Installation

SolvisBen WP/Lino/Solo

Solar and heating buffer storage tank

Prepared for the integration of a heat generator

- Including controller (heating/solar)
- Including hot water station
- Including heating circuit station
- Including solar option

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 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.

3 System Versions

The SolvisBen is available in the following versions:

- As a SolvisBen Gas gas condensing system in four performance levels: 10, 18, 25 or 30 kW
- As a SolvisBen Oil oil condensing system in two performance levels: 17 and 23 kW
- As a SolvisBen Hybrid Gas combined heating pump/gas condensing system with SolvisLea or SolvisLea Eco heating pump (or SolvisBen Hybrid VSG with SolvisMia heating pump) and gas burner in four performance levels: 10, 18, 25 or 30 kW
- As a SolvisBen Hybrid Oil combined heating pump/oil condensing system with SolvisLea or SolvisLea Eco heating pump (or SolvisBen Hybrid VSG with SolvisMia heating pump) and oil burner in two performance levels: 17 and 23 kW
- As the SolvisBen Solo for connecting external heat generators (option for subsequent retrofitting of various gas or oil burners)
- As SolvisBen WP for connecting the SolvisLea air/water heating pump
- As SolvisBen WP-HPT-VSG with built-in heating cartridge for connecting the air/water heating pump SolvisLea Eco or SolvisMia
- As the SolvisBen Lino for connecting the Solvis Lino 4 pellet boiler

Two versions of the integrated hot water station are available:

- WWS-24
- WWS-30.

The following combination options are also available:

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

4 Scope of Delivery

Equipment	Solo	WP	Lino
Pre-assembled:			
• Storage tank with: - Solar stratified charger (self-regulating, maintenance-free) - Charging lances for the flow and return on the heating circuits - Socket for the optional installation of an electrical heating element - Lower transport handle - Adjustable container feet to compensate for uneven flooring	✔	✔	✔
• Hot water station, Depending on the version, as WWS-24 or WWS-30 (30 or 40 stainless steel plates, copper-brazed, adapted thermal mixing valve)	✔	✔	✔
• Integrated heating safety valve, reaction pressure: 3 bar.	✔	✔	✔
• SolvisControl 3 system controller with mains circuit board and main switch	✔	✔	✔
• Boiler flange for burner retrofitting	✔	—	—
• Buffer charging station for charging the storage tank with the SolvisLea/SolvisLino 4, with: - pump, shut-off and thermometer ball valve and EPP insulation shell	—	✔	✔
• Sludge separator with: - magnetic ring and EPP insulation shell	—	✔	✔
• Connection for connecting the external heat generator	✔	✔	✔
• **SolvisBen with integrated heating circuit station plus**: - HKS-G-4.0 mixed heating circuit station with pump, three-way mixing valve and thermometer ball valve	O	O	O
• **SolvisBen with integrated heating cartridge plus**: - Electrical heating cartridge, 6.2 kW	—	O	—
Included:			
• Carry handles for transport to the installation site	✔	✔	✔
• Multi-part removable heat insulation casing	✔	✔	✔
• Storage tank sensor cable tree	✔	✔	✔
• Corrugated pipe and connection group with cap valve, boiler filling and emptying valve and gauge for a heating expansion vessel	✔	✔	✔
• Assembly pack (with seals, outdoor sensor, attachment material, etc.)	✔	✔	✔
• Room controller for a heating circuit	✔	✔	✔
• Systems folder including commissioning and maintenance book, SC-3 operation (customer), product data sheets	✔	✔	✔
• Installation instructions (this document)	✔	✔	✔

✔ *= included, — = not included, O = optional*

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

5 Installation Conditions and Transport

CAUTION

Risk due to the heavy weight of the system

Risk of damage to the system and building

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

WARNING

Danger due to heavy transport weight (> 100 kg)

Personal injury or damage to property.

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

Fig.1: Carrying the SolvisBen

In particularly narrow spaces, you can remove the attached frame panel (for more information, see ➔ *fig. 103 (exploded view), page 66*).

Maintain the following conditions:

Storage

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

Transport and installation site

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

Installation

- Floors must be level at the installation site (+/-1 cm).
- The system must only be installed and operated in a frost-proof room inside a building.
- The system must not be installed in damp rooms such as kitchens, bathrooms or laundry rooms.

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

Observe the clearances.

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

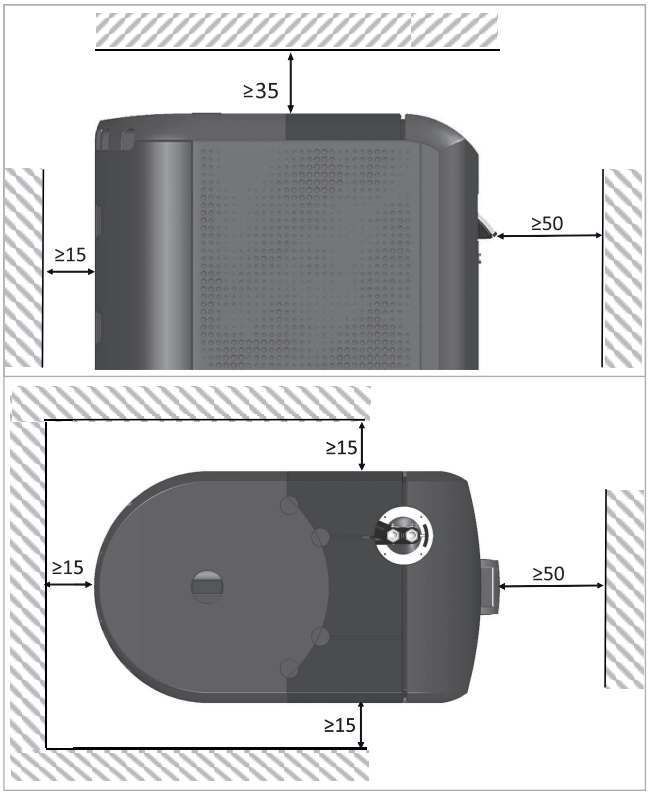


Fig. 2: Minimum spacings for the SolvisBen Solo (all dimensions in cm)

6 Installation

6.1 Heating expansion vessel

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).

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

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

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

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

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

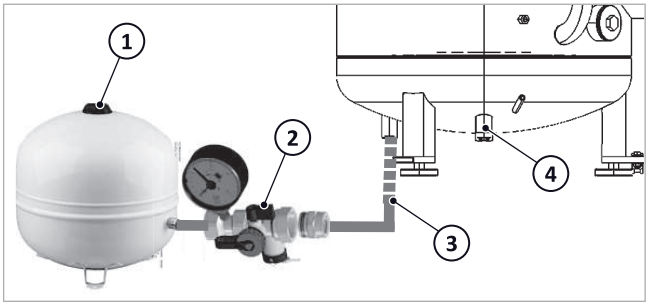


Fig. 3: MEV with connection group on the SolvisBen

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

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

6.2 Solar expansion (optional)

The SolvisBen can be enhanced with a thermal solar system. It already includes a solar stratified charger → *fig. 3* (**4**) for optimal stratification of solar heat in the storage tank and all the control functions for solar operation in the system controller.
The SÜS-5.5 solar heat transfer station that is available as an accessory part can easily be connected to the SolvisBen together with our Solvis collectors and the appropriate assembly material.

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

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

6.3 Storage tank

Installing and aligning the storage tank

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

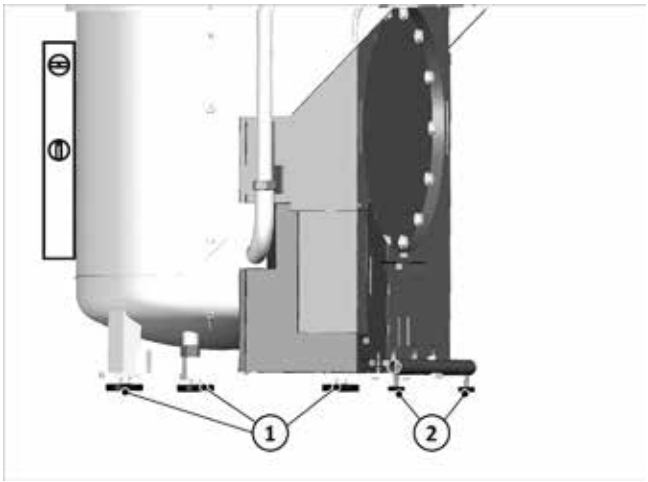


Fig. 4: Installing the storage tank

6.4 Electrical heating element (optional)

When using a combination of the Ben WP and SolvisLea Eco or SolvisMia, the electrical heating element cannot replace the heating cartridge! A Ben WP-HPT-VSG is always required!

Optional: Installing the electrical heating element

The EHS-3-230 elect. heat. element that is available as accessory part can be inserted into socket on SolvisBen to store surplus electr. from a photovolt. system, f. e., in SolvisBen in form of heat using suitable control devices.

1. Remove the front flange insulation (SolvisBen Solo) or fleece disc (SolvisBen -WP / -Lino) and place it to the side for later use.

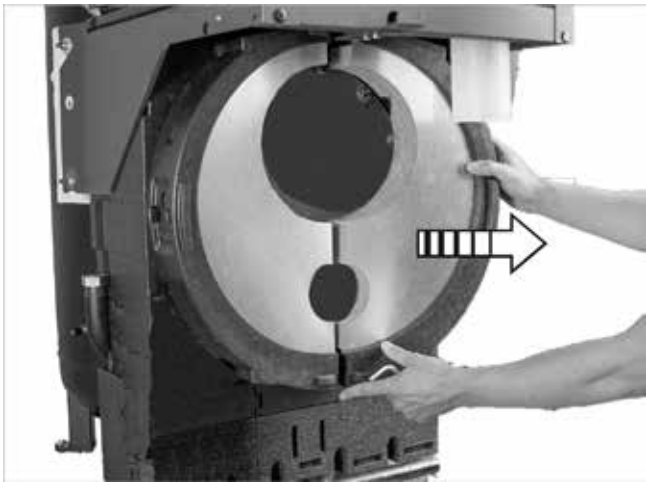


Fig. 5: Removing the front flange insulation (SolvisBen Solo))

2. Unscrew the fixing bracket (**2**) and carry handle (**3**) from the bottom container foot.
3. Remove the bleeder line and blow-out tube from the lead-through panel.

WARNING

Container without support feet – risk of overturning

Risk of injury due to overturning container.

- Secure the container against overturning.

4. First pull the rear flange insulation (**1**) forwards and then pull it down diagonally.

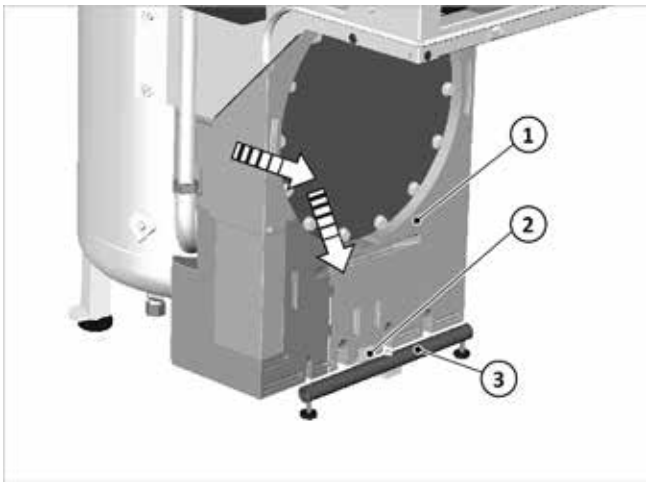


Fig. 6: Removing the rear flange insulation

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

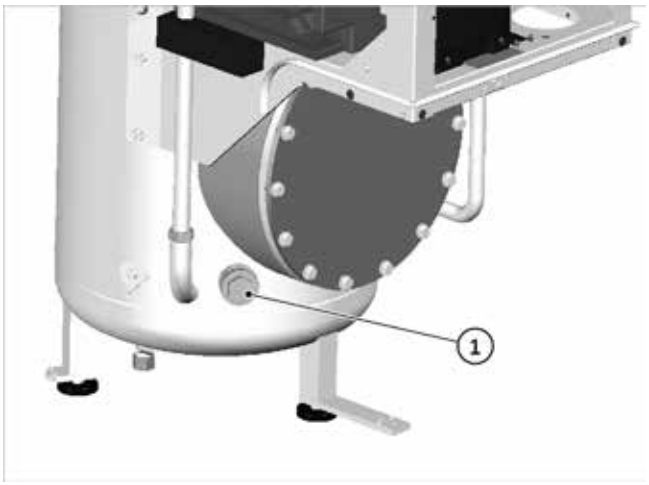


Fig. 7: Socket for electrical heating element

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

CAUTION

Note for start-up

Potential damage to the electrical heating element

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

Adjusting the rear flange insulation

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

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

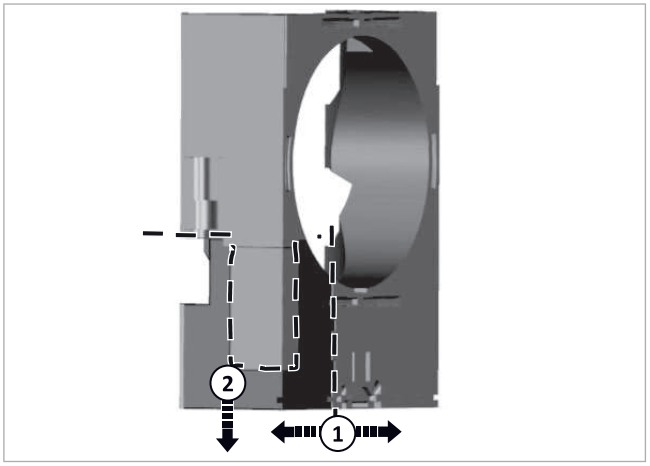


Fig. 8: Separating the flange insulation

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

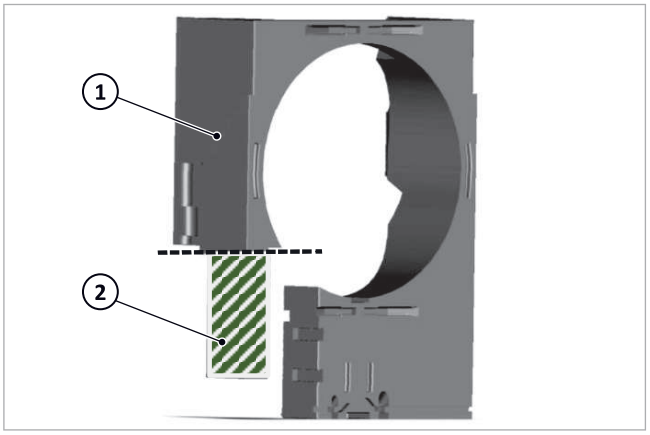


Fig. 9: Cutting the flange insulation

4. Move the main section over the SolvisBen flange in reverse order. Make sure that the flange insulation remains in position and does not become wedged.
5. Push the smaller section of the flange insulation over the electrical heating element connection box from below and then re-engage it with the main section of the flange insulation, first on the top and then on the side.
6. Screw the fixing bracket and carry handle with the support feet onto the container foot.

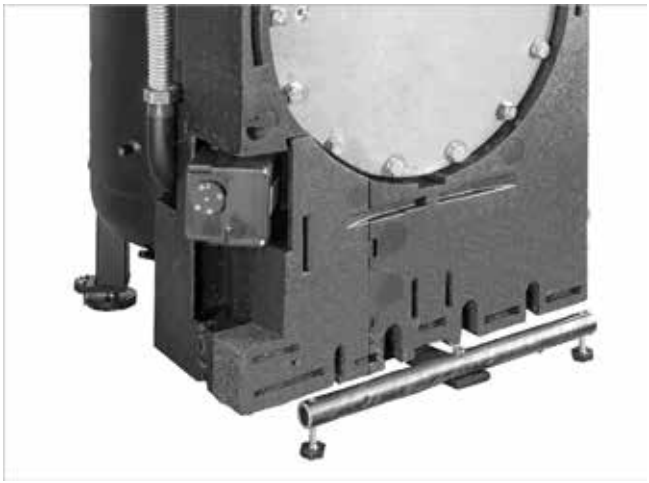


Fig. 10: Installed electrical heating element

7. Attach the additional insulation (**1**).

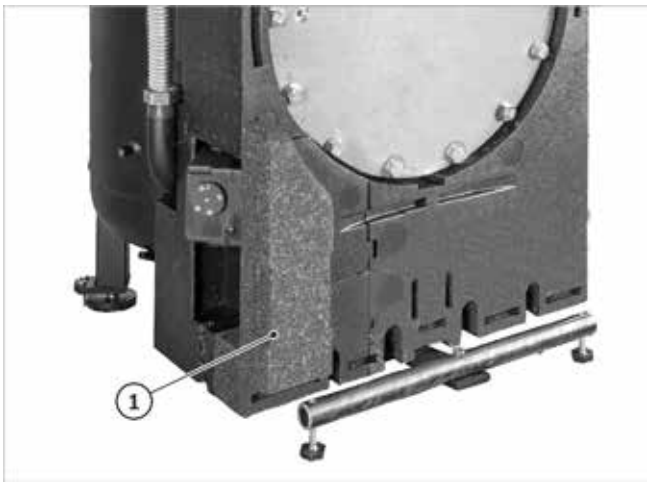


Fig. 11: Fitted additional insulation for the electrical heating element

6.5 Installing the insulation

Insulating the base

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

Fig. 12: Placing the floor disk under the storage tank

6.5.1 Rear tank insulation

Installing the rear tank insulation

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

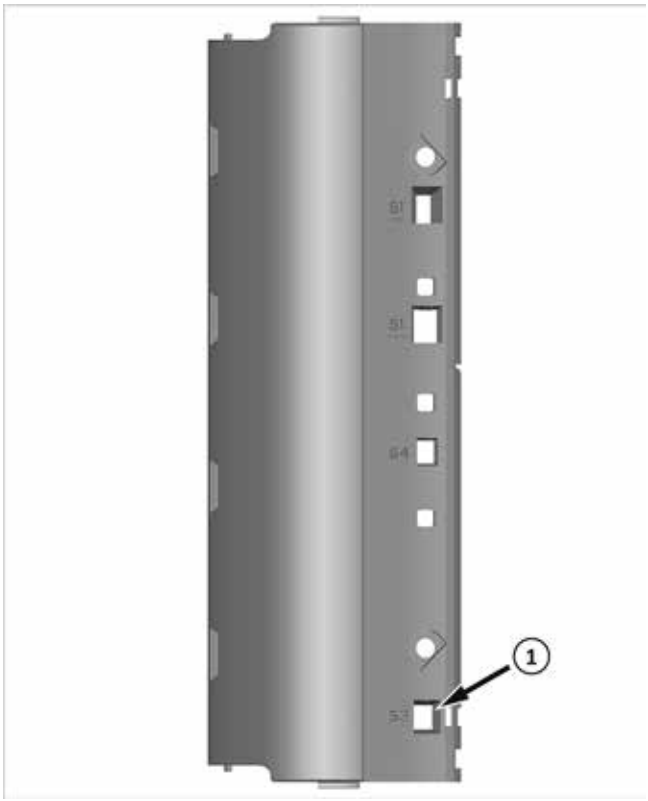


Fig. 13: Rear tank insulation, left side

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

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

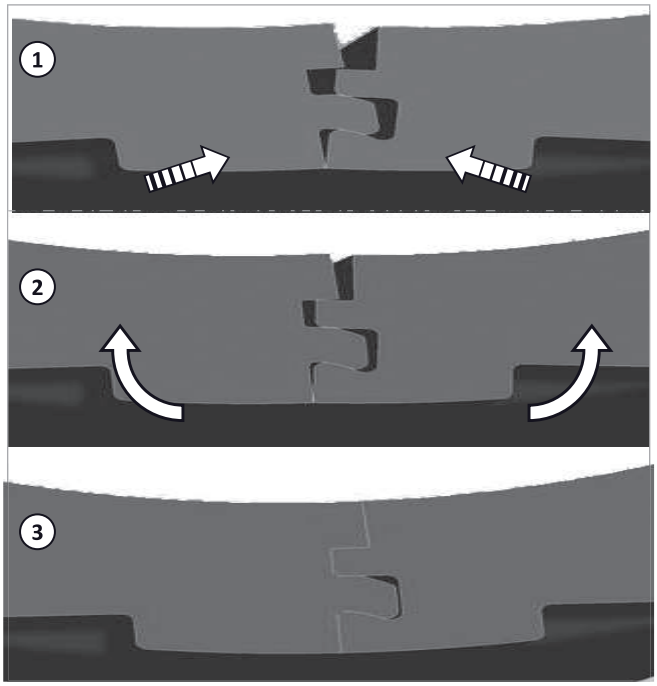


Fig. 14: Fitting together the individual sections

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

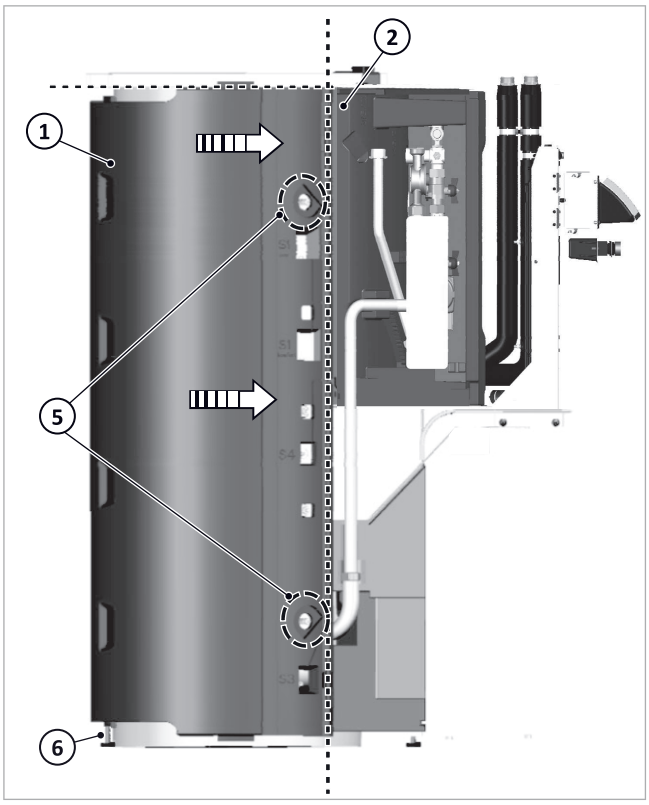


Fig. 15: Positioning the rear tank insulation

3. Use the angled washer (**3**) and screw (**4**) to fasten the tank insulation onto the tank at the top and bottom ➔ *fig. 15* (**5**).

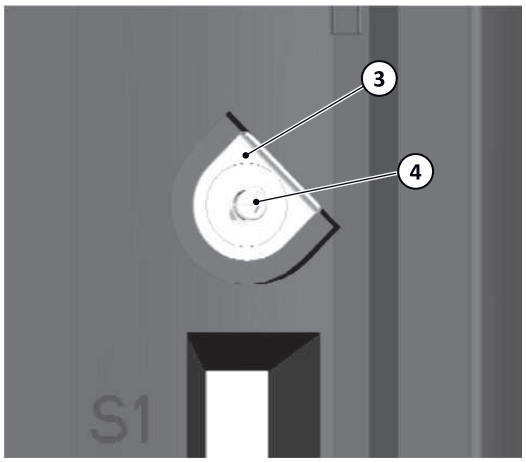


Fig. 16: Top screw connection for the tank insulation

You must:
- Align the straight top end of the rear tank insulation ➔ *fig. 15* (**1**) with the station insulation (**2**)
– level on the vertical to the station insulation ➔ *fig. 15* (**2**) and to the flange insulation.

4. Repeat steps 2 and 3 on the other side of the SolvisBen.
5. Check that the floor disc is positioned correctly.
6. Turn out the foot ➔ *fig. 15*(**6**) until it reaches the floor.

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

Insulating the cover

1. Position the cover disc (**1**) on the storage tank with the firm side facing upwards.
2. Fit the cable routing duct (**2**).

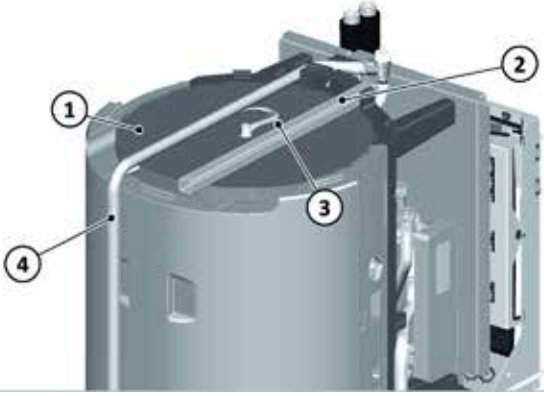


Fig. 17: Positioning the cover disc and cable ducts

3. Route the bleeder tube (**3**) back over the cover disc in a loop.
4. Above that, route the blow out tube (**4**) for the safety valve to the rear.

WARNING
Hot vapours or liquids
Risk of scalding
- Install the blow out tube in a way that rules out personal injuries or material damage due to any escaping liquid.

5. Route the blow out tube at an incline and with max. 2 elbows; do not extend it.
6. If necessary, secure it with duct clamps and preferably route it to a drain outlet through a funnel.
7. The bleeder tube can also be routed into a drain outlet or suitable container.

