Installation

SolvisMax

Stratified solar storage tank

- Installation
- Start-up
- Maintenance

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

Observe the safety notes

This is for your own safety

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

2.2 Regulations

Observe the following specifications

- DIN EN 12828 Heating systems in buildings
- DIN EN 1717 Protection of drinking water (d. w.)
- DIN 1988-100 Codes of practice for d. w. installat. (TRWI)
- DIN EN 806 Specifications for installations inside buildings conveying water for human consumption
- VDI 2035 Part 1, Prevention of damage in water heating installations - Scale formation
- VDI 2035 Part 2, Prevention of damage in water heating installations - Water corrosion
- Directives of the German Institute for Structural Engineering
- German Building Regulations (LBO)
- VDE 0100/IEC 60364 Erection of low voltage systems
- Low Voltage Directive 2006/95/EC.

With integrated burner, also:

- 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

With oil burner:

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

With gas burner:

- German technical rules for gas installation (TRGI) and, if necessary, technical rules for liquid gas (TRF)
- Gas Appliances Regulation 2016/426/EU
- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Test regulations used:
  – EN 15502-1:2015
  – EN 15502-2-1: 2017, EN 607301-1: 2011
  – EN 60730-2: 2009.

Additional specifications in Switzerland

- SVGW (Swiss Gas and Water Industry Association) G1 guidelines for gas installations
- EKAS-Form. 1942: Liquid gas guideline, Part 2
- Specifications from cantonal authorities (e.g. fire service guidelines).

3 System Versions

The SolvisMax is available with the three storage tank sizes 450, 750 and 950 litres, all available in the following versions:

- As a gas condensing system SolvisMax Gas in four performance levels: 10, 18, 25 or 30 kW
- As a SolvisBen Oil oil condensing system in three performance levels: 17, 23 or 28 kW
- As a combined heating pump/gas condensing system SolvisMax Gas Hybrid with SolvisLea heating pump (including SolvisLea Eco) and gas burners in four performance levels: 10, 18, 25 or 30 kW
- As a SolvisMax Oil Hybrid combined heating pump/oil condensing system with SolvisLea Eco heating pump (including SolvisLeaEco) and oil burners in three performance levels: 17, 23 or 28 kW
- As the SolvisMax Solo for connecting the Solvis Lino 4 pellet boiler or an external heat generator (including district heating, option for subsequent retrofitting of various gas or oil burners)
- As the SolvisMax WP for connecting the SolvisLea air/water heating pump (including the SolvisLea Eco).

Three versions of the integrated hot water station are available:

- WWS-24 or WWS-36 (with copper-brazed heat exchangers)
- WWS-30 (with stainless steel-brazed heat exchangers).

Depending on the configuration, the SolvisMax also includes a solar heat transfer station.

- SÜS-LM

The solar heat transfer station can also be retrofitted at any time to utilise all of the benefits of solar thermal support.
As additional combination options, our wall-mounted heating circuit stations (HKS-xx) are available in various designs for up to three heating circuits.

4 Scope of Delivery

The basic kit is delivered in several packages plus documentation. Additional accessories are added to create an entire system.

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

SolvisMax – charging module

- SolvisControl 3 system controller with mains circuit board and main switch
- Hot water station, depending on the version as
  - WWS-24 or WWS-36 (number of heat exchanger plates: 30 or 50 plates and adapted thermal mixing valve design) or
  - WWS-30 (40 plates, stainless steel-brazed)
- Solar heat transfer station for solar thermal collector surfaces of up to approx. 20 m²
- Charging module assembly pack: (with connection piping and sensor cable harness)
- Assembly pack (Pur or Solar): with outdoor sensor, ball valves, bleeders, seals and small assembly materials (Solar: also with cap valve)
- Room controller
- Flange insulation
- Protective cover.

“Pur” version

- Without solar heat transfer station.

“WP” version

For connection to the SolvisLea external heating pump, also with:

- LM-WP electrical assembly pack: with flow sensor, connection materials
- Assembly pack for LM-WP 3-way valve: Switching valve group for heating/HW operation with SolvisLea
- Modbus connection box
- SmartGrid connection box
- Buffer charging station (included)
- Sludge separator (included)

“WP-SL” version

For SolvisMax Solo with SolvisLea Eco, also with:

- electrical heating cartridge including mSTL and relay box.

SolvisMax – storage tank

- Steel stratified storage tank that can be fitted with an integrated heat generator, completely pre-assembled, including sensor sleeves and an integrated solar and heating combined stratified charger.
- Storage tank insulation
- Technical documents:
  - SolvisMAX installation instructions (MAL-MAX-7, this document)
  - SolvisMax installer operating instructions (BAL-SBSX-I)
  - SolvisMAX system diagram (ALS-MAX-7)
  - Privacy policy
- “My Solvis System” systems folder with other documentation.

SolvisMax Gas

Also includes:

Burner box

- Pre-mixed, modulating low NOx radiant burner
- Burner cable
- Attachment nuts
- Burner sealing cable

Intake chamber box

- Intake chamber
- Installation material (seals, retaining plates, nuts, etc.)
- Intake chamber installation instructions

Accessories box

- Condensate hose
- Boiler brush
- Exhaust connection elbow
- Air supply hose
- Gas line
- Exhaust connection fitting
- Assembly pack (with gaskets, attachment material, safety temperature limiter (eSTL), socket boards, etc.)

SolvisMax Öl

Also includes:

Burner box

- 2-stage low NOx blue-flame burner, incl. 2 flexible oil pipes
- Air supply hose
- Burner plug
- Attachment nuts
- Burner sealing cable
- Documentation

Accessories box

- Exhaust connection elbow with siphon and condensate hose
- Boiler brush
- Exhaust connection fitting
- Assembly pack (with gaskets, attachment material, mSTL sensor, socket boards, etc.)
- Oil microfilter with vacuum manometer and retaining plate
- Reflective silencer
- Filling pipe cap with label (only for low-sulphur EL heating oil).

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

Heavy weight of the system may be hazardous.

Risk of damage to the system and building

- Ensure that the floor has sufficient load bearing capacity to support the weight of the system, especially that of the filled storage tank.

Storage tank transport

WARNING

Danger due to the heavy transport weight (> 200 kg)

Personal injury or damage to property.

- Provide suitable transport equipment or enough people for installing the storage tank.
- The storage tank connections must be facing up so that they do not get damaged.
- To transport the storage tank, tilt it back on the carrying aid. If necessary, a sack trolley can be used between the rear feet.
- Do not fit the adjustable feet until after transport because they may break or become damaged during transport.

Fig.1: Tilting the storage tank

Maintain the following conditions

- When (dry) storing, transporting, and assembling the components, ensure that the storage tank is not scratched, warped, or deformed by external factors. Otherwise, the safe and long-lasting operation of the storage tank can no longer be guaranteed.
- Floors must be level at the installation site (+/-1 cm).
- The system must be installed and operated only in a frost-proof room inside a building.
- The system must not be installed in damp rooms such as kitchens, bathrooms or laundry rooms.

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)
- 0.3 m at the side and rear (for the installation of insulation, jacket thickness 120 mm).

6 Installation

6.1 Storage tank and insulation

Installing and insulating the storage tank

1. Plan the space required: approx. 0.30 m of space to the side for installing the storage tank insulation.
2. Screw in the feet (**1**) up to a maximum of 35 mm and screw in foot (**2**) completely.
3. Install the storage tank and use the adjustable storage tank feet (**1**) to align the storage tank vertically (spirit level).
4. Twist out the foot (**2**) until it reaches the floor.

Fig.2: Installing the storage tank

5. Remove the envelope (**2**) with the copy of the nameplate and place it to the side.

When you have finished the installation, attach the copy of the nameplate to the storage tank in a clearly visible position (see ➔ *fig. 108, page 54*).

6. Remove the carrying aid and close the socket (**1**) using the supplied plugs.
7. Fit the sensor cable harness (**4**) to the storage tank and set S1, S3, S4 and S9 into the sensor sleeves using heat conducting paste.
8. Attach the cable to the container wall using pipe fixings (**5**), lead it to the storage tank holder (**3**) and attach it there. Then route the cable out through the opening in the insulation for the storage tank holder.

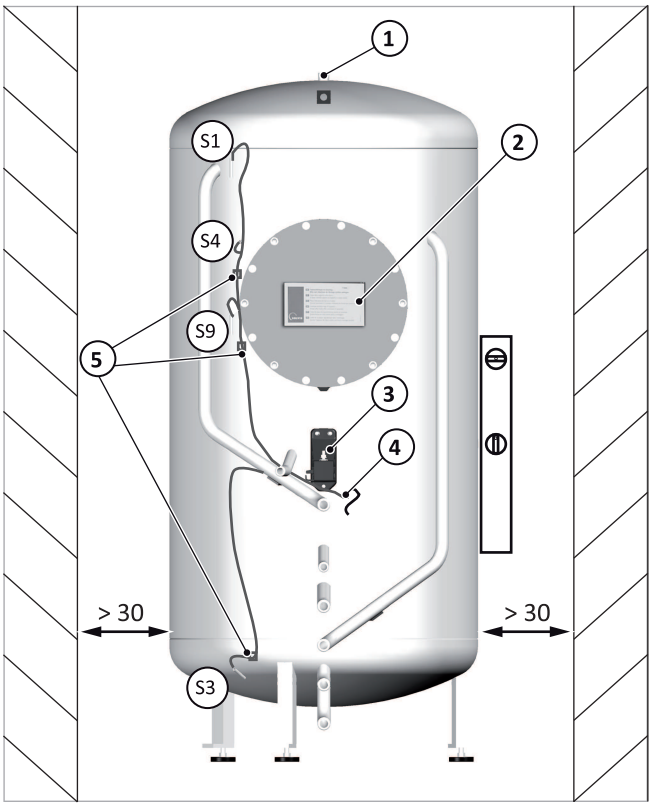


*Fig.3: Storage tank with the nameplate in the envelope (**2**)*

9. Position the floor base plates below the storage tank and position the lower cover base plates on the storage tank.

Fig.4: Position the floor and cover base plates

10. Fitting the flange collar shell

Fig.5: Fit the flange collar shell

11. Screw the rear flange insulation (in two parts) onto the flange cover or, where applicable, onto the heat exchanger insert.

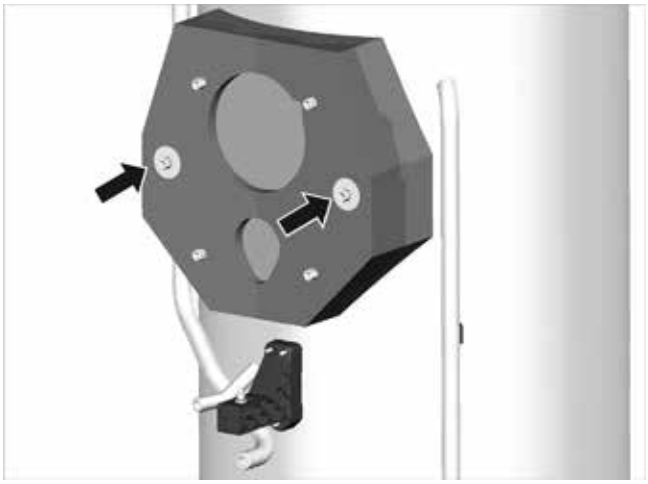


Fig.6: Install the rear flange insulation

12. Lay the insulation, guide it through the specified passage over the bleeder connection, and close it. Press the cover strips onto the fastening strips.

Fig.7: Insulating the storage tank

For information about fitting the burner or heat generator insert, see ➔ *chapter „Installing the gas burner", page 16* and ➔ *chapter "Installing the oil burner", page 23*.
You do not have to switch to the chapter specified above unless you want to fit a heat generator in the storage tank.

To protect the storage tank against contamination during the installation, you can attach an installation guard that is supplied separately over the storage tank insulation.

Installing the front flange insulation

1. Install and screw on the front flange insulation in the order (**1**), (**2**), (**3**). If you are using a heat generator, insulate the front surfaces using insulation pads.

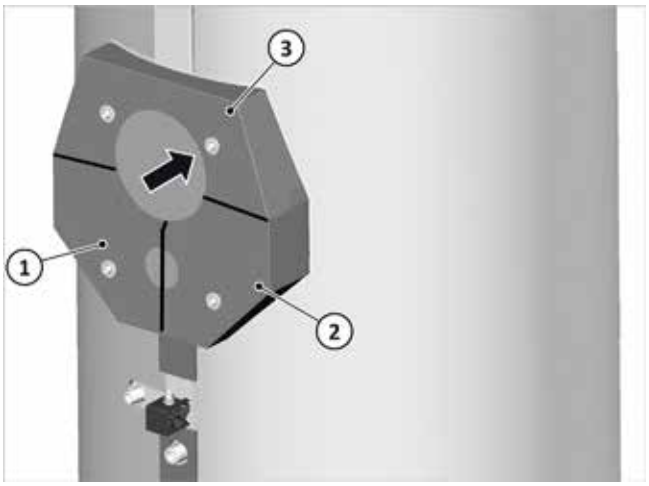


Fig.8: Installing the front flange insulation

Fitting the front bracket

The storage tank and base console are connected to each other by the front bracket (U support).

1. Attach the front bracket (U support) to the bracket on the storage tank and screw it on by hand with the washer and hexagon nut.

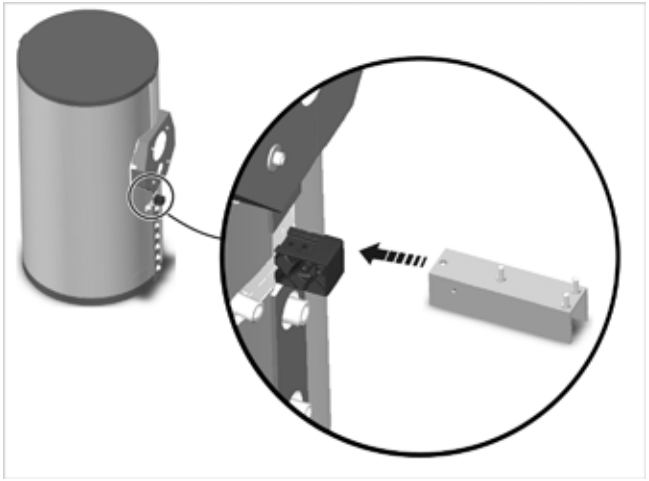


Fig.9: Front bracket

2. Guide the bolt through the bore hole on the side and fasten with the retaining washer.

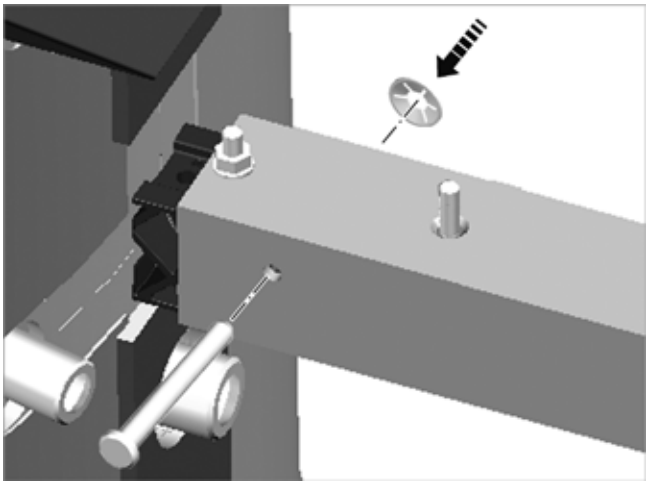


Fig.10: Bolt and retaining washer

Fitting the ball valve

1. Fit the supplied ball valve for the hot water station and solar heat transfer station.

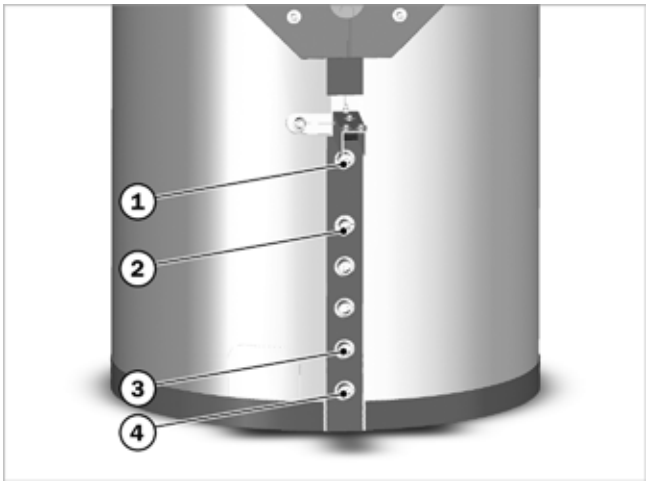


Fig.11: Fit the connections with ball valves

1 *Hot water flow*
2 *Solar flow*
3 *Hot water return*
4 *Solar return*

6.2 Charging module

WP and WP-SL charging modules only

Scope of Delivery

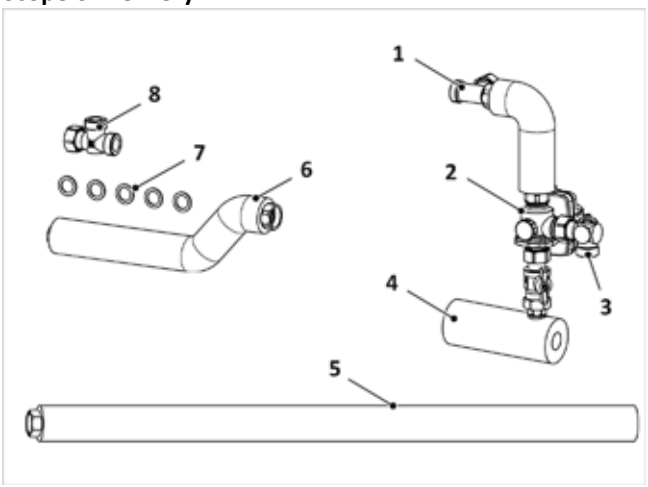


Fig. 12: Assembly pack for LM-WP 3-way valve:

1 *T-piece (WWS flow)*
2 *3-way switching valve*
3 *Bracket with temperature sensor S14*
4 *Corrugated pipe for heating flow*
5 *WP-VL connection pipe:*
6 *Connection pipe for heating flow*
7 *5x seals, 30 x 21 mm*
8 *T-piece G1 (heating flow)*

Installation overview

➔ *Fig. 13* shows the position of the 3-way switching valve at the connections for the storage tank and charging module. The connection pipes for the heating pump and heating flow can be routed through the side pipe lead-through on the right or left.

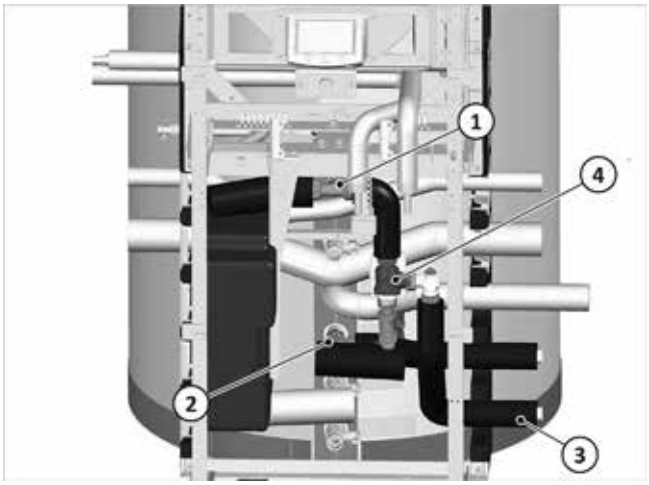


Fig. 13: Position of the 3-way switching valve (connections on the right)

1 *Step 1: Connection to WWS flow*
2 *Step 2: Connection to heating flow*
3 *Step 3: Routing the heating pump flow (here, on the right)*
4 *3-way switching valve*

Fitting the switching valve

1. Fit the supplied switching valve on the WWS flow (**1**).

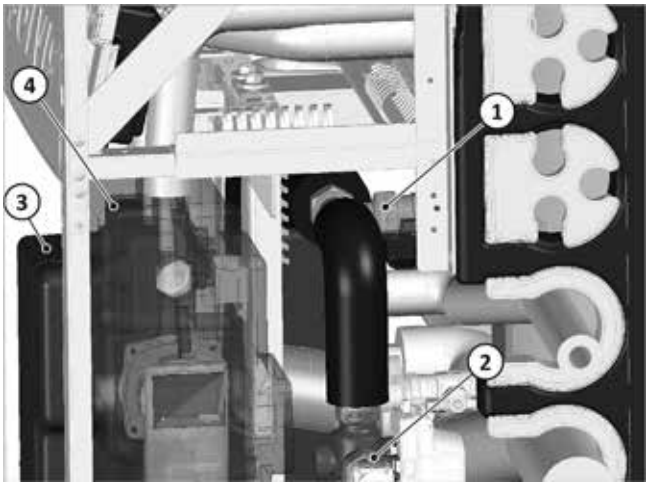


Fig.14: Fitting the switching valve for WP flow on the right

1 *Connection to WWS flow*
2 *3-way switching valve*
3 *Hot water station (WWS)*
4 *Solar heat transfer station (shown as transparent here)*

2. Fit the supplied T-piece (**8**) and seal on the storage tank heating flow connection. Run the heating flow connection pipe (**6**) into the pipe lead-through on the left or right and tighten it while holding it in place.

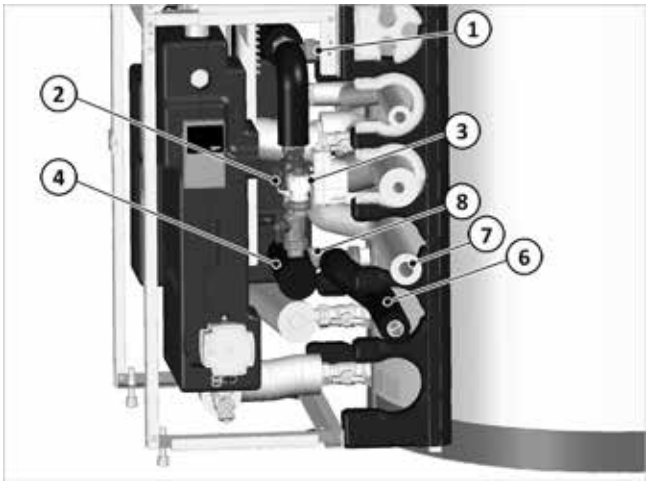


Fig.15: Fitting the switching valve for WP flow on the right

1 *Connection to WWS flow*
2 *3-way switching valve*
3 *Bracket with temperature sensor S14*
4 *Corrugated pipe for heating flow*
5 *Not used*
6 *Connection pipe for heating flow*
7 *Heating return*
8 *T-piece on heating flow*

3. Run the heating pump flow pipe (**5**) into the pipe lead-through on the left or right. Tighten the coupler while holding it in place.
4. Insert the supplied temperature sensor S14 into the immersion tube on the bracket (**3**) and fasten it in place.

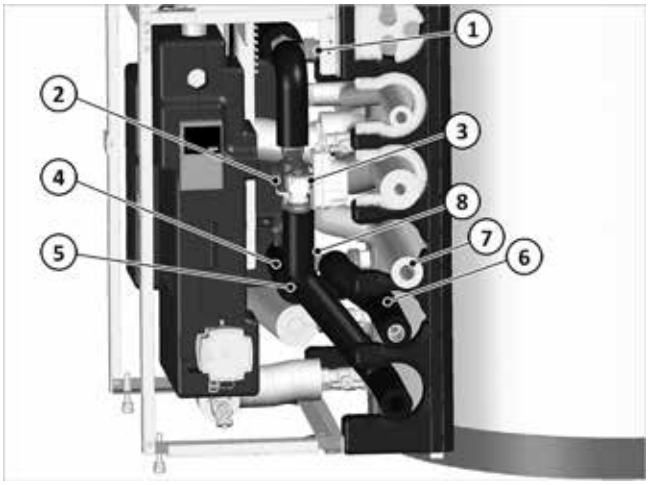


Fig.16: Fitting the switching valve for WP flow on the right

1 *Connection to WWS flow*
2 *3-way switching valve*
3 *Bracket with temperature sensor S14*
4 *Corrugated pipe for heating flow*
5 *Heating pump flow pipe*
6 *Connection pipe for heating flow*
7 *Heating return*
8 *T-piece on heating flow*

5. Connect the supplied switching valve cable to the switching valve.

All charging modules

Installing the charging module

The charging module contains the appropriate stations and valves for the specific system configuration.

1. Put the charging module in place and fasten it with the nuts. The oblong holes in the frame allow for horizontal alignment (**2**).

2. Set the clearance (**3**) on both sides; the height of the clamp can be aligned marginally (**1**), depending on the tightness of the nuts.

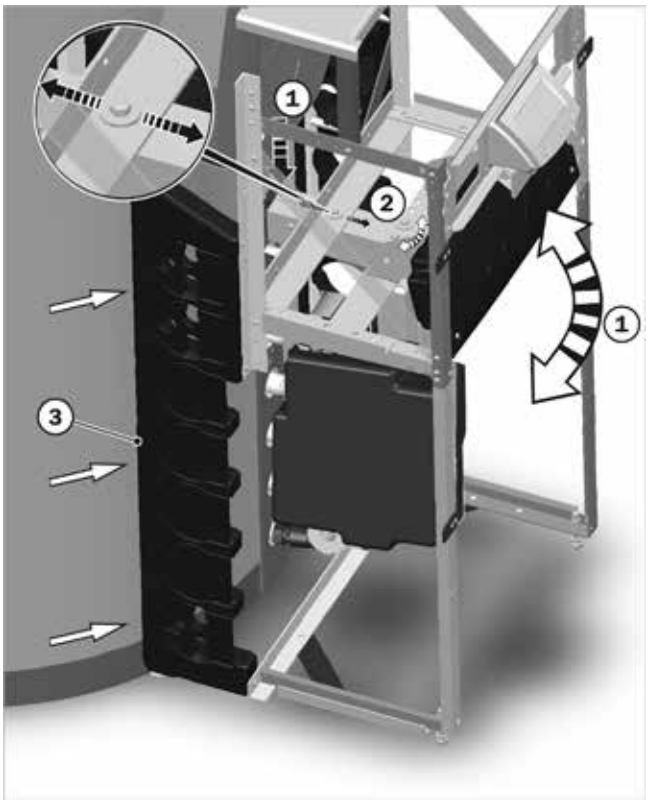


Fig.17: Aligning the charging module

3. Finally, screw the feet at the front of the frame downwards to the floor.

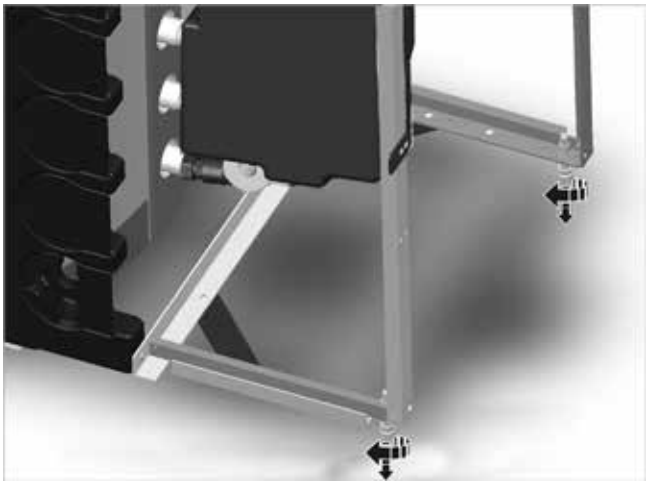


Fig.18: Screw the frame feet downward to the floor

Pipe lead-throughs

The pipe lead-throughs sit on the side of the frame to the left and right. They are adapted to the different lines using inserts.

