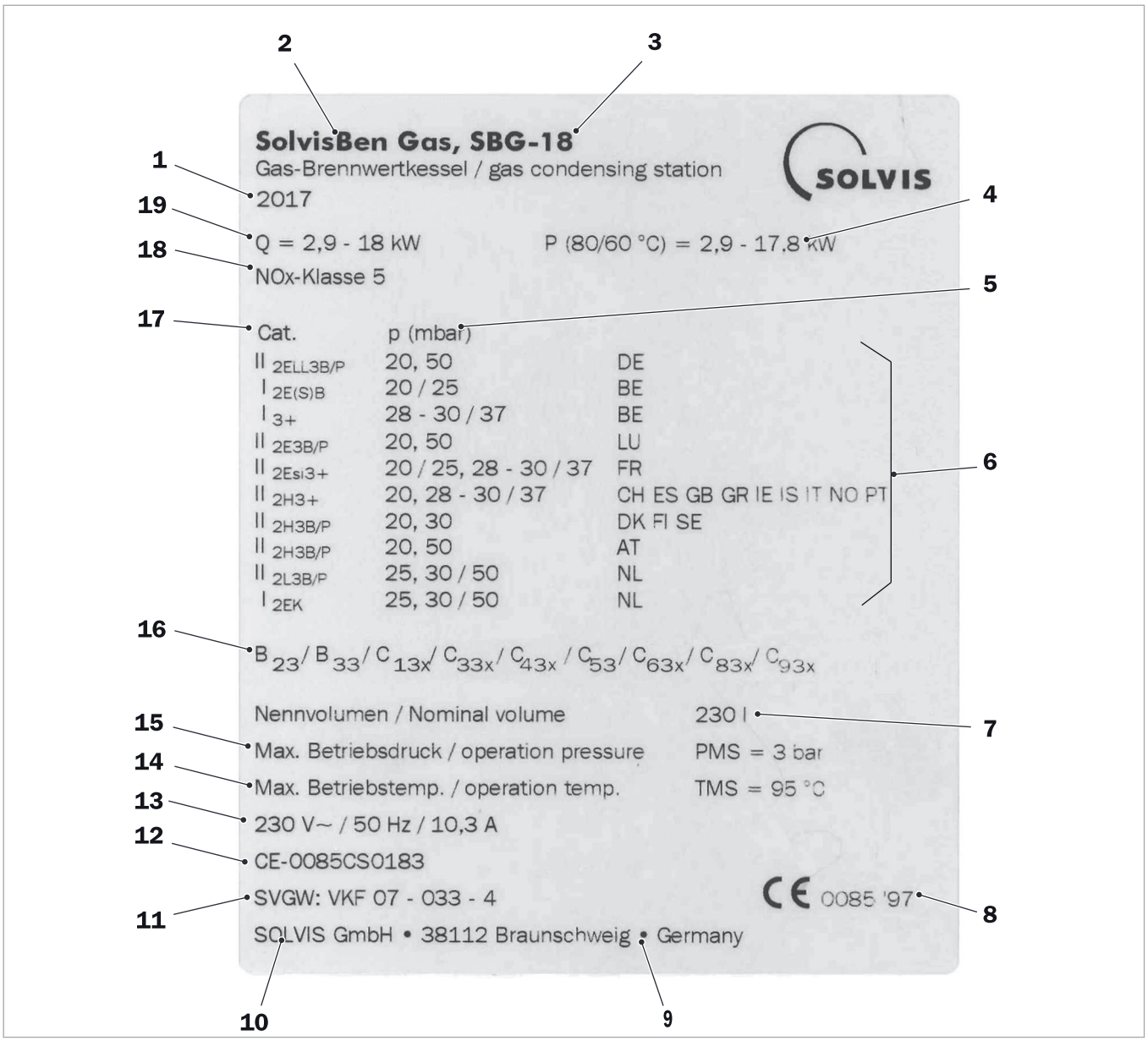


Fig. 159: SolvisBen Gas sample nameplate

1	*Year of manufacture*
2	*Type designation*
3	*Rated heat output (minimum, maximum)*
4	*Useful heat output (min., max.) at flow/return temperature*
5	*Supply pressures*
6	*Countries of destination*
7	*Rated storage tank volume in [l]*
8	*CE marking*
9	*Place of manufacture*
10	*Manufacturer*
11	*VKF approval number of the SVGW*
12	*Product ID number*
13	*Electrical connection data without pumps*
14	*Maximum operating temperature in [°C]*
15	*Maximum operating pressure in [mbar]*
16	*Installation types according to TRGI*
17	*Device category*
18	*NO_x class*
19	*Burner performance (minimum, maximum)*

12 Index

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SOLVIS GmbH
Grotrian-Steinweg-Straße 12
D-38112 Braunschweig

Phone: +49 (0) 531 28904-0
E-mail: info@solvis.de

Internet: www.solvis.com