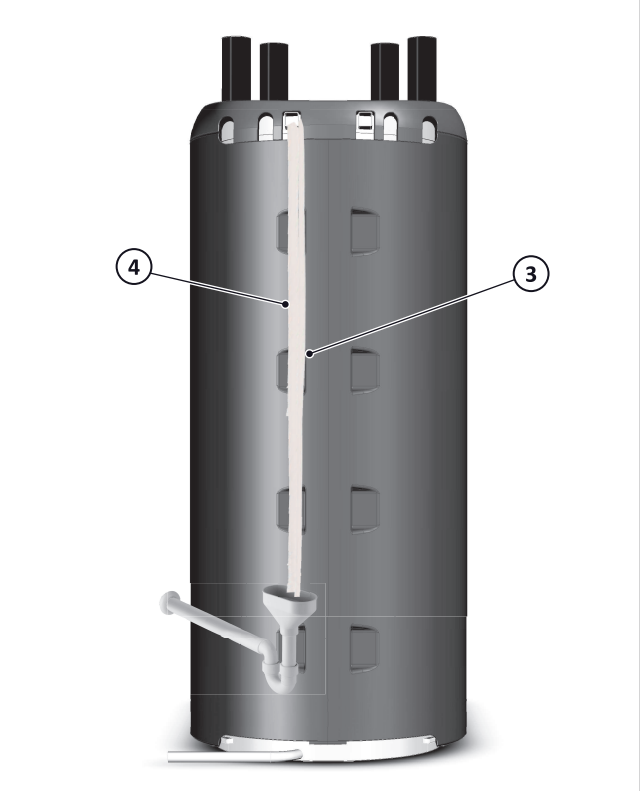


Fig. 18: Installing the blow out tube and bleeder hose

6.5.2 Positioning the sensor cable harness

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

Laying the shared spiral cable

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

1. Starting from behind, press the spiral cable (**1**) into the side slot on the insulation shell above the base panel.

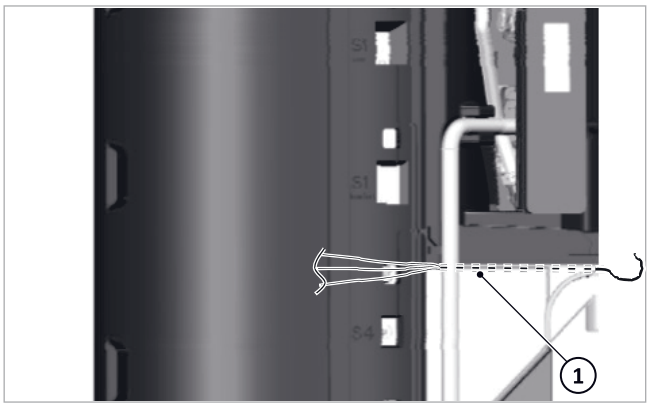


Fig. 19: Clamping the spiral cable

Fitting sensor S3 “Storage tank reference”

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

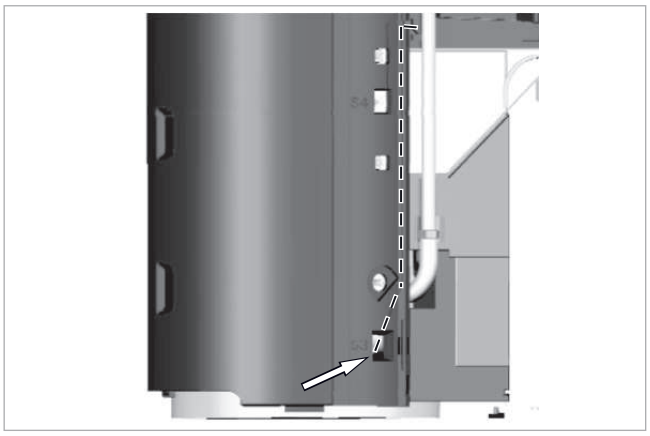


Fig. 20: Installing sensor S3

Installing sensor S4 “Upper heating buffer”

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

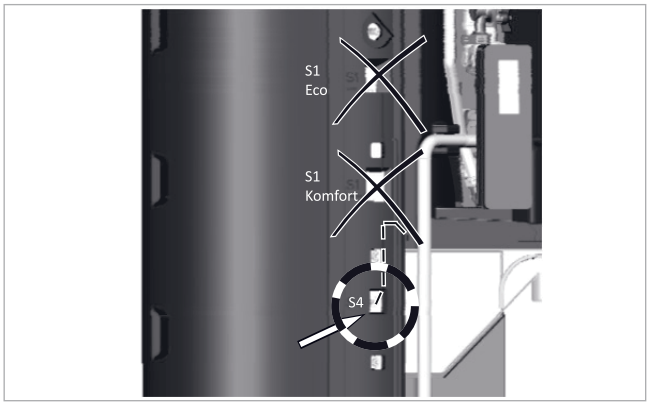


Fig. 21: Installing sensor S4

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

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

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

Reference values for selecting the appropriate position

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

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

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

Fitting sensor S1 at position “S1 Eco”

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

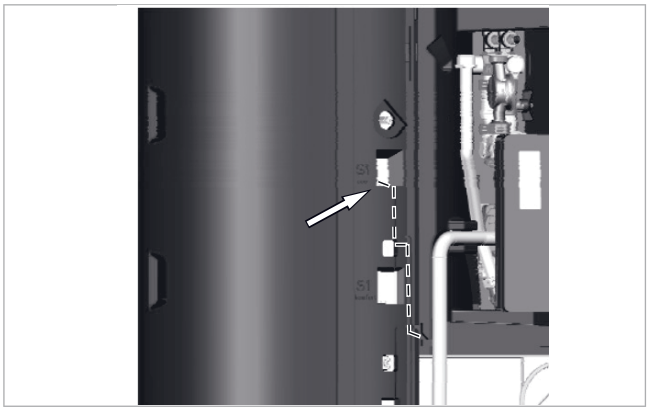


Fig. 22: Fitting sensor S1 in position “S1 Eco”

Fitting sensor S1 at position “S1 Comfort”

1. Take the sensor cable with the imprint “S1” and insert sensor S1 into the second sensor sleeve from the top

("S1 Comfort" imprint on the tank insulation) using heat conducting paste.

2. Push the sensor cable up into the slot on the rear container insulation from the bottom.

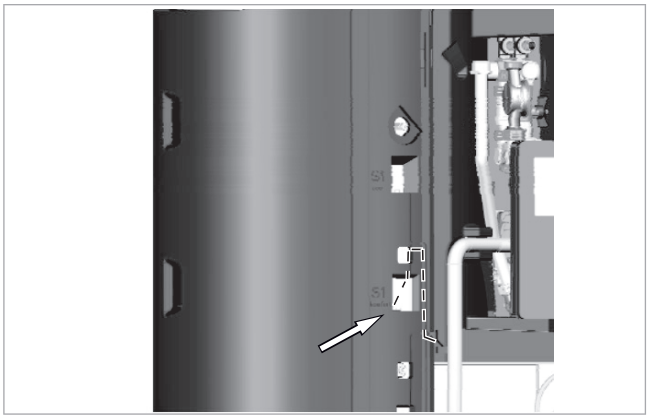


Fig. 23: Fitting sensor S1 in position "S1 Comfort"

6.6 Hot water station

CAUTION

Pressure fluctuations due to the hot water device

Overpressure may damage the system.

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

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

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

Preparing the drinking water connection

For the drinking water-side connection:

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

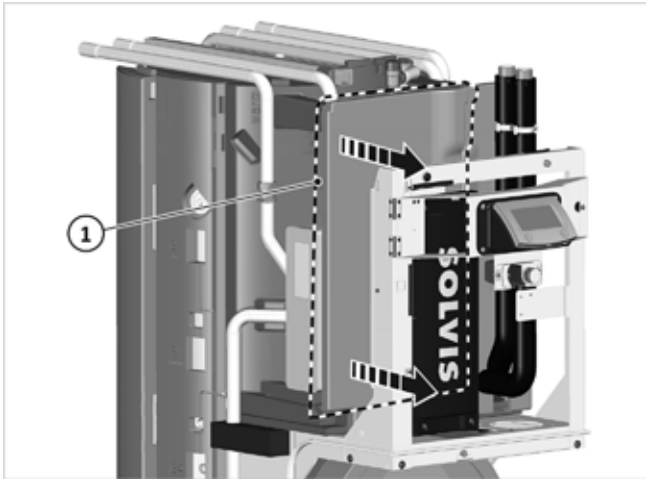


Fig. 24: Removing the front insulation cover on the hot water station (WWS)

Re-tightening the storage tank connections

Connections may have become loose during transport.

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

Fig. 25: Checking/retightening the return screw connection

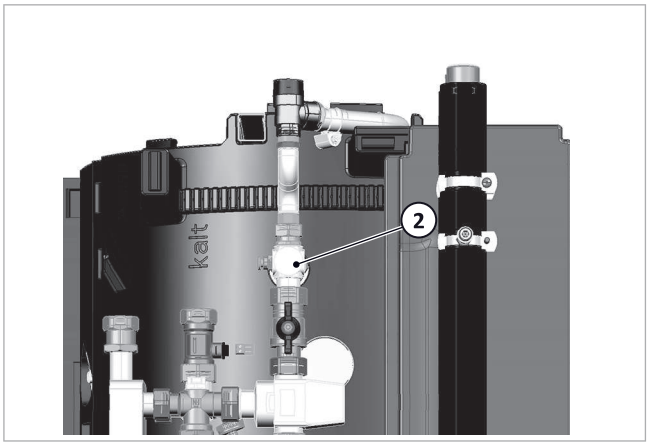


Fig. 26: Checking/retightening the flow screw connection

Fitting the connection from the top (standard)

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

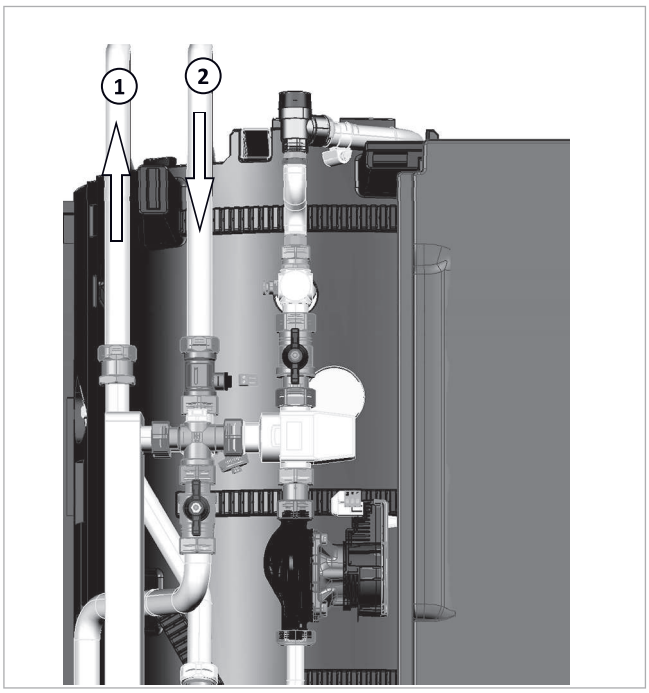


Fig. 27: Connecting the TWK/TWW connection from above

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

Be aware of changes in length.
- Take expansion elbows into consideration.

Optional: Fitting the connector from the rear

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

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

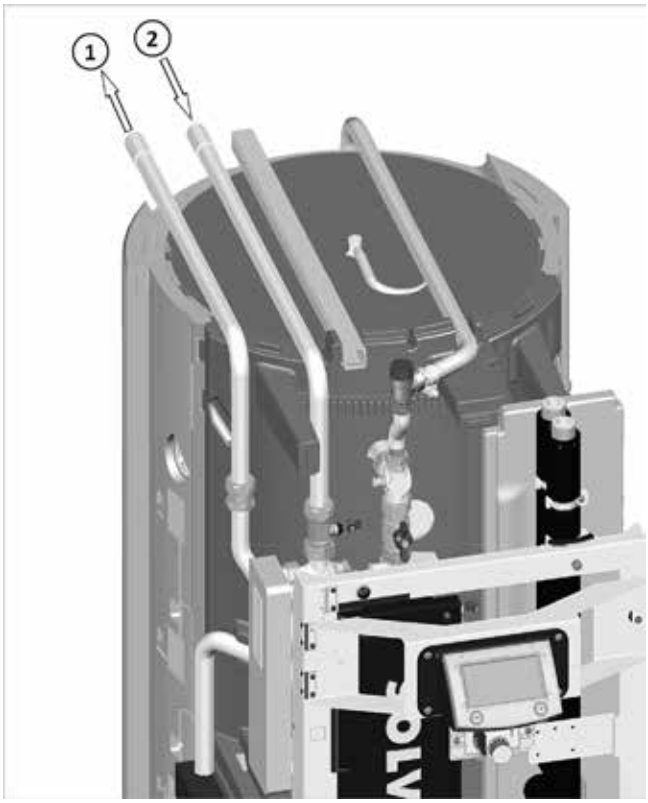


Fig. 28: Rear TWK/TWW connection

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

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

6.7 Heating circuits

6.7.1 With integrated heating circuit station

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

Preparing the hot water connection

For the hot water-side connection:

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

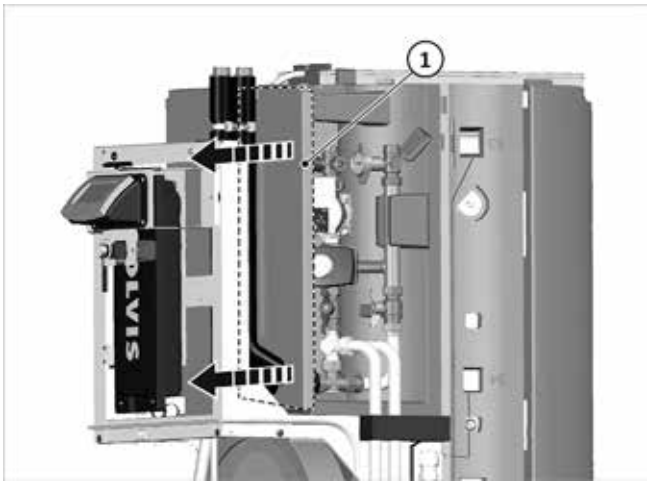


Fig. 29: Removing the front insulation cover for the heating circuit station

Re-tightening the storage tank connections

Connections may have become loose during transport.

1. Check that the union nuts on the flow and return brackets on the storage tank (**1**) are fitted tightly and retighten them if necessary.
2. Check that the union nuts on the corrugated pipe for the flow and below the check valve on the heating circuit station (**2**) are fitted tightly and retighten them if necessary.

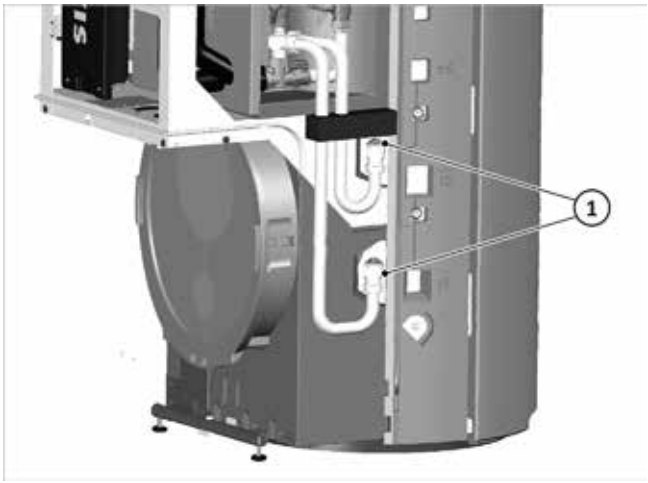


Fig. 30: Checking/retightening the heating circuit station connections

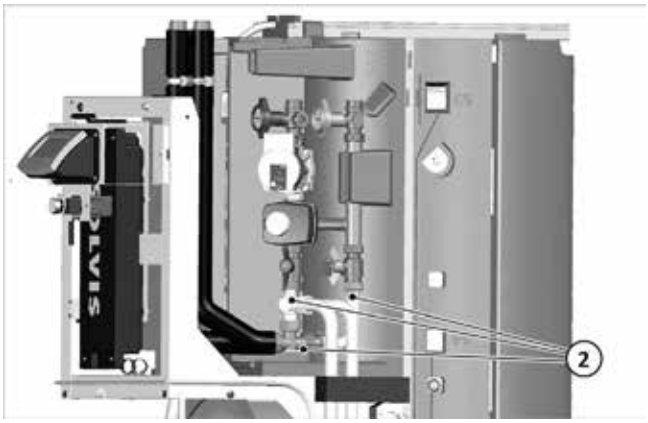


Fig. 31: Checking/retightening the flow/return connections

Fitting the connection from the top (standard)

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

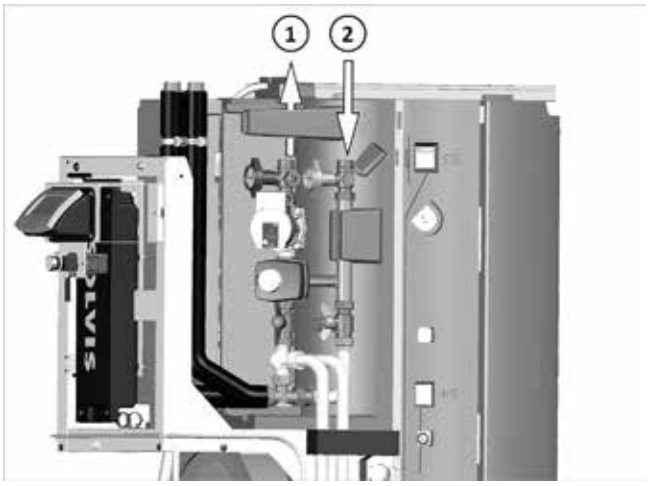


Fig. 32: H-VL/H-RL connection from above

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

Optional: Fitting the connection at the rear

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

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

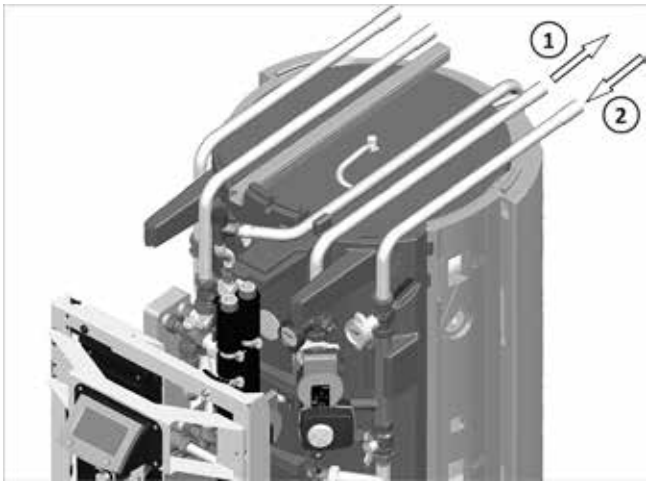


Fig. 33: H-VL/H-RL connection from the rear

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

6.7.2 With external heating circuit stations

For SolvisBen versions without a heating circuit station, external heating circuit stations can be connected to the SolvisBen.

SolvisBen WP and SolvisBen Lino only

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

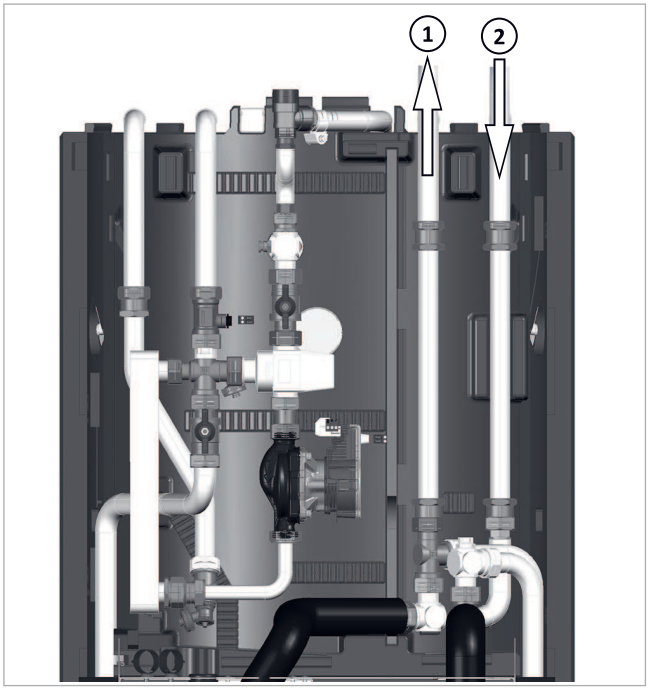


Fig. 34: H-VL/H-RL connection from above

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

SolvisBen Solo only

In the SolvisBen Solo, the flow and return lines for the external heat generator are connected to the heating flow and return lines outside the SolvisBen (see the system diagram ➔ *chapter "Appendix", page 48*).

Connecting an external heating circuit station from below

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

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

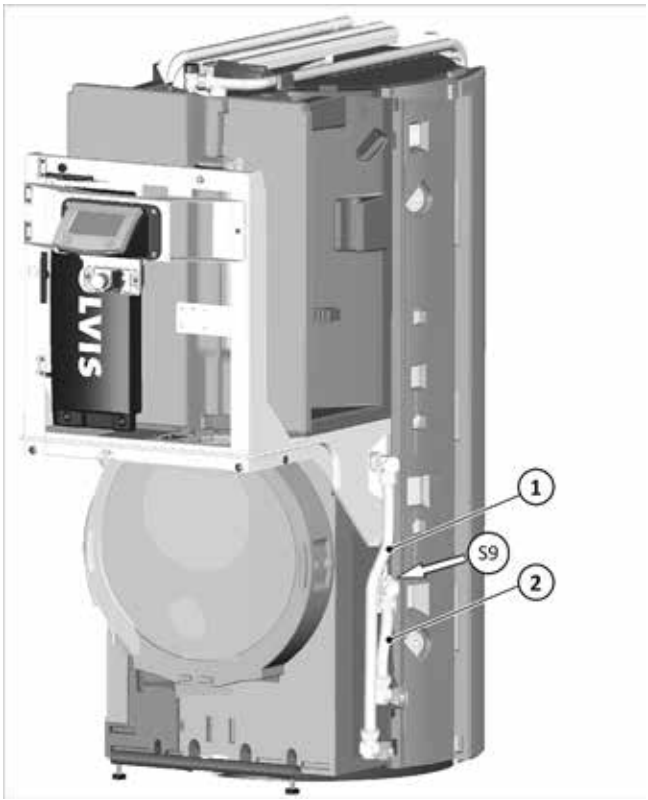


*Fig. 35: H-VL (**1**)/H-RL connection (**2**) for external heating circuit stations*

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

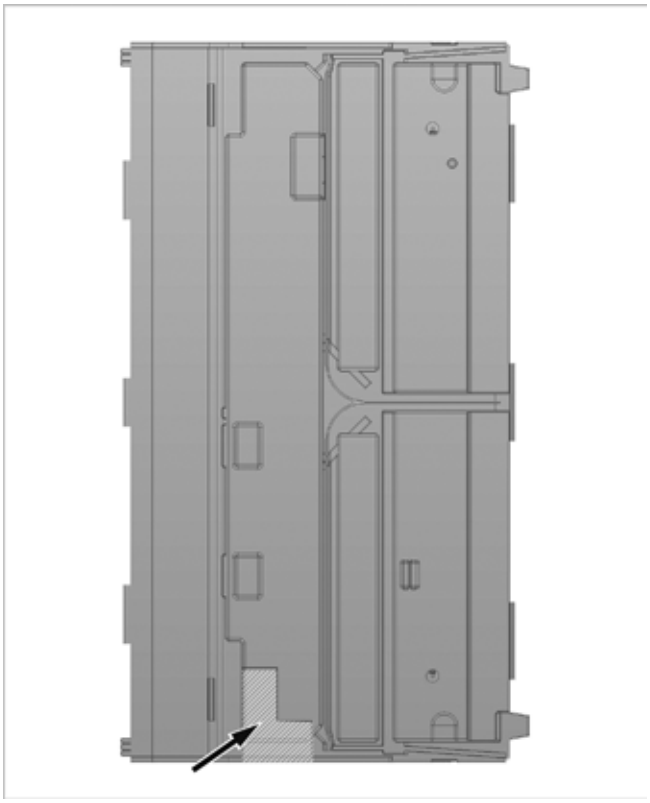


Fig. 36: Cutting the right-hand side part

Connecting an external heating circuit station from above

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

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

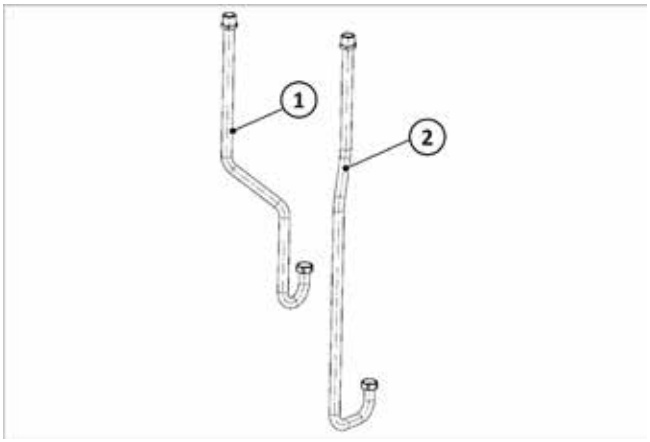


*Fig. 37: H-VL (**1**)/H-RL connection (**2**) for external heating circuit stations*

2. Fasten the pipes at the designated points and route them to the customer-supplied external heating circuit station from the top.
3. Alternatively, the connection pipes can be routed inside the SolvisBen insulation shell at the rear using the

connection set (**1**) that is available as an accessory part.

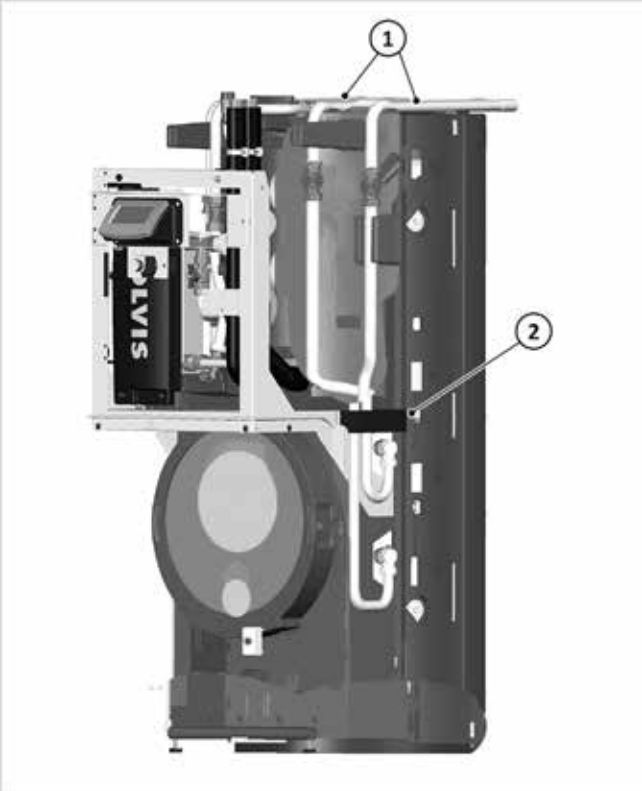


Fig. 38: Pipes routed at the rear

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

6.8 External heat generators

6.8.1 SolvisBen WP and SolvisBen Lino

The PLAS-WP and PLAS-LINO buffer charging stations for SolvisBen WP and SolvisBen Lino are integrated into the lower section of the frame panel. They are already hydraulically and electrically connected at the factory.