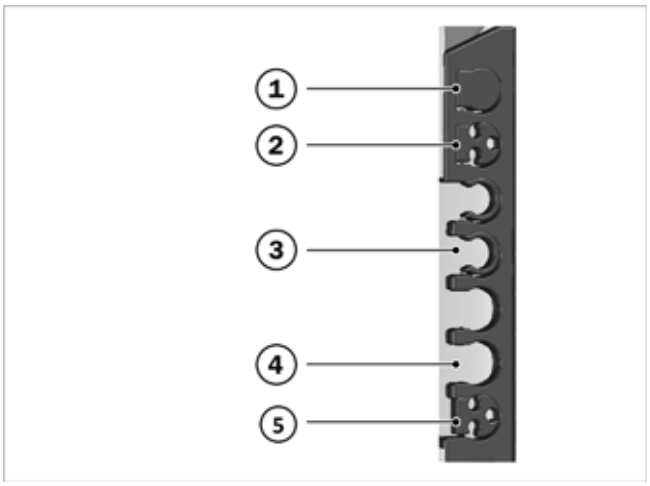


Fig.19: Inserts for the pipe lead-throughs

1 *Cover (closes the pipe lead-through)*
2 *3x reducer (for typical burner lines, electrical lines, etc.)*
3 *Reducer insert (e.g. for drinking water)*
4 *No insert (e.g. heating pipes)*
5 *Heating pump flow*

Guide the bleed connection

All pipe lead-throughs can be fitted on either the left or right side of the frame.

1. Guide the bleed connection for the storage tank to the second pipe lead-through from the top of the frame with the supplied corrugated pipe and fasten it to the frame using the mounting bracket.

The system operator should be able to reach the bleeder from the outside.

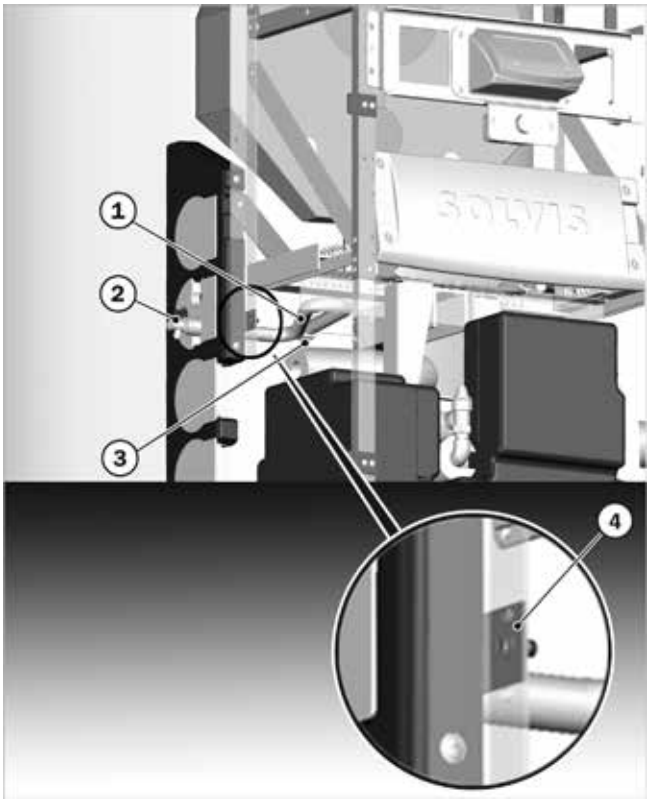


Fig.20: Fit the bleeder connection with the corrugated pipe

1 *Corrugated pipe*
2 *Bleeder*
3 *Bleeder connection*
4 *Mounting bracket*

For information about how to continue with the installation of the connection pipes, see ➔ *chapter "Installing the connection pipes", page 17* (gas burners) or ➔ *chapter "Installing the connection pipes", page 24* (oil burners).
You do not have to switch to the chapter specified above unless you want to fit a heat generator in the storage tank.

6.3 Gas burner

SolvisMax Gas and Gas Hybrid only

6.3.1 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. 16.*

- 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 / Ben 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 15.*

6.3.2 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**).

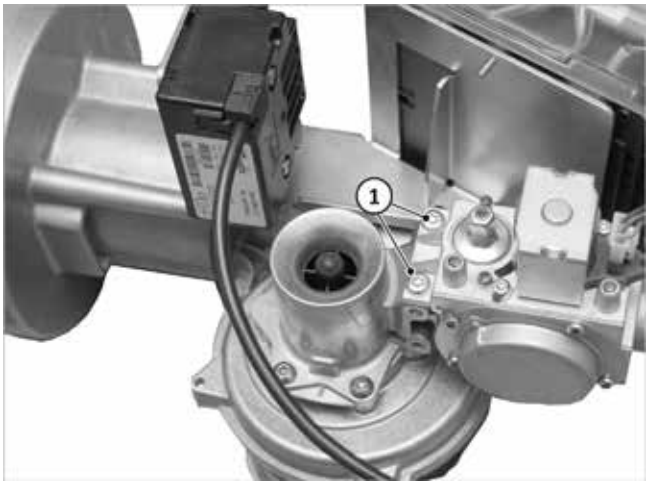


Fig. 21: Removing the gas combination valve

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.

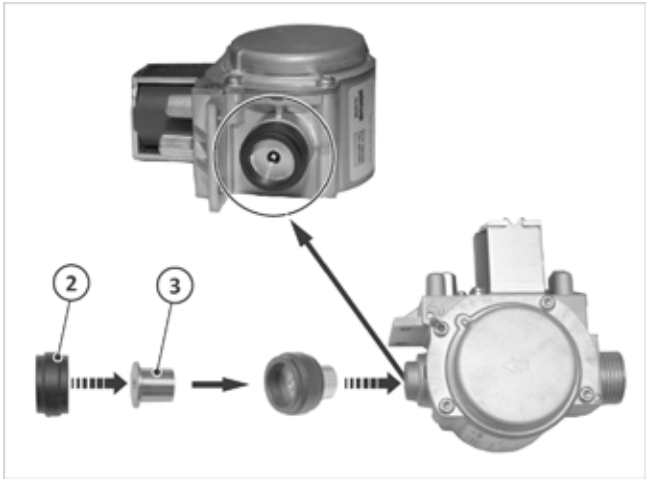


Fig. 22: Installing the liquid gas nozzle

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).

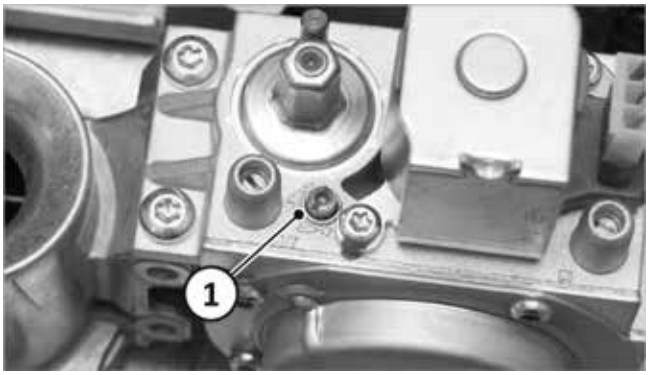


Fig. 23: Setting the burner

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.

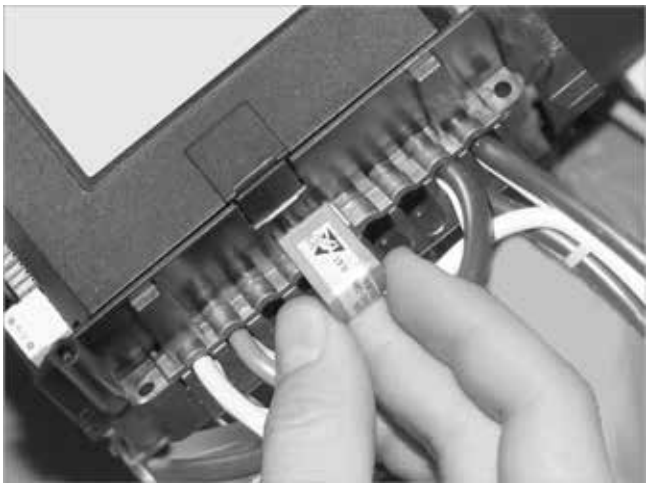


Fig. 24: Installing the burner chip card

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. 47*.

6.3.3 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 in the usual way using SC-2.

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).

6.3.4 Installing the gas burner

Installing the front flange insulation

The front flange insulation consists of three sections:

1. Position and screw down the front left flange insulation.

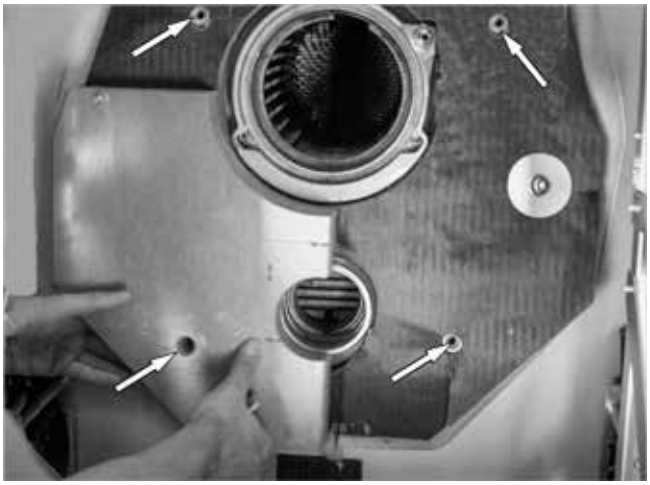


Fig. 25: Installing the front flange insulation

2. Then fit the right and front top flange insulation.

Installing the burner

1. Insert the entire burner sealing cable into the groove of the combustion chamber flange (push up).

WARNING

Prevent leaks on the burner seal

Risk of toxic gas leakage.

- Never operate the burner if the burner sealing cable is not inserted.
- Do not shorten the burner sealing cable!

Fig. 26: Inserting the burner sealing cable (push up)

2. Push the screw connection and insert onto the eSTB cable.

The electrical safety temperature limiter (eSTB) is connected to the burner by a red cable.

3. Insert the eSTB into the immersion tube on the top right of the combustion chamber as far as it will go (front tip of the eSTB approx. 15 cm deep).
4. Tighten the screw fitting.

Fig. 27: Inserting the eSTB

5. Attach the burner to the pre-fitted threaded bolts with the “Top” marking facing up.
6. Fasten the burner flange with the three nuts supplied.
7. Tighten the nuts evenly using an 8 mm socket spanner.

Fig. 28: Fitting the burner

Insulating the burner flange

Two burner scarves are provided for the burner flange insulation:

1. Wrap the first scarf around the flange.
2. Wrap the second scarf around the flange as well and use the two scarves to fill the gap between the burner flange and the front flange insulation.

Fig. 29: Filling the recess on the burner flange

Continue the installation with the section “*Fitting the front flange insulation*” (see ➔ *chapter “Storage tank and insulation”, page 10*.

6.3.5 Installing the connection pipes

Fitting the intake chamber tray

1. Place the supplied protective caps onto the two screw heads on the console.

Fig. 30: Covering the screw heads on the console

2. Hook the bracket on the tray behind the screws (**1**) and press to the left.

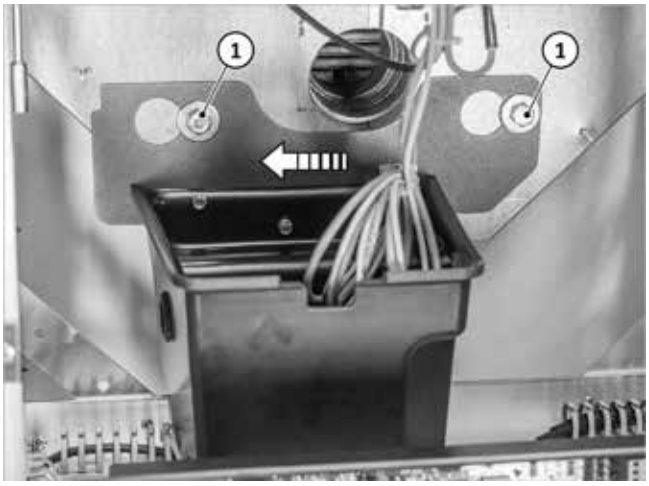


Fig. 31: Hooking on the intake chamber tray

3. Fit a cable lead-through to the burner cable, pull it through the hole on the right and press the cable lead-through into the hole. Ensure that the passage is sealed correctly.
4. Leave the cable that runs from the lead-through to the burner long enough for the burner to be easy to remove at a later stage.

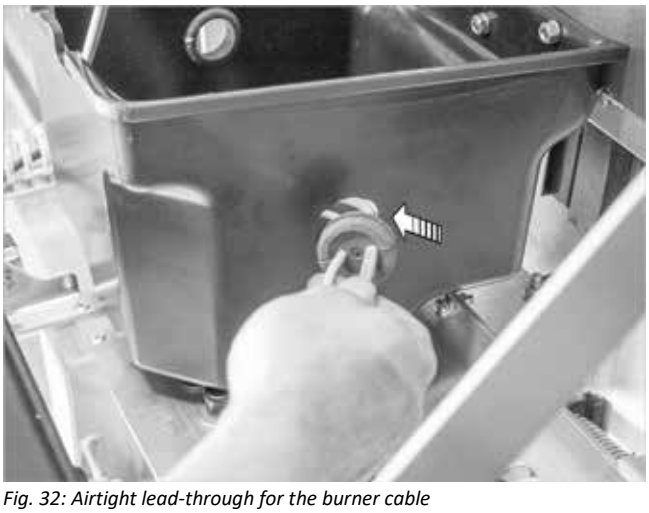


Fig. 32: Airtight lead-through for the burner cable

Fitting the bellows seal bracket

1. Hook the bracket into the opening (**1**) using the hook (**2**).

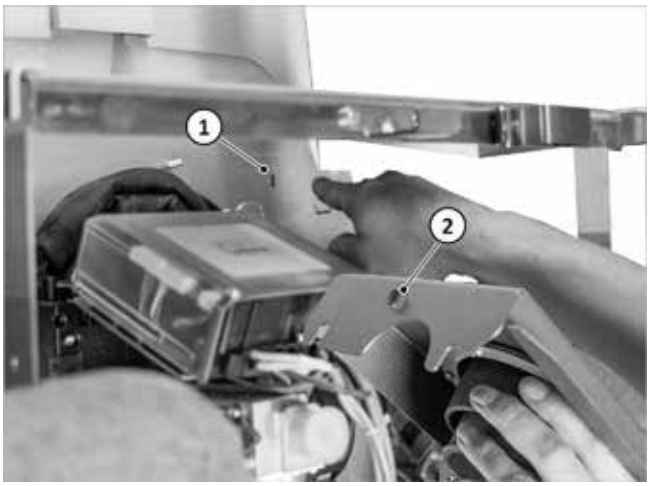


Fig. 33: Inserting the bellows seal bracket

2. Screw the bracket tightly.

Fig. 34: Screwing the bellows seal bracket tightly

Fitting the exhaust connection piece

1. Set the exhaust connection piece onto the exhaust retaining plate and fasten it with the supplied plastic expanding rivets. Observe the position for the installed storage tank size.

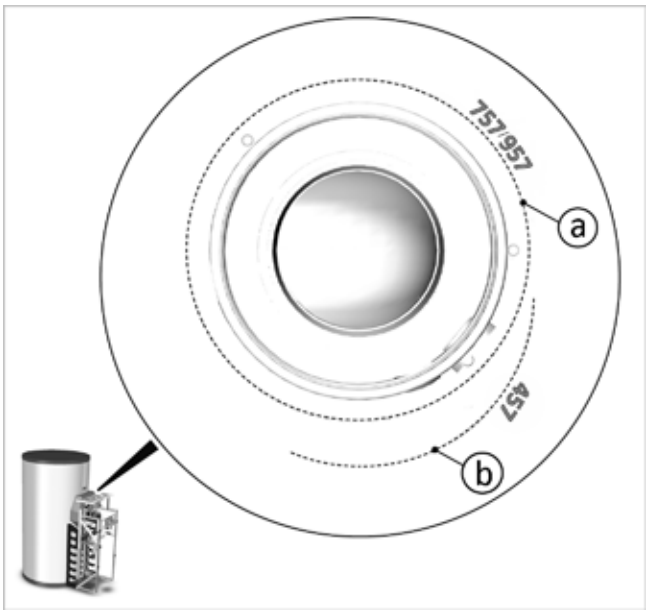


Fig.35: Position of the exhaust connection fitting

a *Position for storage tank sizes 757 and 957*
b *Position for storage tank size 457*

Fitting the bellows seal and clamp

1. Slide the bellows seal and clamp over the end of the pipe.
2. Check that the clamp is resting on the ridge of the bellows seal and above the pipe socket (see the circle).
3. Fasten the clamp.

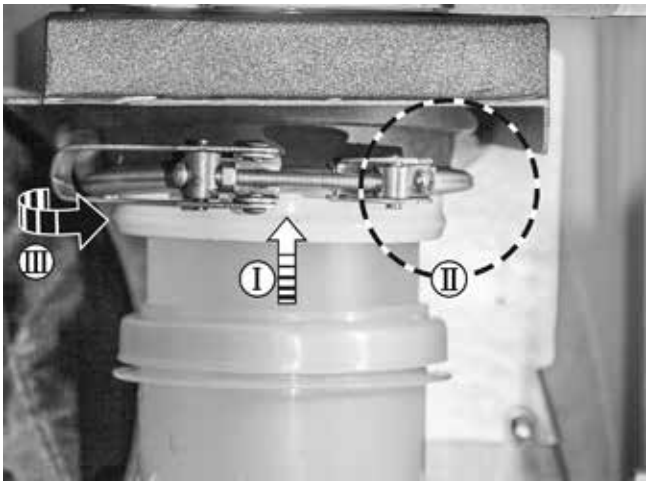


Fig. 36: Fitting the clamp

Fitting the exhaust elbow

1. As shown in ➔ *fig. 37*, slide the union nut (**1**), the snap ring (**2**) and the seal (**3**) onto the lower pipe end of the exhaust connection piece.

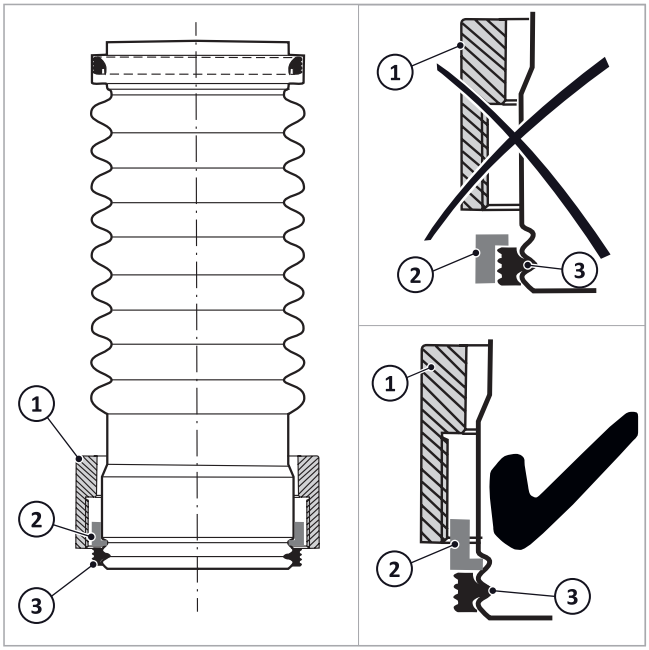


Fig. 37: Union attached

2. Insert the exhaust elbow into the lower opening on the exhaust heat exchanger until the spring pin is locked in the exhaust elbow (**I**).
3. Then, turn and align the exhaust elbow to the pipe end of the exhaust connection piece (**II**).

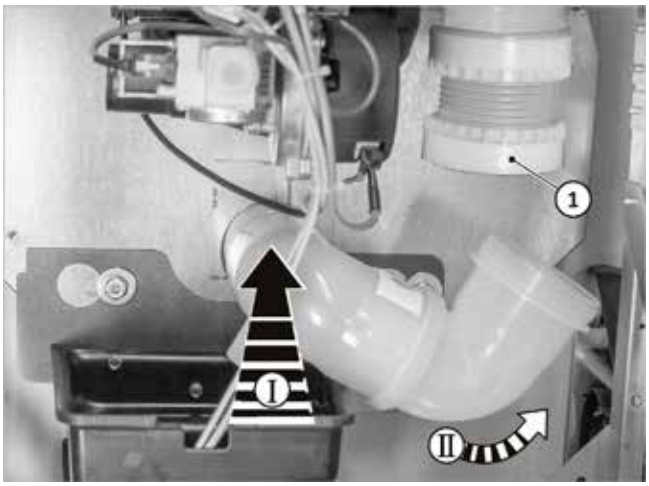


Fig. 38: Fitting the exhaust elbow

4. Place the upper pipe end of the exhaust connection piece onto the exhaust elbow union. Ensure that the

sealing ring and snap ring are sitting straight in the union.

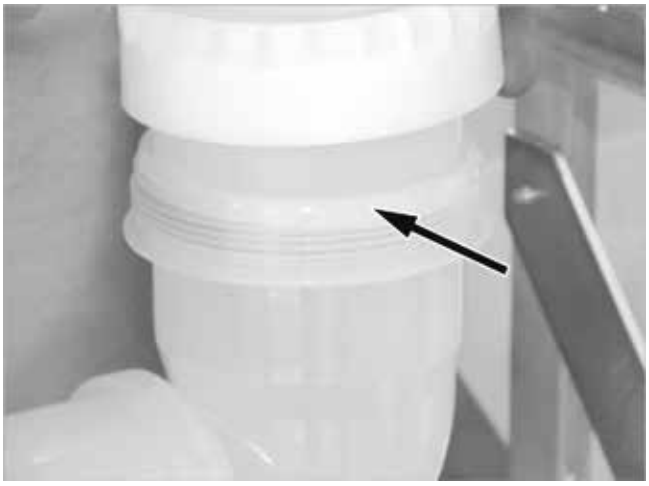


Fig. 39: Screwing on the straightly aligned exhaust elbow

5. Move the union nut (see ➔ *fig. 38***1**) downwards and screw it onto the exhaust elbow.

The exhaust elbow can be removed by turning it roughly 15° clockwise and then pulling it away. When turning the exhaust elbow, the spring lock is disengaged in the fitting.

Installing the condensate hose

1. Fill the condensate siphon with water and fit it on the exhaust elbow (do not forget the seal).
2. Fit a cable lead-through to the condensate hose (**4**) (**1**) and seal the opening closed while pushing the condensate hose through.
3. Fit a union nut (**3**) and seal (**2**) to the condensate hose and screw it onto the siphon.

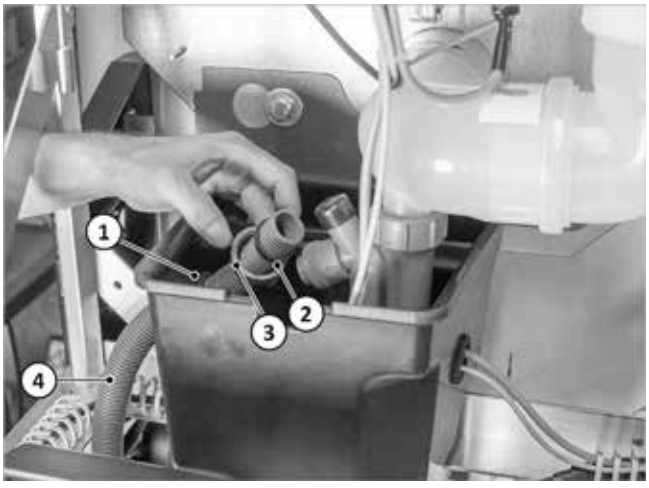


Fig. 40: Guiding the condensate hose through the opening and connecting it

4. Using a 3x reducer (see ➔ *fig. 41*, **2**), guide the other end through the pipe lead-through on either the left or right-hand side of the frame. Ensure that there is a sufficient incline.
5. Guide the condensate hose to the discharge. If you are using a condensate lifting pump, place it on the floor in the lower area of the frame.

Pipe lead-throughs

The pipe lead-throughs sit on the side of the frame to the left and right. They are adapted to the different lines using inserts.

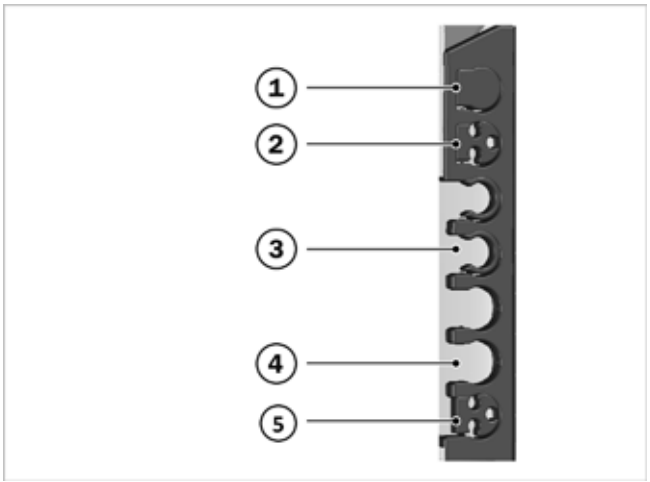


Fig.41: Inserts for the pipe lead-throughs

1 *Cover (closes the pipe lead-through)*
2 *3x reducer (for typical burner lines, electrical lines, etc.)*
3 *Reducer insert (e.g. for drinking water)*
4 *No insert (e.g. heating pipes)*
5 *Heating pump flow*

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.

Connecting the exhaust safety temperature limiter

Exhaust safety temperature limiter (ASTB)

Regulation in Switzerland.

- If an additional ASTB is stipulated, connect it to the malfunction input on the system controller of the SolvisControl (please order the ASTB separately).
- The ASTB must have a floating 230 V~ switching contact.
- To install the ASTB in the exhaust line, replace the supplied exhaust elbow with the exhaust elbow AB-ASTB (please order separately, see ➔ price list).

1. Connect a connection line to two poles on the ASTB switching contact.
2. Remove the jumper (ST 2) from the socket board of the mains module.
3. Lead the connection line on to the mains module and attach to the terminals (ST 2) on the socket board. The polarity is not important.

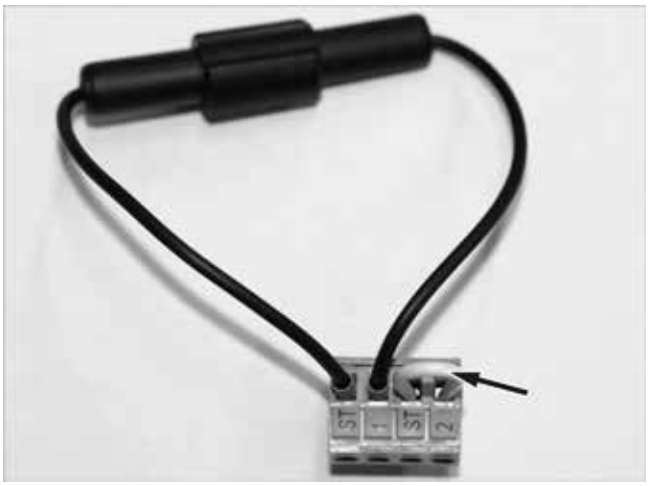


Fig. 42: Socket plug with fuse (black) for SX-LN-3 burner (for the ASTB connection, see the arrow)

Connecting the gas line to the burner

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

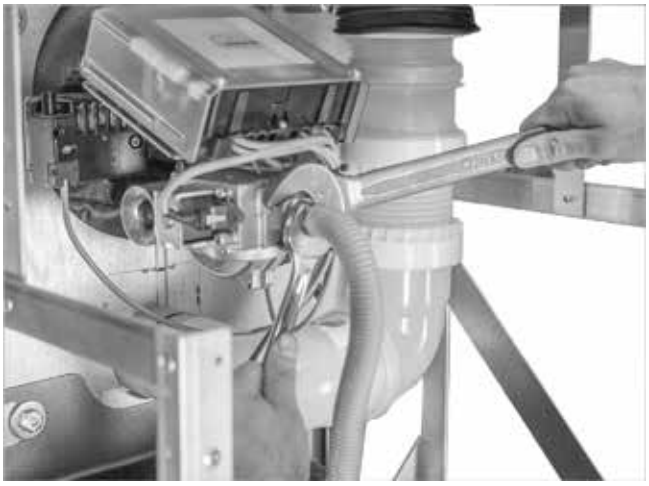


Fig. 43: Connecting the gas line

CAUTION

When installing the system:

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

Routing and attaching the gas line

1. Route the gas line inside the station through the bottom and, when it is level with the tray, fasten it to the tray using the fastening clip.