Connecting to the SolvisLea and SolvisLino 4

The supplied connection pipes can be routed down either on the left or right. To reverse the direction, the supply and return pipes are exchanged so that both pipes extend equally far to the right and left.

1. Install the appropriate pipes for the buffer charging station and sludge separator and connect them to the SolvisLea and SolvisLino using customer-supplied piping.

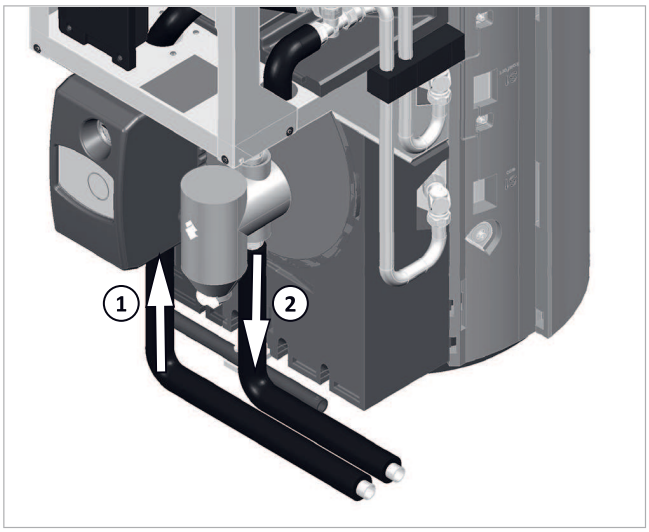


Fig. 39: Installing the connection tubes

1 *Heat generator flow (WE-VL)*
2 *Heat generator return (WE-RL)*

2. For the relevant EPP side section, an internal piece in the lower area must be cut out along the marking.

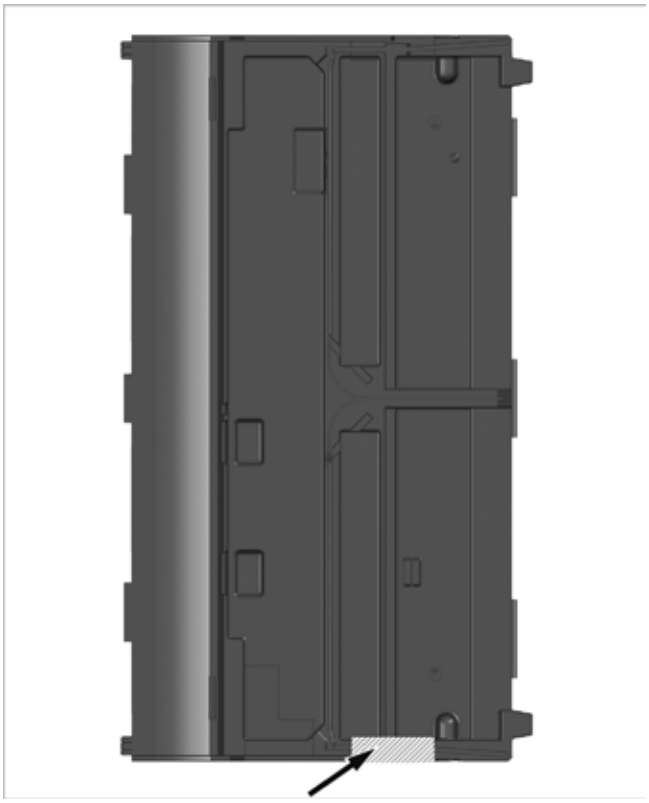


Fig. 40: Cutting out the relevant EPP side section

6.8.2 SolvisBen WP-HPT-VSG

Like with the SolvisBen WP-HPT-VSG, the PLAS-WP buffer charging station is integrated into the lower section of the frame panel. In addition, a heating cartridge and a combined volume flow/temperature sensor and a safety valve are included in the flow below the buffer charging station. A power supply must also be connected here; see ➔ *chapter "Voltage supply for heating cartridge" on page 29*.

Connecting to the SolvisLea Eco or SolvisMia

The supplied connection pipes can be routed down either on the left or right. If required, the pipes can be shortened.

1. Install the pipes appropriately on the elbow of the safety valve and on the sludge separator and and connect them to the SolvisLea Eco or SolvisMia using customer-supplied piping.

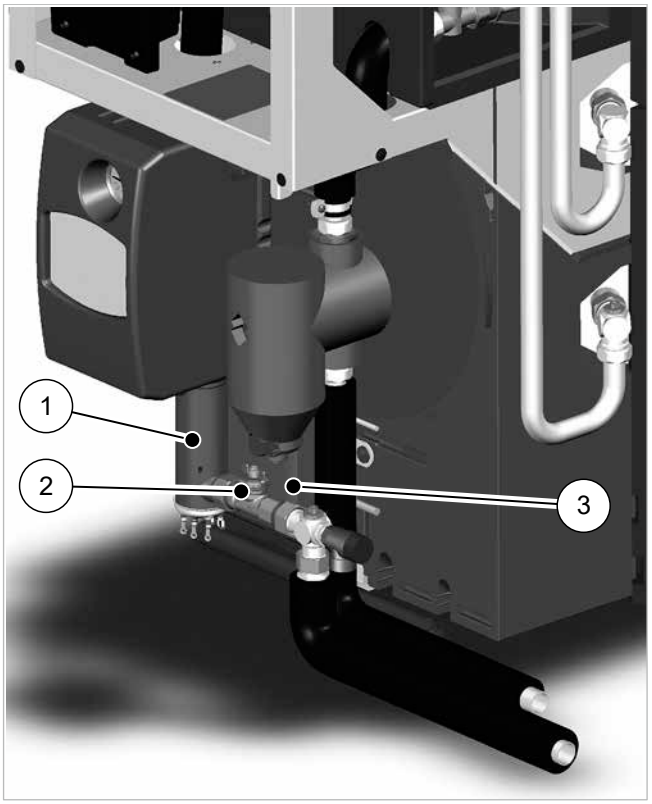


Fig. 41: Installing the connection tubes

1 Heating cartridge
2 Volume flow sensor
3 Connection box

2. For the relevant EPP side part, an internal piece in the lower area must be cut out along the marking.

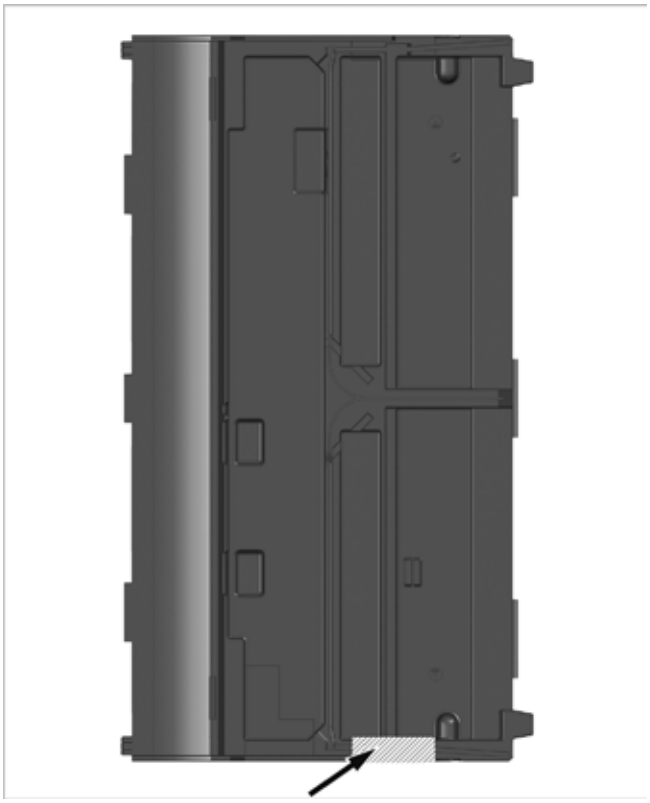


Fig. 42: Cutting out the relevant EPP side section

6.8.3 Solo with integrated heating circuit station

Fitting the connection from above

For the SolvisBen Solo with HKS-G-4.0, the connection to the external heat generators is made from the top in the area in front of the heating circuit station.

1. Connect the heat generator flow (HG-FL) and return (HG-RN) vertically from above.
   - WE-VL: front pipe
   - WE-RL: rear pipe

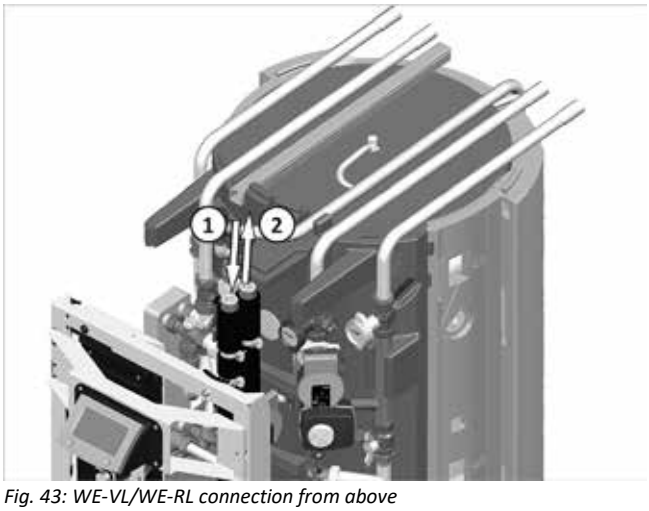


Fig. 43: WE-VL/WE-RL connection from above

1 *Heat generator flow (WE-VL)*
2 *Heat generator return (WE-RL)*

6.8.4 Solo with external heating circuit station

In SolvisBen Solo variants with no heating circuit station, an external heat generator is connected to the customer-supplied heating flow and return connection lines for the external heating circuit stations (see ➔ *chapter "With external heating circuit stations", page 19* and ➔ *chapter "Appendix", page 48*).

6.9 Electrical connection

6.9.1 General information

DANGER

Risk of electrical shock

Damage to health, cardiac arrest possible.

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

CAUTION

Observe ambient conditions

Malfunction or failure of system possible.

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

CAUTION

Country-specific regulations

Regulations can differ depending on the country and the region.

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

WARNING

In the event of incorrect mains connection

Contact voltages can be extremely hazardous.

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

CAUTION

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.

6.9.2 Line routing in the SolvisBen

Routing and connecting the pipes

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

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

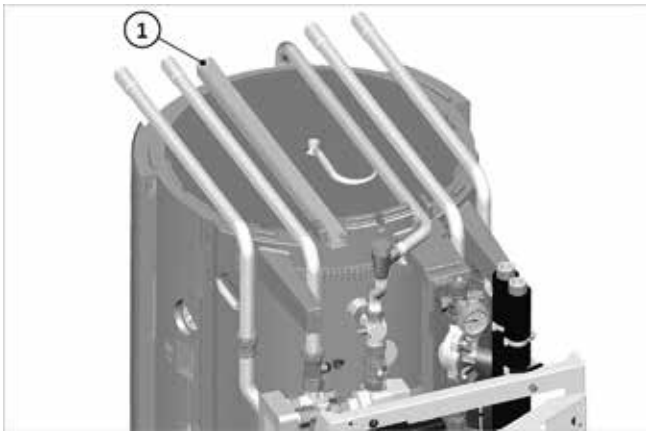


Fig. 44: Cable routing duct

2. Now guide the lines in the area of the hot water station behind the hot water station to the bottom left.

3. The lines exit from the front of the hot water station insulation in the bottom left corner.

4. The lines can be pushed into the slots of the rear insulation shell (**2**) to fix their course in place.

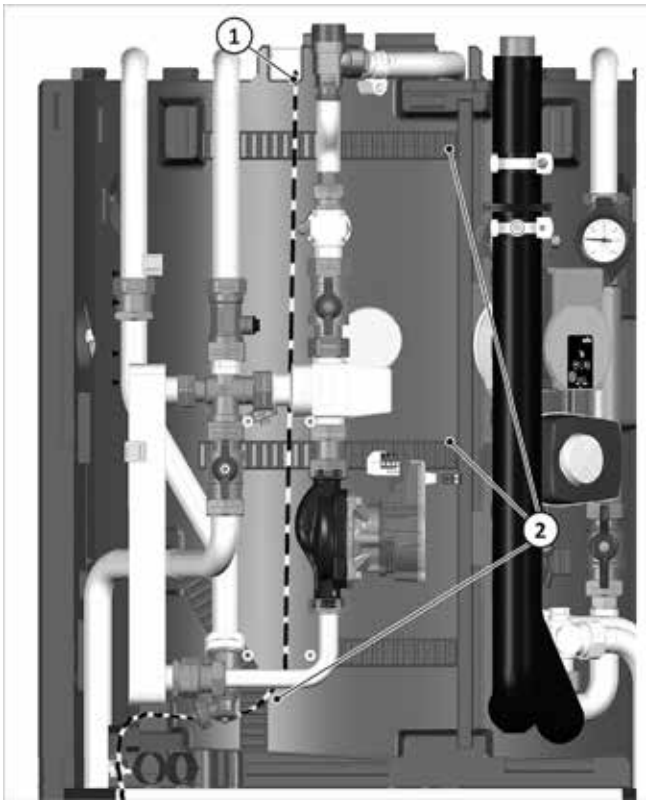


Fig. 45: Cable routing through the hot water station insulation

1 *Cables*
2 *Slots in the insulation shell*

5. Route the low-voltage lines (**1**) into the mains circuit board from below and apply them.

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

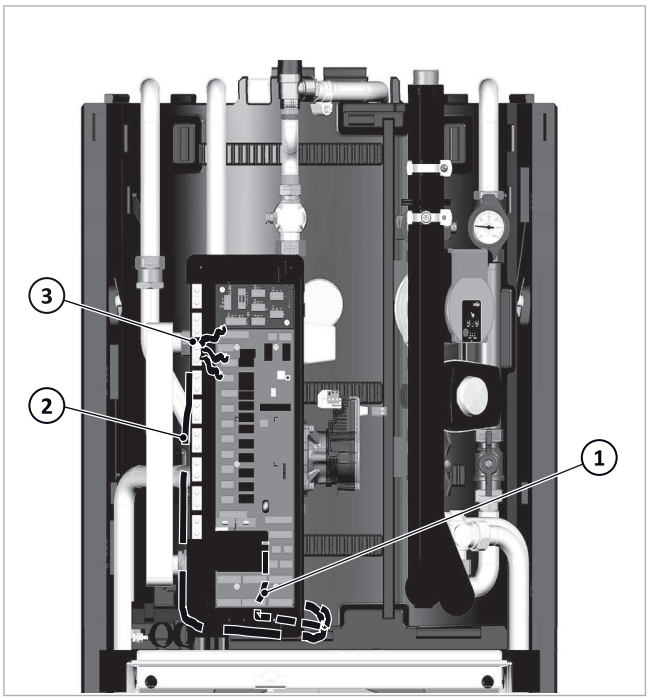


Fig. 46: Connecting to the mains circuit board

1 *Low-voltage lines*
2 *Lines over 50 V*
3 *Strain relief devices*

6.9.3 Equipotential bonding

DANGER

Be careful of electrically conductive parts

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

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

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

Connect the equipotential bonding

Incorporate the unit into the local equipotential bonding.

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

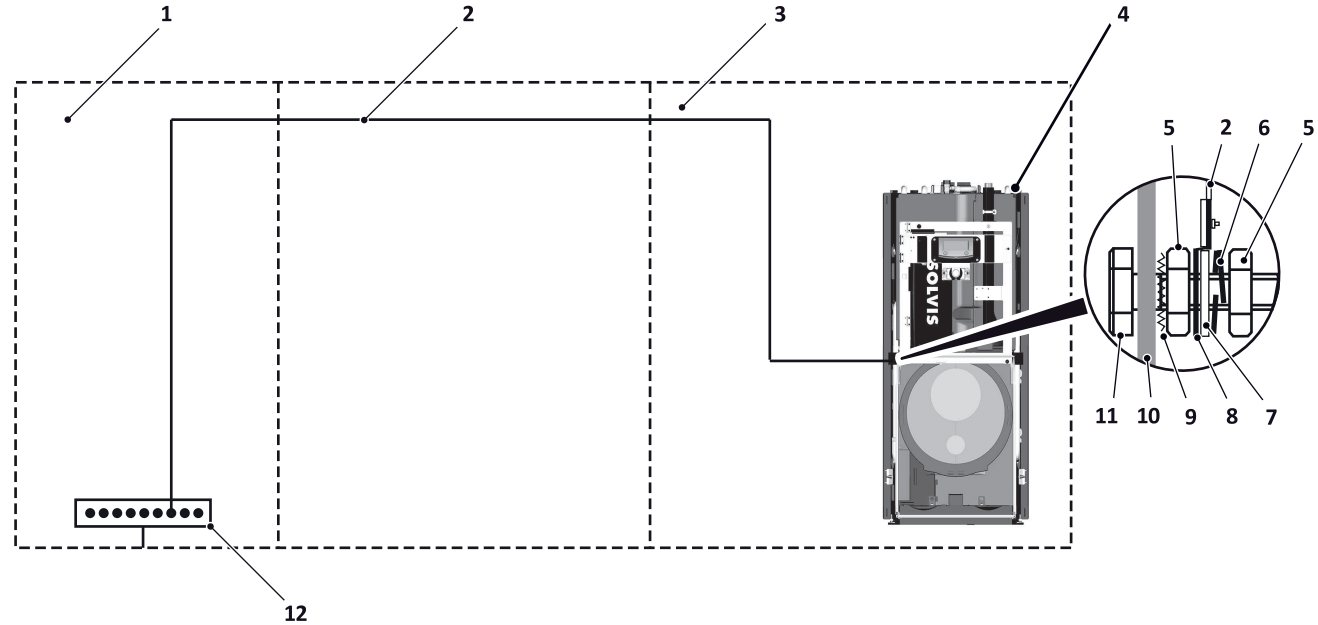


Fig. 47: Equipotential bonding for the SolvisBen Solo

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

6.9.4 Connecting the outdoor sensor

Fitting the outdoor sensor

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

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

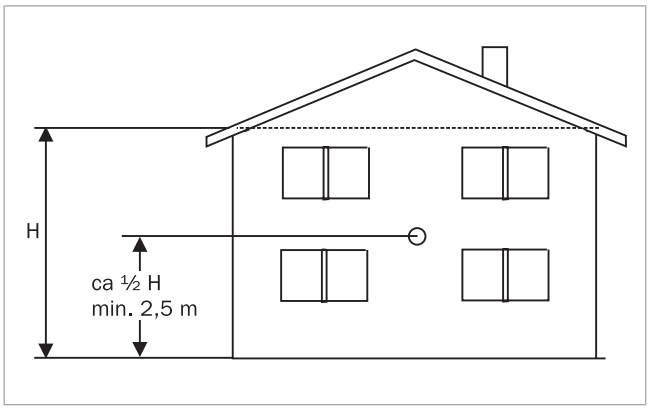


Fig. 48: Position of the outdoor sensor

6.9.5 Connecting the room controller

Fit the housing

DANGER

Risk of electrical shock

Damage to health, cardiac arrest possible.

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

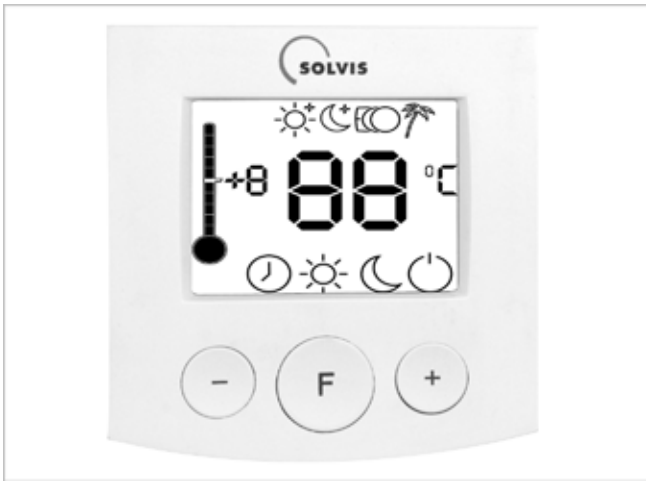


Fig. 49: Room controller BE-SC-3

- 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 50*).
3. Fix the housing to the wall with the supplied plugs and screws.

Fig. 50: 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. 51*).

Fig. 51: 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.

6.9.6 Preparing the Modbus connection (SolvisBen WP only)

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

Installing the Modbus junction box

1. Route the Modbus line of the junction box through the cable routing duct ➔ *Fig. 44* (**1**) in the cover area.
2. Install the junction box at a suitable location.

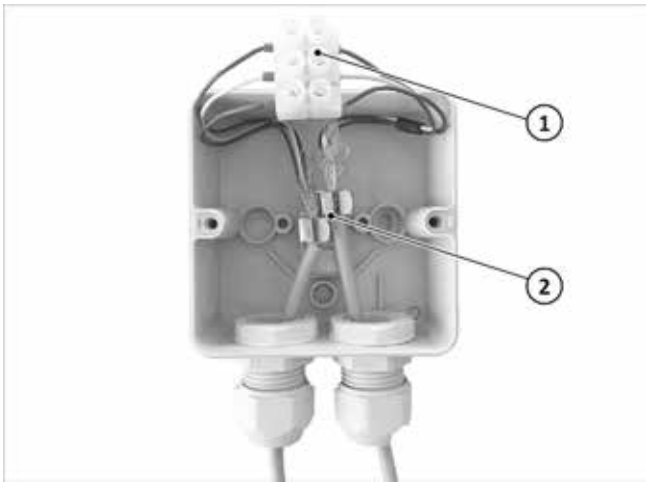


Fig. 52: Attaching the Modbus junction box

1 *Connection terminals*
2 *Shield clamps*

Connecting the Modbus cable from the heating pump

1. Open the junction box.
2. Insert the shielded Modbus cable from the heating pump 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 also ➔ *SolvisLea (MAL-LEA), SolvisLea Eco (MAL-LEA-E) or SolvisMia (MAL-MIA) installation instructions*.

6.9.7 Connecting external heating circuit pumps

Connecting heating circuit pumps

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

Installing the flow sensor

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

Connecting the actuator drives of the heating circuit mixer

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

Checking the heating circuit mixer

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

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

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

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

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

6.9.8 Connecting a solar station (optional)

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

Connection of the collector sensor

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

6.9.9 Connecting SmartGrid (optional)

SolvisBen WP only

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

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

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

6.9.10 Heating pump voltage supply

Only SolvisLea via SolvisBen WP

The voltage supply of the internal heating pump control, including the control lines for switching the integrated electrical heating elements of the SolvisLea, is supplied by the mains circuit board of the SolvisBen WP.

Connecting the voltage supply for SolvisLea

1. Route the 5-wire supply cable from the SolvisLea to the mains circuit board and connect it to the terminals A12 PE/N/L/A12 and A13 of the mains module.
2. Lead the supply line through the strain relief device and secure.

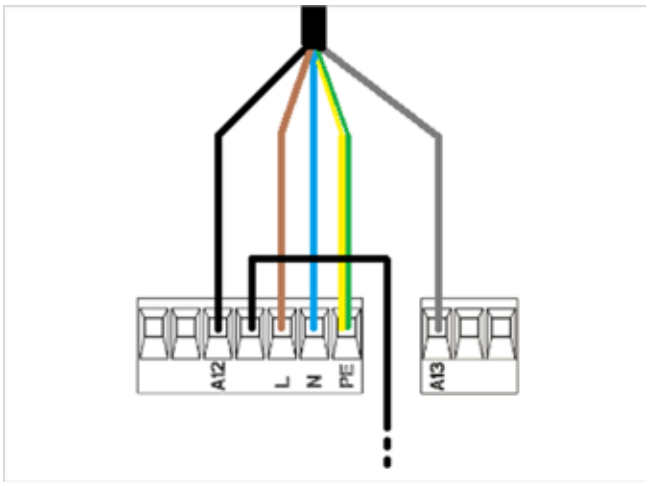


Fig. 53: Connecting SolvisLea

Only SolvisLea Eco via SolvisBen WP-HPT-VSG

The power for the internal heating pump controller is also supplied via the mains circuit board of the SolvisBen WP-HPT-VSG in this case.

Connecting the voltage supply for SolvisLea Eco

1. Route the 3-wire supply cable from the SolvisLea Eco to the mains circuit board and connect it to the terminals A12 PE/N/L of the mains circuit board.
2. Lead the supply line through the strain relief device and secure.

The compressor itself is supplied with voltage separately and not through the SolvisBen; see ➔ *section "Electrical connection" in the installation instructions (MAL-LEA, MAL-LEA-E or MAL-MIA).*

The SolvisMia heating pump does not require a power supply from the SolvisBen.

6.9.11 Voltage supply for heating cartridge

Only SolvisLea Eco with SolvisBen WP

Technical data: heating cartridge

- Electrical power: 6.2 kW
- Connection: 2L/N/PE
- Fuses: 2 x B16A

Connecting the heating cartridge

1. Open the connection box and connect the customer's supply line (min. 2.5 mm²) to the feedthrough terminals (**1**).
2. Close the connection box again.
3. Connect the plugs for the control line on the mains circuit board (A12 and A13).

Fig. 54: Junction box

6.9.12 Mains connection

Checking the connections on the mains module

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

For connection diagrams, see ➔ *chapter "Appendix", p.48*.

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.