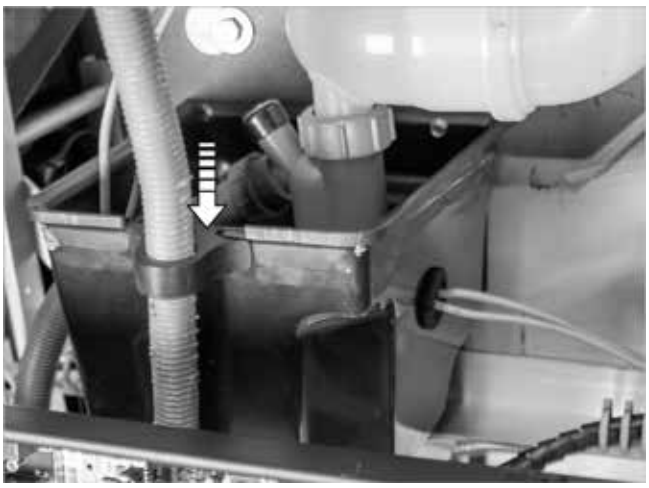


Fig. 44: Fastening the gas line to the tray using the fastening clip

2. Guide the gas line through one of the top pipe lead-throughs on the left or right-hand side of the frame using a 3x reducer (see ➔ *fig. 41*, **2**).

Fitting the intake chamber cover

1. Position the cover and fasten the five rotary flange nuts using the supplied socket spanner.

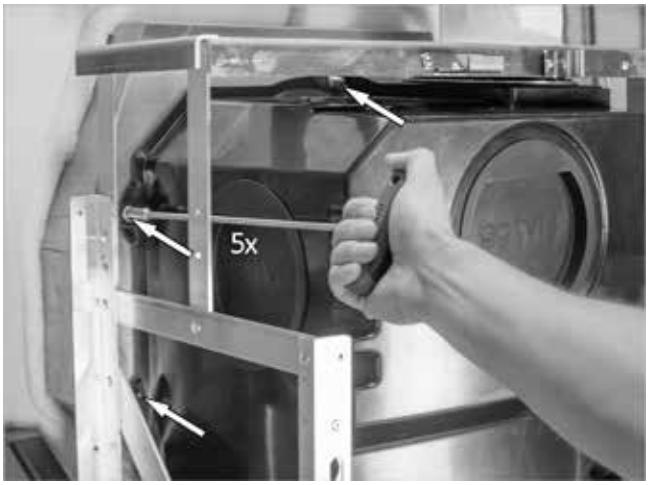


Fig. 45: Fastening the intake chamber cover

2. Store the socket spanner (**1**) on the plant.

Fig. 46: Socket spanner in its storage position

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.

See ➔ *"Connection and system diagrams" document (ALS-MAX-7).*

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).

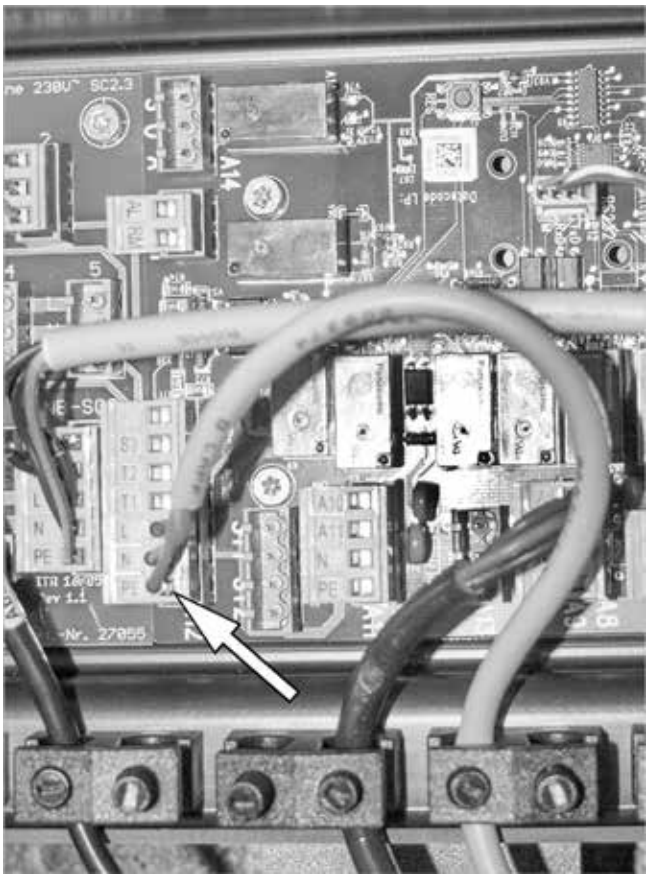


Fig. 47: Connecting the gas burner plug to A12

Gas Hybrid with WP charging module only

When using the WP charging module, a plug is connected to A12 on the mains circuit board. This plug is not required for the Gas Hybrid. Therefore, disconnect this plug and use the strain relief device to secure it in the mains circuit board housing.

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.

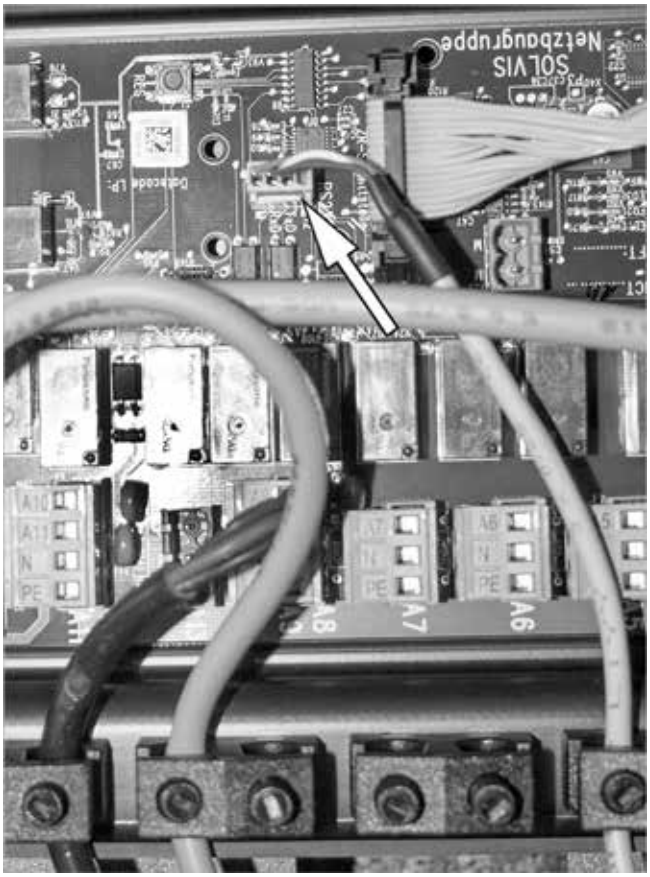


Fig. 48: Connecting the bus plug

Securing the connection lines

1. Guide all the lines from below through the strain relief devices for the control console.
2. Secure the lines with the strain relief devices.

6.3.6 Gas side connection

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. 16.*

- 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 / Ben 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 15.*

Connecting the gas line

1. Connect the gas line to the gas supply on site.

6.4 Oil burner

SolvisMax Oil and Oil Hybrid only

6.4.1 Installing the oil burner

Burner installation

1. Insert the entire burner sealing cable into the groove of the combustion chamber flange (push up).

WARNING
Prevent leaks on the burner seal
Risk of toxic gas leakage.
- Never operate the burner if the burner sealing cable is not inserted.
- Do not shorten the burner sealing cable!

Fig. 49: Inserting the burner sealing cable (push up)

2. Remove the burner from the box.
3. Remove the inserted flame tube (bayonet fastener).

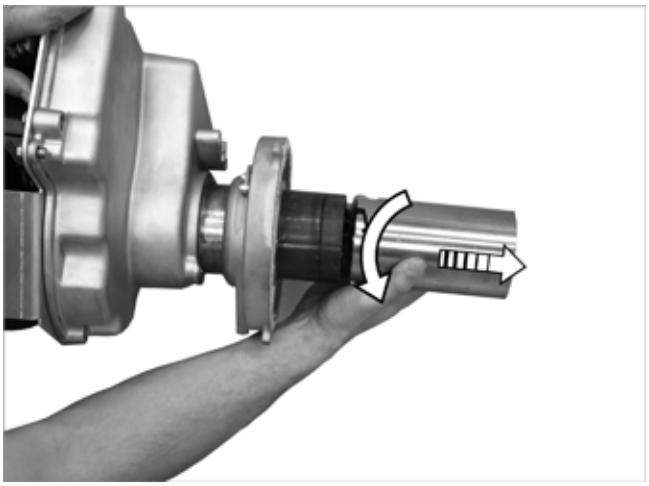


Fig. 50: Removing the flame tube

Before further assembly, check the following factory settings and adjust, if necessary:

4. Pull the nozzle fitting out of the housing.
5. Check the electrodes as shown in the figure and correct them by carefully bending them, if necessary.

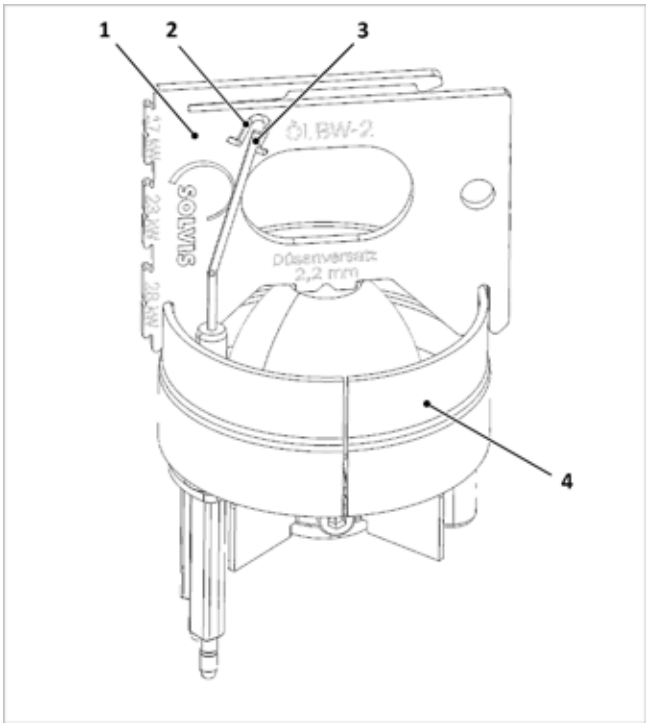


Fig. 51: Checking the position of the ignition electrodes

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

6. Check the electrode gaps as shown in the figure and correct them by carefully bending them, if necessary.

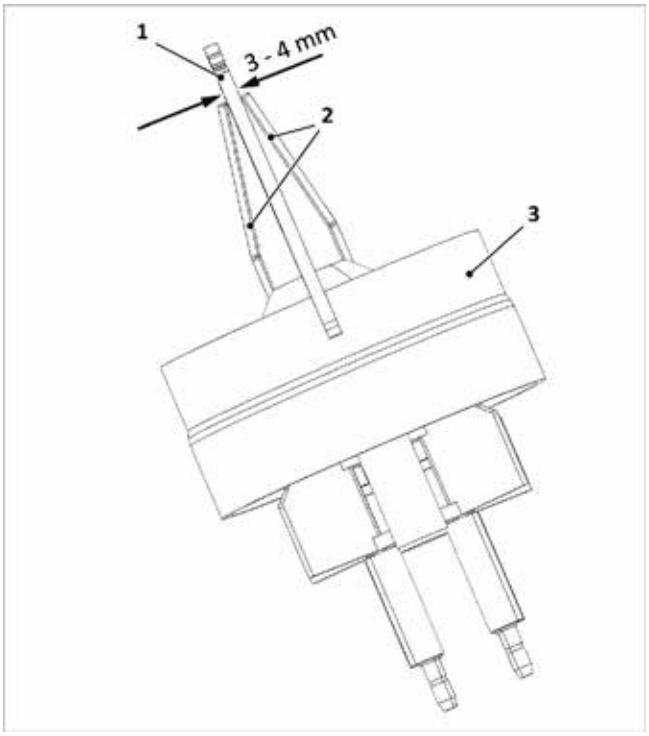


Fig. 52: Checking the ignition electrode gaps

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

7. Re-insert nozzle fitting.
8. Put the door firebrick in place as shown.

Fig. 53: Putting the firebrick in place

9. Put the flame tube in place and secure.

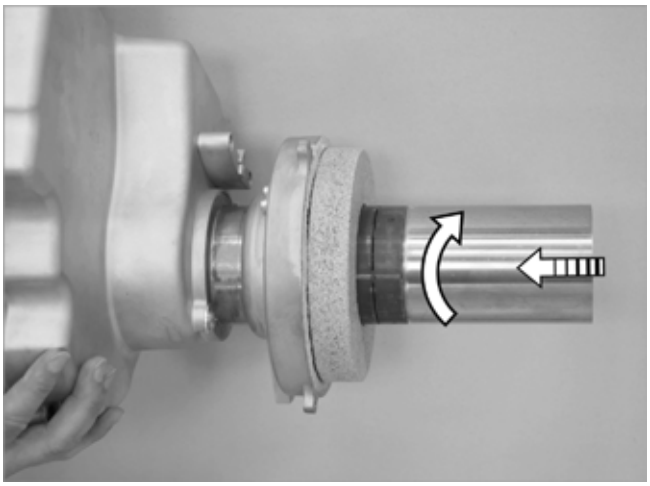


Fig. 54: Put the flame tube in place and secure

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

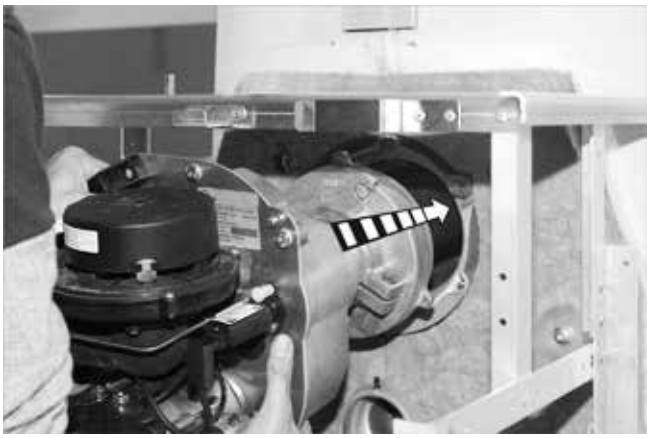


Fig. 55: Fitting the burner

Continue the installation with the section "*Fitting the front flange insulation*" (see ➔ *chapter "Storage tank and insulation", page 10*.

6.4.2 Installing the connection pipes

Installing the air supply hose (part 1)

1. Attach the air supply hose to the blower and secure with a hose clip.

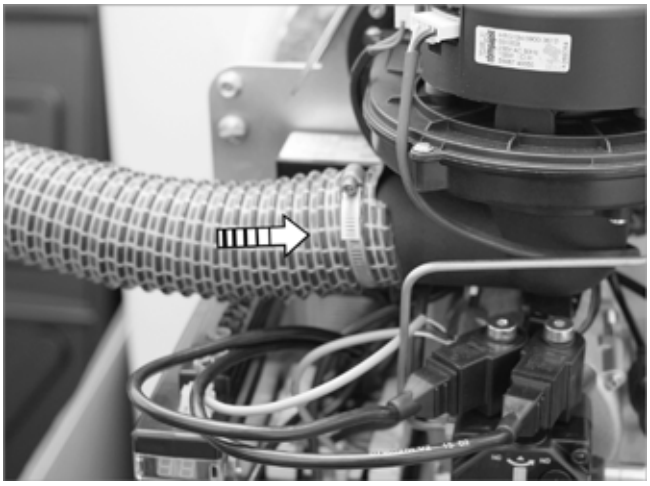


Fig. 56: Attaching the air supply hose to the blower

Fitting the air supply and blow out tube

1. Guide the air supply hose through the opening in the and attach it to the ingoing air support on the burner using the wiring hose clip.
2. Set the exhaust connection piece onto the exhaust retaining plate and fasten it with the supplied plastic expanding rivets. Observe the position for the installed storage tank size.

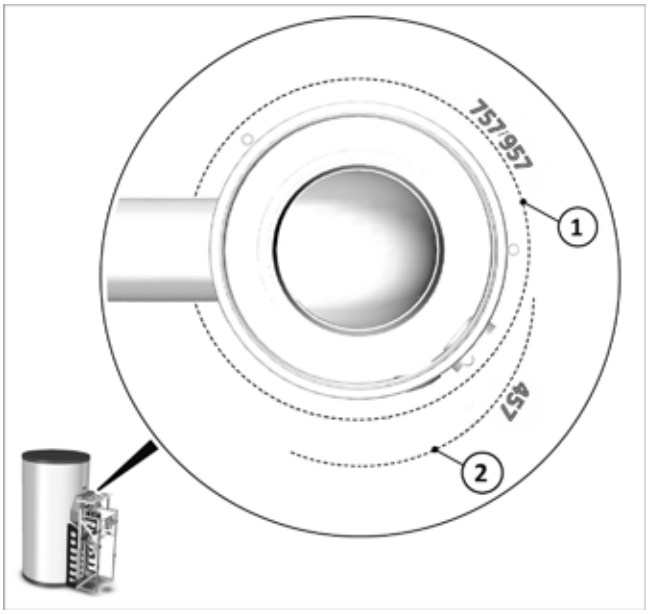


Fig.57: Position of the exhaust connection fitting

1 *Position for storage tank sizes 757 and 957*
2 *Position for storage tank size 457*

3. As shown in ➔ *fig. 58* slide the union nut (**1**), the snap ring (**2**) and the seal (**3**) onto the lower pipe end of the exhaust connection piece.

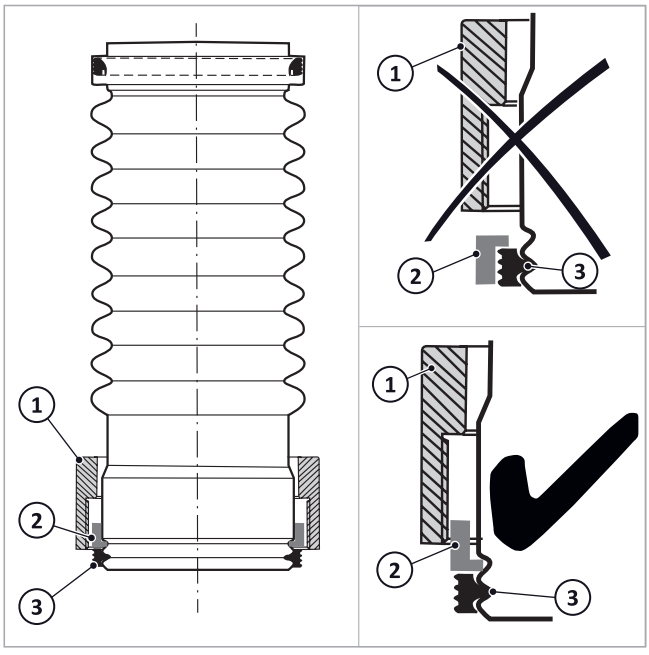


Fig. 58: Union attached

4. Insert the internal pipe silencer from below.

Fig.59: Inserting the internal pipe silencer

5. Connect the exhaust connection piece (see ➔ *fig. 37*) with the union nut pointing downwards.

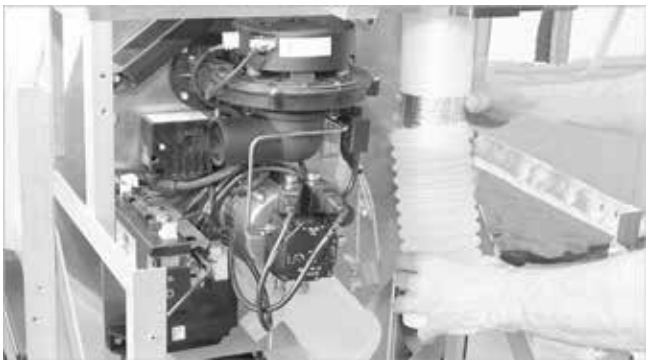


Fig.60: Connecting the exhaust connection piece

6. Align the exhaust connection piece so that it is pointing straight down.

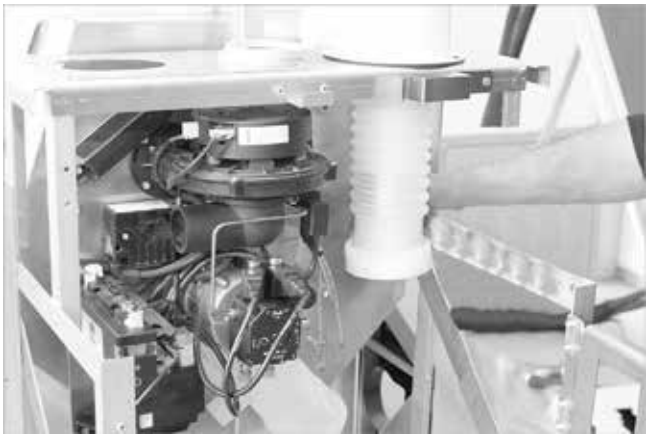


Fig.61: Aligning the exhaust connection piece

7. Insert the exhaust elbow into the lower opening on the exhaust heat exchanger until the spring pin is locked in the exhaust elbow (**1**).
8. **Only when converting SÖ-BW**: There is no spring lock that engages; instead, install the exhaust elbow with

the clamp for attaching the exhaust elbow (see the supplied installation instructions).

9. Then, turn and align the exhaust elbow to the pipe end of the exhaust connection piece (**2**).

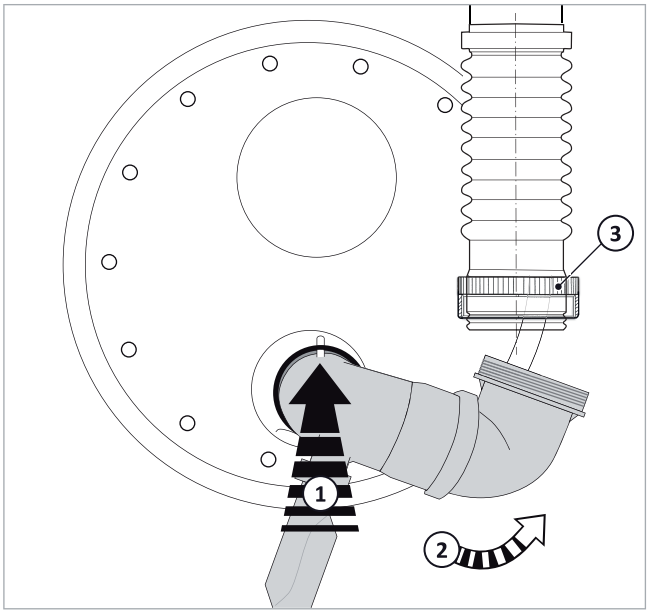


Fig. 62: Fitting the exhaust elbow

10. Place the upper pipe end of the exhaust connection piece onto the exhaust elbow union. Ensure that the sealing ring and snap ring are sitting straight in the union.

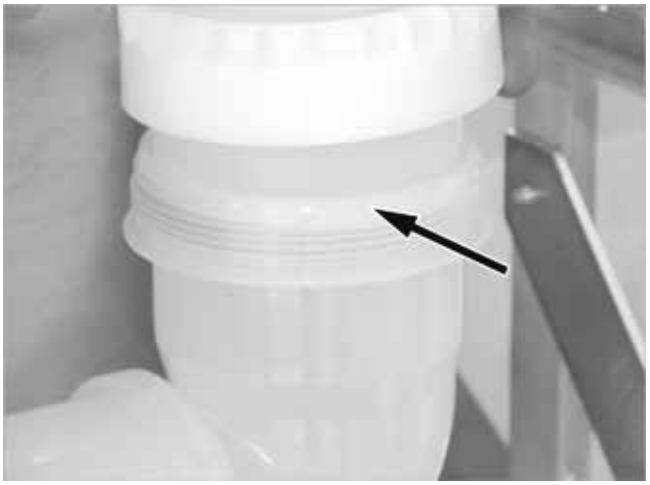


Fig. 63: Screwing on the straightly aligned exhaust elbow

11. Move the union nut (**3**) downwards and screw it onto the exhaust elbow.

The exhaust elbow can be removed by turning it roughly 15° clockwise and then pulling it away. When turning the exhaust elbow, the spring lock is disengaged in the fitting. **Only when converting SÖ-BW**: Release the fastening clamp

Installing the oil filter and oil pipes

1. Attach the oil filter bracket to the console plate using the supplied Allen screw (-> assembly pack).

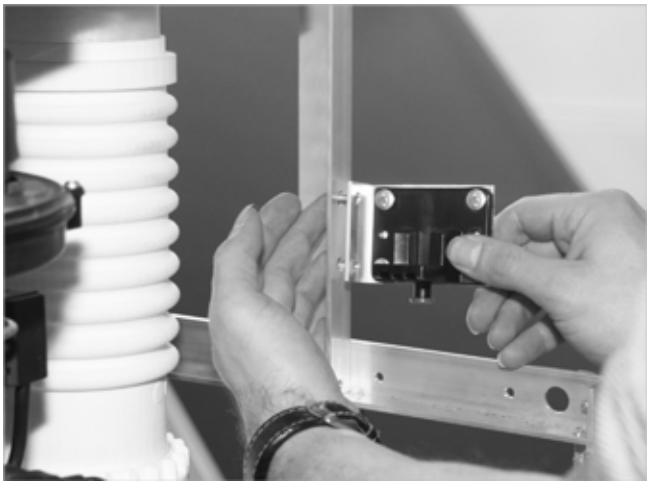


Fig. 64: Attaching the oil filter bracket

2. Fit the oil filter onto 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.

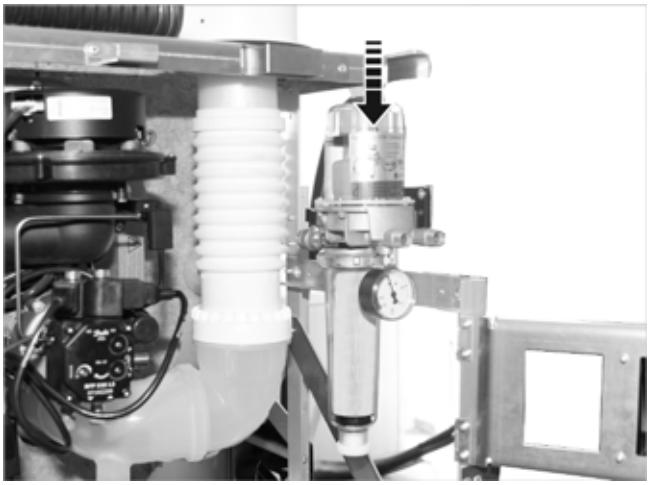


Fig. 65: Oil filter fitted

3. Connect the oil pipes from the pump to the filter.
4. Tightly screw on the flow and return according to the labels on the parts that show the direction of flow.

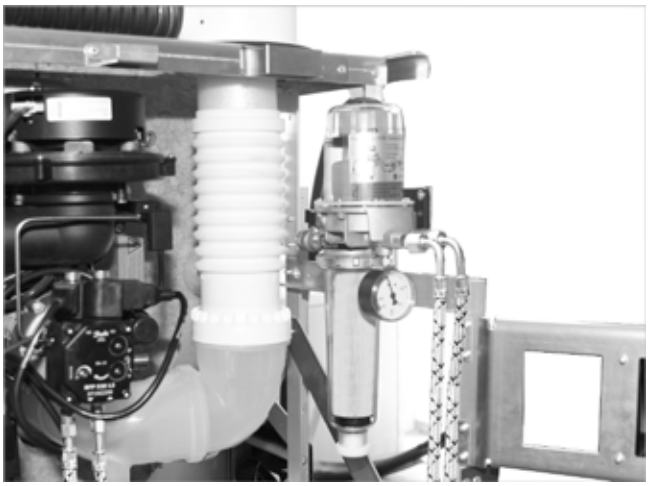


Fig. 66: Connecting the oil pipes

5. Use a 3x reducer (**1**) to guide the oil pipe through one of the upper pipe lead-throughs on the left or right side of the frame.