6.9.13 Completing the connection tasks

Closing the front WWS insulation cover

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

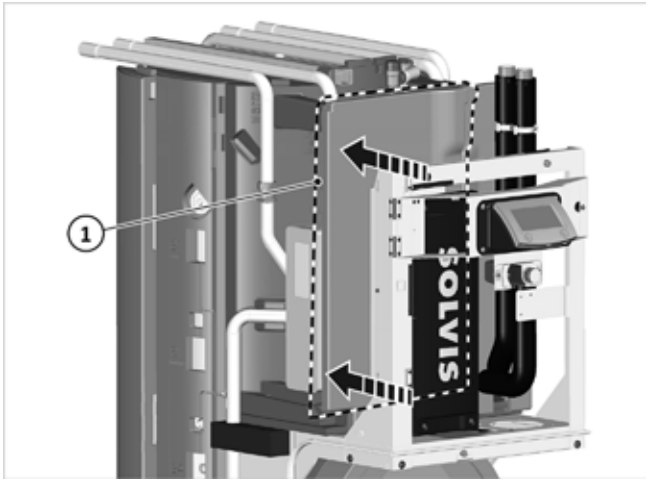


Fig. 55: Installing the front insulation cover on the WWS hot water station

Closing the front HKS insulation cover if necessary

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

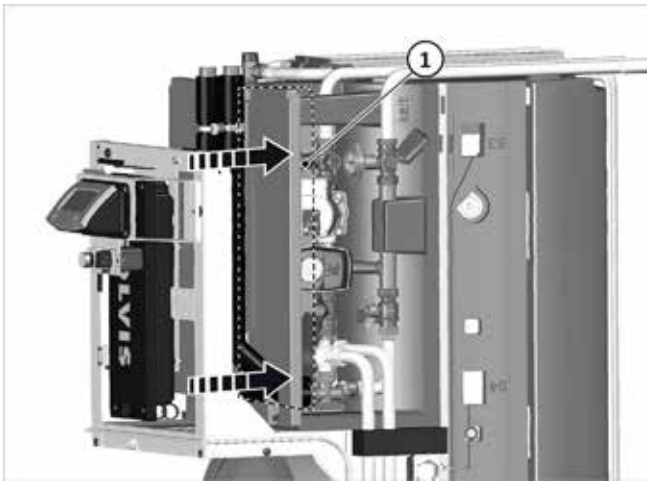


Fig. 56: Attaching the HKS front insulation cover

Close the protective housing for the mains module

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

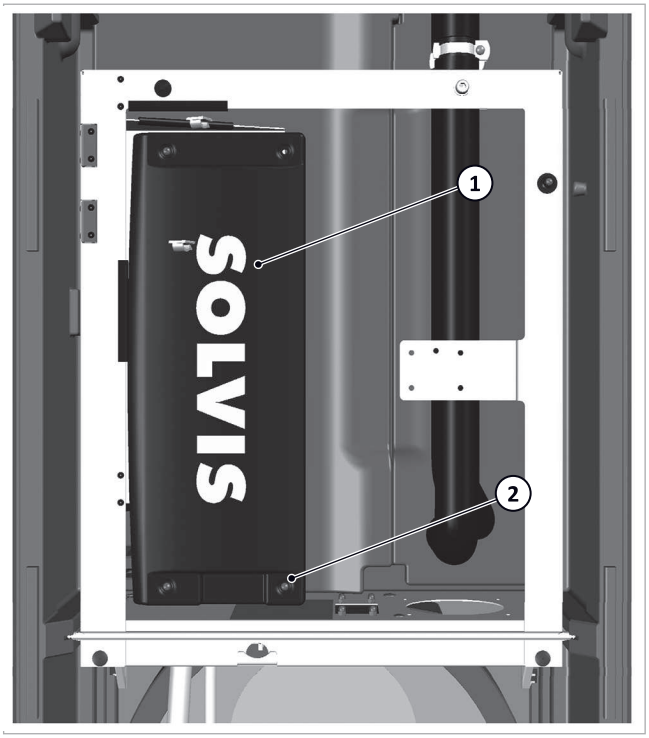


Fig. 57: Attach the cover of the mains circuit board

7 Start-Up

Start-up takes place in the prescribed order:

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

7.1 Storage tank

CAUTION

Observe the quality of the 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.

Fill the system (pressure test)

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

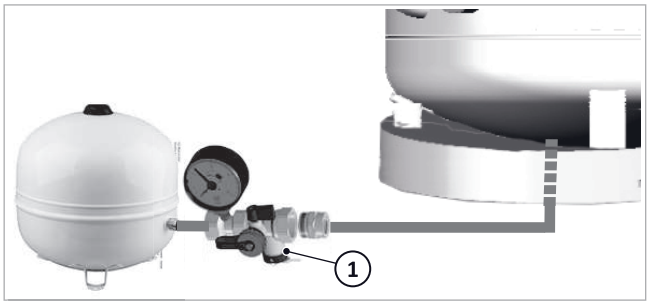


Fig. 58: Boiler filling and emptying valve on the MEV connection group

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.

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

7.2 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).*

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).*

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

7.3 Thermal mixing valve

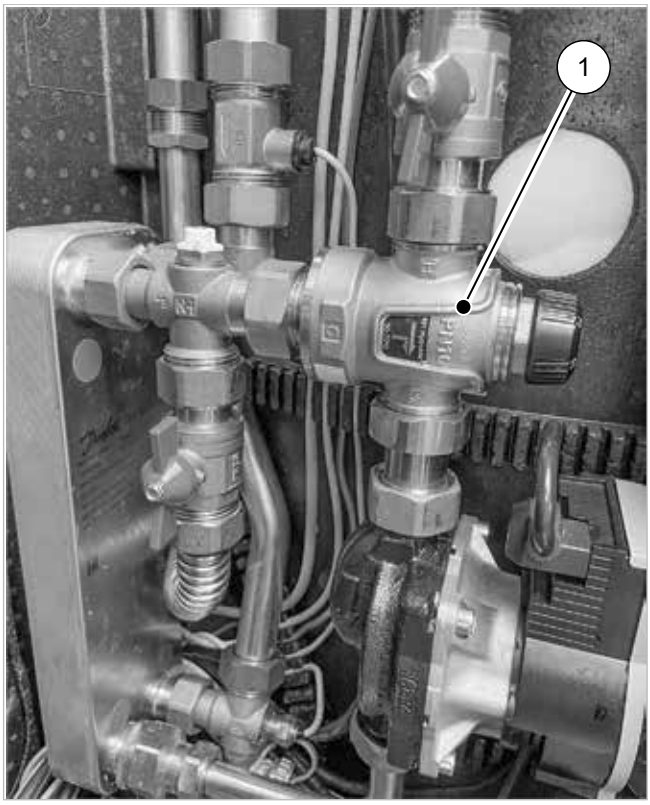


*Fig. 59: Thermal mixing valve (**1**) in the SolvisBen hot water station*

TMV factory default

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

Fig. 60: Setting the TMV

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

- WWS-24/WWS-30: "**65 °C**"

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

7.4 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.

7.5 Wilo PARA heating circuit pump (integrated HKS)

If the pump does not bleed automatically:

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

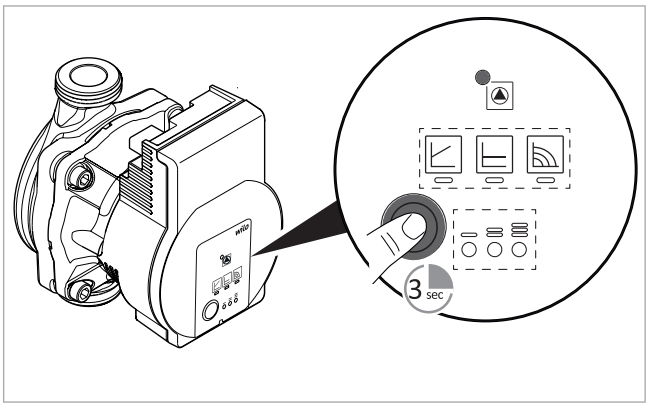


Fig. 61: Starting bleeding

The bleeding function starts and lasts for 10 minutes.

The upper and lower LEDs flash alternately every second.

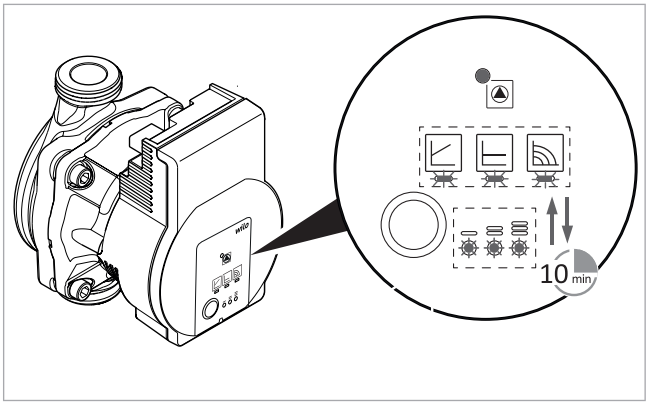


Fig. 62: Bleeding activated display

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

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

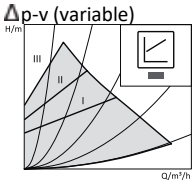
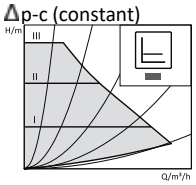
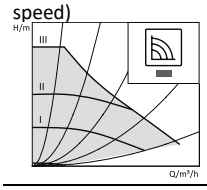
Setting the delivery height and control type

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

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

For detailed pump characteristic curves, see ➔ *chapter "Heating circuit distribution", page 45*.

Note on the control types

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

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

Setting the control type

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

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

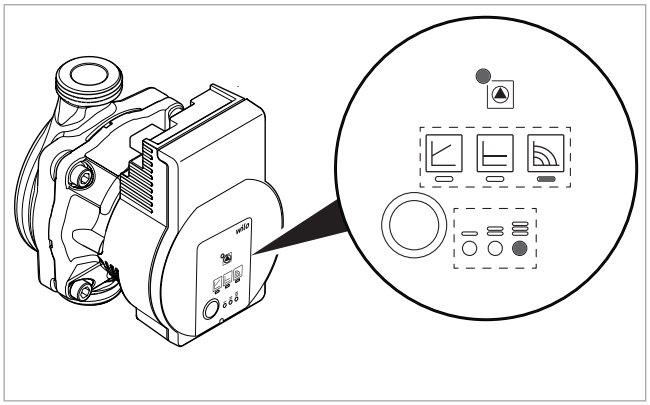


Fig. 63: Basic setting (constant speed, characteristic curve III)

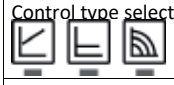
The LEDs indicate the set control type and characteristic curve.

Navigating through the menu

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

** Recommended setting if additional details unknown.*
*** Press the 9th button to return to the basic setting (constant speed, characteristic curve III, see* ➔ Fig. 63*).*

Overview of setting the pump

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

7.6 Buffer charging station pump – SolvisBen WP

7.6.1 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.

7.6.2 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 "**Outputs**" → "**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**".

7.7 Buffer charging station pump – SolvisBen Lino

7.7.1 Adjustment options

The Grundfos UPM3 HYBRID provides five different control types, each with up to three control curves. We recommend the following control type in combination with the SolvisBen Lino and SolvisLino 4:

- **PWM profile C**
  The pump speed is based on the PWM signal from the SolvisControl 3 controller. If the signal stops, the pump stops.

7.7.2 Pump control panel

The control panel consists of a pushbutton, two red/green LEDs and three yellow LEDs.

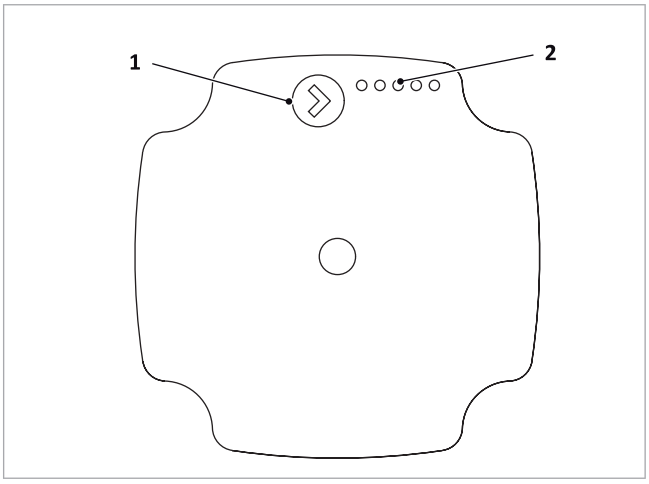


Fig. 64: Grundfos UPM3 Hybrid control panel

1 *Pushbutton*
2 *Five LEDs (2 x red/green, 3 x yellow)*

7.7.3 Fault display

In the event of a fault, the first LED lights up red and the others provide information about the type of fault (see ➔ *chapter "Grundfos UPM3 malfunction messages", page 41*).

7.7.4 Control type setting

Setting control mode

1. Each time that you press the button, you switch to a different control mode. The LEDs flash and indicate the current control mode.
2. Repeat this process until the desired control mode is displayed.
3. After 10 seconds, the display switches back to the operating display and the last setting remains saved.

Setting with SolvisLino 4

Pump setting when connecting the SolvisLino 4 pellet boiler

Control mode	LED 1	LED 2	LED 3	LED 4	LED 5
PWM profile C – signal off	–	Green, 1x/sec	Yellow	Yellow	Yellow
PWM profile C – signal on	–	Green, 12x/sec	Yellow	Yellow	Yellow

7.8 Basic settings

Carrying out the basic settings

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

1. Perform the SolvisControl basic settings.

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

7.9 Final Tasks

7.9.1 Check

Testing the hot water temperature

1. Test the hot water temperature of a tap.

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

7.9.2 Top tank insulation

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

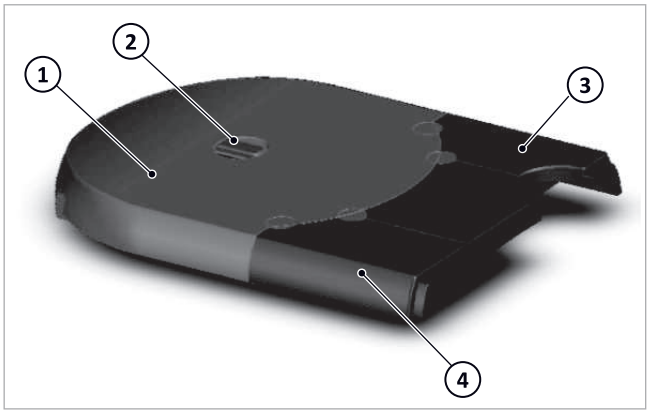


Fig. 65: Top SolvisBen insulation

Fitting the insulation for connections from above

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

1. Take off the top insulation sections for the hot water station → *fig. 65* (**4**) and heating circuit station → *fig. 65* (**3**) from the top.
2. Take the tank insulation → *fig. 65* (**1**) and carefully cut off the four foam plugs along the grooved slot (6) on the hot water station (**5**) using a sharp knife.
3. **Only with an integrated heating circuit station**: Cut off the plugs for the heating circuit station (**7**) along the slots (**8**).

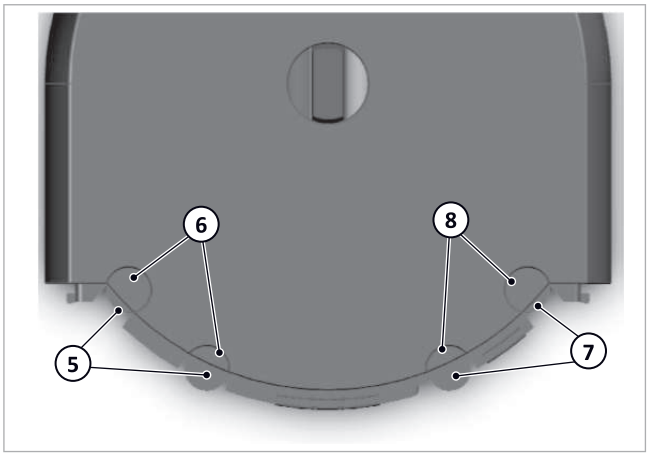


Fig. 66: Cutting the pipe lead-throughs

4. Place the top tank insulation → *fig. 65* (**1**) on the tank.
5. Engage the top tank insulation with the tank insulation. There are four catching points:
   - On the left and right side (**1**)
   - In the middle at the rear (**2**)
   - In the middle at the front (**3**)

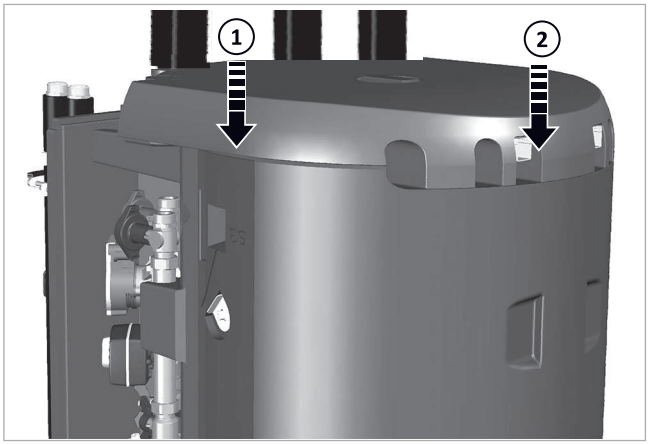


Fig. 67: Right and rear catch

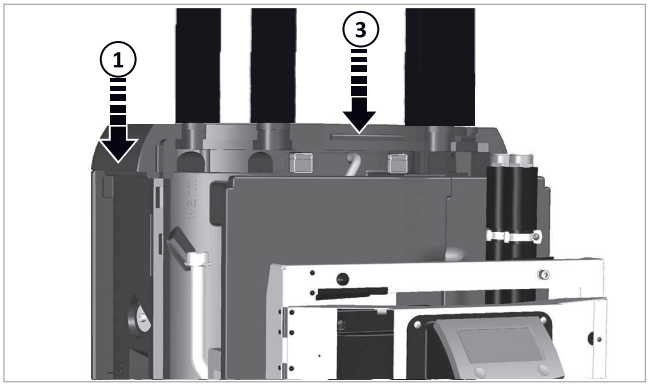


Fig. 68: Left and front catch (SolvisBen Solo)

6. Take off the top insulation for the hot water station ➔ *fig. 65* (**3**).
7. To ensure minimal heat loss, fit the pipe insulation (**1**) flush with the top insulation.

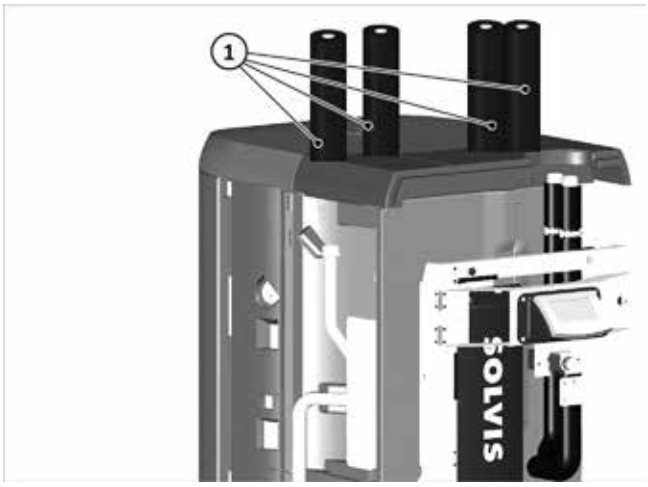


Fig. 69: Top insulation with connections from above (SolvisBen Solo)

Fitting the insulation for connections from the rear

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

1. Completely install the assembled top insulation ➔ *fig. 65* (1+2+3+4) on the tank.
2. Engage the top tank insulation with the tank insulation. There are four catching points:
   - On the left and right side (**1**)
   - In the middle at the rear (**2**)
   - In the middle at the front (**3**)

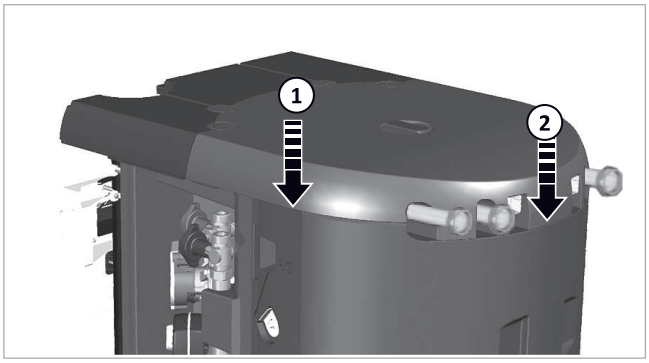


Fig. 70: Right and rear catch

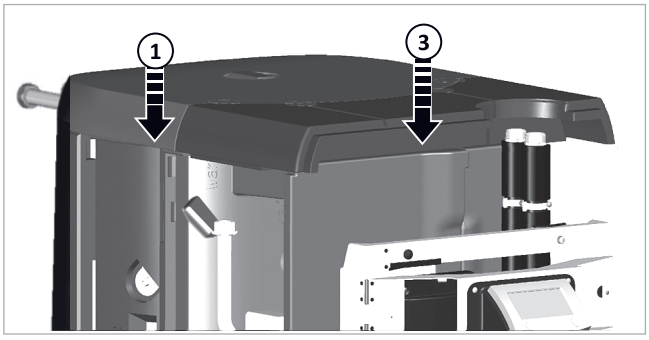


Fig. 71: Left and front catch (SolvisBen Solo)

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

7.9.3 Side tank insulation

Completing the work

1. Take the bag with the fleece plugs and seal the cutout sections in the rear tank insulation using the fleece plugs (see the arrows in ➔ *fig. 72*, *fig. 73 and fig. 74*).

Fig. 72: Fleece plugs on the rear side

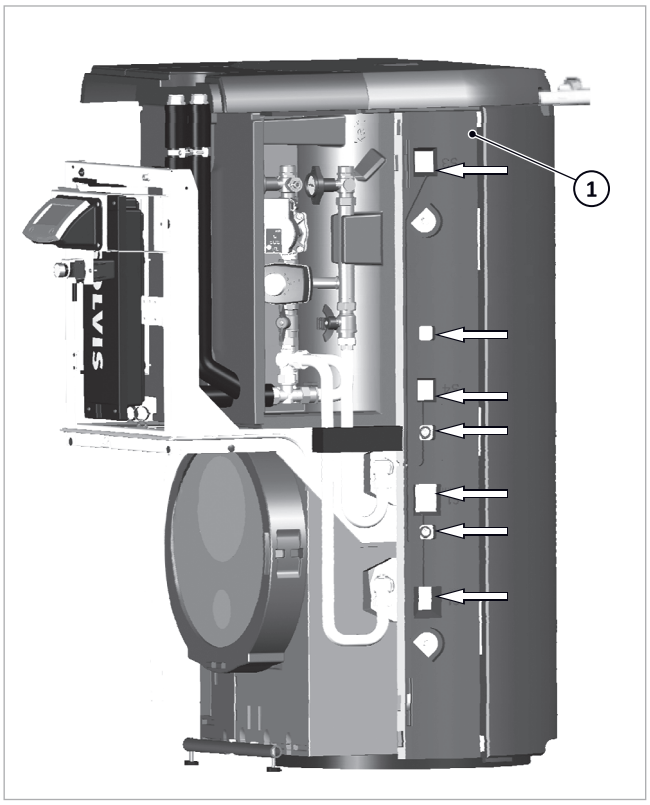


Fig. 73: Fleece plugs on the right side (Solvis Solo)

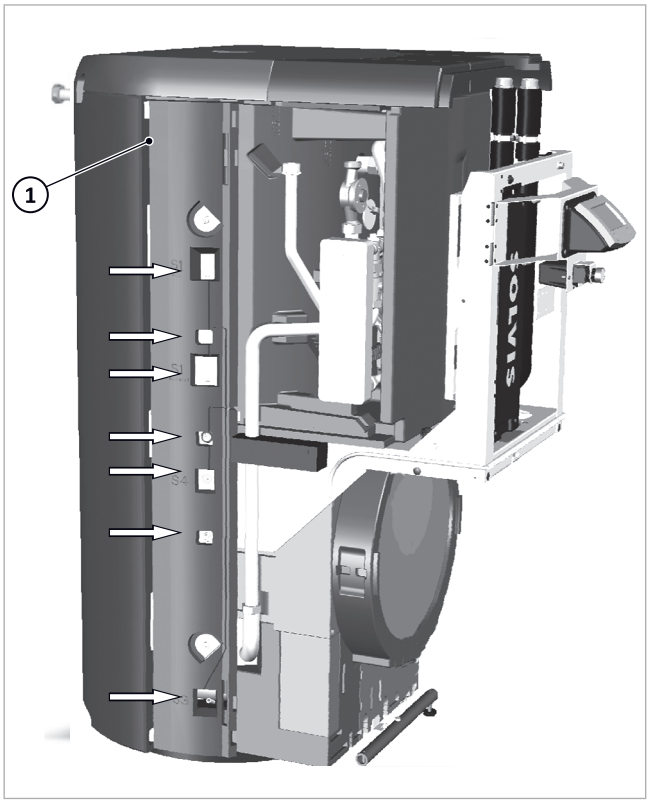


Fig. 74: Fleece plugs on the left side (SolvisBen Solo)

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

Fig. 75: Adding the side section

4. Fold in the side panel.

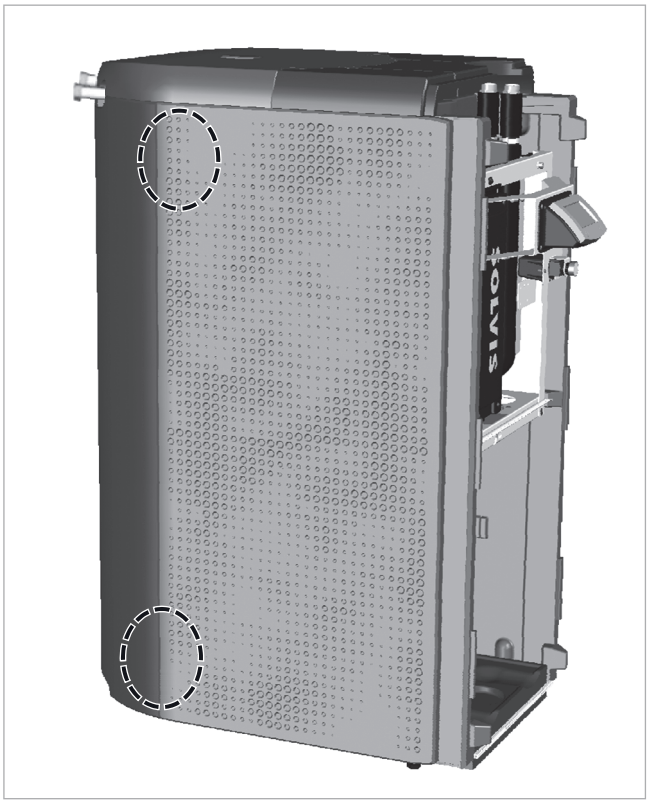


Fig. 76: Pushing in the side panel

5. Now attach the second side panel. To do so, repeat steps 2 to 4.
6. Turn the feet of the two side sections down to the floor but do not raise the side sections while doing so.

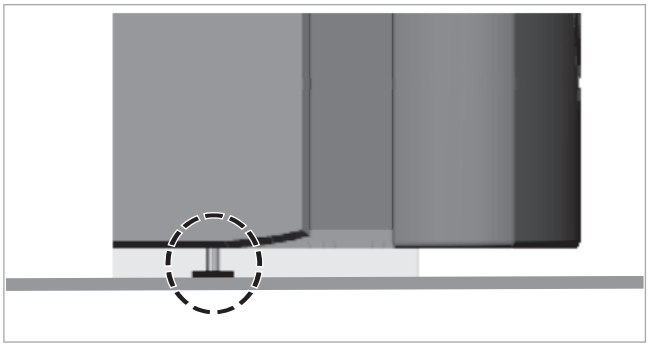


Fig. 77: Turn out the feet on the side sections

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

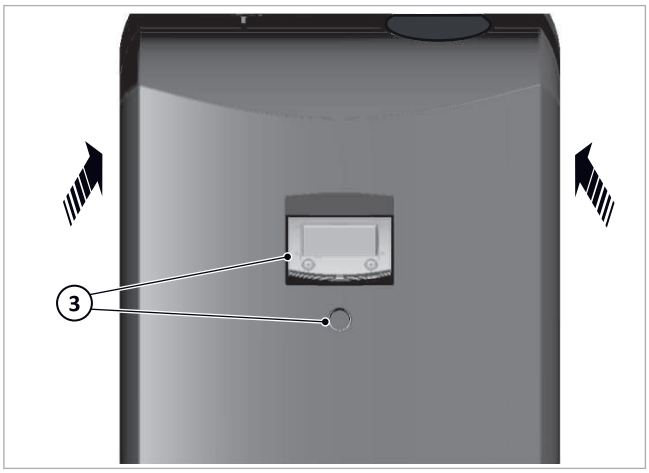


Fig. 78: Fitting the front cover

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

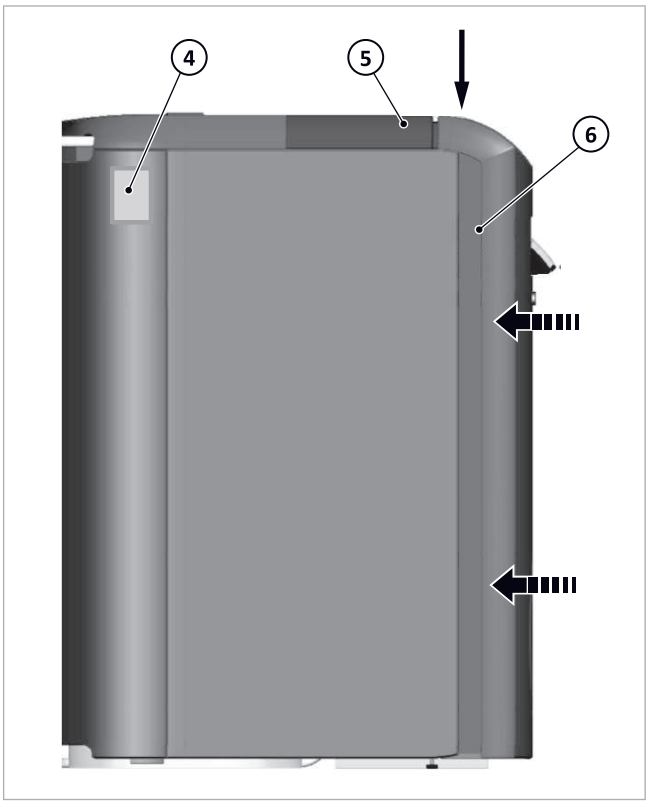


Fig. 79: Side view

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

7.9.4 Handover

Handing the system over to the operator

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

8 Maintenance

WARNING
Hot surface
Possibility of severe burns!
- Prior to the work, always switch off the system and allow it to cool down.
- Do not touch any surfaces or components that may be hot.

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.

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).

Bleed the storage tank

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

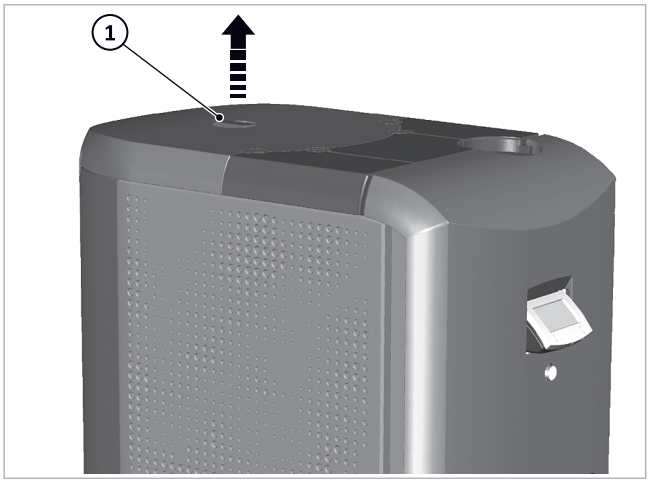


Fig. 80: Removing the bleeder cover

3. Open the manual bleeder on the tank.

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

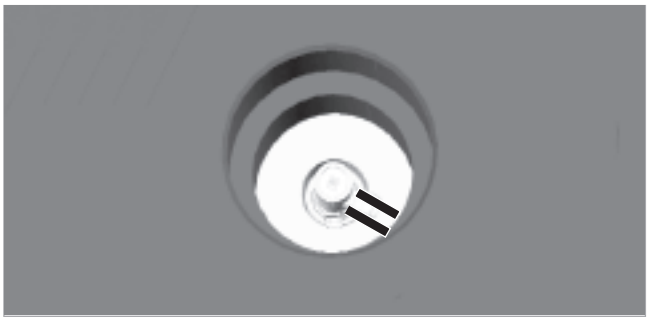


Fig. 81: Bleeder hose on the bleeder

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

Checking the safety functions

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

Cleaning the sludge separator

1. Hold a collecting container under the drain valve (**1**).
2. Open the drain tap to remove the sludge particles and close it again.

Fig. 82: Cleaning the sludge separator using the drain valve

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).

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 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

9.2 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.	

9.3 Grundfos UPM3 malfunction messages

If one or more faults occur, LED 1 lights up red.
If an alarm occurs, the yellow LEDs indicate the cause of the fault based on the table below. If multiple faults occur at the same time, the LEDs indicate the fault with the highest priority.
If there are no more alarms, the display switches back to the operating status.

Display	Operating status	Cause	Remedy
Red LED and 1 yellow LED (LED 5)	Pump attempts to restart every 1.33 seconds	Rotor blocked	Remove dirt and replace pump if necessary
Red LED and 1 yellow LED (LED 4)	Warning message only; pump is running	Mains voltage supply too low/high	Check mains voltage
Red LED and 1 yellow LED (LED 3)	Pump was deactivated because the supply voltage was too low or a severe electronics fault occurred	Electrical system malfunction	Check mains voltage/replace pump

10 Technical Data

10.1 Dimensions and weights

Name	Unit	SolvisBen Solo	SolvisBen WP / Lino
Rated volume	[l]	230	230
Actual volume	[l]	240	232
Approximate empty weight	[kg]	144	Approx. 150
Approximate total weight	[kg]	390	Approx. 400
Storage tank distribution			
Max. hot water ready volume (OK – S4)	[l]	133	133
Heating buffer volume (S4 – S9)	[l]	56	48
Solar buffer volume (S4 – UK)	[l]	107	99
Output data			
Tank material	[–]	S235JR, primed exterior, raw interior	
Heating flow/return connection	[–]	1" male thread, flat sealing, Ø 28 mm connection pipe set	
Cold/hot drinking water connection	[–]	1" male thread, flat sealing, Ø 28 mm connection pipe set	
Heat generator flow/return connection (SolvisBen Solo with heating circuit station)	[–]	1" male thread, flat sealing	–
WP/Lino flow and return connection (SolvisBen WP/Lino)	[–]	–	Ø 28 mm
Max. operating pressure	[bar]	3	
Max. operating temperature	[°C]	95	
Dimensions			
Max. width	[mm]	640	
Max. depth	[mm]	1150	
Max. height	[mm]	1550	
Storage tank tilt height without insulation	[mm]	1400	
Width without insulation	[mm]	550	
Depth without insulation and control	[mm]	920	
Minimum front spacing	[mm]	500	
Minimum side spacing	[mm]	150	

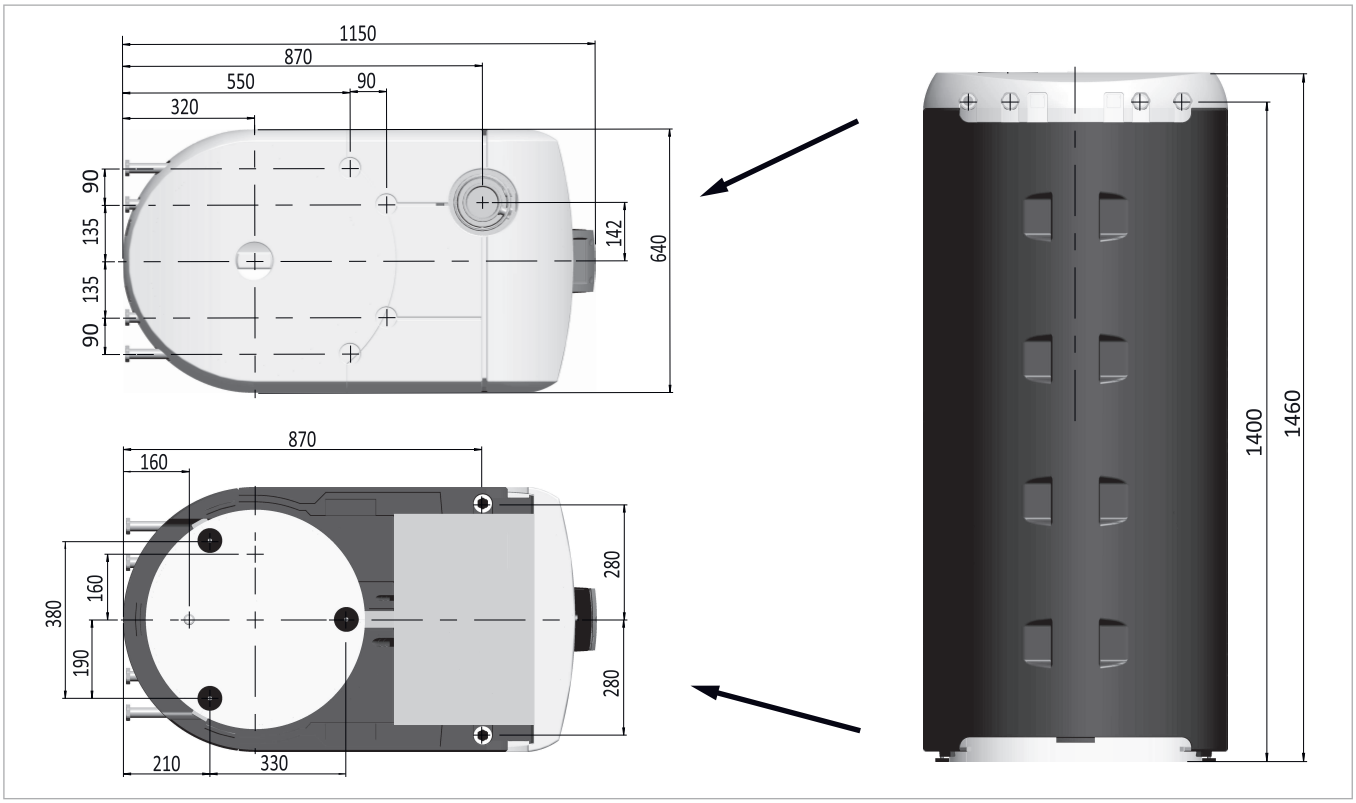


Fig. 83: Views of the SolvisBen Solo (all dimensions in mm)

10.2 SolvisControl system controller

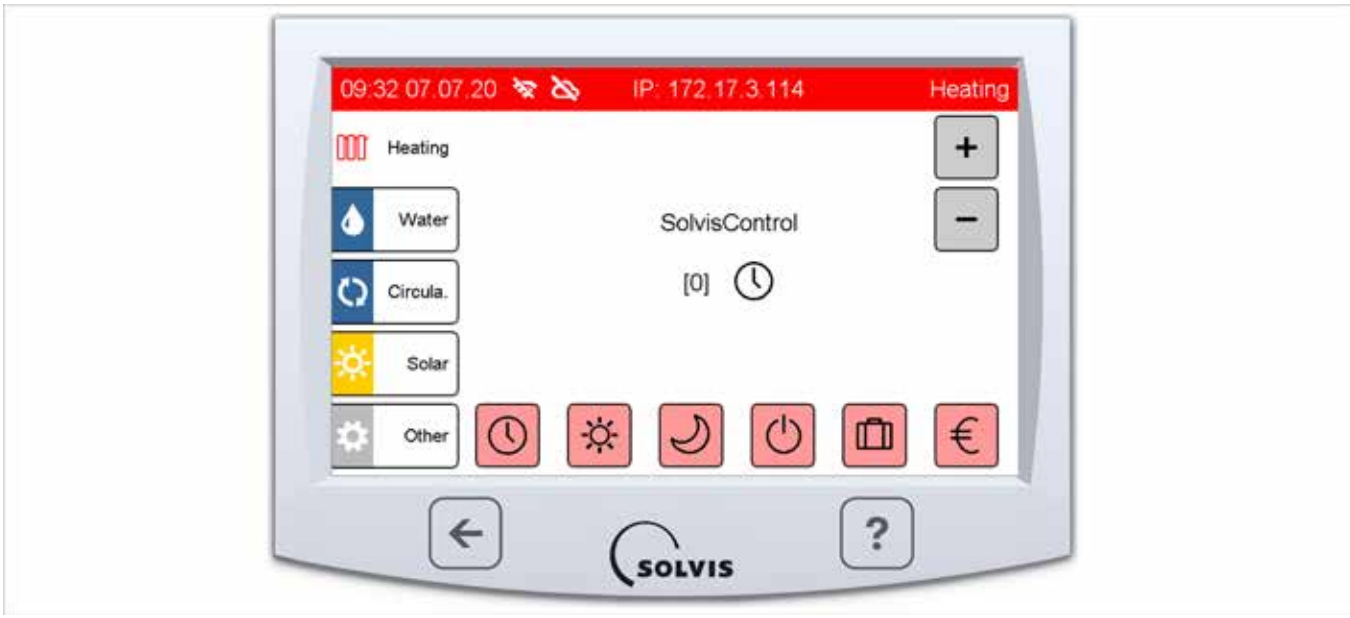


*Fig. 84: SolvisControl with "**Heating**" menu*

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 Solar 2 (SP2)
Alarm output*	Floating contact
Skid control**	Heating circuit pumps (user-defined for A1 – A14, factory setting: off)

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

10.3 Hot water production

Hot water station technical data

Name	Unit	WWS-24	WWS-30
Dispensing volume flow			
TWK/TWW/flow = 10/50/65 °C	**[l/min]**	**24**	**30**
TWK/TWW/flow = 10/50/60 °C	[l/min]	21	25
TWK/TWW/flow = 10/60/70 °C	[l/min]	-	23
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
Number of plates	[pcs.]	30	40
Capacity per side	[litre]	0.25	0.35

10.4 Heating circuit distribution

Technical data for the integrated heating circuit station*)

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

*) *Depending on the SolvisBen version*

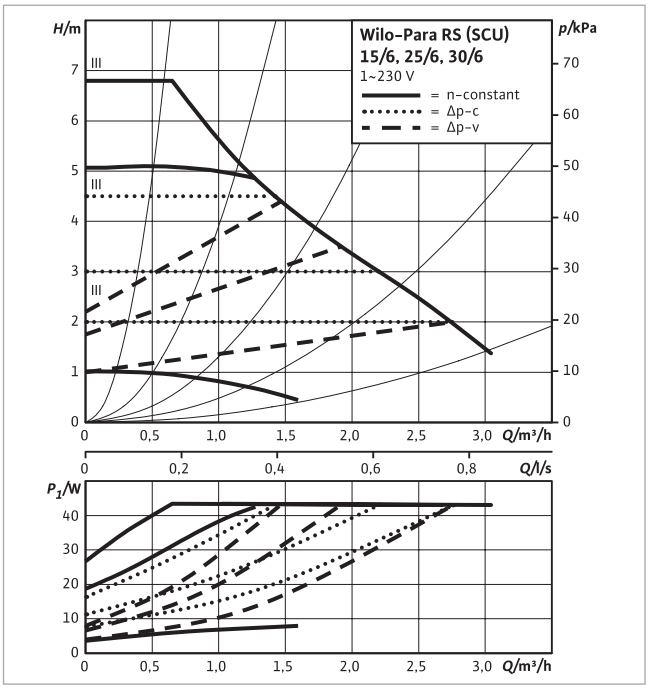


Fig. 85: Wilo-Para 15/6 SCU pump characteristic curve

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

10.5 Ben 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

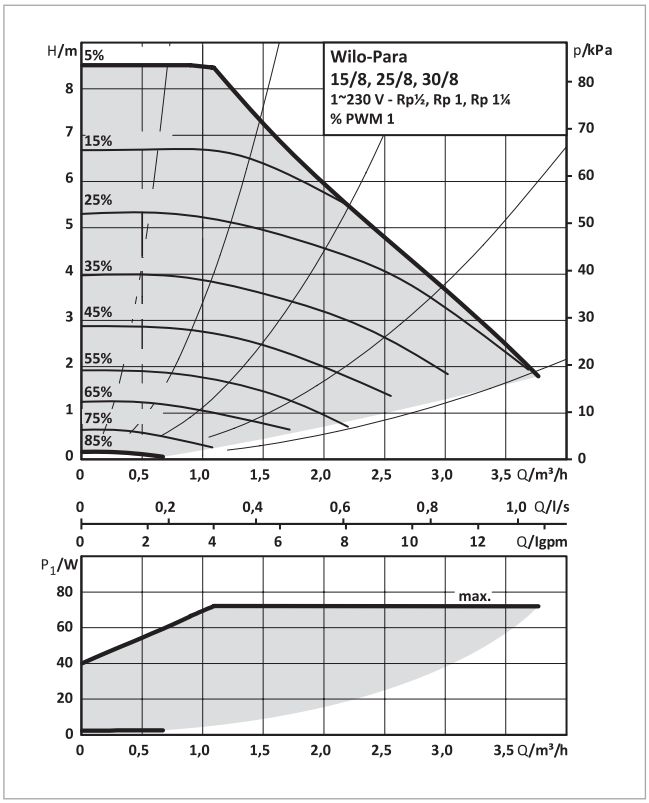


Fig. 86: Wilo PARA 15/8 pump characteristic curves

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

10.6 Ben Lino buffer charging station

PLAS-LINO (integrated)

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

PLAS-LINO hydraulics

PLAS pump	
Manufacturer/type	Grundfos UPM3 Hybrid 15-50
Installation length	130 mm
Speed control	Can be adjusted to PWM-C speed control
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	33 W
Power consumption	0.04 – 0.36 A
EEI	≤ 0.20

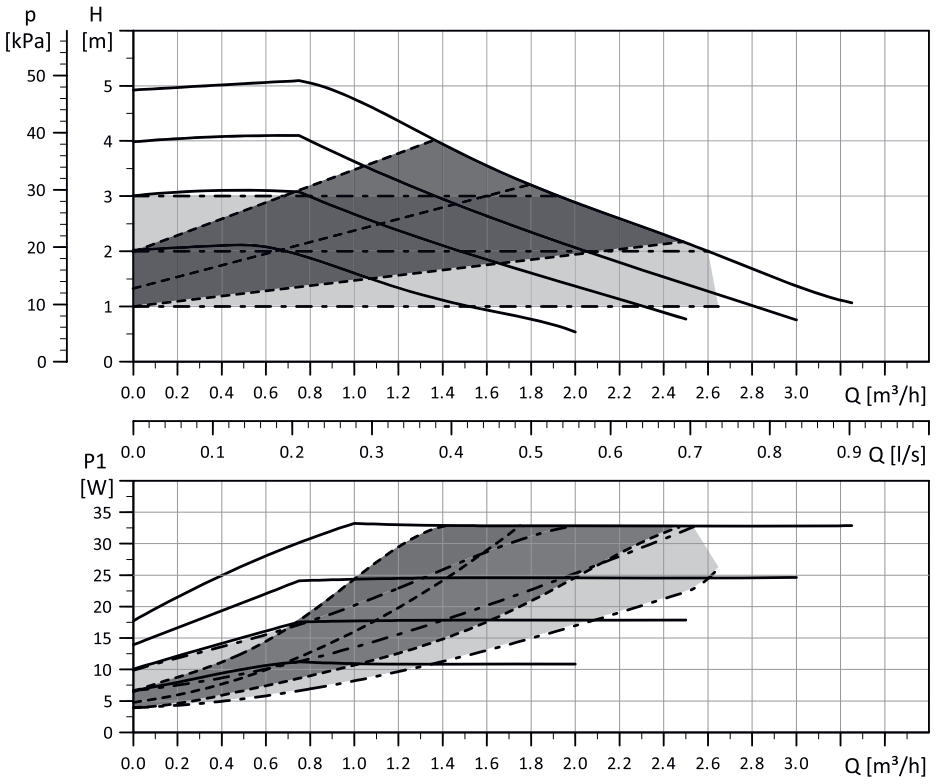


Fig. 87: Grundfos UPM3 Hybrid 15-50 130 pump characteristic curve for constant speed (levels: 3, 4, 5 m)

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

11 Appendix

11.1 Solvis Ben WP/WP-HPT-VSG mit Mia/Lea/Lea Eco system diagram

11.1.1 A heating circuit with solar

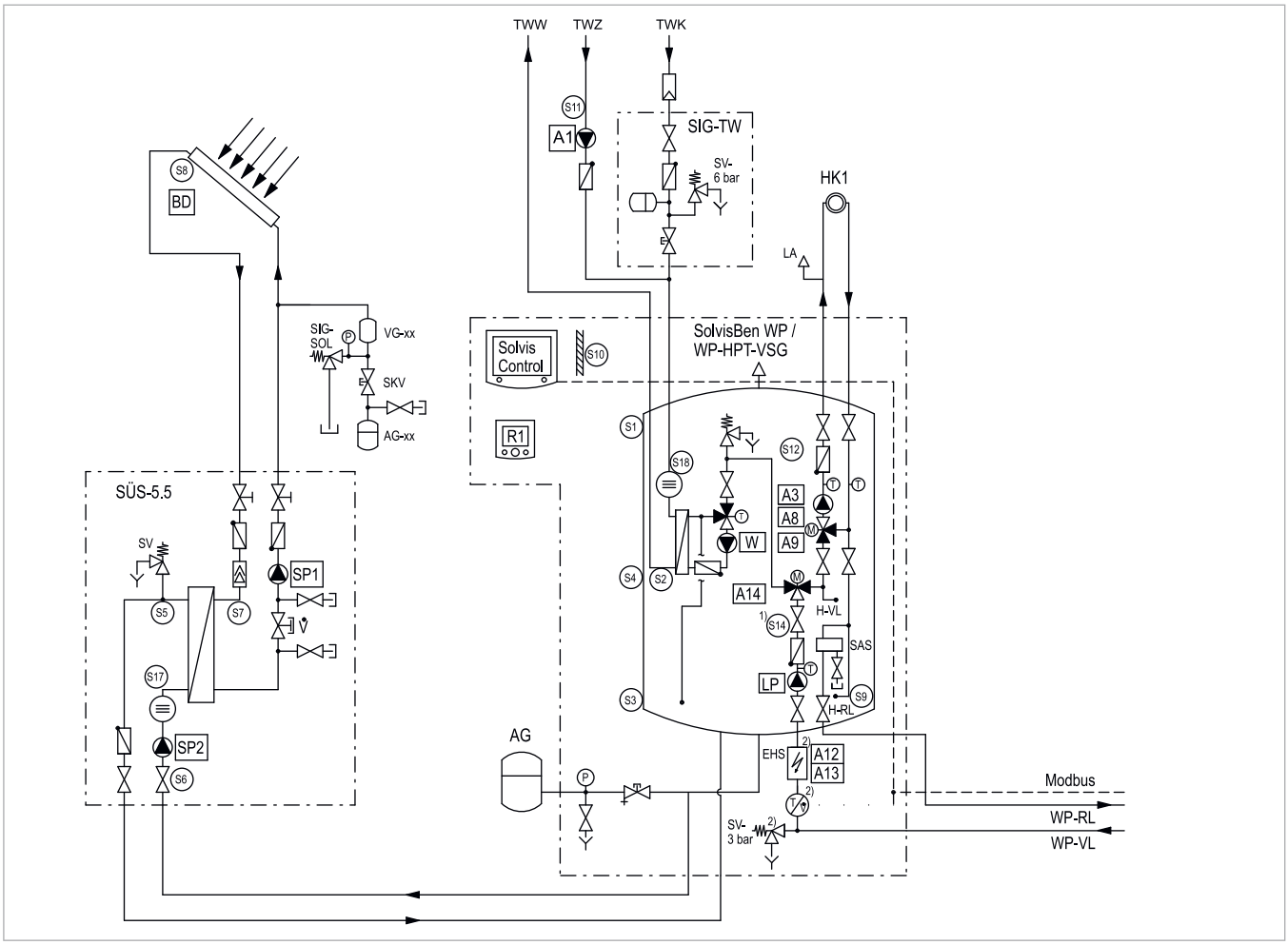


Fig. 88: SolvisBen WP with integrated heating circuit station, solar system and SolvisLea, SolvisLea Eco or SolvisMia heating pump – part 1

1) SolvisLea: with SolvisBen WP (integrated EHS in heating pump, S14 sensor in SolvisBen), 2) SolvisLea Eco and SolvisMia: with SolvisBen WP-HPT-VSG (integrated EHS and volume flow/temperature sensor in the SolvisBen)

Equipment

- Stratified solar storage tank
- SolvisControl 3 system controller
- Drinking water heating
- Solar circuit with one collector (field)
- One mixed heating circuit

Assemblies:

R1	*Room operating unit, heating circuit 1*
SIG-TW	*Safety group, drinking water connection*
BD	*Lightning protection box*
AG-xx	*Membrane expansion vessel, solar circuit*
VG-xx	*Primary tank, solar circuit*
SUES-5.5	*Solar heat transfer station*

Abbreviations

LA	*Air separator*
AG	*Expansion vessel*
SAS	*Sludge separator*
SV	*Safety valve*
TWK	*Drinking water network, cold connection*
TWW	*Drinking water network, hot connection*
TWZ	*Drinking water network, circulation connection*
H-RL	*Heating return*
H-VL	*Heating flow*
LP	*Load pump*
SIG-SOL	*Solar circuit safety group*
SKV	*Cap valve, solar circuit*
V̄	*Adjusting valve*
HK1	*Heating circuit 1*