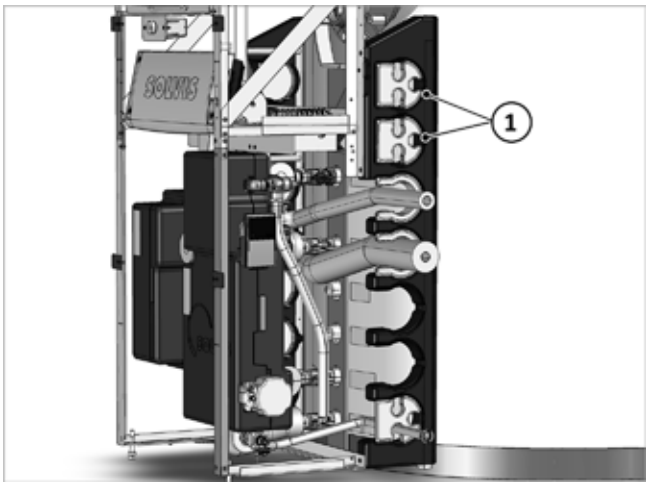


Fig. 67: Guiding the oil pipe using a 3x reducer

Installing the condensate hose

1. Fill the condensate siphon with water and fit it on the lower exhaust elbow (do not forget the seal).
2. Connect the condensate hose to the condensate siphon.
3. Guide the condensate hose through one of the pipe lead-throughs on the left or right side of the frame using a 3 x reducer. Ensure a sufficient incline.
4. Guide the condensate hose to the discharge. If you are using a condensate lifting pump, place it on the floor in the lower area of the frame.

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.

Fitting the mechanical safety temperature limiter (mSTL) on the burner

1. Insert the mSTL (-> assembly pack) into the immersion tube at the top right of the combustion chamber as far as it will go (front tip of the mSTL approx. 15 cm deep).
2. Tighten the screw fitting.

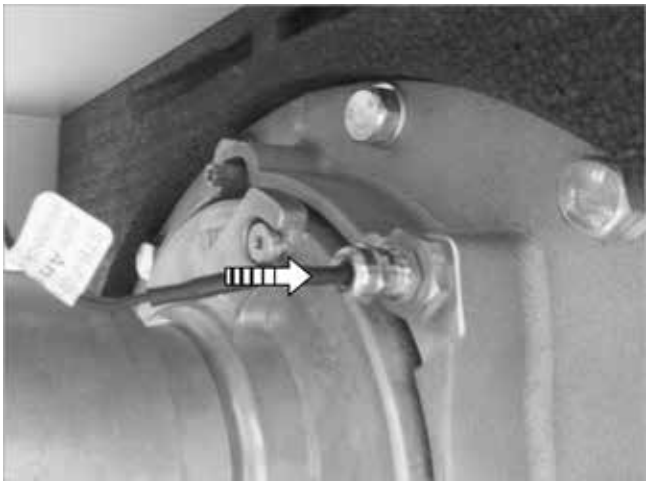


Fig. 68: Inserting the mSTL

3. Attach the mSTL unlocking switch to the bore hole provided on the left-hand retaining fitting on the mains module housing (**1**). To do this, unscrew the protective

cap of the unlocking switch and the attachment nut beneath it, insert the thread, and fasten with the attachment nut. Screw the protective cap back on.

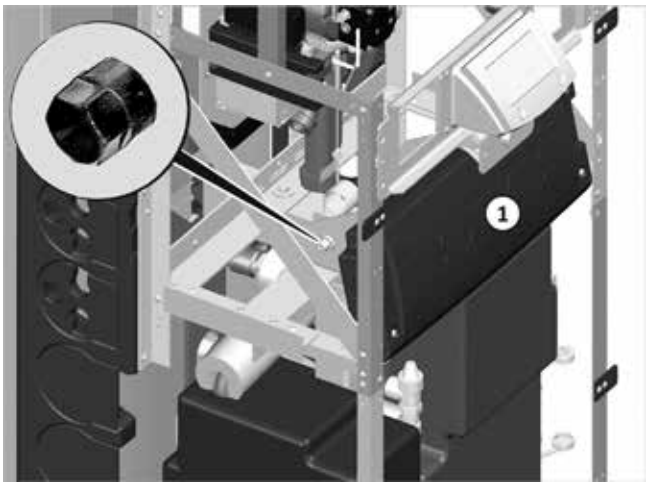


Fig. 69: mSTL unlocking switch

4. Guide the mSTL connection pipe on the side through the strain relief device on the control console and attach the socket board to the mains module (lower right) according to the labelling (ST 1 ST 2).
5. Secure the cable with the strain relief device.

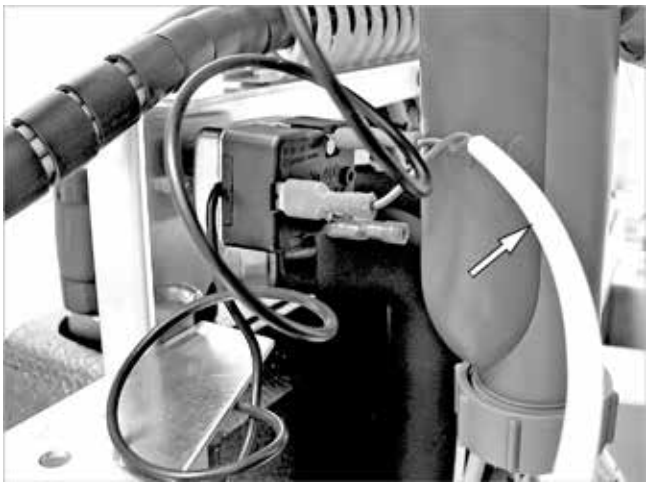


Fig. 70: mSTL with connection line

Connecting the exhaust safety temperature limiter

Exhaust safety temperature limiter (ASTB)

Regulation in Switzerland.

- If an additional ASTB is stipulated, connect it to the malfunction input on the system controller of the SolvisControl (please order the ASTB separately).
- The ASTB must have a floating 230 V~ switching contact.
- To install the ASTB in the exhaust line, replace the supplied exhaust elbow with the exhaust elbow AB-ASTB (please order separately, see ➔ price list).

1. Connect a connection line to two poles on the ASTB switching contact.
2. Remove the jumper (ST 2) from the socket board of the mains module.
3. Lead the connection line on to the mains module and attach to the terminals (ST 2) on the socket board. The polarity is not important.

Connecting the burner plug to the burner

Two burner plugs are supplied in the burner box. These are connected to the interface of the automatic firing system as described below:

1. First connect the seven-pin burner plug.
2. **Oil Hybrid with WP charging module only**: When using the WP charging module, a seven-pin plug is connected to A12 on the mains circuit board. This plug is not required for the Oil Hybrid. Therefore, disconnect this plug and use the strain relief device to secure it in the mains circuit board housing.
3. Then connect the four-pin plug (for the second burner stage).
4. Fit the two-pin reset plug that is connected to the plug.

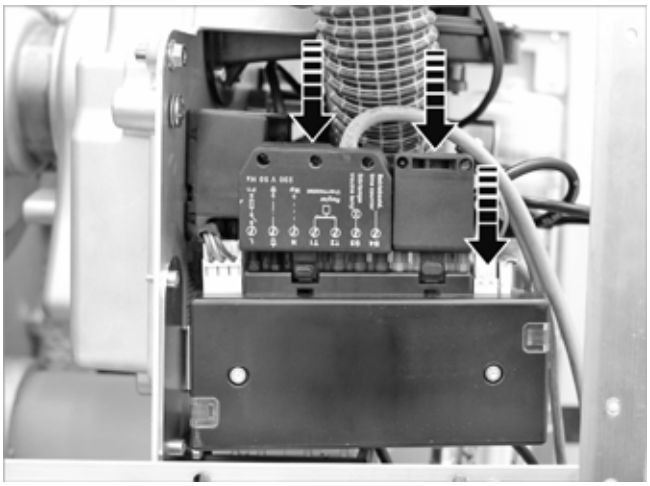


Fig. 71: Connecting the plugs

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.


See ➔ *"Connection and system diagrams" document (ALS-MAX-7).*

Securing the connection lines

1. Guide all the lines from below through the strain relief devices for the control console.
2. Secure the lines with the strain relief devices.

6.4.3 Oil-side connection


CAUTION

Permitted fuel

To fulfil the terms of the warranty

- The SolvisMax / Ben Öl 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.

Oil supply


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.

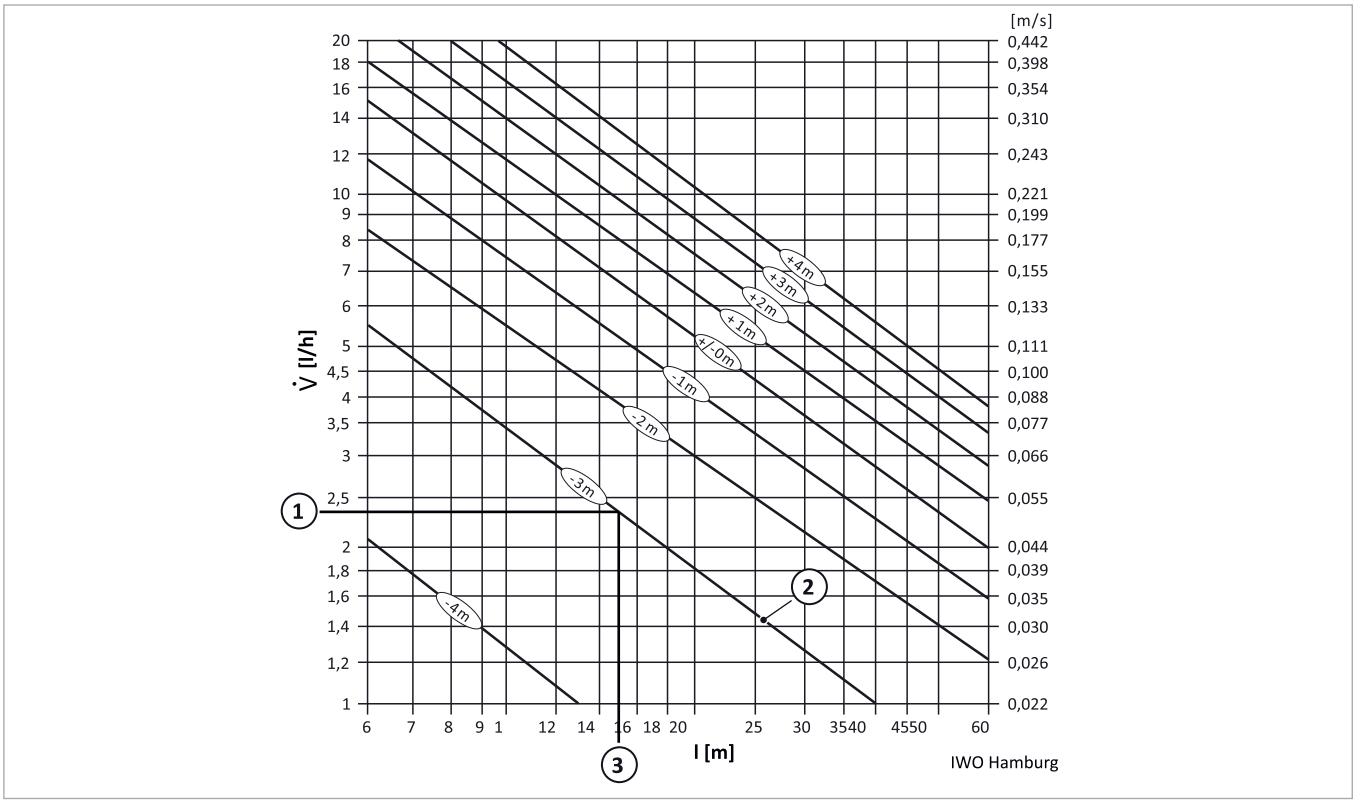


Fig. 72: Maximum pipe length in the single pipe system as a function of delivery height

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**.

6.5 Exhaust gas and condensate

SolvisMax Gas/Oil and Gas/Oil Hybrid only

6.5.1 Exhaust-side connection

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", page 31*).

Shaft requirements

The exhaust lines must be arranged outside of the installation room of the fireplace in separate, ventilated shafts. The shafts must be made of non-flammable, deformation-resistant materials and must be fire-resistant for 90 min. They may be fire-resistant for just 30 min for buildings with low heights.

The following internal dimensions are required for sufficient rear ventilation of the exhaust line DN 80.

- Rectangular: min. 135 x 135 mm
- Round: min. ø155 mm

Lower clearances can be selected between the line and shaft for ambient air-independent fireplaces that take in combustion air from the mouth via the annular gap if the furnace blower can withstand the intake resistance.

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.

SolvisMax Oil and Oil Hybrid 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.

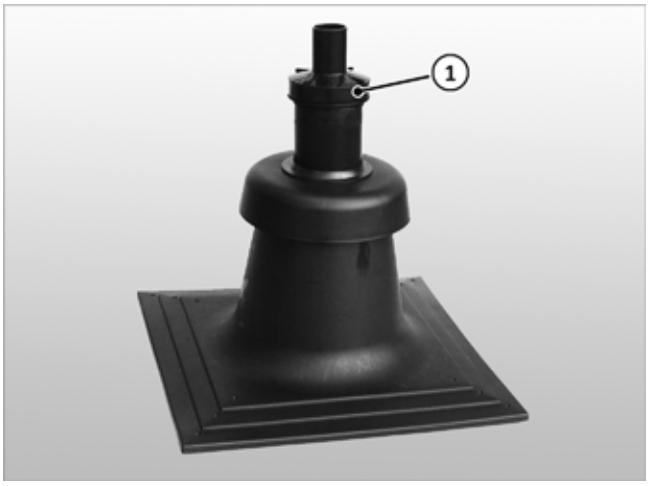


Fig. 73: Inserted reflective silencer

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.

6.5.2 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: SolvisBen/Max 10 and 18 kW
- DN 80: SolvisBen/Max 10, 18, 25 and 30 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.

The CAS-6 exhaust line set is **not** suitable for the SolvisMax Oil heat value.

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 "Burner", page 69.*

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.

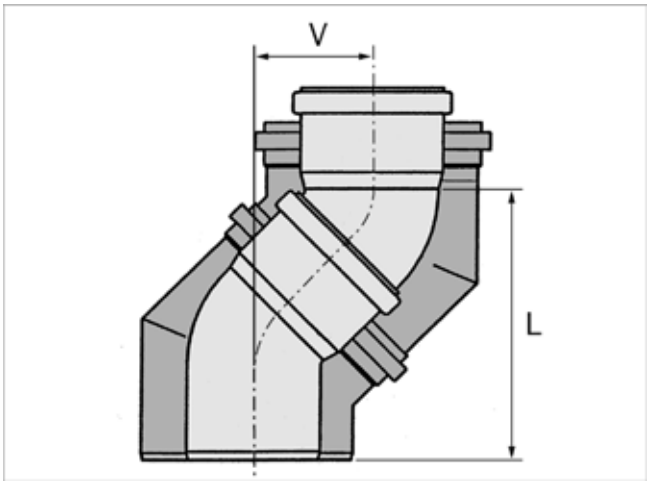


Fig. 74: Offset and length

6.6 Condensate discharge line connection

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.

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.

Laying the condensate hose

Do not attach the condensate discharge line higher than 20 cm below the siphon height.

1. Guide the condensate hose out through the pipe lead-throughs of the base console on the on the left or right (use a 3 x reducer).
2. Connect the condensate hose to the waste water line of the building without hindrance.

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** must be installed.

6.7 SolvisLea heating pump

SolvisMax Solo or SolvisMax Gas/Oil Hybrid only

The WP charging module already includes the three-way switching valve required for operation with the SolvisLea heating pump. The scope of delivery also includes the wall-mounted PLAS-WP buffer charging station and sludge separator, both of which must be installed in the connection pipes between the SolvisBen and SolvisLea.

6.7.1 Installing SolvisLea

Installing the SolvisLea

1. Install the SolvisLea according to the installation instructions (MAL-LEA) and route the connection pipes to the SolvisMax.

6.7.2 Installing the 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/Max. The direction of flow should be from bottom to top or horizontal. It can be installed in the flow or return line (observe the direction of flow of the pump).

6.7.3 Installing the sludge separator

Installing the sludge separator

1. Fit the supplied sludge separator into the return line between the SolvisMax and SolvisLea (see system diagram ALS-MAX-7).

6.7.4 Heating pump connection

Connecting the heating pump to the SolvisMax

1. Connect the return line for the heating pump to the return line shared by the heating circuits (see system diagram ALS-MAX-7).
2. Run the flow line to the SolvisMax charging module and connect it to the heating pump flow line (**3**) of the charging module.

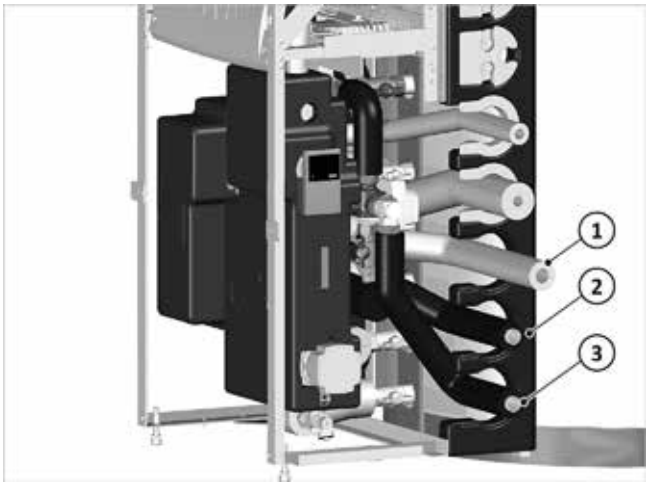


Fig. 75: Hydraulic connection of the SolvisLea

1 *Heating pump return*
2 *Heating flow*
3 *Heating pump flow*

3. Guide the power cable and the control line for the buffer charging station pump into the front frame through a pipe lead-through (with a 3x reducer insert).
4. Guide the cable further into the mains module housing.

CAUTION

Danger due to overpressure

Potential damage to the heating system

- The system must be secured using a heating safety valve with a reaction pressure of max. 3 bar.

6.8 Membrane expansion vessel

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 admission pressure of the expansion vessel with the following formula. However, it must be a minimum of 1.5 bar and maximum of 2.0 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.

$$p_o = \frac{H_{Hk} - H_{Sp}}{10} + 0{,}5\ [\text{bar}] \qquad (\text{min. } 1{,}5\ \text{bar})$$

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

1. Attach the expansion vessel to the wall or floor.
2. Connect the expansion vessel using the cap valve as per DIN EN 12828.

The safety group 3.0 HKS provides a simple connection option: The expansion vessel with cap valve can be connected to the system there using a corrugated pipe (see the system diagram ALS-MAX-7).

6.9 Heating circuits

Connect the heating circuit

1. You can insert the corrugated pipe into the station on either the right or left and connect it to the container.
2. Press the insulation into the pipe lead-throughs and connect it to the heating circuit on the outside of the frame.

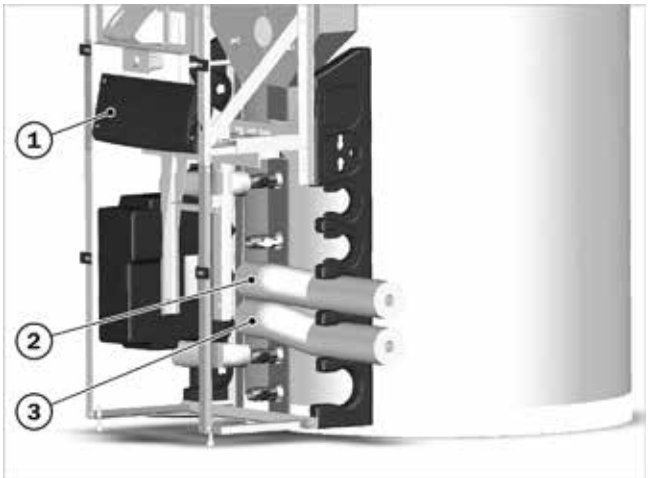


Fig.76: Hydraulic heating circuit connection

1 *Mains module housing*
2 *Heating return*
3 *Heating flow*

3. Guide the cable for the flow sensors and pumps from the heating circuit station through a pipe lead-through (with a 3 x reducer insert) into the front frame.
4. Guide the cable further into the mains module housing.

CAUTION
Danger due to overpressure
Potential damage to the heating system
- The system must be secured using a heating safety valve with a reaction pressure of max. 3 bar.

IMPORTANT
Expansion vessel required for heating systems
- An expansion vessel is required for heating systems.
- Take the heating water volume into account when selecting the size of expansion vessel, and opt for a larger rather than a smaller vessel (in accordance with DIN 4807-2 or local equivalent).

6.10 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.

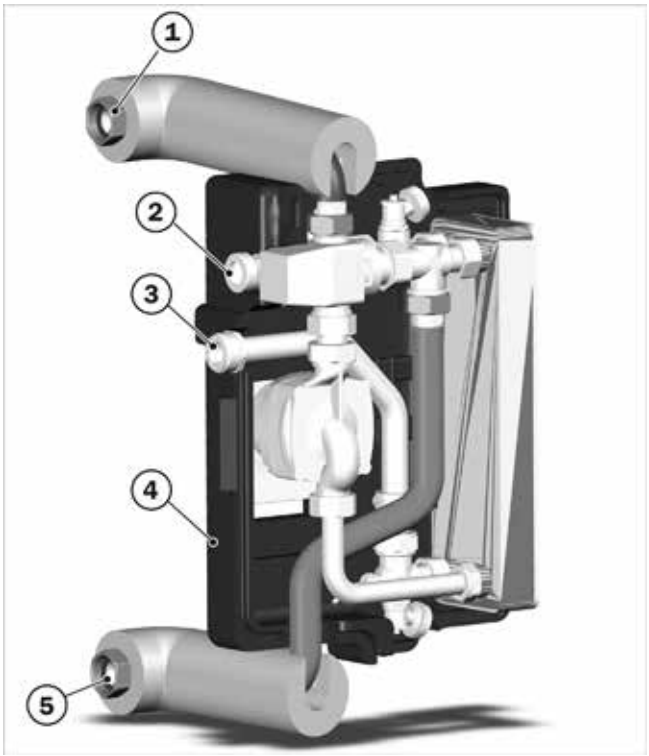


Fig.77: WWS-24 connections

1 *Primary flow (HW flow, here: WWS-24)*
2 *Drinking water, cold*
3 *Drinking water, hot*
4 *Thermal insulation shell, rear*
5 *Primary flow (HW return)*

The hot water station is already prefitted in the charging module.

Connecting the hot water station

1. Connect the station on the storage tank side to the ball valves for the storage tank connections using the corrugated pipes. When using the SolvisMax WP, it is alternatively connected to the T-piece.

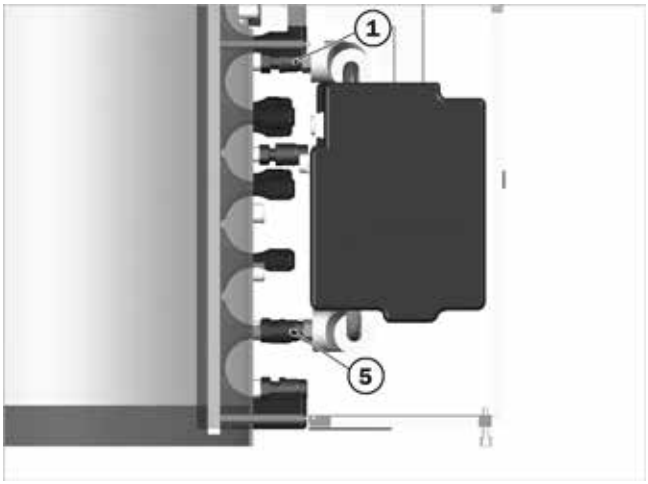


Fig.78: Connecting the hot water station

1 *Primary flow (HW flow, here: WWS-24)*
5 *Primary return (HW return)*

2. Screw the cold and hot water pipes onto the station connections using the seals. The lines can be routed on either the left or right; to do so, please use the appropriate pair of pipes from the connection pipe set. The other pair of pipes can be disposed of.

3. Insulate the pipes; if necessary, shorten the supplied pipe insulation to do so.

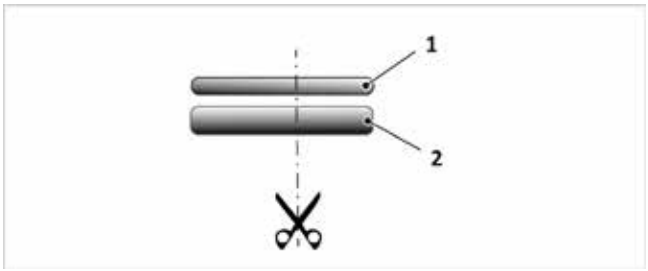


Fig.79: If necessary, shorten the pipe insulation

1 *Cold water pipe insulation*
2 *Hot water pipe insulation*

4. Insert the supplied reducers for the pipe lead-through.

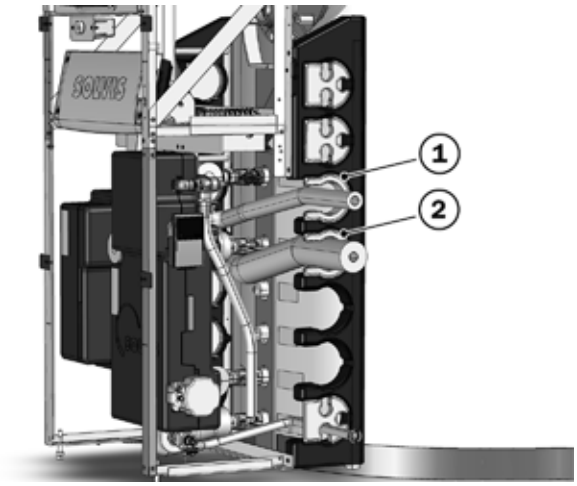


Fig.80: Hot water station, lead-through for drinking water pipes (right)

1 *Cold water lead-through with reducer insert*
2 *Hot water lead-through with reducer insert*

5. Connect the pipes to the drinking water supply outside of the frame.

Connect the circulation line according to the system diagram (ALS-MAX-7). Due to the integrated circulation return stratification in the heating layer charger (combined stratified charger), an external circulation station is not required.

6.11 Solar option

6.11.1 Solar heat transfer station

CAUTION

Avoid excessively high temperature loads.

Otherwise, there may be damage to the solar system.

- The lower edge of the collector field **must not** be below the upper edge of the SolvisMax!

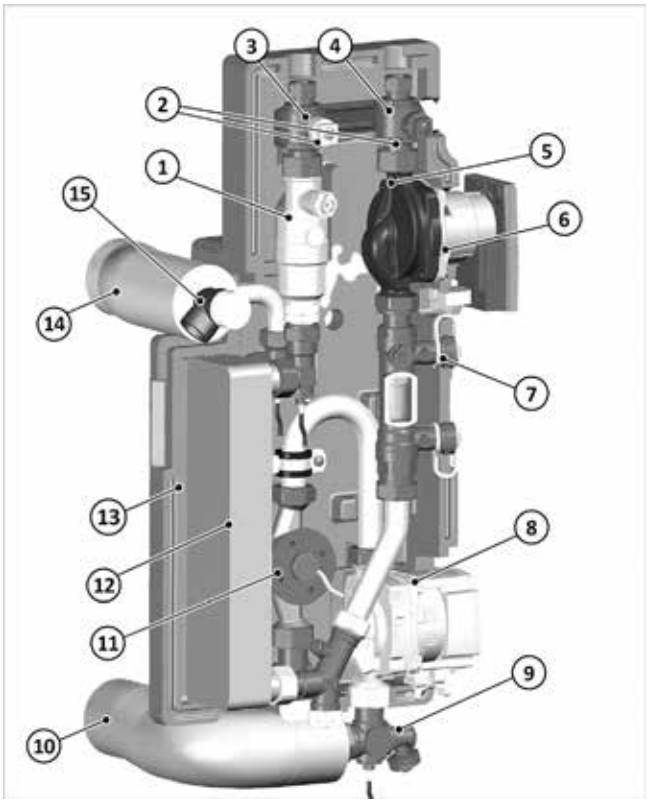


Fig.81: Overview of the solar heat transfer station parts

1 *Compressed air cylinder*
2 *Ball valves*
3 *Solar flow (collector side)*
4 *Solar return (collector side)*
5 *non-return flap*
6 *Primary pump*
7 *Filling and flushing connections*
8 *Secondary pump*
9 *Boiler filling and emptying valve (storage tank side)*
10 *Solar return (storage tank side)*
11 *Volume flow encoder*
12 *Plate heat exchanger*
13 *Rear wall insulation shell*
14 *Solar flow (storage tank side)*
15 *Safety valve (storage tank side)*

Depending on the system configuration, the solar heat transfer station is a part and in this case is prefitted in the charging module.

Connecting the solar heat transfer station

1. Remove the cover of the insulation shell and connect the station (connections **10** and **14**) to the ball valves on the storage tank connections using the 2 corrugated pipes.

When connecting a solid fuel boiler, use the RO-FBK-RL connection pipe (see step 2).

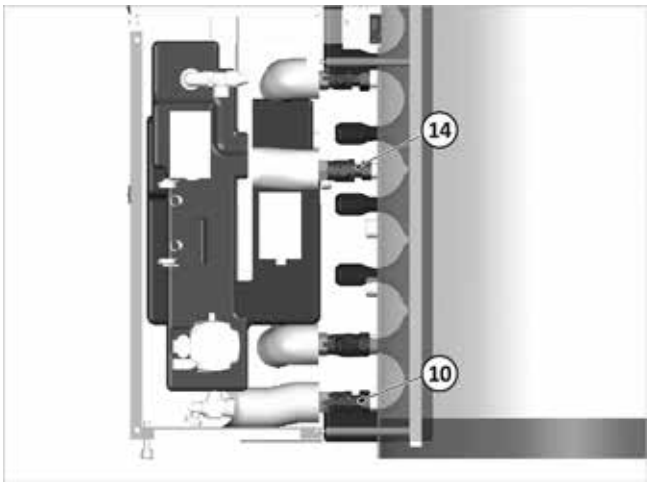


Fig.82: Connecting the solar heat transfer station

10 *Solar flow return (storage tank side)*
14 *Solar flow (storage tank side)*

2. Only for solid fuel boilers: Attach connection pipe RO-FBK-RL (please order separately) according to drawing.

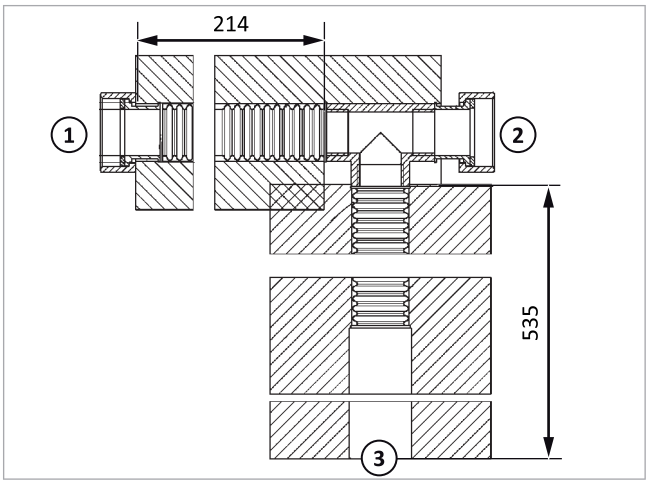


Abb.83: Connection pipe solid fuel boiler (RO-FBK-RL)

1 *Solar station connection, return flow*
2 *Connection storage tank, return flow*
3 *Connection solid fuel boiler, return flow*

3. Fit the storage tank-side safety valve (**15**) with a blow out tube.
4. Install solar flow and return (collector side).

6.11.2 Connecting the collector(s)

Routing the solar pipes to either the left or the right

For the SolvisMax Gas, route the solar pipes as follows before installing the tray for the intake chambers:

1. Connect the pipe set (**1**) to the solar station (**2**) and guide the pipes to the back.

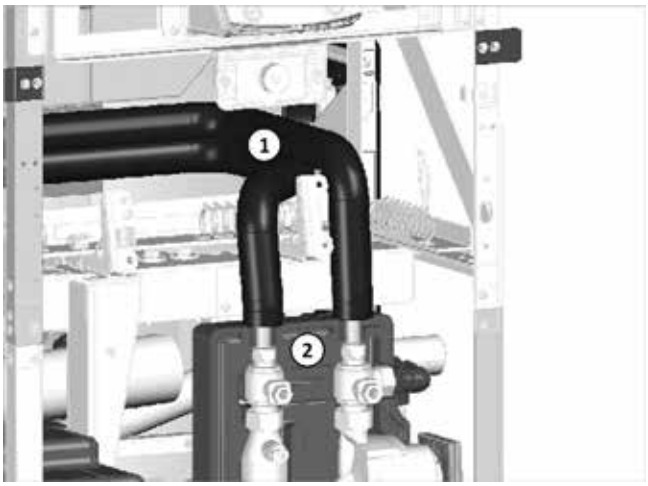


Fig. 84: Guiding the pipe set to the back

2. Bend the corrugated pipe into shape and guide it out from the lead-through (**1**) to the left.

The pipes can be routed either on the right or left.

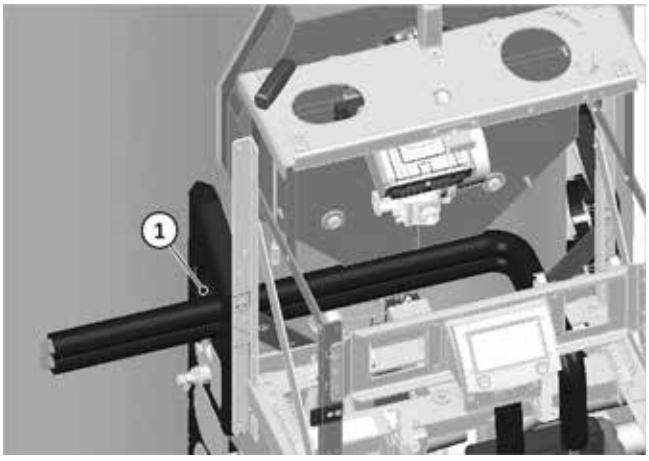


Fig. 85: Bending the corrugated pipe to the left

3. Use the double pipe clamp (**1**) to attach the pipes at the designated point.

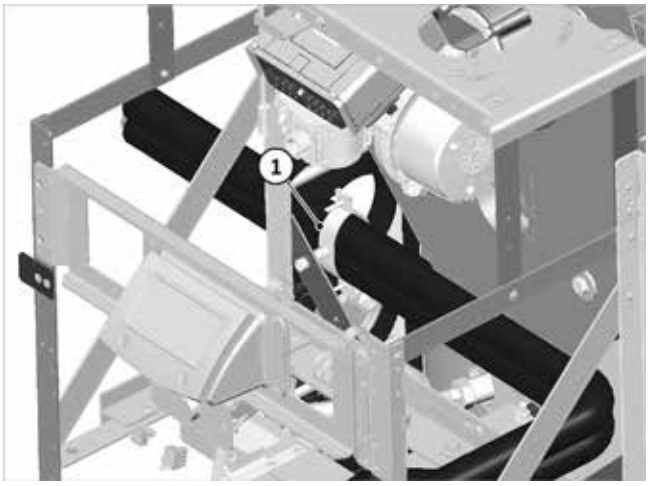


Fig. 86: Attaching the pipes

4. At the free end of the return flow solar pipe, fit the clamp ring T-piece from the accessory pack so that the outlet can be connected to the primary tank using the MEV corrugated pipe (1 m long).

6.11.3 Solar expansion vessel

CAUTION

Expansion vessels are required for solar and heating systems

- Expansion vessels must be used with solar and heating systems.
- Neither install nor operate the system until a system-specific design for the expansion vessel has been laid out.

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).

- A primary tank protects the membrane in the membrane expansion vessel (MEV) from inadmissibly high temperatures.
- To ensure that the tank can be bled, fit the primary tank vertically so that there is a nozzle at the high point!
- To avoid pressure surges, connect the primary tank to the solar circuit from above!
- Connect the primary tank and expansion vessel to the solar return!

A calculation table sheet for the expansion vessel design (and a primary solar tank where applicable) and for determining the admission pressure and system filling pressure can be downloaded using the following link:

https://extranet.solvis.de/public/user_upload/MAG_Nachdruckhaltung_ab.xls

Contact our Technical Sales department if you have any questions.

Setting the admission pressure on the solar expansion vessel

1. Determine the admission pressure of the solar expansion vessel at system height according to the following formula.
2. Release the admission pressure on the solar expansion vessel valve or refill with nitrogen if necessary (however, at least to 2.4 bar as for roof installations with a horizontal difference of 0 metres).

$$p_o = \frac{H_{Koll} - H_{MAG}}{10} + 2{,}4\,[\text{bar}] \qquad (\text{min. } 2{,}4\text{ bar})$$

P_0 *Solar expansion vessel admission pressure [bar]*
H_{Coll} *Height of the highest point of the collector [m]*
H_{St} *Height of the lower edge of the storage tank [m]*

Preparing the safety group

Depending on the type and number of collectors and the system height between the MEV and the upper edge of the collector, a safety valve with a reaction pressure of 6 bar or 8 bar must be installed in the collector circuit. The respective maximum system heights for a 6 bar valve are specified in the table below. If the system height exceeds this value, the 8 bar safety valve must be used.

Type	Pcs.	QFD*	VG-xx	AG-xx	H**
F-553	1	12	5	35	12
	2	12	12	50	9
	3	15	18	80	11
	4	15	35	100	11
F-653	1	12	8	35	9
	2	12	18	80	14
	3	15	35	100	12
C-254 AR/ECO	2	12	5	35	12
	3	12	8	50	14
	4	12	12	50	10
	5	12	12	80	15
	6	15	18	80	12
LU-304	1	12	8	35	12
	2	12	12	50	10
	3	12	18	80	12

* Quick fit duct with an overall length of up to 50 m
** System height up to which a 6 bar safety valve can still be used

Notes on installing flat seals:

- **Cleaning and inspection**: sealing surfaces and threads must be clean and free from cracks. Flat seals must be dry and must not be damaged.
- **Lubrication**: provide the thread with a suitable lubricant (e.g. Solar Fermit).
- **Applying seals**: hand-tighten the screw connection
- **Tightening**: tighten by a half-turn, while applying counterpressure.

CAUTION

Note in the event of leaks

Seals/connections may become damaged.

- Retighten only at the **ambient temperature**
- and when the unit is **de-pressurised**.

Establish pressure-tight joints using hemp and a suitable sealing paste, e.g. Solar Fermit.

Variant with an expansion vessel

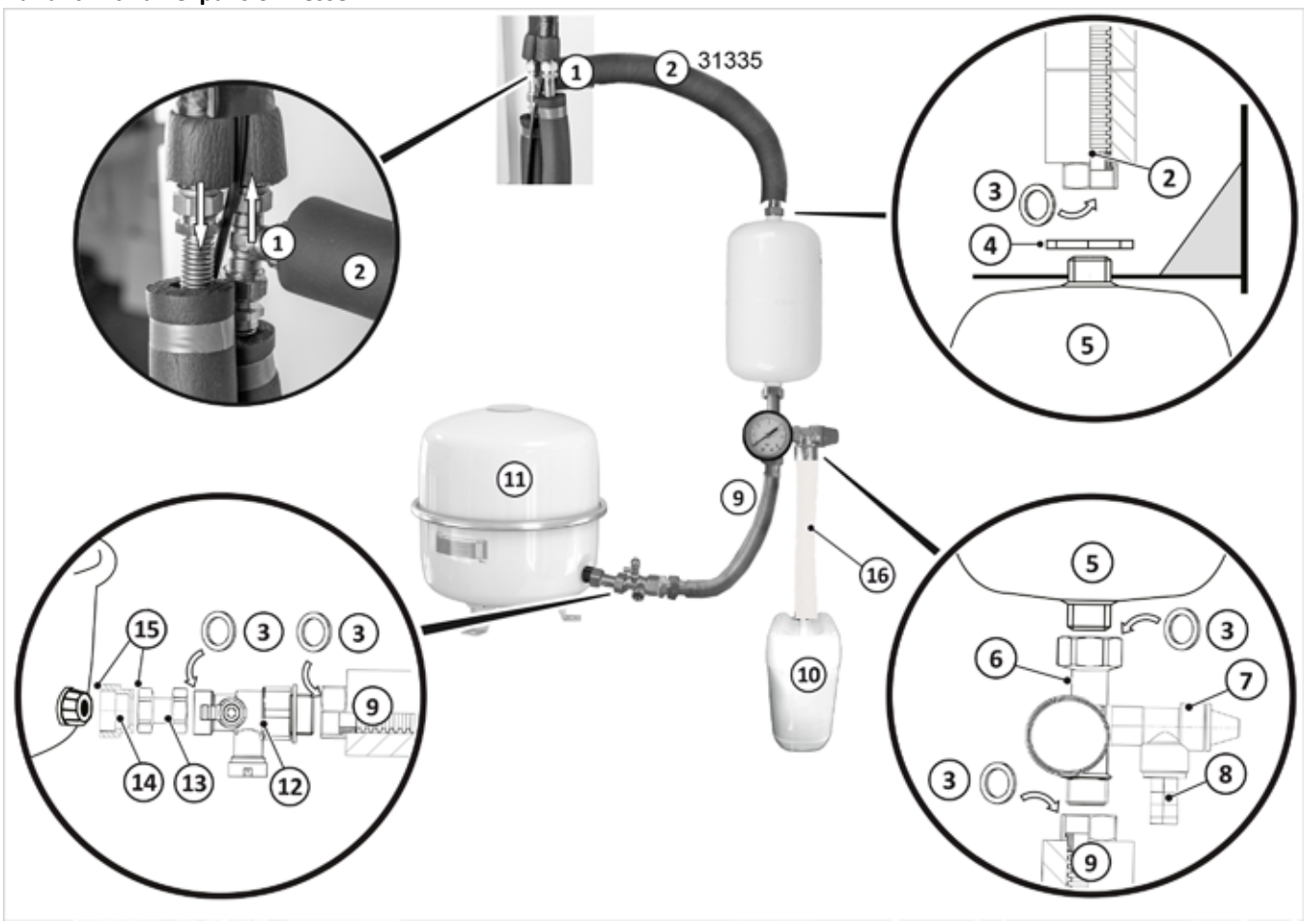


Fig. 87: Connecting the solar MEV

1	*T-piece on return*	9	*Flexible corrugated pipe, 400 mm (included)*
2	*Flexible corrugated pipe, 1m (can be extended with 31021 and 31022)*	10	*Collecting container (e.g. Tyfocor canister)*
3	*Flat seal (included)*	11	*Membrane expansion vessel AG-xx*
4	*Wall bracket locknut*	12	*Cap valve*
5	*Primary tank VG-xx*	13	*Connector piece, flat sealing (included)*
6	*Safety group 31291*	14	*Socket nipple 31352 (for AG-80)*
7	*Safety valve, 6 or 8 bar*	15	*Seal male thread with hemp*
8	*Hose nozzle 08298*	16	*Blow out tube*

Installing the primary tank and safety group

1. Select a suitable installation variant based on the size of the tanks and the space available. Note the corrugated hose lengths!
2. Attach the wall bracket for the primary tank (with VSG-5/8/12/18) at the specified height. Position the 35 l primary tank on the wall or floor in a way that ensures it can be bled.
3. Mount the primary tank on the wall bracket using the locknut (**4**).
4. Install the safety value (**7**) with the self-sealing thread on the safety group (**6**). Follow the instructions provided!
5. Screw the hose nozzle (**8**) into the safety valve. Connect a blow out tube of a suitable length onto the hose nozzle and fasten it. Guide the tube into a collecting container (e.g. an empty Tyfocor canister (10 l)).
6. Install the safety group (**6**) with the flat seal on the bottom of the primary tank (**5**).
7. Establish the connection between the solar return through the T-piece (**1**) and the primary tank using the supplied 1 m corrugated pipe (**2**): install the clamp ring screw connection on the solar return, and the flat seal on the primary tank. Hold the pieces in place while tightening them.
8. Attach the flexible 400 mm corrugated pipe (**9**) with the inserted flat seal to the free end of the safety group.

Installing the cap valve and solar expansion vessel

1. Seal the outer thread of the MEV (**11**) with hemp and brush with Solar Fermit.
2. With MEV-80 and MEV-150 only: Install the reducer socket nipple (**14**) for converting from 1" to ¾". Seal the connection nipple with hemp and brush with Solar Fermit.

3. Fit the connector piece (**13**) for the cap valve with the (fixed) internal thread onto the MEV connection. Attach the cap valve (**12**) with the inserted flat seal to the connector piece.
4. Position the MEV on the floor or wall (in the case of the MEV-35/50).
5. Attach the flexible 400 mm corrugated pipe (**9**) coming from the primary tank with the inserted flat seal to the free end of the cap valve, while applying counter-pressure.

Variant with two expansion vessels

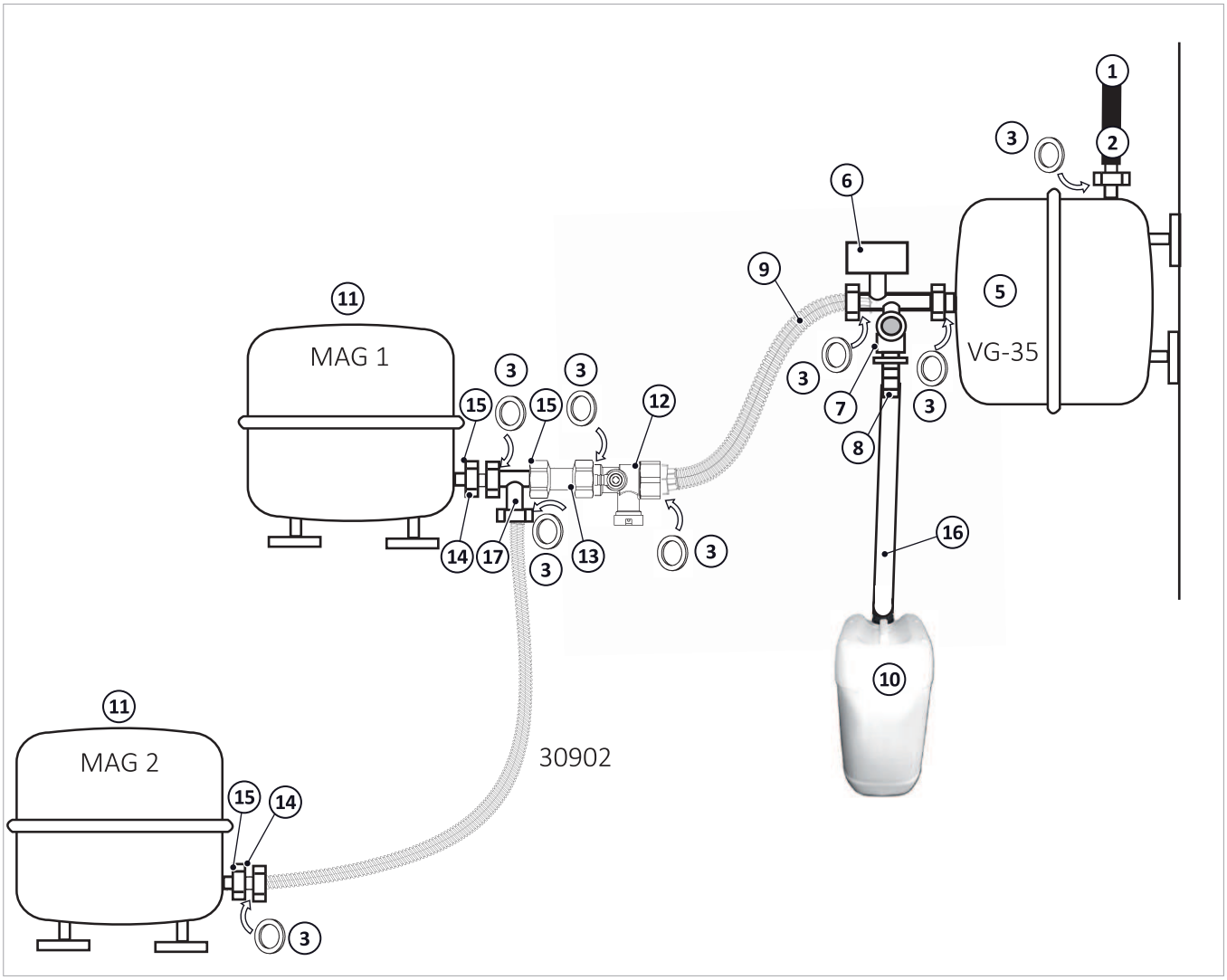


Fig. 88: Connection of two solar MEV

1	*T-piece on return*	10	*Collecting container (e.g. Tyfocor canister)*
2	*Flexible corrugated pipe, 1m (can be extended with 31021 and 31022)*	11	*Membrane expansion vessel AG-xx*
3	*Flat seal (included)*	12	*Cap valve*
5	*Primary tank VG-xx*	13	*Connector piece, flat sealing (included)*
6	*Safety group 31291*	14	*Expansion kit socket nipple*
7	*Safety valve, 6 or 8 bar*	15	*Seal male thread with hemp*
8	*Hose nozzle 08298*	16	*Blow out tube*
9	*Flexible corrugated pipe, 400 mm (included)*	17	*Expansion kit T-piece*

Installing the two solar expansion vessels

1. Seal the connection nozzles for the expansion vessels with hemp and brush with Solar Fermit.
2. Attach the respective socket nipples (**13**) to MEV 1 and MEV 2.
3. Attach the T-piece (**15**) with the inserted flat seal to MEV 1.
4. Establish the connection between the T-piece and MEV 2 using the corrugated pipe (2 x flat seals).
5. Install the connector piece, cap valve and connection to the primary tank as described above.

6.12 Electrical connection

6.12.1 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

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

Prevent the system from being influenced by electromagnetic fields.

Risk of heating system malfunction or failure.

- Prevent electrostatic discharges.
- Keep strong electrical fields such as those created by mobile phones away from the heating system. These fields can cause sensitive electronic components to malfunction.

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.
- The sensor cable for volume flow encoders should not be longer than 10 m.

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%).

6.12.2 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.

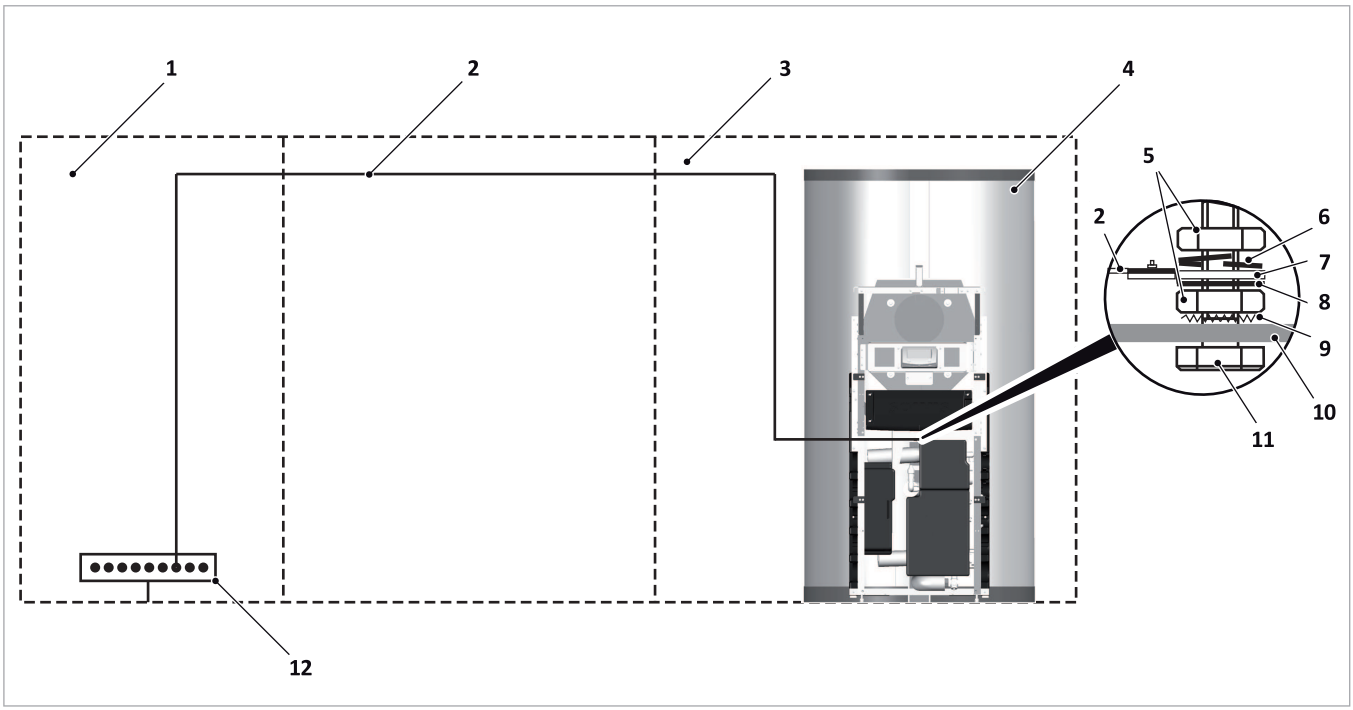


Fig. 89: Equipotential bonding for the SolvisMax

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

6.12.3 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 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.

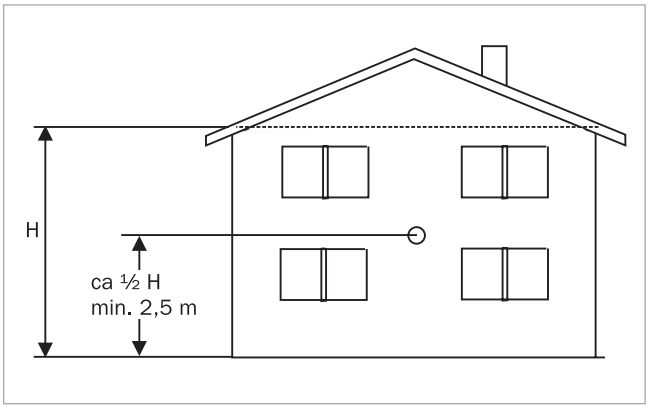


Fig. 90: Position of the outdoor sensor

6.12.4 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

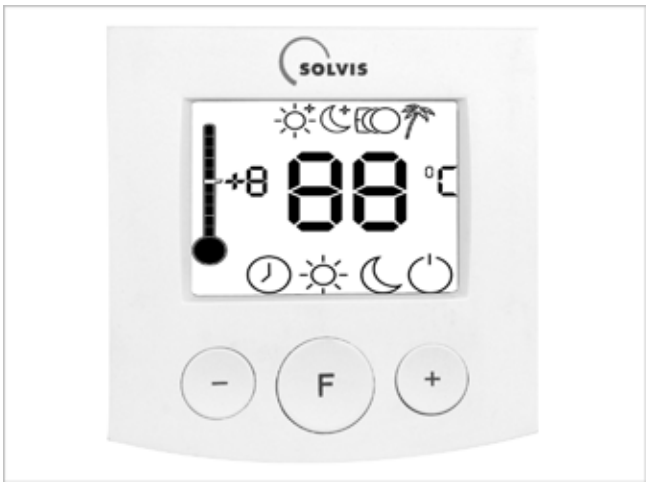


Fig. 91: Room controller BE-SC-2

- 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 ➔ *figure 92*).
3. Fix the housing to the wall with the supplied plugs and screws.