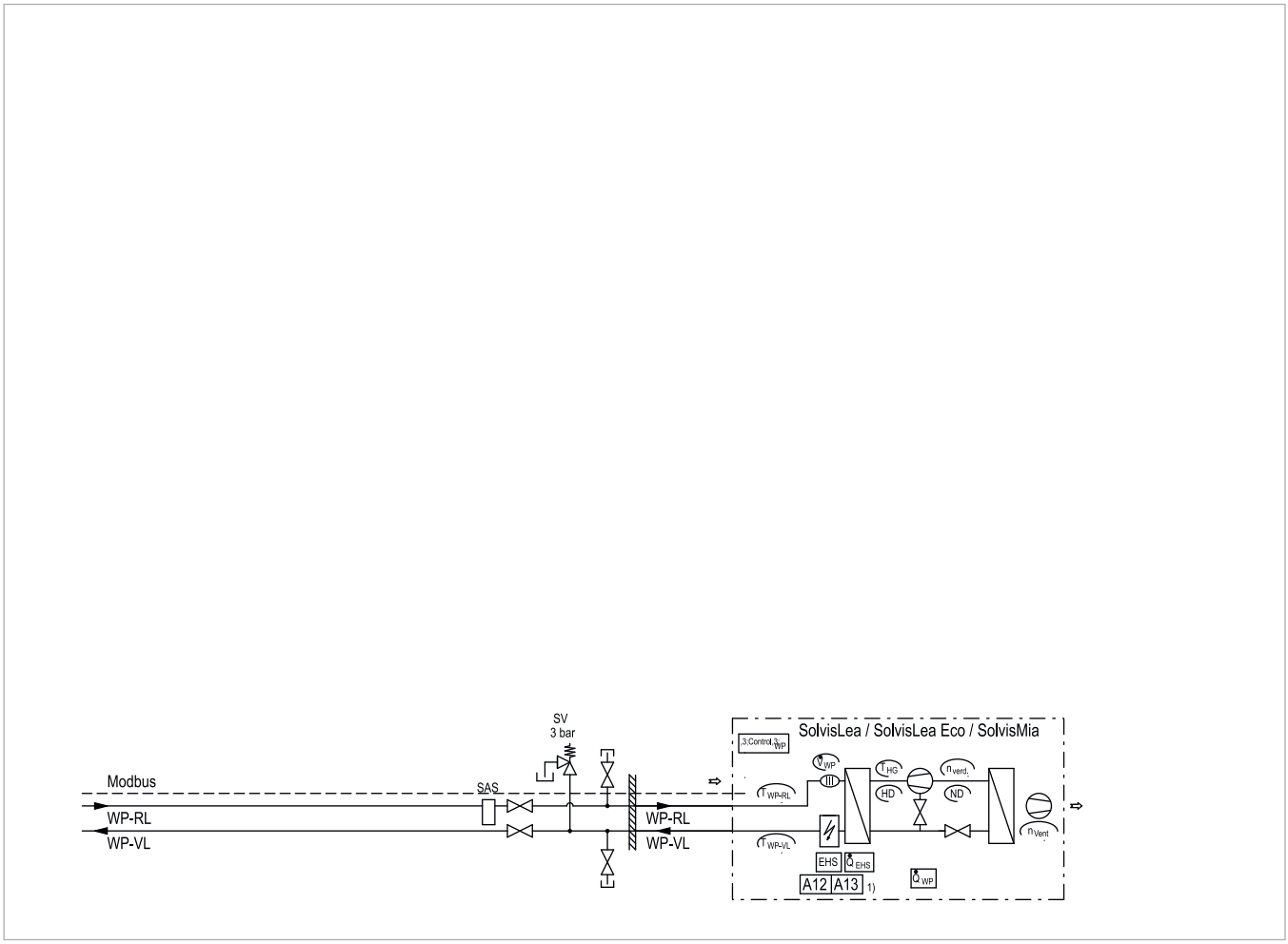


Fig. 89: SolvisBen WP with integrated heating circuit station, solar system and SolvisLea, SolvisLea Eco or SolvisMia heating pump – part 2

The diagram shown represents an overview of the system based on the information available to us. It does not replace detailed and specific planning. Please note: to ensure the system functions correctly, the installation, operating and maintenance instructions must be followed. When connecting a third-party boiler, do not rely solely on the information provided by Solvis – always consult the manufacturer of the boiler. The shut-off and safety valves shown provide a rough guide only. Observe all the relevant standards, guidelines and technical rules at all times. This is the only way to ensure that installations are carried out correctly.	

11.2 System diagram for SolvisBen Lino with SolvisLino 4

11.2.1 A heating circuit with solar

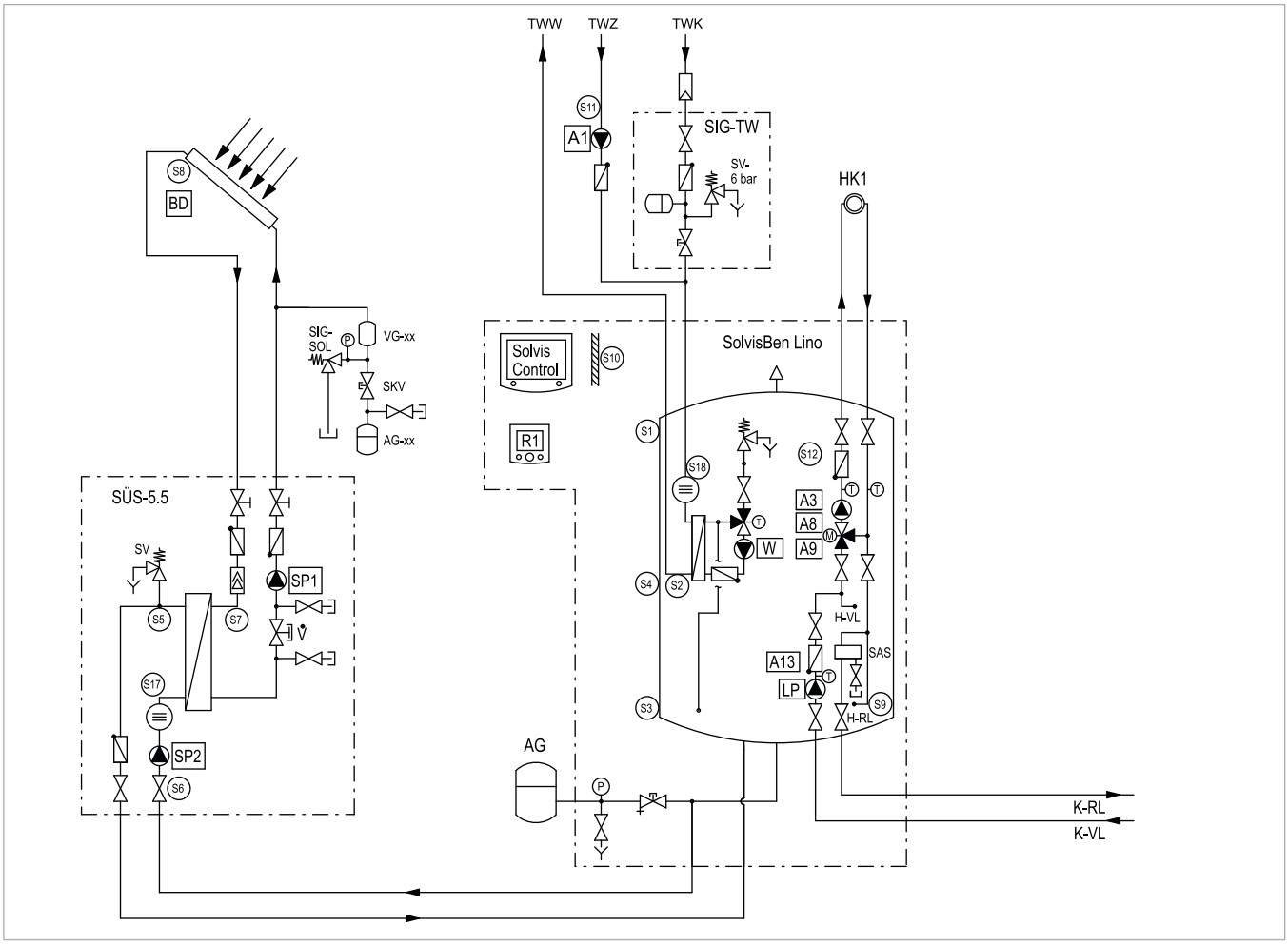


Fig. 90: SolvisBen Lino with integrated heating circuit station, solar system and SolvisLino 4 pellet boiler – part 1

Equipment

- Stratified solar storage tank
- SolvisControl 3 system controller
- Drinking water heating
- Solar circuit with one collector (field)
- One mixed heating circuit

Assemblies:

R1	*Room operating unit, heating circuit 1*
SIG-TW	*Safety group, drinking water connection*
BD	*Lightning protection box*
AG-xx	*Membrane expansion vessel, solar circuit*
VG-xx	*Primary tank, solar circuit*
SUES-5.5	*Solar heat transfer station*

Abbreviations

LA	*Air separator*
AG	*Expansion vessel*
SAS	*Sludge separator*
SV	*Safety valve*
TWK	*Drinking water network, cold connection*
TWW	*Drinking water network, hot connection*
TWZ	*Drinking water network, circulation connection*
FA	*Automatic firing system*
H-RL	*Heating return*
H-VL	*Heating flow*
K-RL	*Boiler return*
K-VL	*Boiler flow*
SIG-SOL	*Solar circuit safety group*
SKV	*Cap valve, solar circuit*
V	*Adjusting valve*
HK1	*Heating circuit 1*

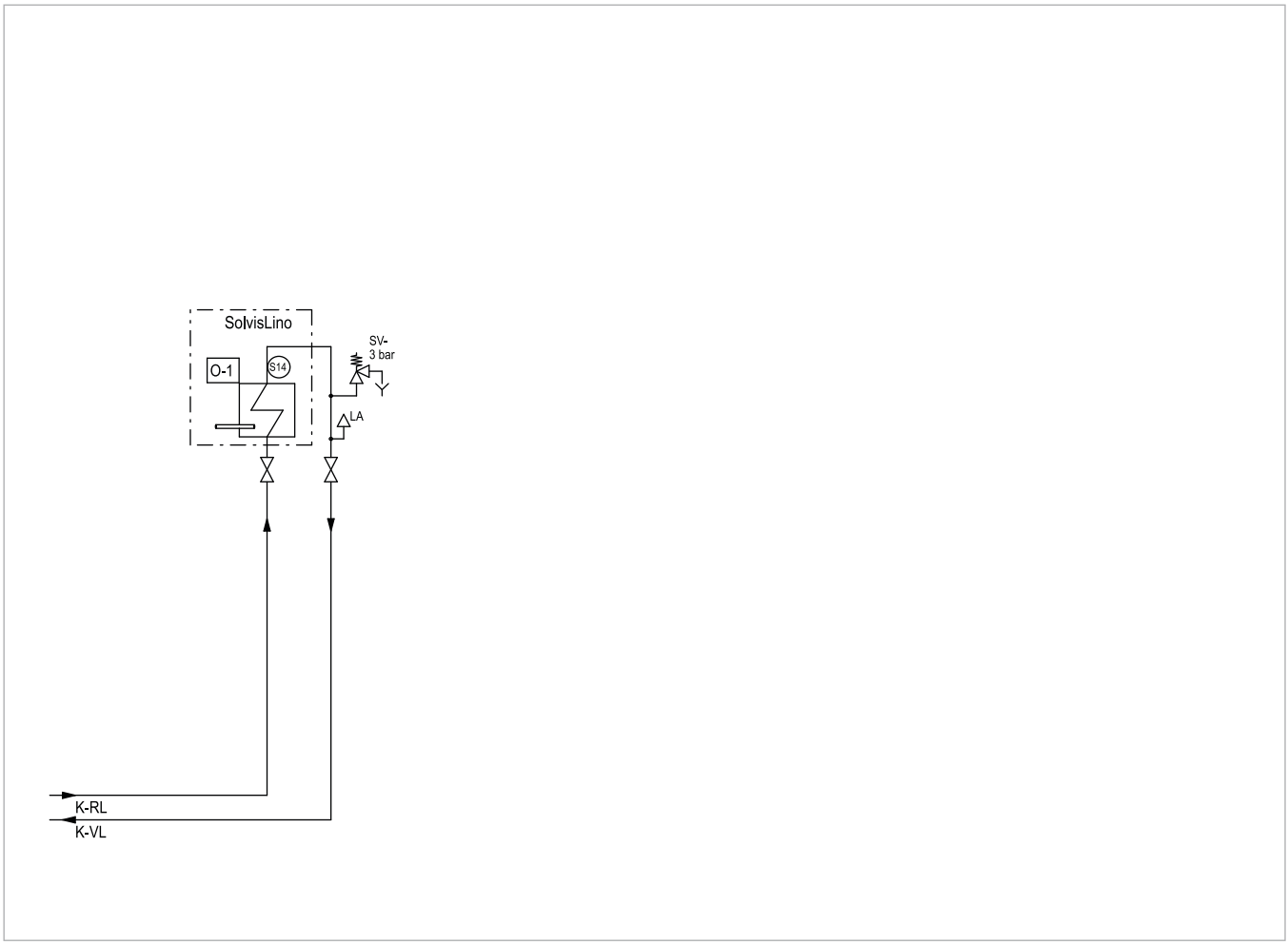


Fig. 91: SolvisBen Lino with integrated heating circuit station, solar system and SolvisLino 4 pellet boiler – part 2

The diagram shown represents an overview of the system based on the information available to us. It does not replace detailed and specific planning. Please note: to ensure the system functions correctly, the installation, operating and maintenance instructions must be followed. When connecting a third-party boiler, do not rely solely on the information provided by Solvis – always consult the manufacturer of the boiler. The shut-off and safety valves shown provide a rough guide only. Observe all the relevant standards, guidelines and technical rules at all times. This is the only way to ensure that installations are carried out correctly.	

11.2.2 Three heating circuits and solar

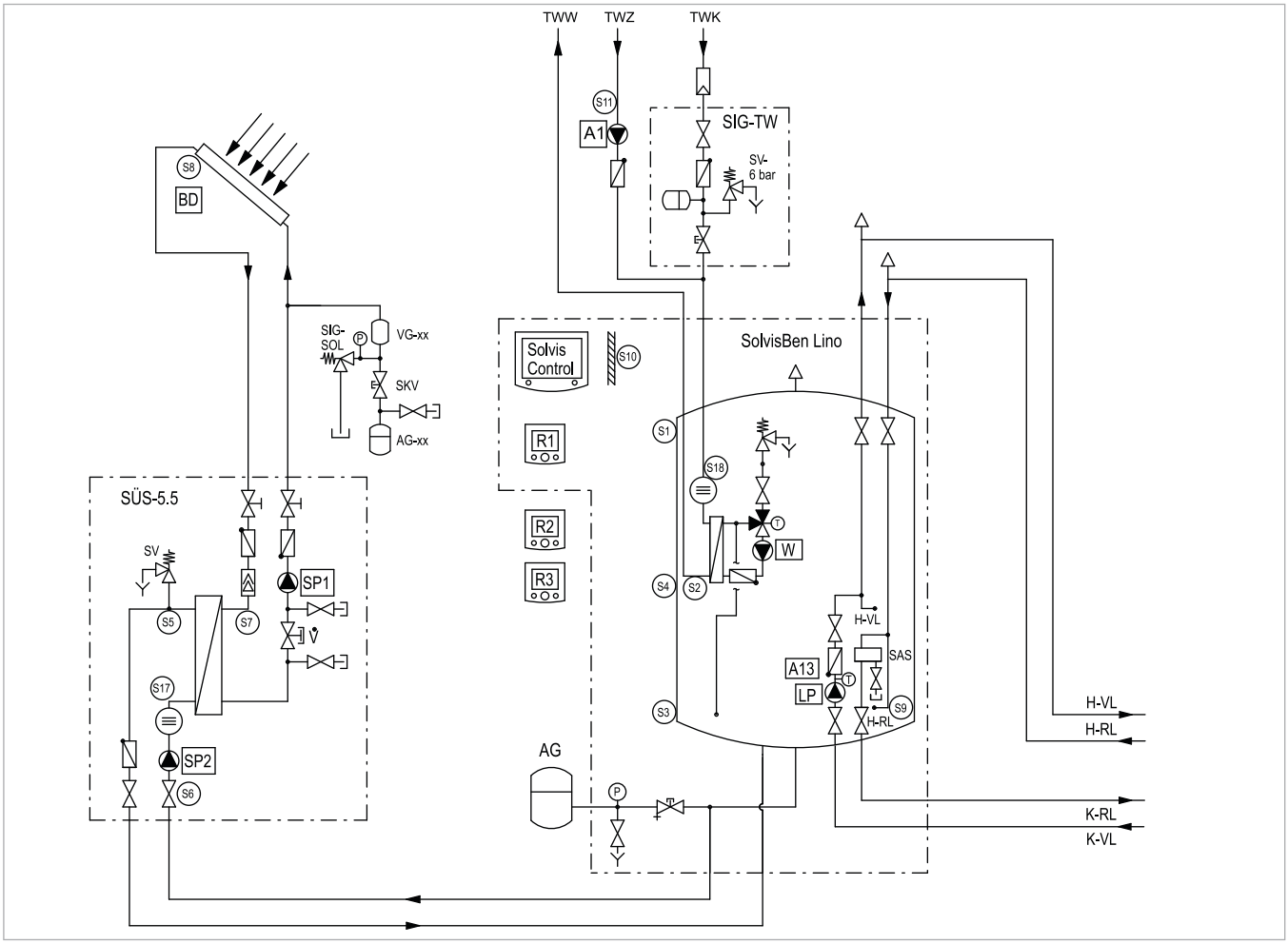


Fig. 92: SolvisBen Lino with three mixed heating circuits, solar system and SolvisLino 4 pellet boiler – part 1

Equipment

- Stratified solar storage tank
- SolvisControl 3 system controller
- Drinking water heating
- Solar circuit with one collector (field)
- Three mixed heating circuits

Assemblies:

R1	*Room operating unit, heating circuit 1*
SIG-TW	*Safety group, drinking water connection*
BD	*Lightning protection box*
AG-xx	*Membrane expansion vessel, solar circuit*
VG-xx	*Primary tank, solar circuit*
SUES-5.5	*Solar heat transfer station*
R2	*Room operating unit, heating circuit 2*
R3	*Room operating unit, heating circuit 3*
HKS-G	*Heating circuit station, mixed*
VTL-3	*Distributor bar, 3-way*

Abbreviations

LA	*Air separator*
AG	*Expansion vessel*
SAS	*Sludge separator*
SV	*Safety valve*
TWK	*Drinking water network, cold connection*
TWW	*Drinking water network, hot connection*
TWZ	*Drinking water network, circulation connection*
FA	*Automatic firing system*
H-RL	*Heating return*
H-VL	*Heating flow*
K-RL	*Boiler return*
K-VL	*Boiler flow*
SIG-SOL	*Solar circuit safety group*
SKV	*Cap valve, solar circuit*
V̇	*Adjusting valve*
HK1-3	*Heating circuit 1 to 3*

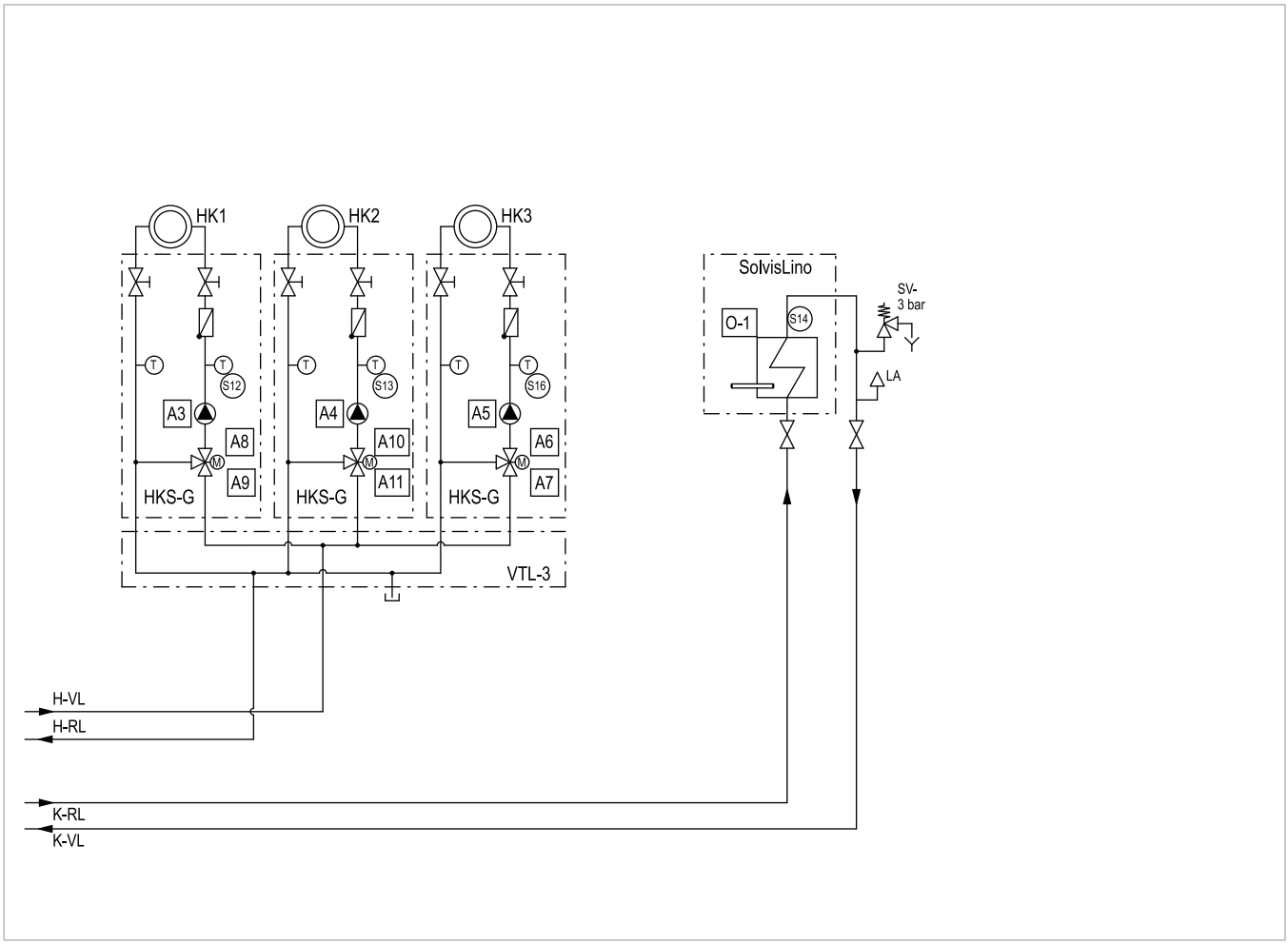


Fig. 93: SolvisBen Lino with three mixed heating circuits, solar system and SolvisLino 4 pellet boiler – part 1

The diagram shown represents an overview of the system based on the information available to us. It does not replace detailed and specific planning. Please note: to ensure the system functions correctly, the installation, operating and maintenance instructions must be followed. When connecting a third-party boiler, do not rely solely on the information provided by Solvis – always consult the manufacturer of the boiler. The shut-off and safety valves shown provide a rough guide only. Observe all the relevant standards, guidelines and technical rules at all times. This is the only way to ensure that installations are carried out correctly.	