Fig. 92: 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. 93*).

Fig. 93: 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.

6.12.5 Preparing the Modbus connection

WP and WP-SL charging modules only

The SolvisControl 3 system controller and SolvisLea 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 from the SC-3 to a junction box loosely positioned in the WP charging module at the factory and must now be attached outside the SolvisMax.

Installing the Modbus junction box

1. Route the junction box Modbus line through the pipe lead-throughs ➔ *fig. 19* (**1**) on the side.
2. Install the junction box at a suitable location.

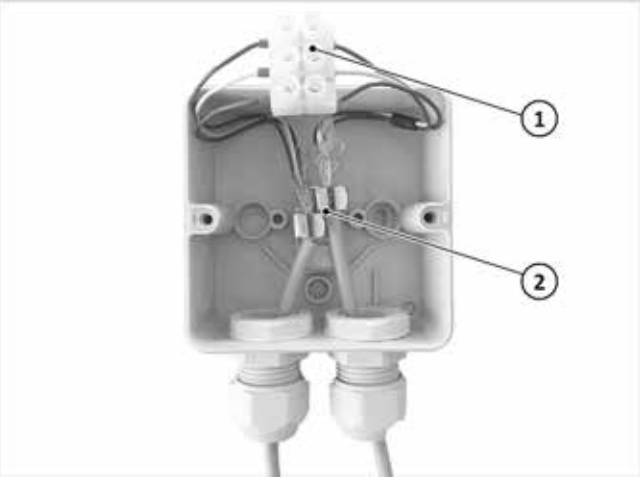


Fig. 94: Attaching the Modbus junction box

1 *Connection terminals*
2 *Shield clamps*

Connecting the SolvisLea Modbus cable

1. Open the junction box.
2. Insert the shielded Modbus cable from the SolvisLea into the junction box.
3. Strip the cable, expose the shielding and fasten it in the shield clamp.
4. Strip the insulation from the wires and attach wire end sleeves to them.
5. Connect the wires according to the colour coding (brown/white/green) to the pre-assembled terminals.

See ➔ *Installing SolvisLea (MAL-LEA)*.

6.12.6 Connecting the PLAS-WP-WM pump

WP and WP-SL charging modules 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 +”

6.12.7 Connecting the switching valve group

WP and WP-SL charging modules only

Connecting the switching valve

1. Run the connection cable for the three-way switching valve to the SolvisControl 3 mains circuit board.
2. Connect the power cable to output A14 and secure the cable using the strain relief device.

Connecting flow sensor S14

1. Run the cable for flow temperature sensor S14 to the SolvisControl 3 mains circuit board.
2. Connect the cable socket board to S14.

6.12.8 Connecting the 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 (= heating 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 / BAL-LEA-I).*

6.12.9 Connecting the collector sensor

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.*

6.12.10 Connecting the SmartGrid (optional)

WP and WP-SL charging modules 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, the 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 SolvisMax and connect according to the connection diagram.

For system diagrams and connection diagrams, see the ➔ *SolvisMax 7 system diagram document (ALS-MAX-7).*

6.12.11 SolvisLea voltage supply

WP and WP-SL charging modules only

The voltage supply for the internal heating pump controller of the SolvisLea Eco is provided by the mains circuit board of the WP or WP-SL charging module.

Connecting the voltage supply for SolvisLea

1. Route the three-wire supply line from the SolvisLea 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 compressor itself is supplied with voltage separately and not through the SolvisMax (see ➔ *chapter "Electrical connection" in the installation instructions (MAL-LEA).*

6.12.12 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", page 76*.

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.

6.12.13 Completing the connection tasks

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**).

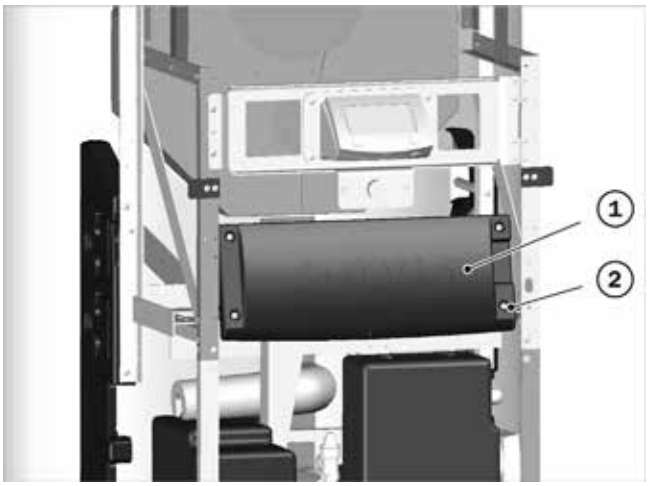


Fig. 95: Fastening the mains module cover

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 Filling the storage tank

CAUTION

Observe the quality of the fill water

There may be damage due to limescale formation/corrosion in the heating system.

- The fill water for the heating system must meet the requirements of VDI 2035, parts 1 and 2.

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

Use the system log included in the plant documentation; it serves as proof of proper heating water treatment.

Fill the system (pressure test)

1. Fill the system using the boiler filling and emptying valve (**1**).

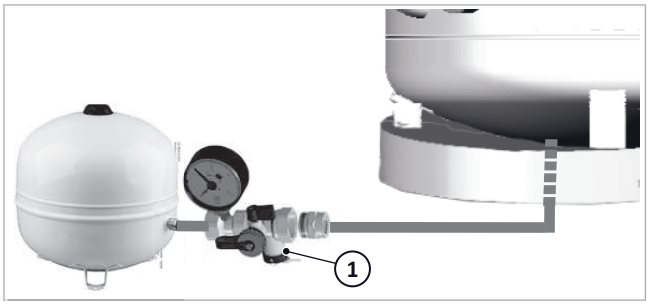


Fig. 96: Boiler filling and emptying valve on the MEV connection group

2. Bleed the system, including the storage tank.
3. Check that there are no leaks.

CAUTION

Pay attention to the pressure in the heating system

The safety valve may blow out.

- The maximum permitted pressure is 3.0 bar.

4. Set the filling pressure to 0.5 bar above the admission pressure, between 2.0 and 2.5 bar.

7.2 Configuration SolvisControl

Configuring the SolvisControl

SolvisControl must be configured before starting up the system.
After configuration, the startup process can be continued.

1. Configure the SolvisControl.

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

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 / BAL-LEA-I).*

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

7.3 Setting the thermal mixing valve

TMV factory default

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

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

- WWS-24/30: "**65 °C**"
- WWS-36: From the factory default setting, turn open toward "**70 °C**" (≈ 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:

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

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_{full}	*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:

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

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 ➔ *"System planning" in the planning document for SolvisLea (PUL-LEA).*

7.5 Gas burner

SolvisMax Gas and Gas Hybrid 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 15.*

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 / BAL-LEA-I).*

7.5.2 Settings

Setting the CO_2 value (max. burner performance)

The CO_2 value is always set at full load. CO_2 value to set at maximum burner performance:
- For natural gas: 9.9%
- For liquid gas: 12.0%

1. Set the CO_2 value using the adjusting screw (**2**) on the burner.

2. Start "Max. burner performance" in the maintenance function.
   - Screwing in the adjusting screw = CO_2 value decreases
   - Loosening the adjusting screw = CO_2 value increases

Fig. 97: Setting the burner

1 *Measuring supports*
2 *CO_2 adjusting 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:
- for natural gas: not below 8.9%
- for liquid gas: not below 11.0%

- 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", "Gas burner" section, page 61.*
- 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. 97* (**1**).

7.6 Oil burner

SolvisMax Oil and Oil Hybrid only

CAUTION

Permitted fuel

To fulfil the terms of the warranty

- The SolvisMax / Ben Öl 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. 70*
- Other components are not permitted.

Performance ranges for the burner

Within the specified performance ranges, (see ➔ *"Burner performance setting values" table, p. 71*) 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
- 20/28 kW burner: 10/18 bar.

Check the prerequisites for setting the burner:

1. The burner must run for at least 10 min. before taking the measurement.
2. The operating temperature is reached at the upper heating buffer (sensor S4).

Exhaust value to aim for:

- CO_2 13.3%

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 / BAL-LEA-I).*

Set up the burner in the following order

For information on the burner performance setting values, see ➔ *"Burner performance setting values" table, page 71*.

1. Start "Max. burner performance" in the maintenance function.
2. Set the pump pressure to level 2.
3. Set the blower speed to level 2.
4. Start "Min. burner performance" in the maintenance function.
5. Set the pump pressure to level 1.
6. Set the blower speed to level 1.

Setting the pump pressure

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

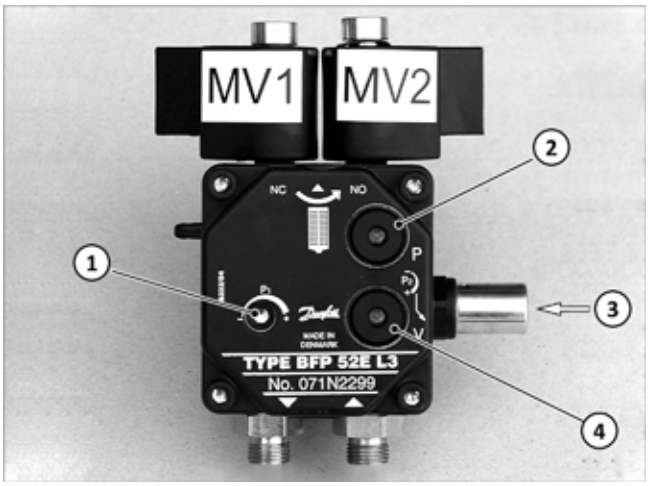


Fig. 98: Setting the pump pressure on the oil pump

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

Setting the blower speed

The setting is made on the interface for the automatic firing system. Alternatively, the CoCo-Mobil SÖ-BW (ALG-COCO-MO-BW) reading unit can be used.
The operating status of the burner is displayed on the control unit.
You can only set the blower speed when the operating status is normal 8. or hibernation 0. (standby).

Fig. 99: Setting the blower speed on the interface

1 *Display, 2-digit*
2 *Performance levels*
3 *Button*
4 *Rotary regulator*

1. Press the button (**3**) for 3 seconds.

The display switches to R. and both dots flash.

2. If the burner is in hibernation, the display “P” must be set in addition, using the rotary regulator (**4**). Use the Allen key supplied to do this.
3. Briefly press the button (**3**).

The display level switches to P. 1.

4. Use the rotary regulator (**4**) to set it to the level required P. 1. (level 1) or P.2. (level 2) using

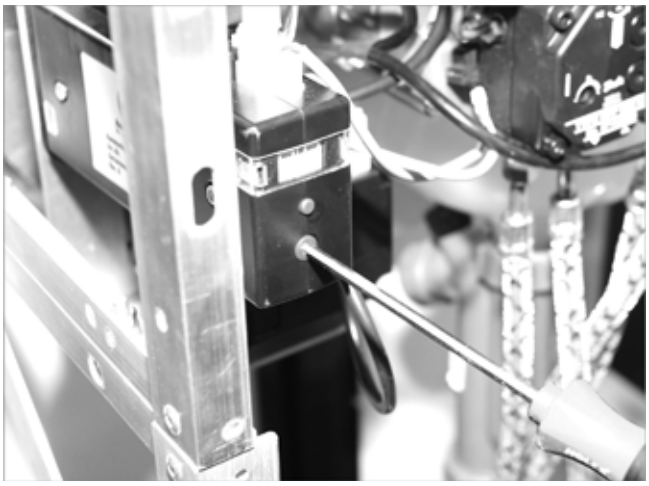


Fig. 100: Set the desired level

5. Briefly press the button.

The display level switches to the preset value for the speed level e.g. 6.8. (level 1) or 9.5. (level 2).

6. Briefly press the button to change the values.

The value on the display flashes.

7. Use the rotary regulator to adjust the value in the desired direction.
8. Press the button briefly to accept the set value.
9. Press the button again to display the set value.
10. Use a u-tube manometer to measure/check the blower pressure for the individual levels on the measurement connection (**1**) and adjust if necessary (repeat the steps beginning with **5.** in the same manner).

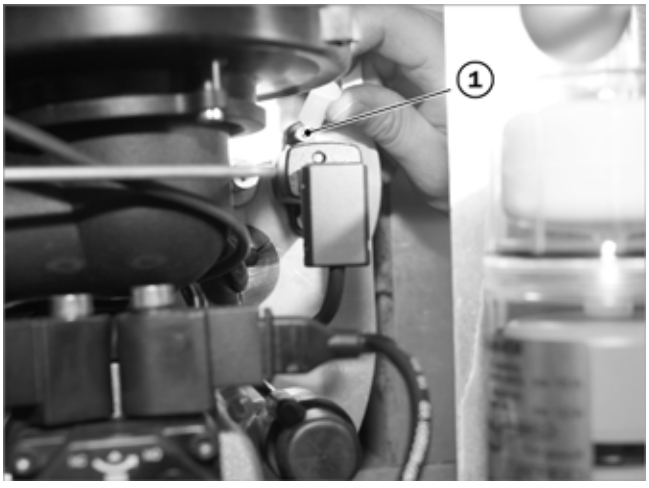


Fig. 101: Measuring the blower pressure

11. Set the rotary regulator to E.C. to set the other blower level.
12. Briefly press the button to return to the level selection (repeat the steps beginning with **3.** in the same manner).
13. To exit programming mode, set the rotary regulator to E.C. on the respective level and briefly press the button (repeat until the display shows the operating status 8.).

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 "**ON**" (manual mode) on the SolvisControl while heating up the water ("**Installer menu**" > "**Outputs**" > "**Manual mode**").
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 setpoint 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 Solar circuit (optional)

WARNING
Risk of hot steam escaping when working on the solar system
Scalding of hands and face possible.
- Carry out work on the solar system only when there is no direct sunlight or when the collectors are covered.

CAUTION
Hot surfaces
Risk of burns without proper attention.
- The solar lines, primary tank and expansion vessel may become hot during operation.

CAUTION
When filling the solar circuit:
- Fill only with original Tyfocor LS-rot ready-mixed heat transfer fluid and flush.
- Using other types of heat transfer fluid in this system is prohibited because it may damage the solar circuit components.
- Use only the Füll-Jet unit to flush and fill the system (please order separately).

7.8.1 Flushing the MEV line

Flushing the MEV line

1. If not performed before: check the admission pressure of the MEV(s) and adjust it according to the system height.
2. Set the flow meter (V̇) to flushing position 1.

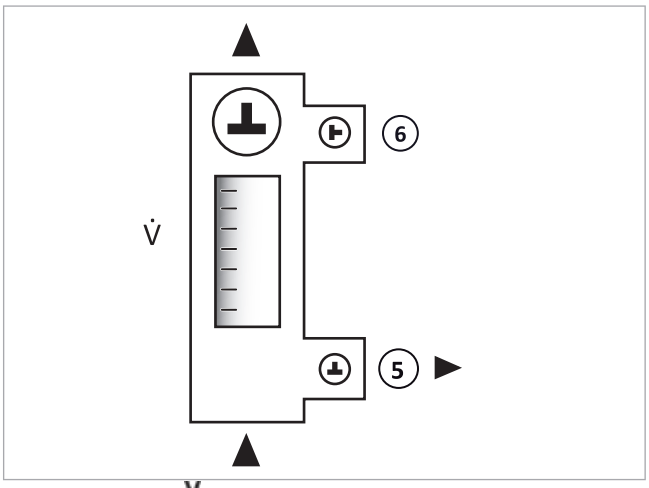


Fig. 102: Flow meter V̇ in flushing position 1

3. Fully open the cap valve (**3**) on the MEV.
4. Connect the pressure hose for the flushing and filling station (**FFS**) to the BFD valve (**4**) and open the BFD valve.
5. Connect the FFS flushing hose to the BFD valve (**5**) and open the BFD valve.
6. Fill the solar circuit with Tyfocor LS-rot antifreeze and flush: FFS => BFD valve (**4**) => primary tank => collector field => solar heat transfer station to BFD valve (**5**) => FFS
7. Flush until the solar fluid exits into the FFS container free of bubbles and clear (flush for at least 5 minutes).
8. Close the BFD valve (**4**) and switch off the FFS pump.
9. Close the cap valve on the MEV.

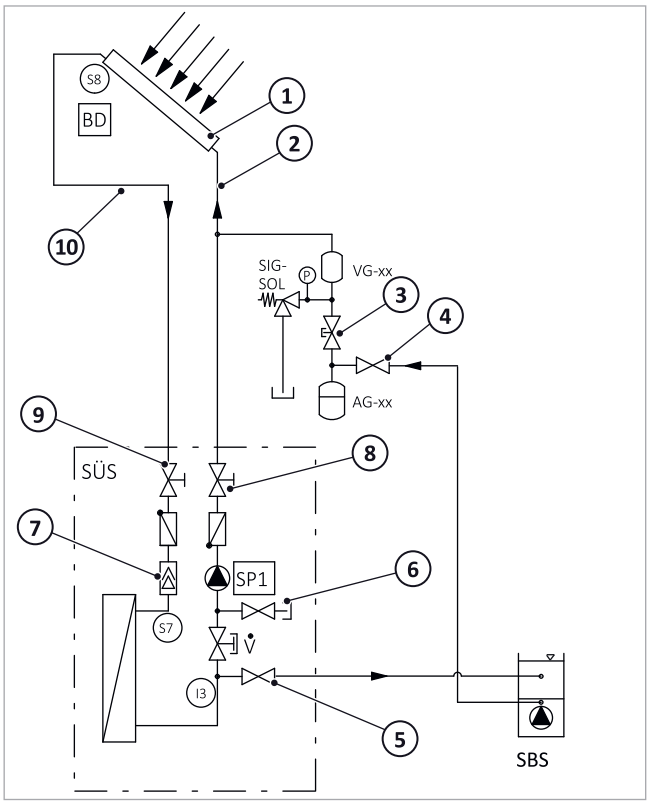


Fig. 103: Solar heat transfer station: Flushing the heat exchanger

1	*Solvis collectors*
2	*Solar return*
3	*Cap valve*
4	*BFD valve for pressure hose*
5	*BFD valve for flushing hose*
6	*BFD valve*
7	*Deaerator*
8	*Ball valve in the solar return*
9	*Ball valve in the solar flow*
10	*Solar flow*
AG-xx	*Expansion vessel*
BD	*Lightning protection box*
FFS	*Flushing and filling station FUES-SBS (accessory part)*
SUES	*Solar heat transfer station (primary circuit)*
VG-xx	*Primary tank (accessories)*
V̇	*Flow meter*

7.8.2 Flushing the pump line

Flushing the pump line

1. Set the flow meter (V̇) to flushing position 2.

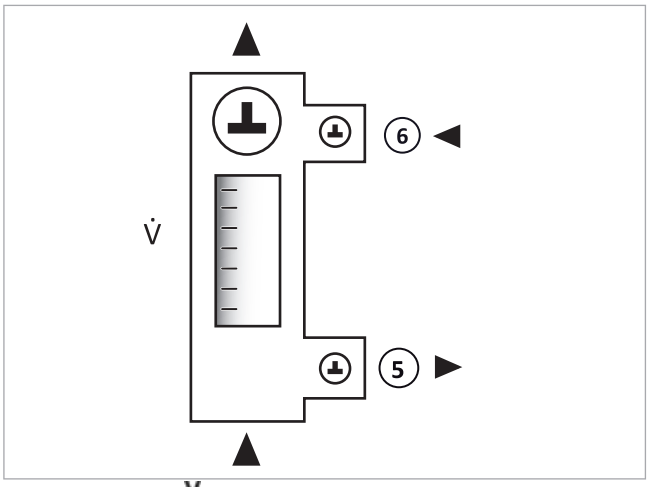


Fig. 104: Flow meter V̇ in flushing position 2

2. Connect the pressure hose for the flushing and filling station (**FFS**) to the BFD valve (**6**) of the flow meter and open the BFD valve.
3. Switching on and flushing the flushing pump: FFS => BFD valve (**6**) => primary pump => collector field => solar heat transfer station to BFD valve (**5**) => FFS
4. Flush until the solar fluid exits into the FFS container free of bubbles and clear (flush for at least 15 minutes).
5. Bleed the solar circuit again by building up and releasing pressure. To do so, close and open the BFD valve (**5**) two to three times.
6. If Tyfocor exits without any bubbles, close the BFD valve (**5**) and increase the system pressure to 4 bar.
7. Close the BFD valve (**6**) and switch off the FFS pump. Check the system to ensure that there are no leaks.
8. Bleed the deaerator (**7**).
9. Fully open the cap valve (**3**).
10. Set the system pressure to the calculated operating pressure by slowly opening the BFD valve (**5**). Rule of thumb: MEV admission pressure + 0.3 bar.
11. Set the flow meter to the flow position (see ➔ *fig. 106, page 52*), close the BFD valves (**5**) and (**6**), remove the SBS and screw on the caps.

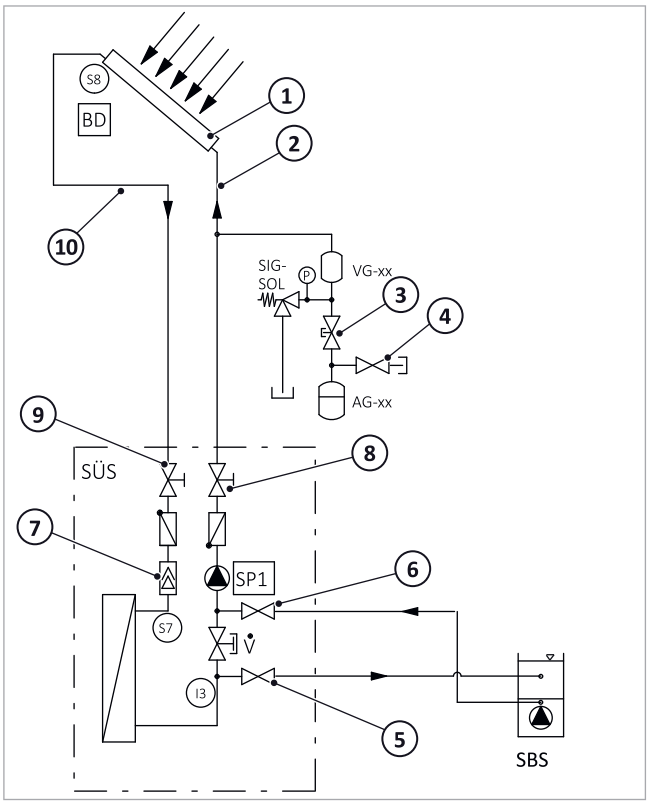


Fig. 105: Solar heat transfer station: Flushing the pump line

1	*Solvis collectors*
2	*Solar return*
3	*Cap valve*
4	*BFD valve*
5	*BFD valve for flushing hose*
6	*BFD valve for pressure hose*
7	*Deaerator*
8	*Ball valve in the solar return*
9	*Ball valve in the solar flow*
10	*Solar flow*
AG-xx	*Expansion vessel*
BD	*Lightning protection box*
FFS	*Flushing and filling station FUES-SBS (accessory part)*
SUES	*Solar heat transfer station (primary circuit)*
VG-xx	*Primary tank (accessories)*
V̇	*Flow meter*

7.8.3 Completing the solar station

Finishing the solar station

1. Ensure that the solar circuit and the storage tank connections are fully insulated.
2. Attach the insulation shell to the station.

CAUTION

Bleed the solar system after start-up

- Once the solar circuit has been refilled, gas will be emitted during operation, which collects in the station deaerator → *fig. 105, page 52* (**7**). The gas emissions decrease as the operation time increases. It is therefore important to bleed the deaerator and check the system pressure every day in the first few days after start-up and then at regular intervals, depending on the amount of air discharged.

Checking the primary volume flow

The SolvisControl uses the speed control on the solar pump to continuously optimise the flows based on the solar energy provided by the sun.

- With minimum control, the value:

$$\dot{V}_{min} = \frac{A\ [in\ m^2]}{6} \left[\frac{l}{min}\right]$$

should not be exceeded in the primary circuit. Regulate the flow meter if required. (With A = installed collector surface).

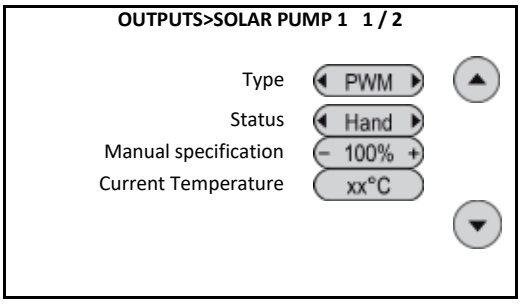
- With maximum control, the value:

$$\dot{V}_{max} = \frac{A\ [in\ m^2]}{3} \left[\frac{l}{min}\right]$$

at minimum should be reached in the primary circuit. Check the pipe dimensions and wiring if necessary. (With A = installed collector surface).

- The factory setting for the secondary circuit is the optimum setting.

1. Switch to the "**Installer**" user mode.
2. Open the "**Outputs**" submenu.
3. In the "**OUTPUTS**" menu, open the "**Analogue/PWM**" menu item and then the "**Solar pump 1**" output.
4. Switch the "**Status**" from "**Auto**" to "**Manual**".
5. Set the "**Manual specification**" to 100 %.



6. Read the volume flow at the flow meter (on the upper surface of the float.

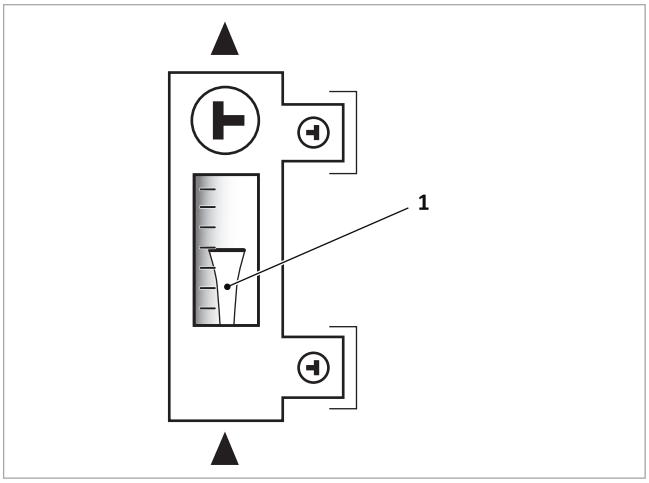
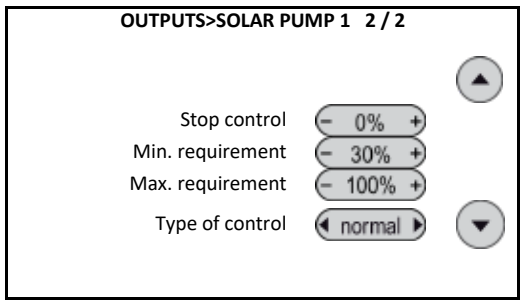


*Fig. 106: Read the volume flow at the upper edge of the float (**1**)*

7. Note the value in the start-up report.
8. Set the "**Manual specification**" to 30 %; this is the factory setting for minimum control.
9. Check the volume flow at the flow meter.

Alternative handling:

- If a flow cannot be read, increase the "**Manual specification**" incrementally until a flow can be detected. Apply the percentage value set for "**Min. control**" on the second page, "**OUTPUTS>SOLAR PUMP 1 2 / 2**".



- If the flow is too high (see the energy saving tip), regulate the volume flow accordingly using the flow meter and repeat steps 5 to 7.

10. Set the "**Status**" to "**Auto**" again.

7.9 Buffer charging station pump

WP and WP-SL charging modules only

7.9.1 Adjustment options

The Wilo Para 15/8 iPWM is speed-controlled by a PWM signal from the SC-3. The pump does not need to be set.

7.9.2 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. Switch to the installer menu on the SC-3.
2. Select "**Output**" => "**More**" => "**Analogue/PWM**" => "**Load pump**" from the menu.
3. Set "**Manual specification**" to "**100%** ".

=> Pump runs at maximum speed.

4. Set to "**0%**" after approx. 20 seconds by pressing "**+**".

=> Pump does not run.

5. Set to "**100%**" after approx. 10 seconds by pressing "**–** ".

=> Pump runs at maximum speed.

6. Repeat the procedure for a few minutes.
7. Set "**Manual specification**" to "**Auto**".

7.10 Heating circuit pumps

Starting up the heating circuit pumps

1. Bleed the heating circuits and heating circuit pumps for the external heating circuit stations.
2. Perform hydraulic balancing on the heating circuits.
3. Set the desired control type and necessary delivery height on the heating circuit pumps (see the heating circuit station installation instructions).

7.11 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.

- ➔ *"Skid control",*
- ➔ *"Plausibility check" and*
- ➔ *"Saving your data" in the operating instructions (BAL-SBSX-3-I / BAL-LEA-I).*

7.12 Final Tasks

7.12.1 Check

Testing the hot water temperature

1. Test the hot water temperature of a tap.

If the water is not warm enough, see ➔ *sec. "Troubleshooting" in the operating instructions for (BAL-SBSX-3-I / BAL-LEA-I).*

7.12.2 Fitting the protective cover

Attaching the protective cover

1. Fit the casing. When doing so, insert the side parts from behind, first the lower one and then the upper one.

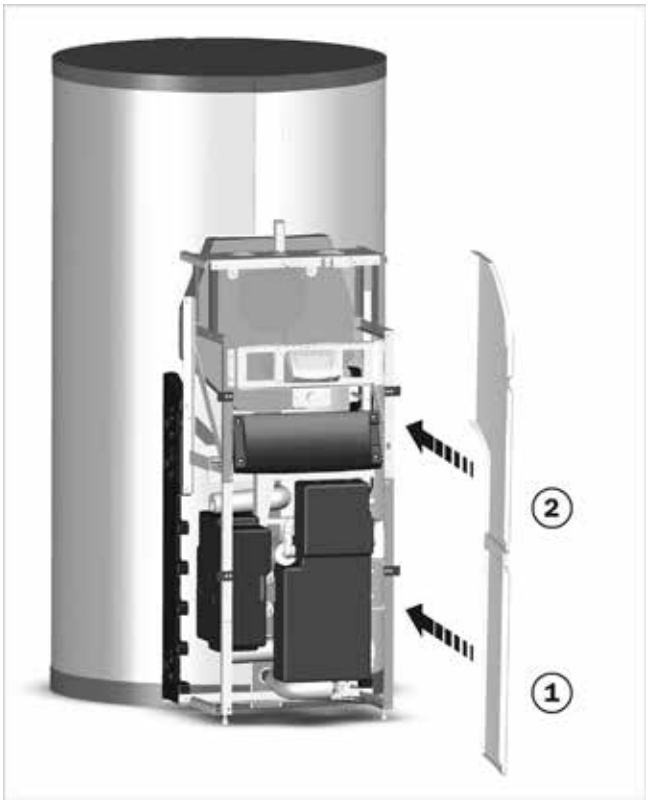


*Fig. 107: Insert the lower side part (**1**) first.*

2. Attach the copy of the nameplate and energy label to the unit casing in a clearly visible position.
3. Label pipes and cables.
4. Store the instructions in the systems folder.

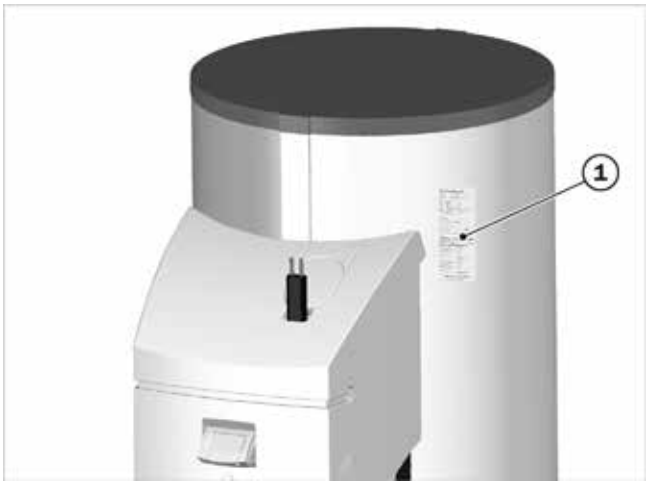


*Fig.108: Nameplate (**1**) attached to the insulation*

7.12.3 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

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).

Bleeding the storage tank

WARNING
Sudden steam blasts that occur when bleeding the storage tank can be hazardous.
Risk of scalding hands and face.
- Use a hose and suitable collecting vessel for safe bleeding.

1. Plug the hose onto the bleeder.
2. Carefully bleed the storage tank.

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 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

SolvisMax Gas and Gas Hybrid 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 casing.
3. Remove the front flange insulation.
4. Remove the hoses on the exhaust measuring device.
5. Remove the exhaust line from the exhaust heat exchanger.
6. Disconnect the fuel supply.
7. Pull the eSTL connector out of the immersion tube.
8. Loosen the 3 nuts.
9. Remove burner and hang it in the installation holder.

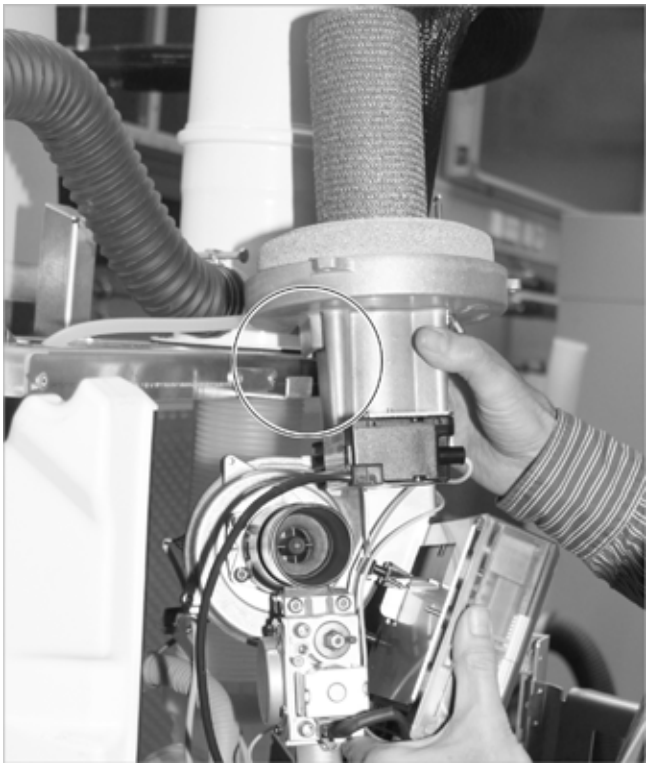


Fig. 109: Burner in maintenance position on the console

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.

Checking the ignition and ionisation electrodes

1. Check the clearance of the ionisation electrode using an electrode gauge → *fig. 111* (**2**) (if necessary, correct it by through careful bending).
   Distance to burner fleece:
   • Ionisation electrode → *fig. 110* (**1**): 7.25 mm
   • Ignition electrode → *fig. 110* (**2**): 6.9 mm
   • Electrodes below one another → *fig. 111* (**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 → *section "Maintenance" in the BAL-SBSX-I / BAL-LEA-I operating instructions*.
5. Start "**Min. burner performance**" in maintenance function.

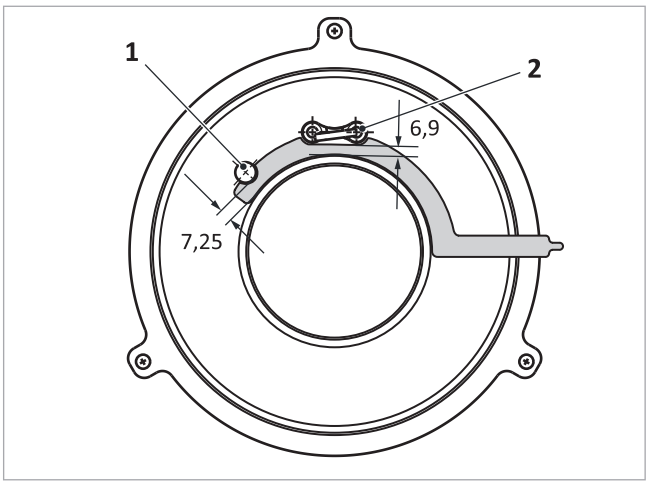


Fig. 110: Clearance from ionisation electrode and ignition electrode to burner tile

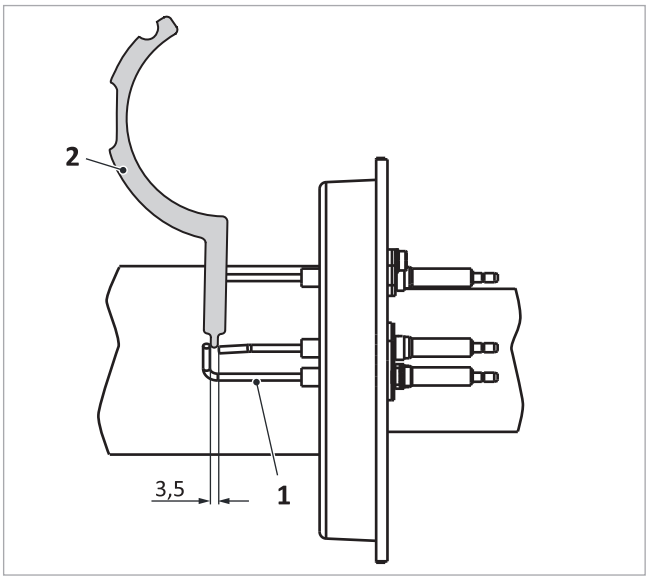


Fig. 111: Clearance from electrode to gauges on the ignition electrode

Fitting the burner

1. Attach the burner to the pre-fitted threaded bolts with the “Top” marking facing up.
2. Fasten the burner flange with the three nuts supplied.
3. 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. 46* or ➔ *tab. “Burner performance setting values”, p. 71*.

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.

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. 112: Inserting the eSTL

8.2.3 Oil burner

SolvisMax Oil and Oil Hybrid 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 casing.
3. Remove the front flange insulation.
4. Remove the air supply hose on the burner.
5. Turn the knurled nut for the nozzle fitting (see ➔ *fig. 120, p. 59*) anticlockwise by approx. 2 turns (nozzle fitting is pulled “backwards”).
6. If necessary, remove the burner cable.
7. Remove the quick release screws on the burner insert.
8. Remove the burner insert and lay it down.

Fig. 113: Quick release screws on the burner insert

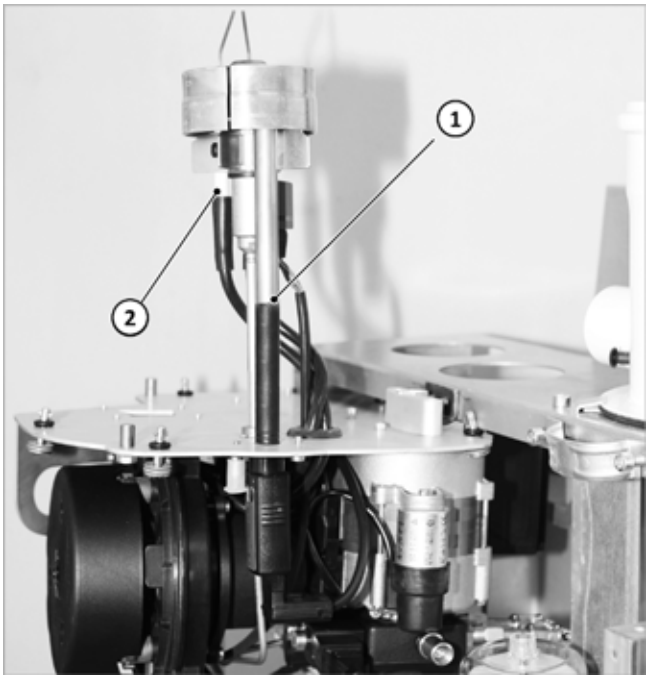


Fig. 114: Attaching the burner to the console

1 *Viewing sleeve for the flame monitor*

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.

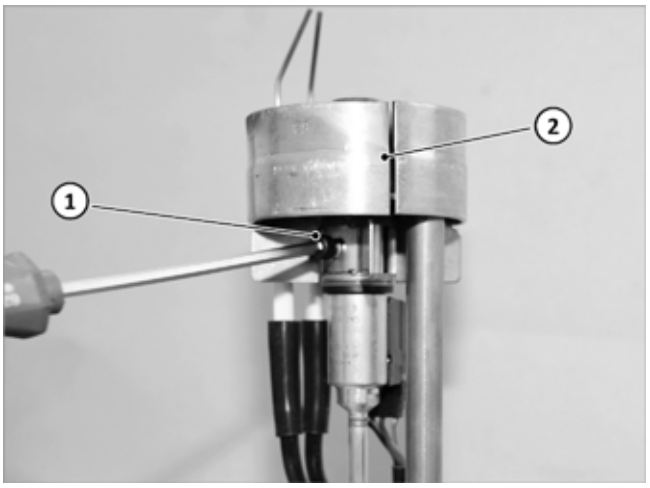


Fig. 115: Mixing head on nozzle fitting

Check the viewing sleeve

1. Remove the viewing sleeve; see ➔ *fig. 114* (**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.

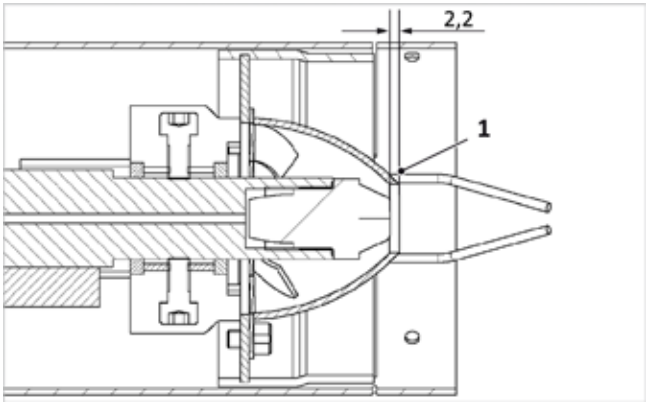


Fig. 116: Cross section of mixer head

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.

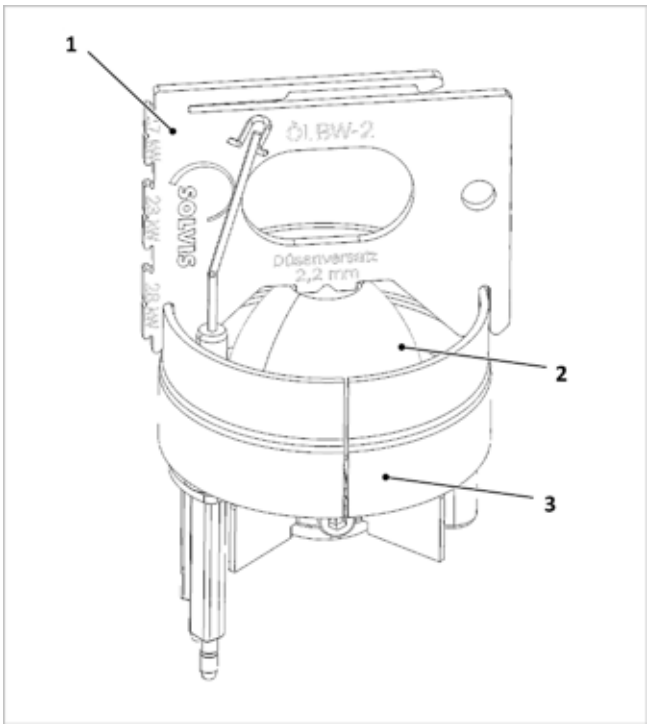


Fig. 117: Mixer head with the setting gauge attached

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.

Checking the ignition electrodes

1. Check the position of the electrodes (**3**) as shown in ➔ *fig. 118* and correct by carefully 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.

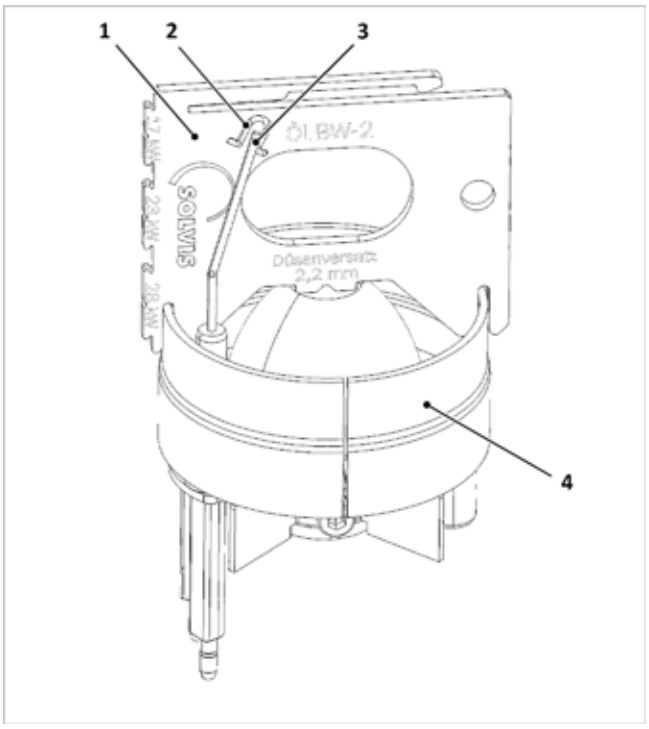


Fig. 118: Check the ignition electrodes

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

3. Check the electrode gaps as shown in ➔ *fig. 119* and correct by carefully bending them, if necessary.

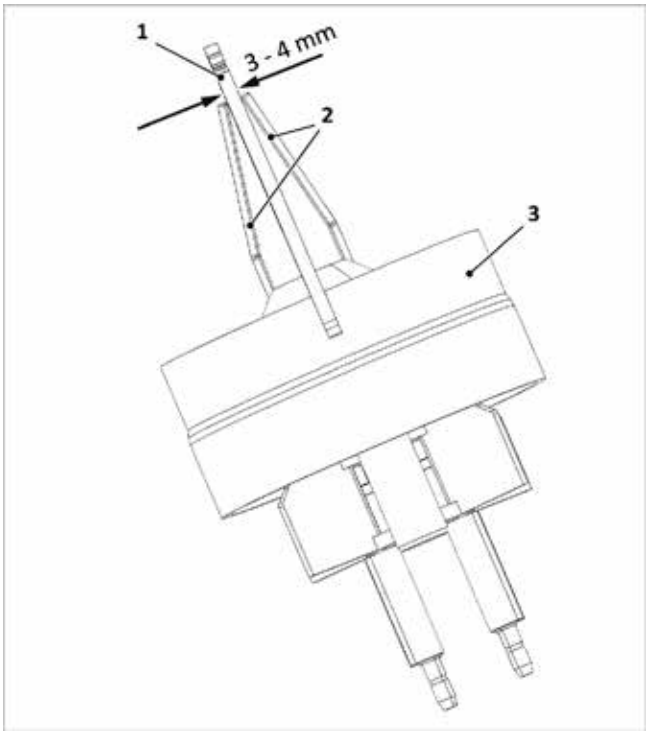


Fig. 119: Checking the ignition electrode gaps

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.
2. Check if the flame tube is secure, tighten if necessary.

Inserting the burner

1. Slide the burner insert into the combustion chamber.
2. Secure the burner insert with the quick release screws.

Position of the nozzle fitting

1. A knurled nut is located in front of the burner base plate at the connection of the oil pipe and the nozzle fitting (➔ *fig. 120*). You can use this to move the entire mixing unit forwards or backwards. The knurled nut can be adjusted up to a certain point (limit stop of the mixing unit in the flame tube). Adjust the knurled nut so that the mixing unit is touching the limit stop.

Caution Screw the knurled nut only lightly against the stop! If you screw in the knurled nut when the burner housing has been removed, the mixing unit will be moved further out. In this case, the burner housing will no longer fit together because the mixing unit is pressed against the limit stop in the flame tube.

Fig. 120: Knurled nut (limit stop for oil pipe/nozzle fitting)

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. 46* or ➔ *tab. "Burner performance setting values", p. 71*.

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 Solar system maintenance

WARNING

Risk of hot steam escaping when working on the solar system

Scalding of hands and face possible.

- Carry out work on the solar system only when there is no direct sunlight or when the collectors are covered.

CAUTION

Hot surfaces

Risk of burns without proper attention.

- The solar lines, primary tank and expansion vessel may become hot during operation.

Checking the solar liquid (annually)

1. Bleed the solar circuit and take a sample at the deaerator at the same time.
2. Perform a visual check and odour check. Replace the solar liquid if there is a pungent odour or dark colour.
3. Check the antifreeze using the antifreeze refractometer. (The antifreeze limit must not exceed -23 °C).
4. Test the pH value with a test strip. (If the pH value is below 8.0, replace the solar liquid.)
5. Check the solar operating pressure.

Checking the solar expansion vessel admission pressure (every 2 years)

1. Close the cap valve (**7**, see ➔ *fig. 105, p. 52*) on the solar expansion vessel (horizontal marking).
2. Open the drain valve on the cap valve using a 6 mm open-end wrench and discharge the overpressure from the expansion vessel.
3. Check the admission pressure on the valve of the expansion vessel and refill with nitrogen if necessary; see ➔ *"Setting the admission pressure on the solar expansion vessel", chapter "Membrane expansion vessel", p. 33.*
4. Close the drain valve.
5. Open the cap valve (vertical marking).

Checking the flow (every 2 years)

1. Switch on the solar pump (manual mode).
2. Check the flow at the flow meter on the primary solar circuit (collector circuit).

Checking the sensor values

1. Check that the temperatures measured at the solar heat transfer station are plausible.
2. Check that the temperatures measured on the collector sensor and the storage tank reference sensor are plausible.

Checking the solar circuit

1. Check all the components and safety valves on the solar station for leaks and ensure that they are functioning properly.
2. Visually check the collector(s), pipe lines, and associated insulation.
3. Check that the collector mounting system is positioned and functioning correctly.

8.4 Cleaning the surfaces

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.

If necessary, wipe visible surfaces with water and a neutral conventional household cleaner.

9 Troubleshooting

9.1 Pumps

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).

9.3 Unlocking the automatic firing system

Only SolvisMax Oil Hybrid

You unlock the burner malfunction directly from the automatic firing system on the burner.

All other heat generators

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: switch the main switch off and back on.
   - If the malfunction is not unlocked, there is a communication error (malfunction message F090):
2. Is communication cable (mains module <--> SC-2) connected?
3. Load the factory settings in SolvisControl ("INSTALLER menu > Data"); see also the → *"Data" section in the BAL-SBSX-3-I / BAL-LEA-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 / BAL-LEA-I operating instructions.*

9.4 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	Blower 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 blower 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 at normal mains voltage, replace the automatic firing system. Disconnect the automatic firing system from the mains, malfunction message in message logging with "**Installer**">"**Messages**">"**Unlock burner malfunction**"
Invalid parameter	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
Communication interrupted	E90	Time-out (10s) for the cyclic bus telegram.	Automatic firing system blocked	F90 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.
Programming mode	E95	Automatic firing system is in programming mode.	Automatic firing system blocked	Perform maintenance
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	Perform maintenance
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

9.5 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 / BAL-LEA-I operating instructions.*

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

9.5.1 General fault table

Fault	Cause	Remedy
Burner does not start	Power supply interrupted	Check fuse and plug
	Safety thermostat (mSTB) has triggered	Press the unlocking button
	No burner requirement from controller	Check requirement signal or controller settings
	Defective oil preheater	Check oil preheater; replace if necessary
Burner switches to fault during preaeration	Stray light / flame detected when there is no flame	Check flame monitoring and solenoid valves
		White deposits on the flame tube. Clean.
	Blower defective / blower speed not achieved	Check blower, power and signal cables, and replace if necessary
Burner starts but no flame is created	Ignition transformer switches off	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
Burner starts but goes out after a short time (flame extinguished)	Flame tube loose	Check and secure
	Incorrect combustion settings	CO_2 below 12.5%, calibrate burner according to setting table, see ➔ *"Burner performance setting values" table, p. 71*
		Blower speed / oil pressure too high, calibrate burner in setting range according to setting table, see ➔ *"Burner performance setting values" table, p. 71*
	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 ➔ *"Burner performance setting values" tab., p. 71*); Check pump pressure
	Incorrect combustion settings	CO_2 too high, calibrate burner according to setting table, see ➔ *"Burner performance setting values" table, p. 71*
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" table, p. 71*).

Fault table (continued)

Fault	Cause	Remedy
Burner switches to fault at irregular intervals	Solenoid valve coils defective	Replace
	Flame tube loose	Check and secure
	Oil pump condenser defective	Replace
	Air in the oil supply	Check oil supply, provide for bubble-free, clean oil
	Oil supply interrupted	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, foot valve)
		Filter or oil pipe blocked, clean or replace if necessary
	Incorrect combustion settings	CO_2 below 12.5%, calibrate burner according to setting table, see ➔ *"Burner performance setting values" table, p. 71*
		Blower speed / oil pressure too high, calibrate burner in setting range according to setting table, see ➔ *"Burner performance setting values" table, p. 71*
	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

9.5.2 Program sequence and fault display

Program sequence (normal mode)

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 is "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 flushing	Blower speed check for ignition speed
10	Flushing	Blower runs at flushing speed

Fault display

Display	Error	Explanation
3	Blower speed timeout	Blower speed deviation is too high
4	No flame generation	No flame signal during safety period
5	Flame failure	Flame failure during operation
10	Remote reset error	More than 5 remote resets within 15 minutes
11	Flame detected when there is no flame	Flame signal prior to safety period
15	Defective oil preheater	No response from oil preheater thermostat
31	CRC error for burner parameter	Incorrect internal parameter setting
32	Defective voltage supply	Undervoltage/overvoltage
48	Communication timeout	No eBus communication during the past 2 minutes
99	Safety shutdown	Internal safety check failed

9.5.3 Fault logging on the automatic firing system

CAUTION

- Never replace the automatic firing system with a standard unit (special model).
- Opening the automatic firing system is prohibited and damages the unit.

The interface for the automatic firing system is used for operation and to display malfunctions.

Fig. 121: Interface for automatic firing system CM 168

1	*Display*	3	*Button*
2	*Performance levels*	4	*Rotary regulator*

General information on display and operation

- The normal operating status is indicated by 8. The number of dots that are illuminated corresponds to the burner level (one dot: level 1, two dots: level 2).
- Press the button for 3 seconds to access the menu level. Press the button briefly to select or confirm.
- The rotary regulator is used to set values or select menu items. Use the supplied Allen key to turn the rotary regulator.
- Select E.C. to return to a previous level. Exiting programming mode is done level by level until the operating status is displayed.
- If there is no user input for approx. 1 minute, the display automatically returns to the operating status.
- Menu navigation is not interrupted when a boiler module fault occurs.
- A fault that occurs on the automatic firing system is indicated by an alternating display of E. (error) and the error code (e.g. 4).

Accessing the error history

The automatic firing system saves the last 10 error values in the order that they occurred.
This error history can be read as follows.

1. Starting from hibernation 0. (standby) or normal operating status of the burner 8., press the button for 3 seconds.

The display level switches to A.. Both dots flash.

2. Use the supplied Allen key to turn the rotary regulator until E. (error) appears on the display.
3. Briefly press the button.

The display level switches to E.1. Both dots flash.

4. Use the rotary regulator to select a value between E.1 and E.0. Note that E.1 is the error that occurred most recently, E.2. is the error before that, etc.).
5. Briefly press the button.

The relevant error code is now displayed.