11.3 System diagram for SolvisBen Solo with third-party boiler

11.3.1 A heating circuit with solar

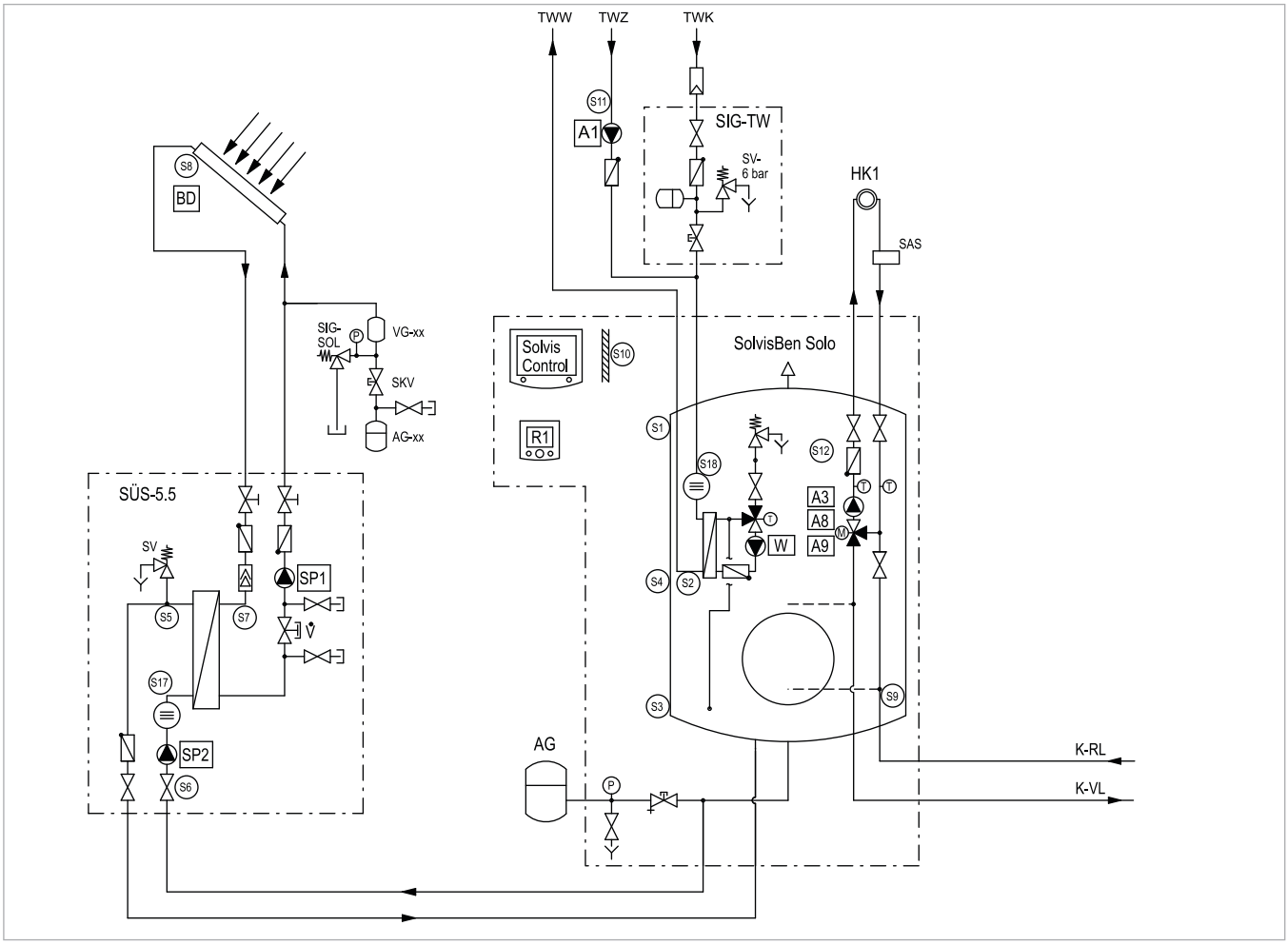


Fig. 94: SolvisBen Solo with three mixed heating circuits, solar system and third-party boiler – part 1

Equipment

- Stratified solar storage tank
- SolvisControl 3 system controller
- Drinking water heating
- Solar circuit with one collector (field)
- One mixed heating circuit

Assemblies:

R1	*Room operating unit, heating circuit 1*
PLAS-UGM	*Buffer charging station, unmixed*
SIG-TW	*Safety group, drinking water connection*
BD	*Lightning protection box*
AG-xx	*Membrane expansion vessel, solar circuit*
VG-xx	*Primary tank, solar circuit*
SUES-5.5	*Solar heat transfer station*

Abbreviations

LA	*Air separator*
AG	*Expansion vessel*
SAS	*Sludge separator*
SV	*Safety valve*
TWK	*Drinking water network, cold connection*
TWW	*Drinking water network, hot connection*
TWZ	*Drinking water network, circulation connection*
FA	*Automatic firing system*
H-RL	*Heating return*
H-VL	*Heating flow*
K-RL	*Boiler return*
K-VL	*Boiler flow*
SIG-SOL	*Solar circuit safety group*
SKV	*Cap valve, solar circuit*
V	*Adjusting valve*
FK	*Third-party boiler (customer-supplied)*
HK1	*Heating circuit 1*

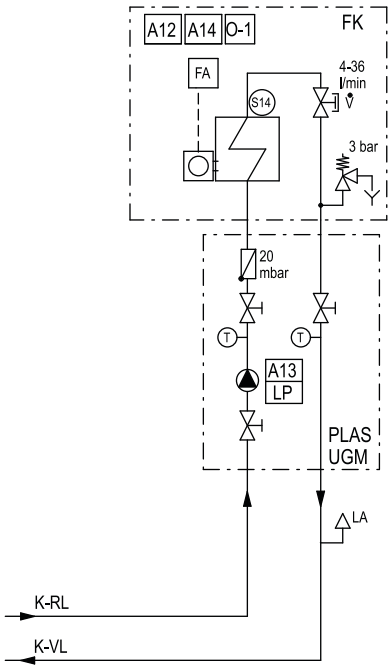


Fig. 95: SolvisBen Solo with three mixed heating circuits, solar system and third-party boiler – part 2

The diagram shown represents an overview of the system based on the information available to us. It does not replace detailed and specific planning. Please note: to ensure the system functions correctly, the installation, operating and maintenance instructions must be followed. When connecting a third-party boiler, do not rely solely on the information provided by Solvis – always consult the manufacturer of the boiler. The shut-off and safety valves shown provide a rough guide only. Observe all the relevant standards, guidelines and technical rules at all times. This is the only way to ensure that installations are carried out correctly.	

11.3.2 Three heating circuits and solar

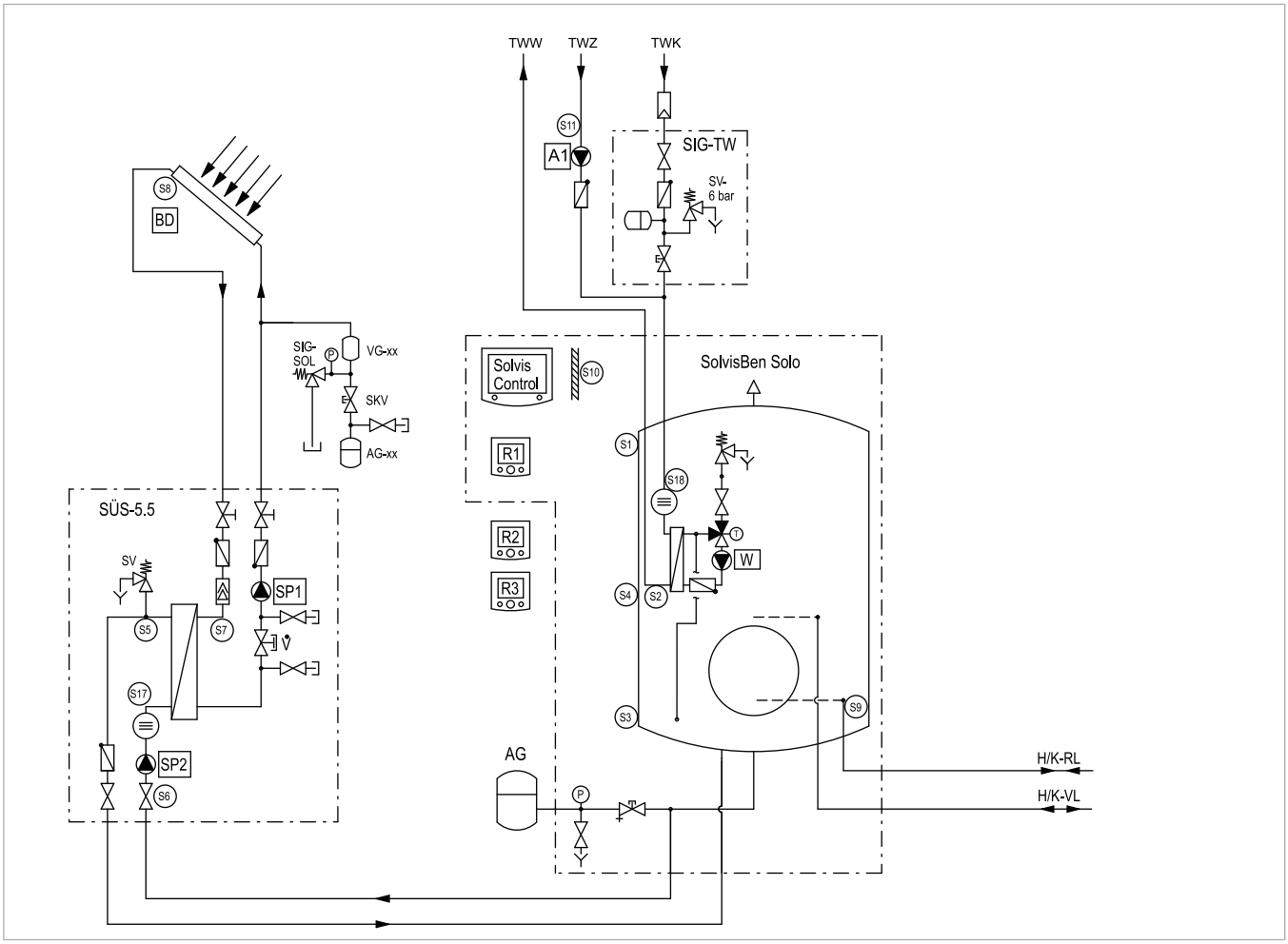


Fig. 96: SolvisBen Solo with three mixed heating circuits, solar system and external boiler – part 1

Equipment

- Stratified solar storage tank
- SolvisControl 3 system controller
- Drinking water heating
- Solar circuit with one collector (field)
- Three mixed heating circuits

Assemblies:

R1	*Room operating unit, heating circuit 1*
PLAS-UGM	*Buffer charging station, unmixed*
SIG-TW	*Safety group, drinking water connection*
BD	*Lightning protection box*
AG-xx	*Membrane expansion vessel, solar circuit*
VG-xx	*Primary tank, solar circuit*
SUES-5.5	*Solar heat transfer station*
R2	*Room operating unit, heating circuit 2*
R3	*Room operating unit, heating circuit 3*
HKS-G	*Heating circuit station, mixed*
VTL-3	*Distributor bar, 3-way*

Abbreviations

LA	*Air separator*
AG	*Expansion vessel*
SAS	*Sludge separator*
SV	*Safety valve*
TWK	*Drinking water network, cold connection*
TWW	*Drinking water network, hot connection*
TWZ	*Drinking water network, circulation connection*
FA	*Automatic firing system*
H-RL	*Heating return*
H-VL	*Heating flow*
K-RL	*Boiler return*
K-VL	*Boiler flow*
SIG-SOL	*Solar circuit safety group*
SKV	*Cap valve, solar circuit*
V̄	*Adjusting valve*
FK	*Third-party boiler (customer-supplied)*
HK1-3	*Heating circuit 1 to 3*

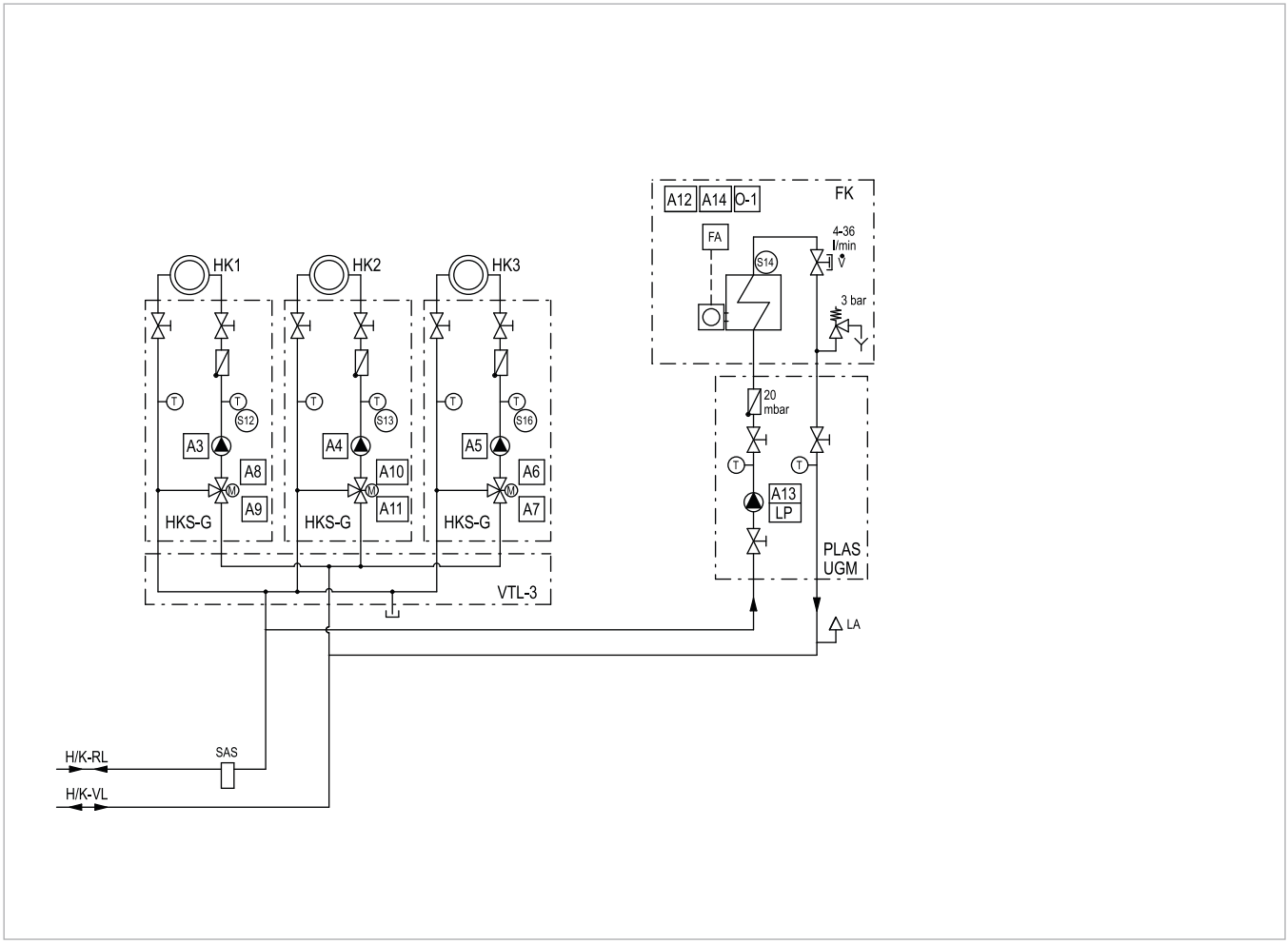


Fig. 97: SolvisBen Solo with three mixed heating circuits, solar system and external boiler – part 2

The diagram shown represents an overview of the system based on the information available to us. It does not replace detailed and specific planning. Please note: to ensure the system functions correctly, the installation, operating and maintenance instructions must be followed. When connecting a third-party boiler, do not rely solely on the information provided by Solvis – always consult the manufacturer of the boiler. The shut-off and safety valves shown provide a rough guide only. Observe all the relevant standards, guidelines and technical rules at all times. This is the only way to ensure that installations are carried out correctly.	

11.4 Mains circuit board

11.4.1 Connection table (system status)

SolvisBen WP / SolvisBen Lino / SolvisBen Solo

Sensors (temperature sensors and volume flow encoders)			Actuators (pumps, signals and control valves)		
Inputs		Designation (sensor)	Outputs		Designation
no.	Option*		no.	Option*	
S1	All	Sto. tank, top	A1	All	Circulation pump
S2	All	Hot water	A2	Lino / Solo	(Unused)
S3	All	Sto. tank reference		WP	PLAS WP load pump
S4	All	Heating buffer, top (HPo)	A3	All	Pump for heating circuit 1
S5	All	Solar flow 2	A4	All	Pump for heating circuit 2
S6	All	Solar return 2	A5	All	Pump for heating circuit 3
S7	All	Solar flow 1	A6	East-west roof	Valve 1
S8	All	Collector		SFB	(Unused)
S9	All	Heating buffer, bottom (HPu)		HC 3	Heating circuit 3 mixer open
S10	All	Outdoor temperature	A7	East-west roof	Valve 2
S11	All	Circulation		SFB	Load pump
S12	All	Flow for heating circuit 1		HC 3	Heating circuit 3 mixer closed
S13	All	Flow for heating circuit 2	A8	All	Heating circuit 1 mixer (open)
S14	All	SolvisLea/SolvisLino 4 flow / third-party boiler	A9	All	Heating circuit 1 mixer (closed)
S15	All	Cold water (optional)	A10	All	Heating circuit 2 mixer (open)
S16	East-west roof	Collector 2	A11	All	Heating circuit 2 mixer (closed)
	SFB	Solid fuel boiler	A12	Lino / Solo	Burner (L = 230 V~)
	Other	Flow for heating circuit 3		WP	SolvisLea control voltage (L/N/PE), heating element, stage 1 and 3 (A12->DHC1)
S17	All	Solar volume flow encoder	A13	Lino / Solo	PLAS Lino load pump / third-party boiler
S18	All	Water volume flow encoder		WP	Heating element, stage 2 and 3 (->DHC2)
I-1	Lino / Solo	External burner requirement	A14	Lino / Solo	Burner (floating)
	WP	SmartGrid connection board		WP	3-way switching valve
I-2	All	(Unused)	O-1	Lino / Solo	Modulation (0 to 10 V)
I-3	All	(Unused)		WP	(Unused)
R1	All	Room control element for heating circuit 1	SP1	All	PWM solar pump 1
R2	All	Room control element for heating circuit 2	SP2	All	PWM solar pump 2
R3	All	Room control element for heating circuit 3	W	All	PWM hot water pump
ST1	All	Jumper	LP	All	PWM load pump, PLAS WP/PLAS Lino
ST2	All	Jumper			

* *"All" = applies to SolvisBen WP, SolvisBen Lino and SolvisBen Solo, "SFB" = additional solid fuel boiler or "HC 3" = additional mixed circuit*

11.4.2 SolvisBen WP connection diagram

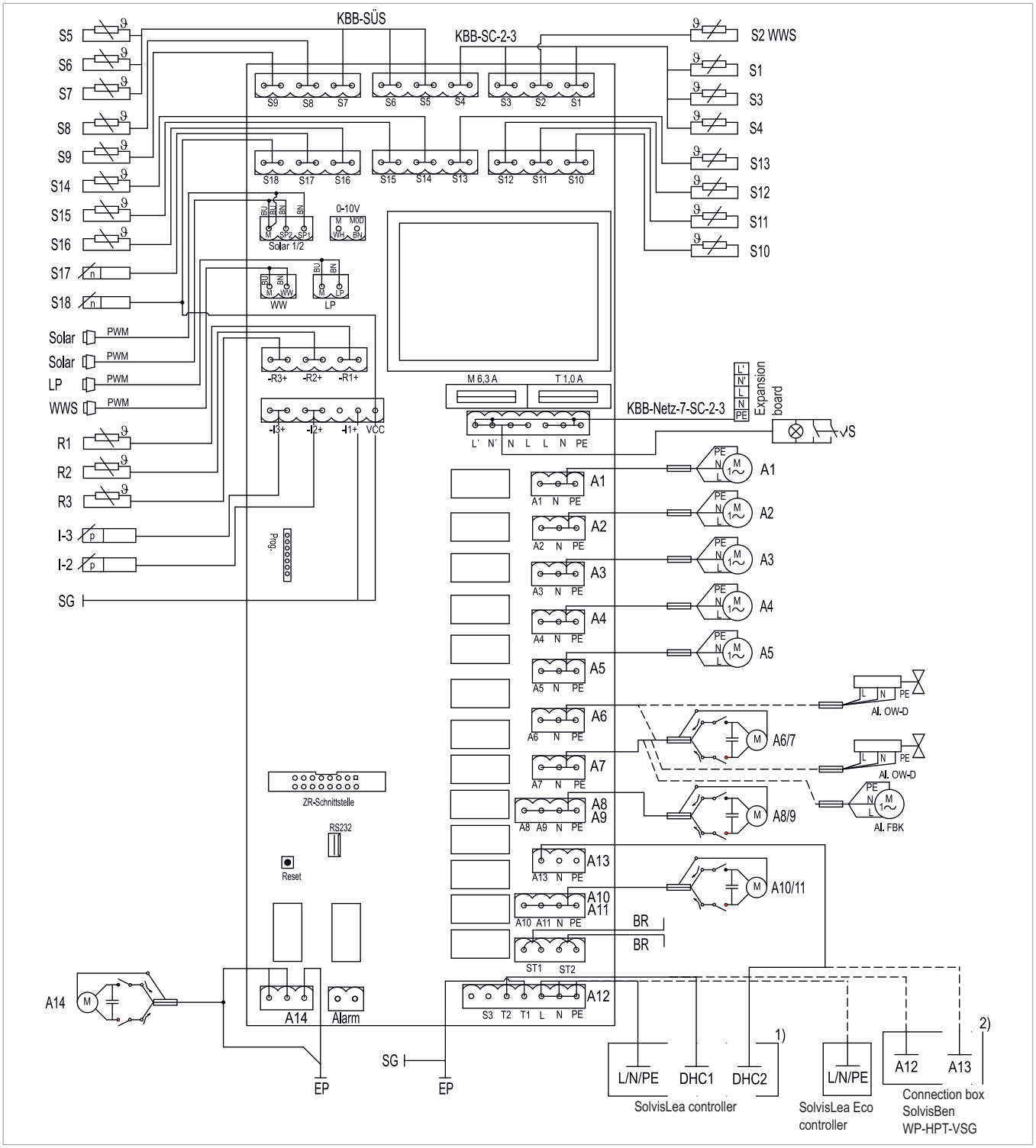


Fig. 98: SolvisControl 3 mains circuit board for SolvisBen WP

1) SolvisLea: with SolvisBen WP (integrated EHS in heating pump, S14 sensor in SolvisBen), 2) SolvisLea Eco and SolvisMia: with SolvisBen WP-HPT-VSG (integrated EHS and volume flow/temperature sensor in the SolvisBen)

AL FBK	*Solid fuel boiler alternative*
AL OWD	*East-west roof alternative*
BR	*Jumper*
X4	*Connection to SolvisLea X4*
EP	*Expansion board, see* ➔ fig. 100, p. 61
KBB SC-2-3	*SolvisControl 3 sensor cable harness*
KBB-SÜS	*Sensor cable harness for solar heat transfer station*
LP	*Load pump*
PWM	*Pulse width modulation*
R1-R3	*Room operating unit*
SG	*SmartGrid connection board, see* ➔ Fig. 101, p. 62
Solar	*Solar pump*
St	*SolvisLea controller*
WWS	*Hot water station*
ZR	*Central controller interface*
UV	*Switching valve*

11.4.3 SolvisBen Lino and SolvisBen Solo connection diagram

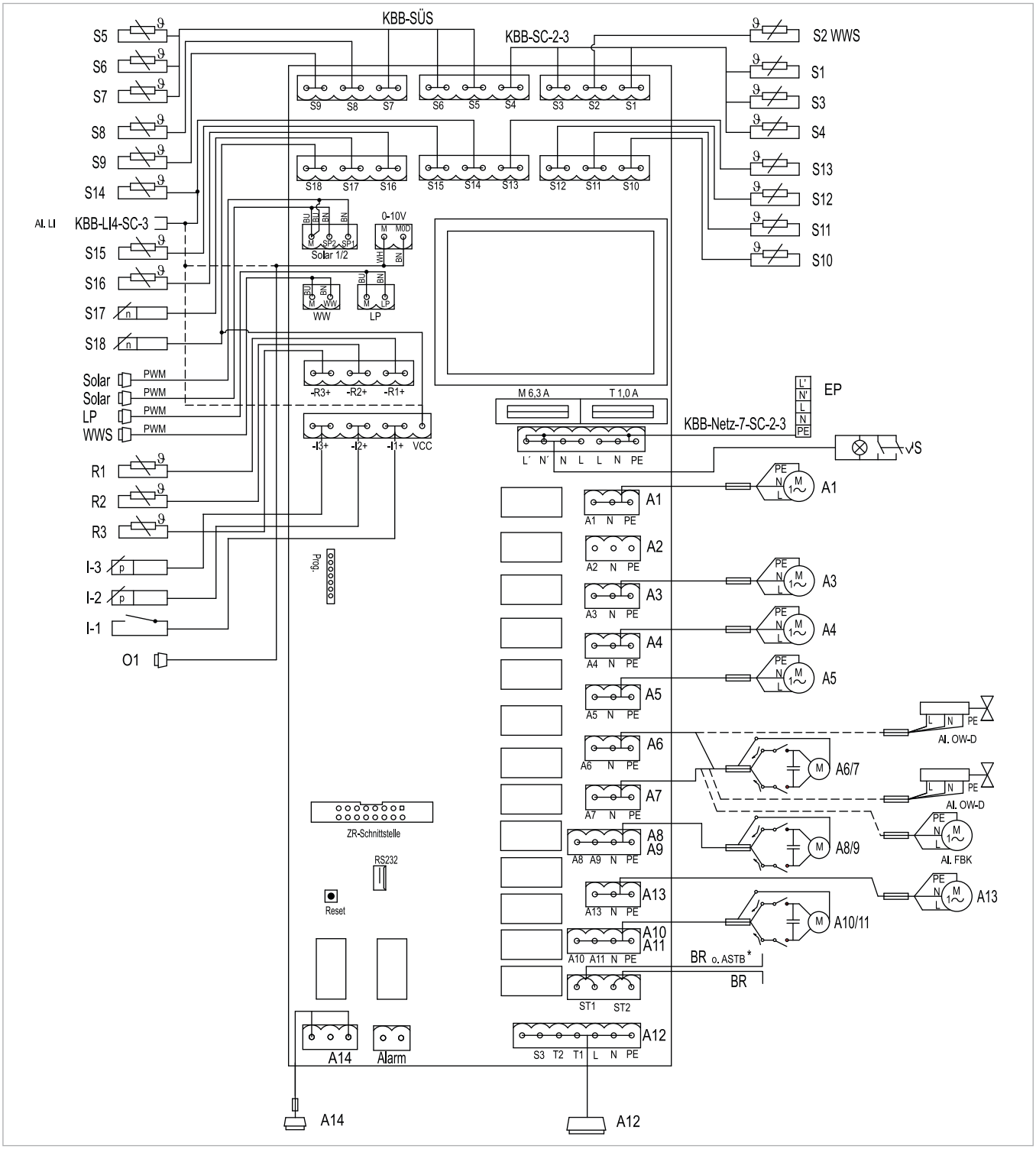


Fig. 99: SolvisControl 3 mains circuit board for SolvisBen Solo/SolvisBen Lino

* Exhaust safety temperature limiter (ASTB) required only in Switzerland

AL FBK	*Solid fuel boiler alternative*
AL LI	*Alternative SolvisLino 4 pellet boiler*
AL OWD	*East-west roof alternative*
ASTB	*Exhaust safety temperature limiter*
BR	*Jumper*
EP	*Expansion board, see* ➔ fig. 100, p. 61
KBB SC-2-3	*SolvisControl 3 sensor cable harness*
KBB-SÜS	*Sensor cable harness for solar heat transfer station*
LP	*Load pump*
PWM	*Pulse width modulation*
R1-R3	*Room operating unit*
Solar	*Solar pump*
WWS	*Hot water station*
ZR	*Central controller interface*

11.5 Expansion Board

11.5.1 Connection table

Actuators (pumps)		
Output no.	**SolvisBen HP**	**SolvisBen Lino/Solo**
AC1	SmartGrid connection board and A12 voltage supply	(Reserve)
AC2	A14 voltage supply	Load pump
AC3	(Reserve)	(Reserve)
AC4	Solar pump 1 and 2	Solar pump 1 and 2
AC5	Hot water pump	Hot water pump

Fig. 100: Expansion board for SolvisControl 3 mains circuit board

11.6 SmartGrid connection board

The SmartGrid connection board is an interface with several functions. It can relieve the mains by switching off the heating pump. It is also possible to take advantage of favourable tariffs during periods with low loads to charge the hot water area to a particularly high temperature.

Furthermore, instead of low-cost electricity, your own electricity from a PV system can also still be used (additional hardware and potential inverter programming necessary).