6. Set the rotary regulator to E.C. to read additional error codes from the history.
7. Briefly press the button to return to the setting values (repeat the steps beginning with **4.** in the same manner).
8. To exit programming mode, set the rotary regulator to E.C. on the respective level and briefly press the button (repeat until the display shows the operating status 8. or hibernation 0.).

Alternatively, the accumulated messages can be queried and the starting behaviour of the burner can be viewed using the CoCo-Mobil SÖ-BW reading unit (ALG-COCO-MO-BW).

9.6 SolvisLea heating pump

For more information about SolvisLea and SolvisLea Eco malfunction messages, see ➔ *SolvisLea installation instructions (MAL-LEA).*

10 Technical Data

10.1 Storage tank

SolvisMax technical data

Name	Abb.	Unit	457	757	957
Rated volume		**[litre]**	**450**	**750**	**950**
Actual volume		[litre]	470	718	909
Storage tank distribution					
Hot water ready volume		[litre]	96	171	82 / 212 / 301 Provision regarding sensor positioning
Heating buffer volume		[litre]	22	34	34
Solar buffer volume		[litre]	352	512	793 / 663 / 574
Tank					
Tank material		–	S235JR, primed exterior, raw interior		
Heating flow/return connection		–	28 mm pipe		
Cold/hot drinking water connection		–	28 mm pipe		
Operating limits					
Maximum operating pressure		[bar]	3		
Maximum operating temperature		[°C]	95		
Maximum heating flow/return volume flow		[m³/h]	2		
Dimensions					
Maximum width (including insulation)	D	[mm]	870	1020	
Maximum depth	T	[mm]	1380	1550	
Maximum height	H	[mm]	1800	1920	2300
Tilt height without insulation	k	[mm]	1670	1760	2140
Diameter without insulation	d	[mm]	650	790	
Exhaust connection height	A	[mm]	1569		
Centre of exhaust elbow to back of insulation	U	[mm]	1064	1210	
Minimum front spacing		[mm]	500		
Minimum side/rear spacing		[mm]	300		

Dimensions of the system

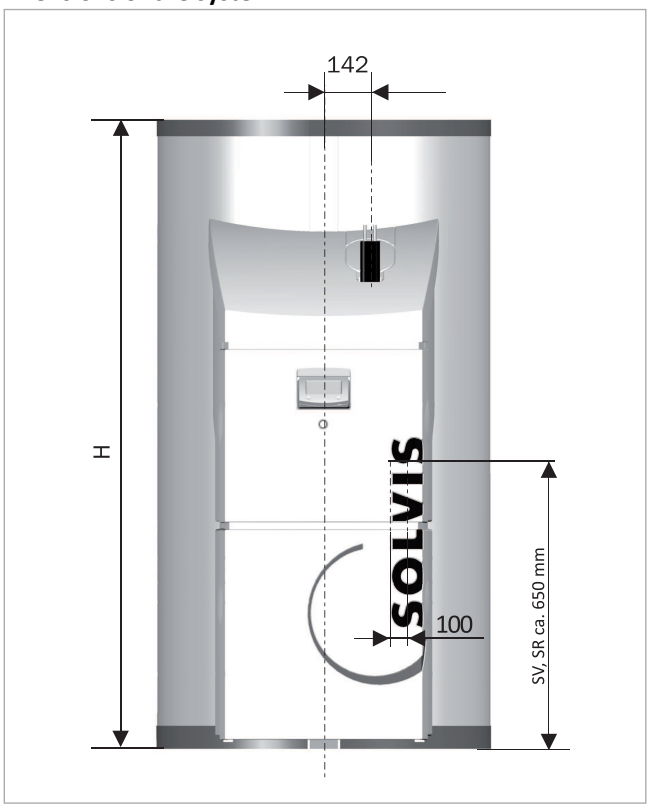


Fig. 122: Front view

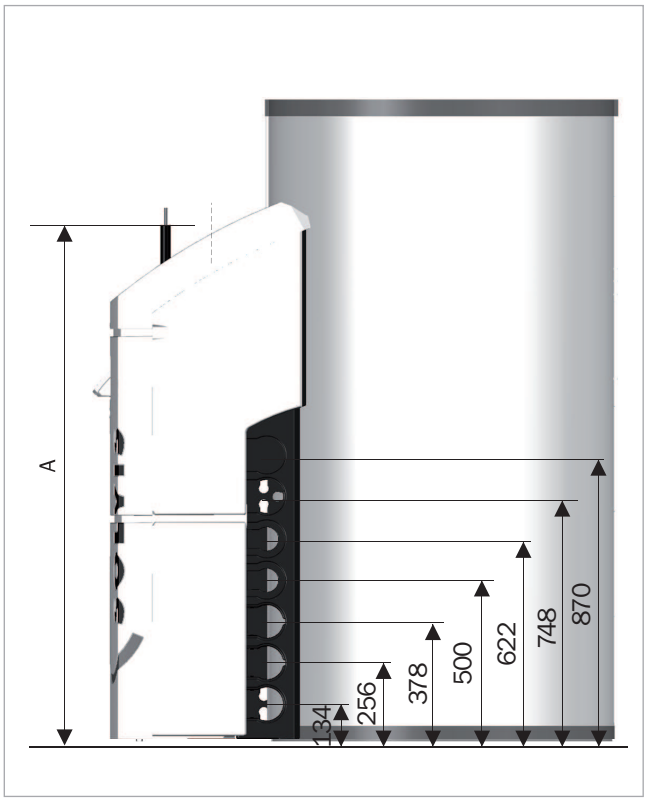


Fig. 124: Side view

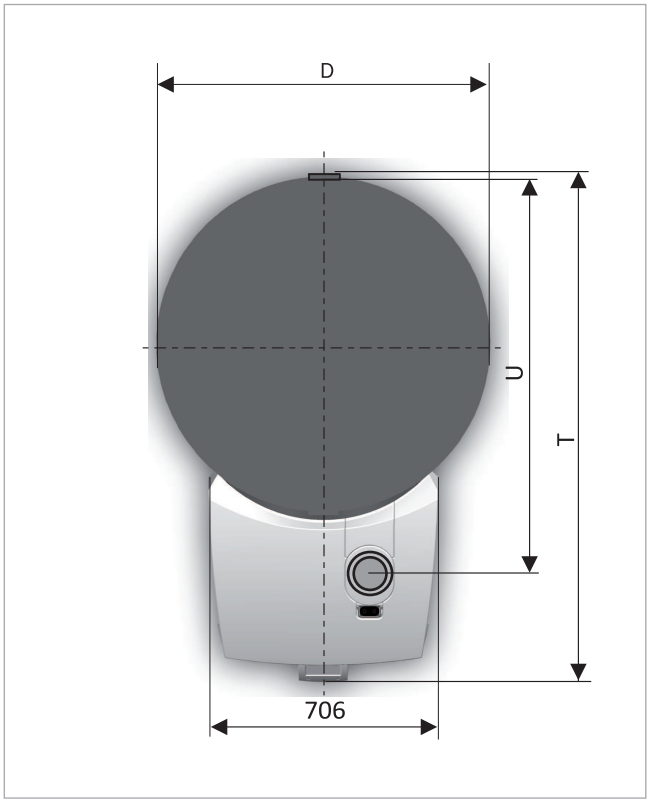


Fig. 123: Top view

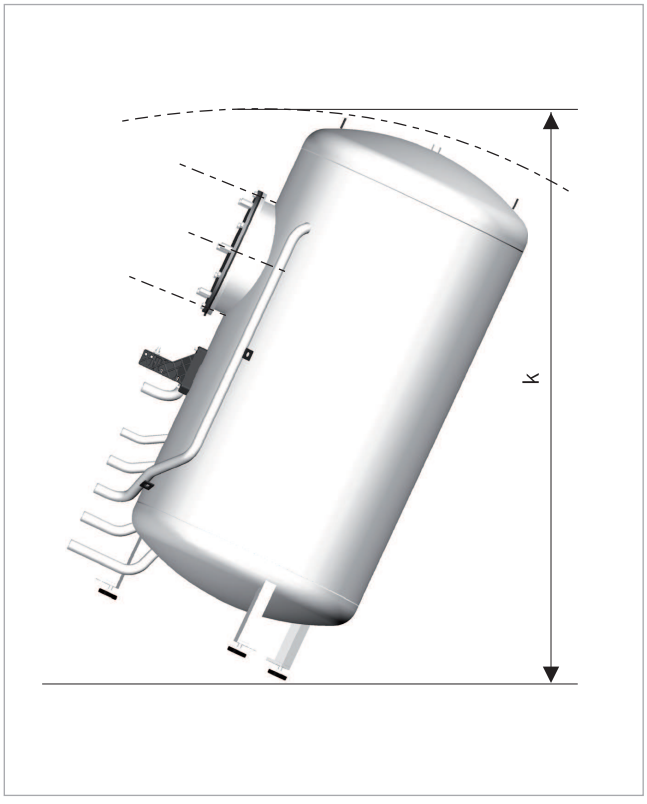


Fig. 125: Tilt height

10.2 Burner

Burner and exhaust values for the flue calculation.

10.2.1 Gas burner

Combustion data

Burner performance	Unit	1,9 - 10 kW	2,9 - 18 kW	4,8 - 25 kW	4,8 - 30 kW
Fuel	–	Natural gas/liquid gas[1]			
Burner type	–	Blower burner			
Rated heat load (burner performance)	kW	1.9 - 10	2.9 - 18	4.8 - 25	4.8 - 30
Rated heat output (boiler performance) P_n at 80/60°C	kW	1.9 - 9.9	2.9 - 17.8	4.7 - 24.4	4.7 - 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_{53x} / C_{63x} / C_{83x} / C_{93x}			
CO_2 content with natural gas at max. performance	%	9.9			
CO_2 content with liquid gas at max. performance	%	12.0			
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 at distance of 1 m and max. performance**	dB (A)	45	53	51	58
Burner noise indoors at 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

[1] The UBS-SX-LN-3-xx refitting set is required for operation with liquid gas
[2] Total burner power consumption including control (for concentric exhaust systems)
[*] according to DIN 15502
[**] according to ISO 3744

10.2.2 Oil burner

Combustion data

Burner type	10/17 kW		14/23 kW		20/28 kW	
	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Rated heat output (boiler performance at 50/30°C)	10.5 kW	17.0 kW	14.4 kW	23.4 kW	20.8 kW	27.0 kW
Rated heat output (boiler performance at 80/60°C)	10.0 kW	16.0 kW	13.4 kW	21.7 kW	19.5 kW	25.0 kW
Rated heat load (burner performance)	10 kW	15 - 17 kW	14 kW	20 - 23 kW	20 kW	26-28 kW
Standard efficiency coefficient (1)	104.6 %	104.6 %	104.1 %	104.1 %	103.1 %	103.1 %
Partial load energy coefficient at 23/21°C	105.1 %	105.1 %	104.4 %	104.4 %	-	-
Boiler efficiency at 80/60°C (1)	97.4 %	96.3 %	–	95.8 %	95.2 %	94.6 %
Boiler efficiency at 50/30°C (1)	103.1 %	102.6 %	–	101.7 %	101.3 %	100.5 %
Exhaust temperature at 80/60°C (2)	62°C	63°C	63°C	64°C	64°C	69°C
CO_2 for calculating the exhaust routing	13.5 %	13.5 %	13.5 %	13.5 %	13.5 %	13.5 %
CO	9 mg/kWh	10 mg/kWh	14 mg/kWh	15 mg/kWh	23 mg/kWh	36 mg/kWh
CO standard emission factor	3 mg/kWh	3 mg/kWh	5 mg/kWh	5 mg/kWh	12 mg/kWh	12 mg/kWh
NO_X	64 mg/kWh	56 mg/kWh	66 mg/kWh	66 mg/kWh	70 mg/kWh	70 mg/kWh
NO_X standard emission factor	60 mg/kWh	60 mg/kWh	63 mg/kWh	63 mg/kWh	68 mg/kWh	68 mg/kWh
Exhaust gas mass flow	15.7 kg/h	26.1 kg/h	21.5 kg/h	35.1 kg/h	27.8 kg/h	40.7 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					

Results according to certification test based on DIN 303, 304, EC Efficiency directive 92/42 EEC.
(1) Efficiency coefficient and utilisation ratio incl. losses for hot water production
(2) SolvisMax Oil BW thus meets the requirements of EC 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 stage:					
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
1. stage:					
10.6	11.4	10.9	10	0.92	**12***
Burner type 14/23 kW:					
2nd stage:					
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
1. stage:					
13.4	14.4	13.8	8	1.20	**12***
Burner type 20/28 kW:					
2nd stage:					
27.0	28.6	28.5	19	2.41	29
26.2	27.8	27.6	18	2.34	27
25.3	26.9	26.8	17	2.26	25
24.5	26.1	25.9	16	2.19	24
1. stage:					
19.8	21.1	20.9	10	1.76	**16***

** 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
20/28 kW:	Danfoss, OD 0.50 gph, 60°S	18.5 mm	2 mm

10.3 SolvisLea heating pump

For SolvisLea and SolvisLea Eco technical data, see
➔ *SolvisLea installation instructions (MAL-LEA).*

10.4 SolvisControl system controller

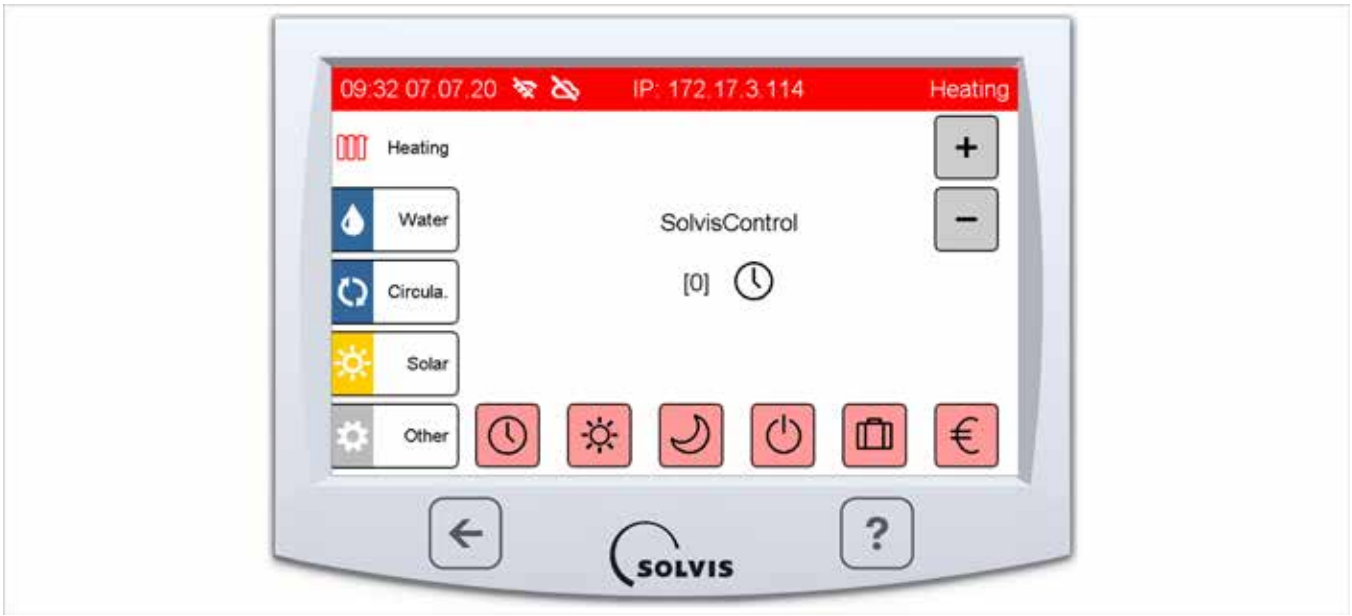


*Fig. 126: SolvisControl with "**Heating**" menu*

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 Solar2 (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 station

Hot water station technical data

Name	Unit	WWS-24	WWS-30	WWS-36
Dispensing volume flow				
TWK/TWW/flow = 10/50/65 °C	**[l/min]**	**24**	**30**	**36**
TWK/TWW/flow = 10/50/60 °C	[l/min]	21	25	30
TWK/TWW/flow = 10/60/70 °C	[l/min]	-	23	24
TWK/TWW/flow = 10/60/65 °C	[l/min]	14	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 to 50		
Power consumption	[A]	0.02 to 0.43		
Energy efficiency index	EEI	≤ 0.20		
Plate heat exchanger				
Manufacturer Danfoss, type	[-]	XB06H+-1-30	XB06H-1-40 StS	XB06H+-1-50
Number of plates	[pcs.]	30	40	50
Capacity per side	[litre]	0.25	0.35	0.5

10.6 Solar heat transfer station

Solar heat transfer station technical data

Name	Unit	SUES-Max
Max. recommended collector surface	[m²]	5-20
Rated flow	[l/(h*m²)]	10-25
Primary circuit		
Flow meter	[l/min]	0.5-15
Pressure sensor	[bar]	0-6
Max. operating temperature	[°C]	120
Safety valve	[bar]	6
Connection	[mm]	12/15
Primary pump		
Make/type		Wilo PARA ST 15/13
Minimum inflow pressure	[mWS]	0.5
Power consumption	[W]	2-75
Energy efficiency index	EEI	< 0.23
Plate heat exchanger		
Make/type		Danfoss XB05M-1-30
Number of plates		30
Capacity per side	[litre]	0.3
Performance		
Primary 75/60 °C and secondary 55/70 °C		14 kW
Primary 65/33 °C and secondary 25/60 °C		7 kW
Secondary circuit		
Volume flow encoder		VSG-SÜS
Max. operating temperature	[°C]	95
Safety valve	[bar]	4
Secondary pump		
Make/type		Grundfos UPM3 15-40
Minimum inflow pressure	[mWS]	0.5
Power consumption	[W]	2-25
Energy efficiency index	EEI	< 0.20

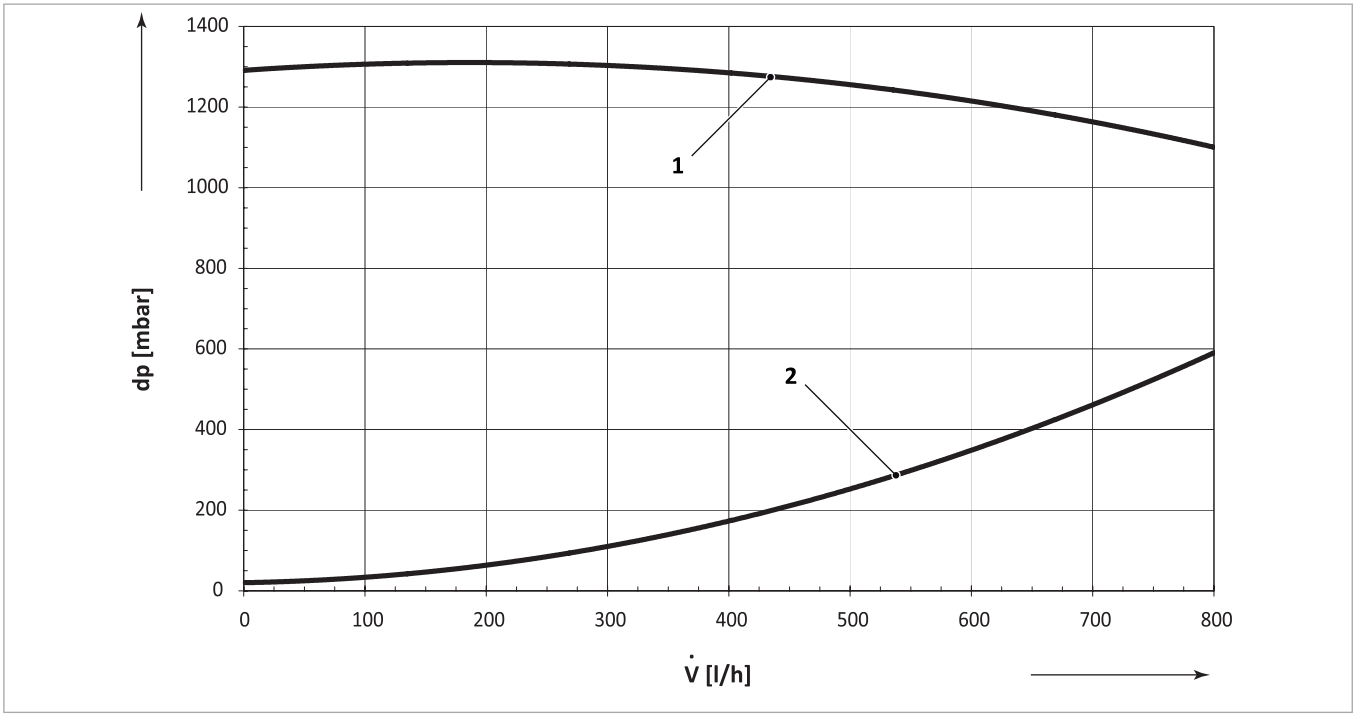


Fig. 127: Pressure loss curve for the primary circuit

1 *PARA ST 15/13*

2 *Primary circuit SÜS-LM*

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
Installation length	130 mm
Speed control	via PWM1
Permitted media temperature	2 °C to 95 °C
Minimum inflow pressure	0.5 bar (at 95 °C)
Mains connection	230 V ~/ 50 Hz
Maximum power consumption	2 to 75 W
Power consumption	0.03 – 0.38 A
EEI	≤ 0.21

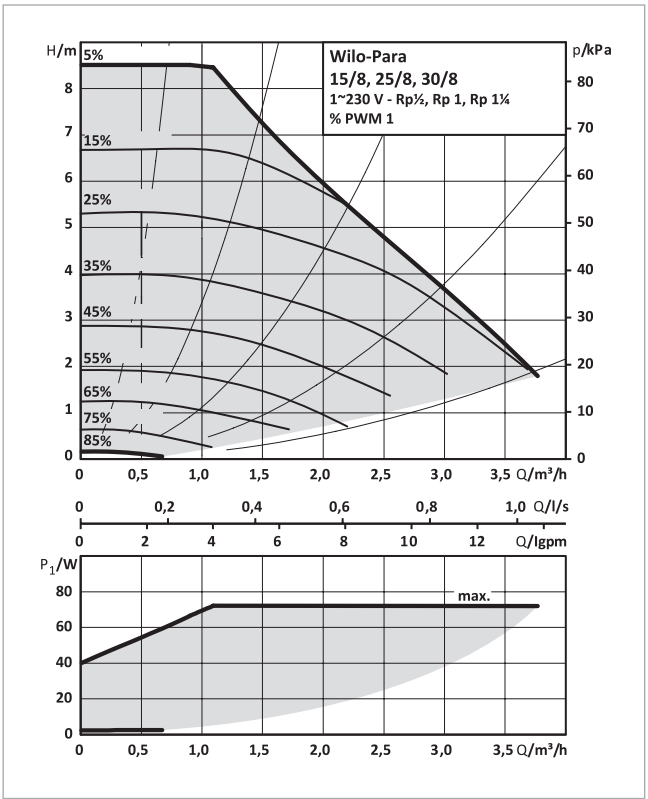


Fig. 128: Wilo PARA 15/8 pump characteristic curves

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

11 Appendix

11.1 System diagrams and connection diagrams

For system diagrams and connection diagrams, see the ➔ *SolvisMax 7 system diagram document (ALS-MAX-7).*

11.2 Sensors and connections on the storage tank

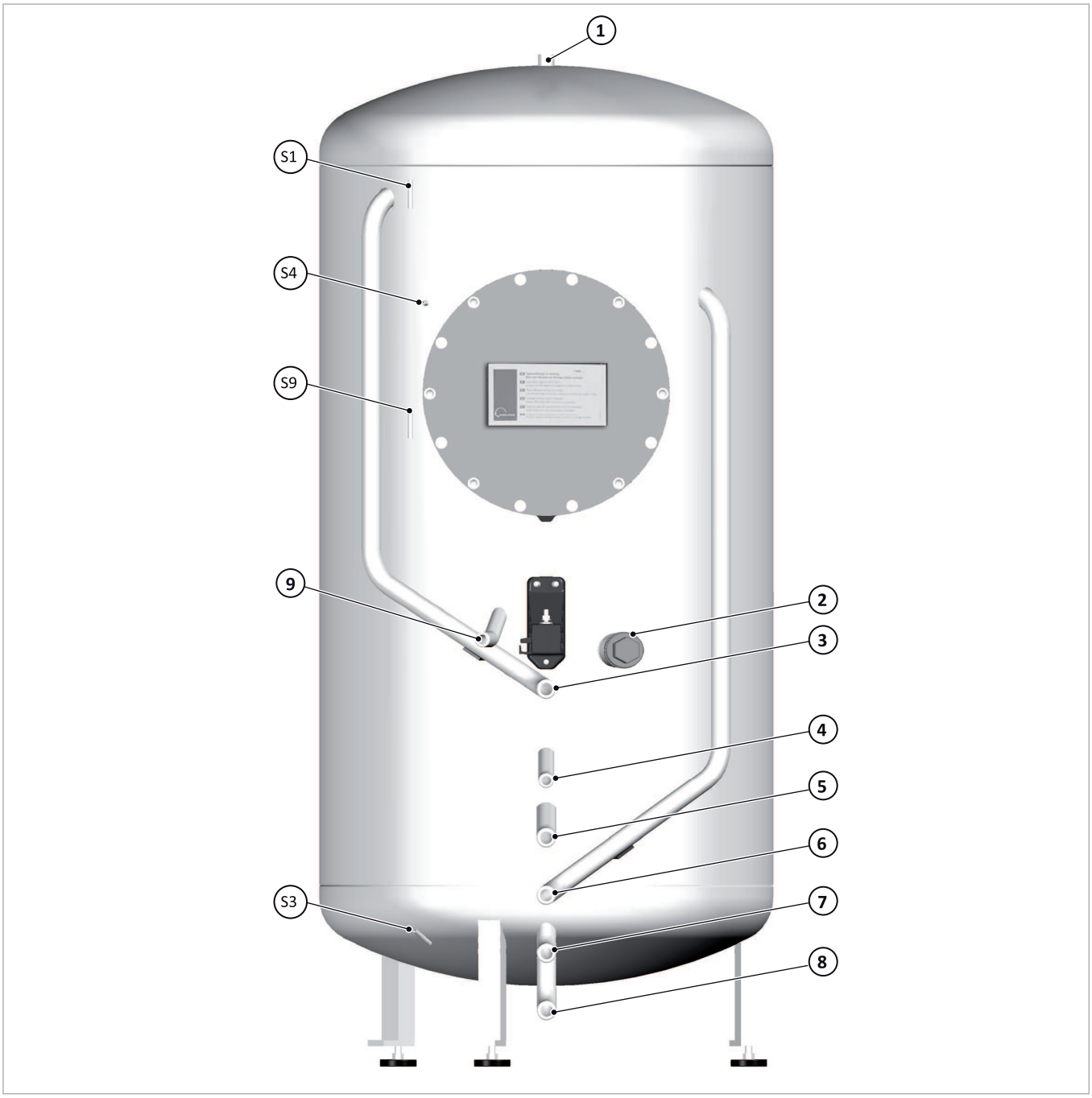


Fig. 129: Front view of the stratified storage tank

1	*Socket for bleeding*
2	*Socket for electrical heating element*
3	*Hot water flow (WWS)*
4	*Solar flow (SÜS)*
5	*Heating return*
6	*Heating flow*
7	*Hot water return (WWS)*
8	*Solar return (SÜS)*
9	*Storage tank bleeder*
S1	*Upper storage tank temperature sensor*
S3	*Storage tank reference temperature sensor*
S4	*Upper heating buffer temperature sensor*
S9	*Lower heating buffer temperature sensor*
S9	*Lower heating buffer temperature sensor*

12 Index

Notes

Art.-Nr.: 32457 - MAL-MAX-7-EN - Dokument-Nr.: 32457-3 / Redaktioneller Stand: 04.21 - Technischer Stand: 03.21

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

Phone: +49 (0) 531 28904-0
Fax.: +49 (0) 531 28904-100
E-mail: info@solvis.de

Internet: www.solvis.com