11.6.1 Connection table

Operating status	Switch state		Explanation
	SG1	SG2	
1 – “utility supply company idle period”	1	0	Heating pump disabled by utility supply company
2 – Normal mode	0	0	If nothing is connected to the connection board, this state is continuously active.
3 – Increased operation	0	1	Increase of the setpoint
4 – ext. requirement	1	1	Heating pump switches on if possible; operation as 3

11.6.2 Connection Diagram

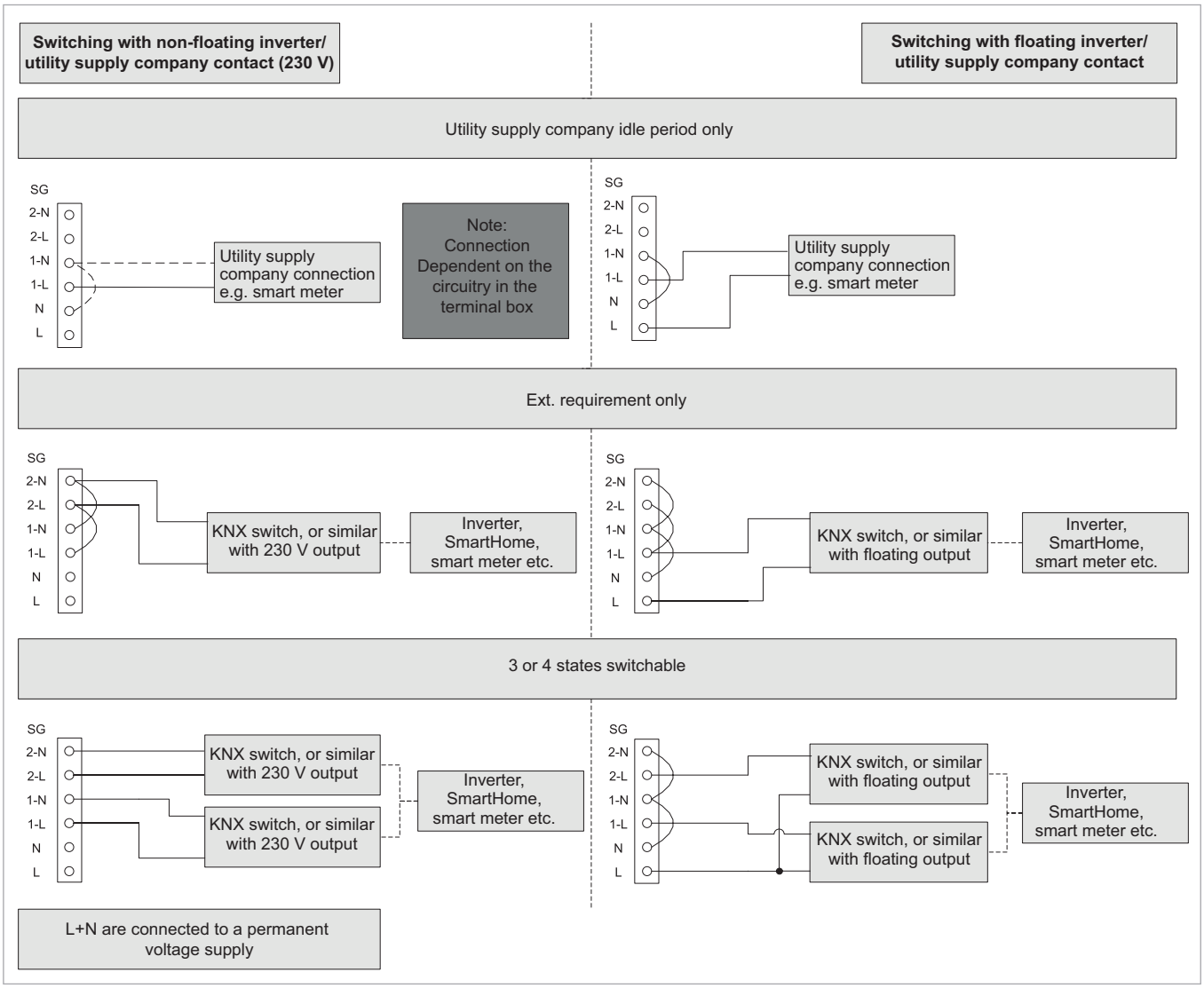


Fig. 101: SmartGrid connection options for the SolvisControl 3 mains circuit board

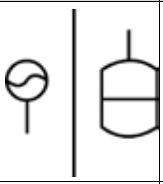
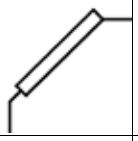
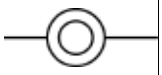
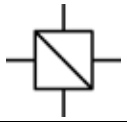
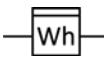
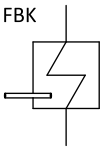
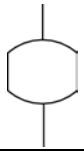
11.7 Explanation of Symbols

11.7.1 Hydraulic elements

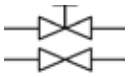
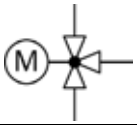
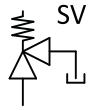
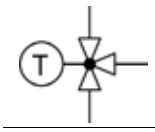
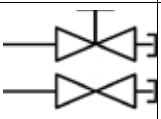
Valves

Symbol	Meaning
	Manometer
	Thermometer

Components

Symbol	Meaning
	Membrane expansion vessel
	Oil or gas burner
	Solar collector
	Consumers in the heating circuit
	Heat exchanger
	Heat quantity counter
	Solid fuel boiler (FBK) or pellet boiler (Lino 3)
	Primary tank VG-xx

Valves

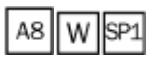
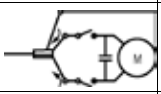
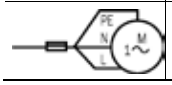
Symbol	Meaning
	Shut-off valve or valve
	Adjusting valve
	Bleeding tap
	Motor-driven mixing valve
	Gravity brake / non-return valve
	Safety valve
	Thermostatic mixing valve
	Solar cap valve
	Boiler filling and draining valve
	Thermal discharge safety device (TAS)

Other hydraulic components

Symbol	Meaning
	Volume flow encoder
	Pump
	Sludge separator
	Drinking water filter

11.7.2 Electrical symbols

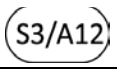
Actuators

Symbol	Meaning
	General actuator (pump / control valve / mixing valve / connection)
	Servomotor (e.g. on the three-way mixing valve)
	Motor (e.g. of a pump)

Sensors

Symbol	Meaning
	General sensor (temperature sensor, volume flow encoder, etc.)
	Volume flow encoder
	Temperature sensor

Other electrical components

Symbol	Meaning
	Jumper
	On/off switch (button with lock function)
	Automatic firing system
	Lightning protection box
	Room control element
	Terminal S3 at output A12

11.8 Spare parts overview

The available spare parts are listed in the ➔ *SolvisBen spare parts list (TNF-EST-BEN)*.

11.9 Accessories

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

11.10 Sensors and connections on the storage tank

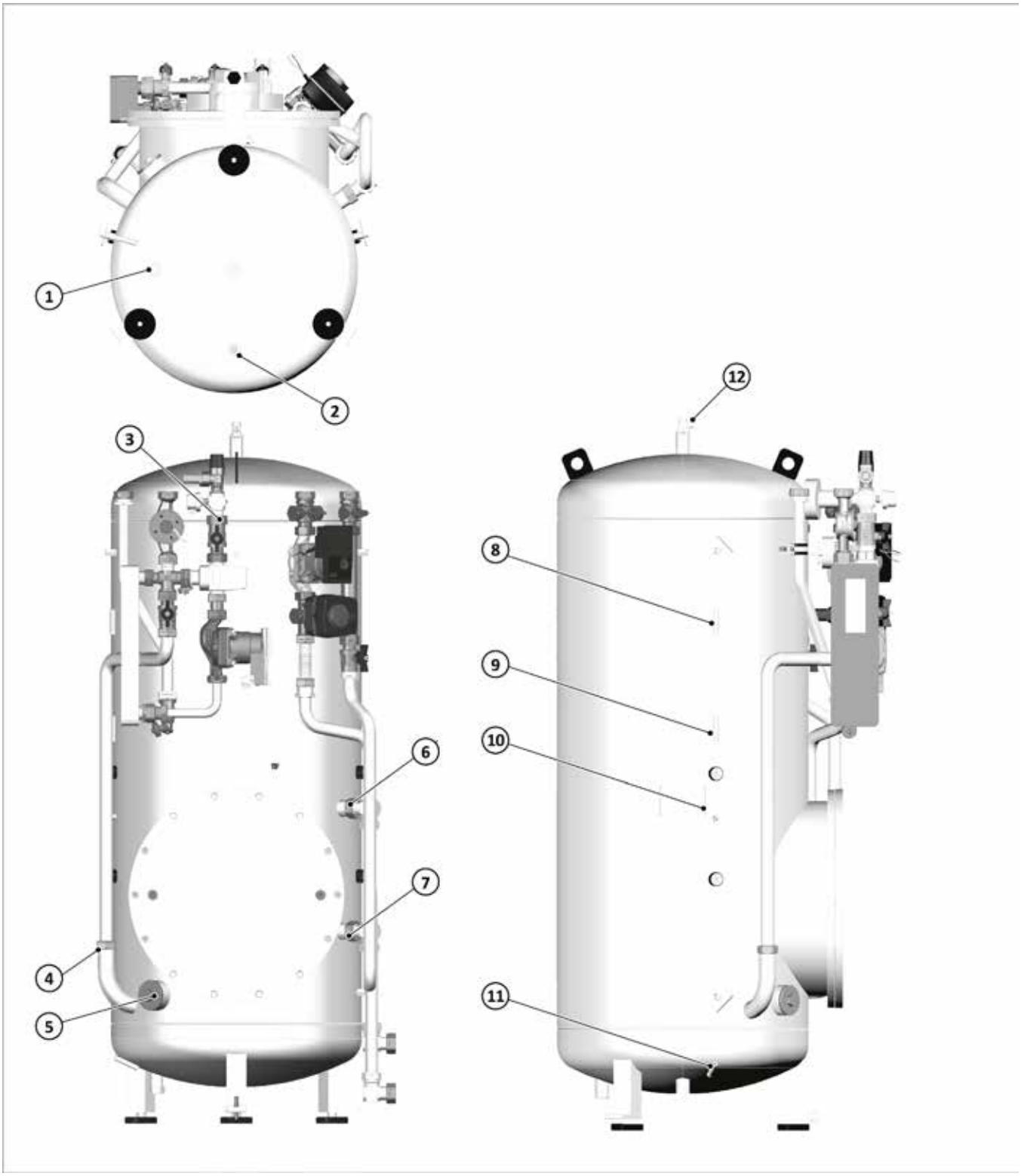


Fig. 102: Front view of the stratified storage tank, SolvisBen Solo

1 *Solar flow (SÜS)*
2 *Solar return (SÜS)*
3 *Hot water flow (WWS)*
4 *Hot water return (WWS)*
5 *Socket for electrical heating element*
6 *Heating flow*
7 *Heating return (sensor S9, bottom heating buffer)*
8 *Sensor S1, storage tank, top, Eco*
9 *Sensor S1, storage tank, top, Comfort*
10 *Sensor S4, heating buffer, top*
11 *Sensor S3, storage tank reference*
12 *Storage tank bleeder*

Storage tank bleeder

11.11 Spare parts overview

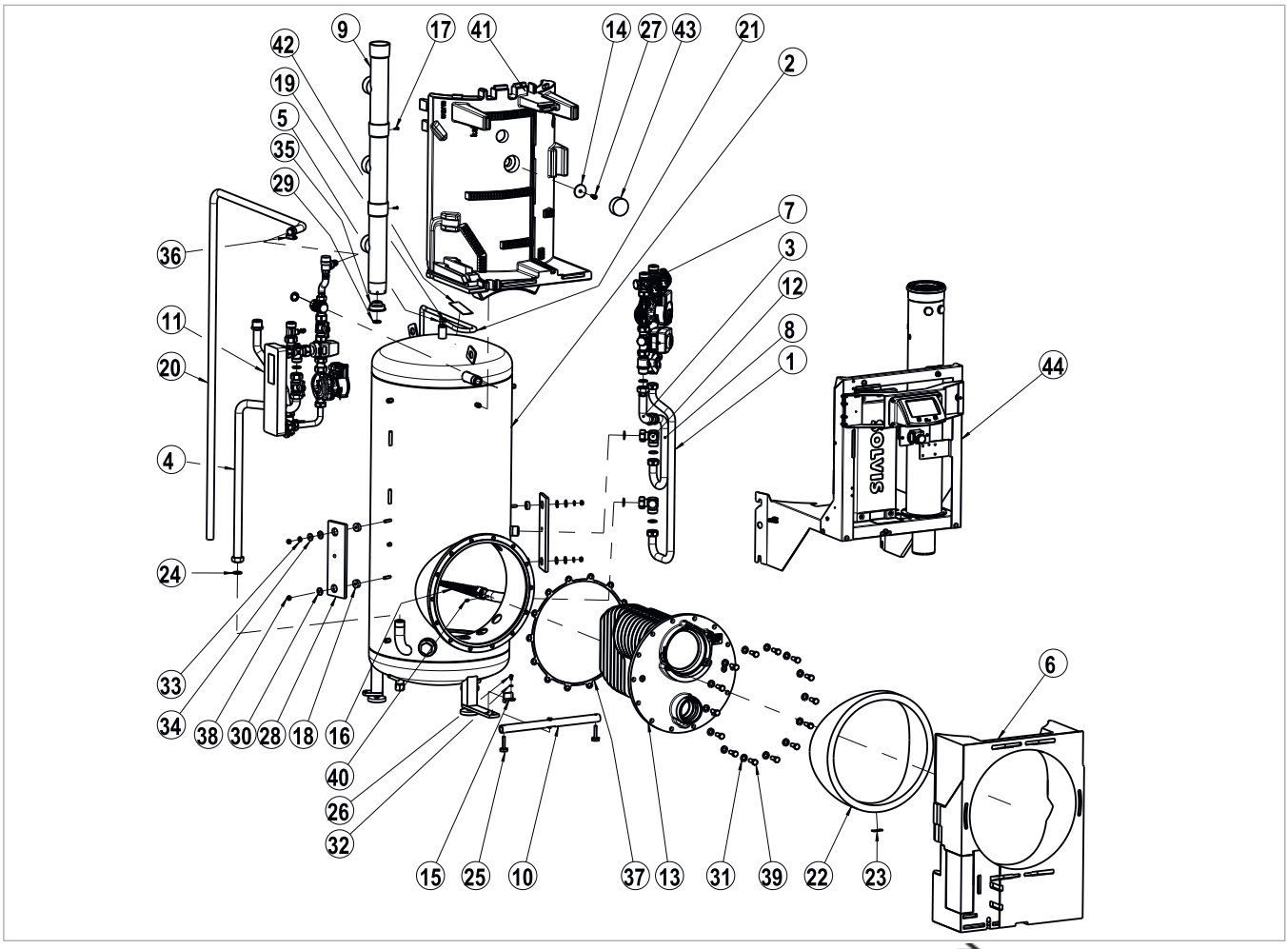


Fig. 103: Spare parts overview for SolvisBen with WWS and heating circuit pump (for all deliverable spare parts, see ➔ TNF-EST-BEN)

#	Designation	Part no.	Spare part designation	#	Designation	Part no.	Spare part designation
1	Heating return conn. pipe set	31191	Heating return conn. pipe set	23	Bandage clip	---	---
2	SolvisBen container 231	---	---	24	Seal 30x21mm	27075	Charging module seal set WWS 7
3	Heating flow corrugated pipe	30310	Heating flow pipe set BEN	25	Height adapter M8x45	30270	Height adapter set
4	WWS return corrugated pipe	29330	WWS return corrugated pipe	26	Cylinder screw M6x10	---	---
5	Bleeder with hose connect.	10432	Bleeder with hose connect.	27	Cylinder head screw M8x16	---	---
6	Ben rear flange insulation, 2-pc.	30376	Ben rear flange insulation, 2-pc.	28	Insulation for base support	---	---
7	Heating circ. stat., G Kvs 4.0	---	---	29	O-ring	---	---
8	Heating flow connect. pipe set	30310	Heating flow pipe set BEN	30	Mudguard pane	---	---
9	Stratifier 63 cpl	---	---	31	Pane 13	---	---
10	Lower SolvisBen transport handle	30301	Transport handle set	32	Pane 6.4	---	---
11	Hot water station 24 Ben	---	---	33	Pane 8.4	---	---
12	Bracket G1 ÜW x G1 AG	29289	Bracket G1 ÜW x G1 AG	34	Pane, 8.4/24x2	---	---
13	WT insert SX/BW-7	29240	WT insert for Gas/Oil 6/7	35	Solar stratifier mount	---	---
*		10389	Blind flange cover	36	Hose clip	---	---
14	EPP front attachment plate	---	---	37	Screw flange seal 7	27855	Screw flange seal 7
15	Flange insulation attachment plate	30174	Flange insulation attachment plate	38	Hexagon nut M8	---	---
16	Charging lance	29306	Charging lance	39	Hexagon screw M12x30	---	---
17	Drilling screw 3.9 x 16	---	---	40	Expanding rivet	---	---
18	Thermal decoupling ring	---	---	41	Station insulation	---	---
19	2-thread clamp 14.4-15.1mm	30954	2-thread clamp 14.4-15.1mm	42	Nameplate	---	---
20	Hose	---	---	43	Station ins. fleece plug	29488	Station ins. fleece plug
21	Bleeder hose	10433	Bleeder hose	44	Console assembly	---	---
22	Flange collar insulation	30261	Flange collar insulation				

11.12 Nameplate

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

11.12.1 SolvisBen HP

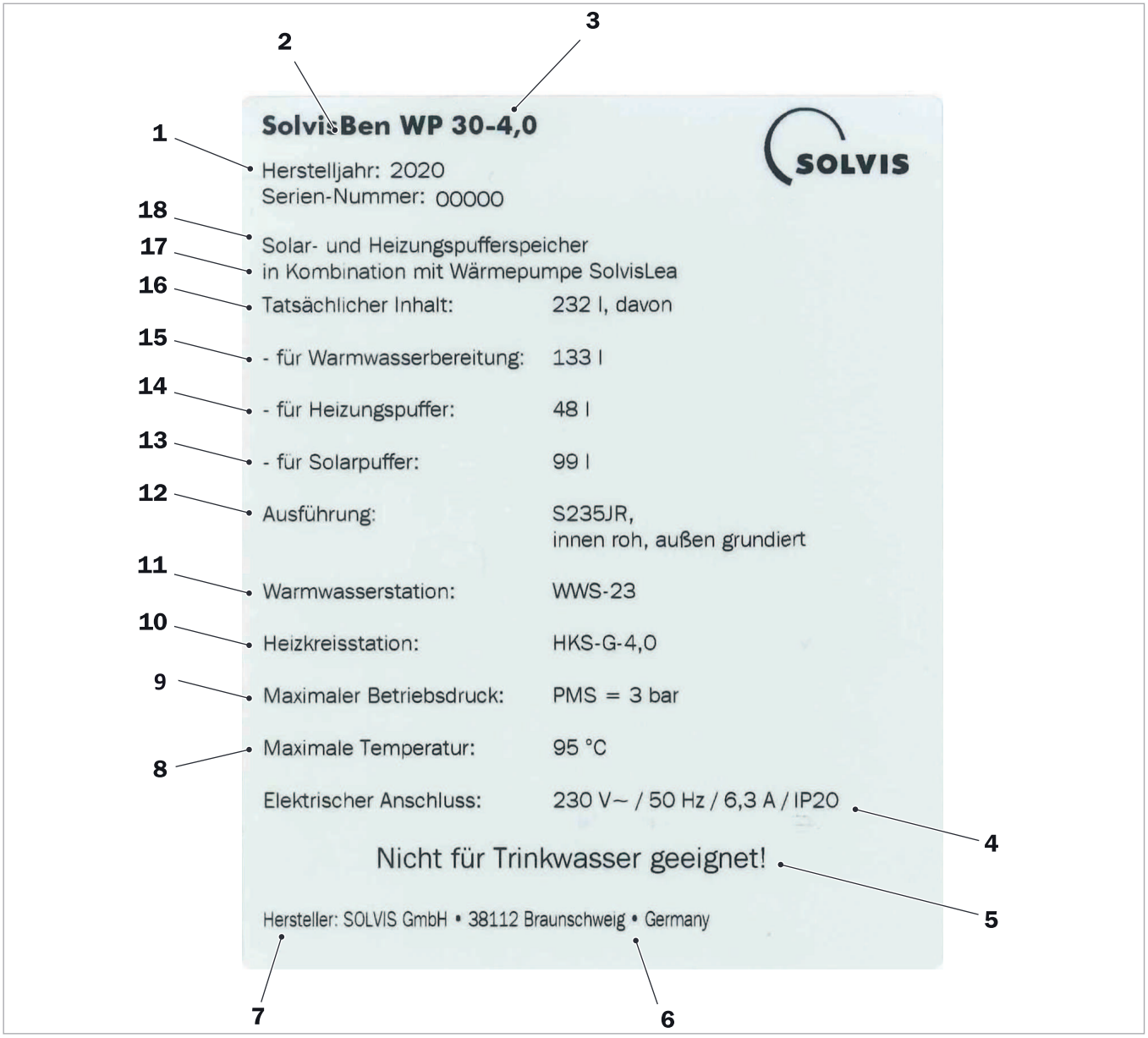


Fig. 104: SolvisBen WP sample nameplate

1	*Year of manufacture*	**10**	*Heating circuit station type (if installed)*
2	*Type designation*	**11**	*Hot water station type*
3	*WWS/HKS type size*	**12**	*Container wall material design*
4	*Electrical connection data/protection class*	**13**	*Solar buffer volume*
5	*Container content, no drinking water*	**14**	*Heating buffer volume*
6	*Place of manufacture*	**15**	*Hot water buffer volume*
7	*Manufacturer*	**16**	*Actual water content*
8	*Maximum temperature in [°C]*	**17**	*In combination with SolvisLea heating pump*
9	*Maximum operating pressure in [mbar]*	**18**	*Solar and heating buffer storage tank*

11.12.2 SolvisBen Lino

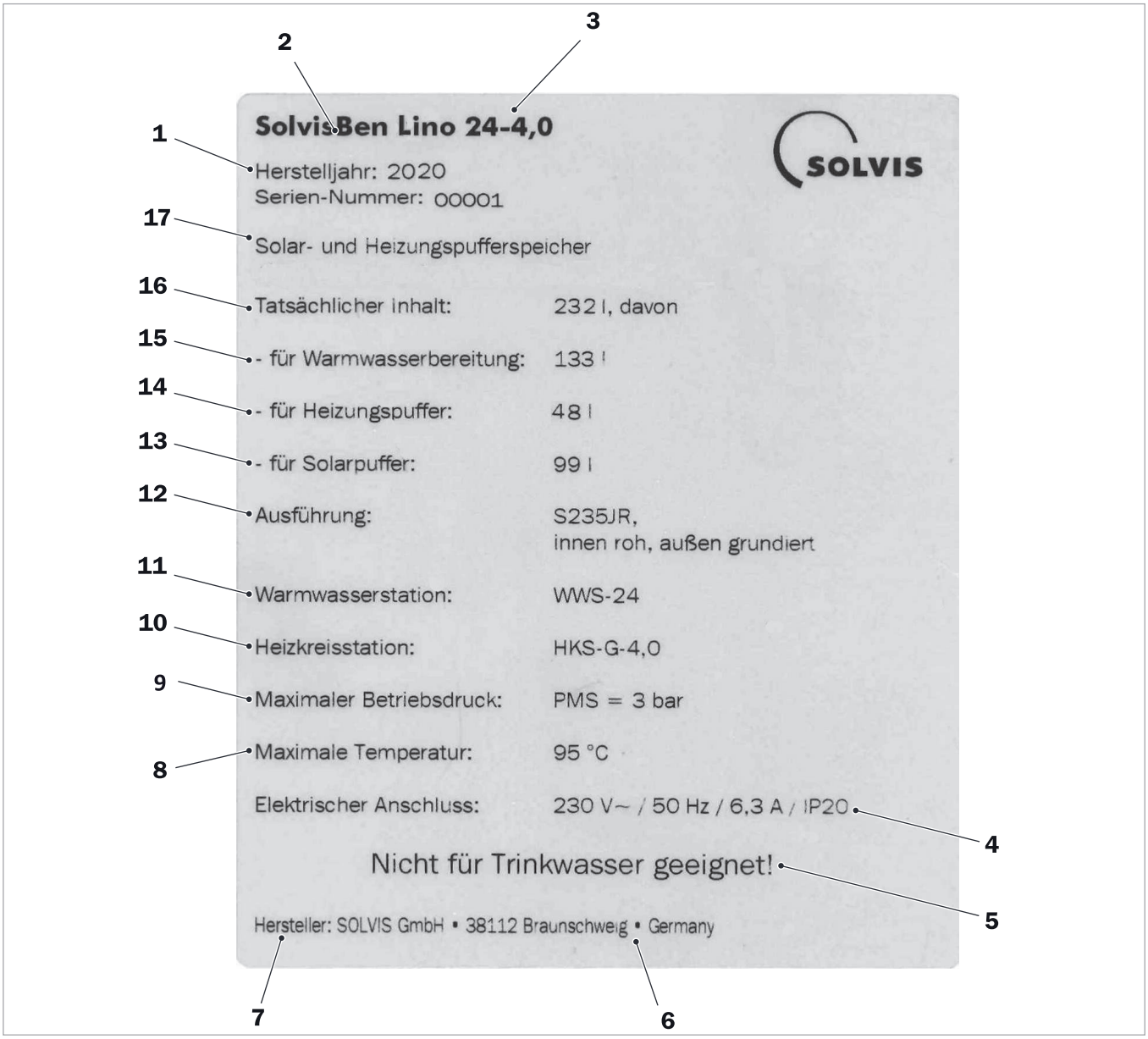


Fig. 105: SolvisBen Lino sample nameplate

1	*Year of manufacture*
2	*Type designation*
3	*WWS/HKS type size*
4	*Electrical connection data/protection class*
5	*Container content, no drinking water*
6	*Place of manufacture*
7	*Manufacturer*
8	*Maximum temperature in [°C]*
9	*Maximum operating pressure in [mbar]*
10	*Heating circuit station type (if installed)*
11	*Hot water station type*
12	*Container wall material design*
13	*Solar buffer volume*
14	*Heating buffer volume*
15	*Hot water buffer volume*
16	*Actual water content*
17	*Solar and heating buffer storage tank*

11.12.3 SolvisBen Solo

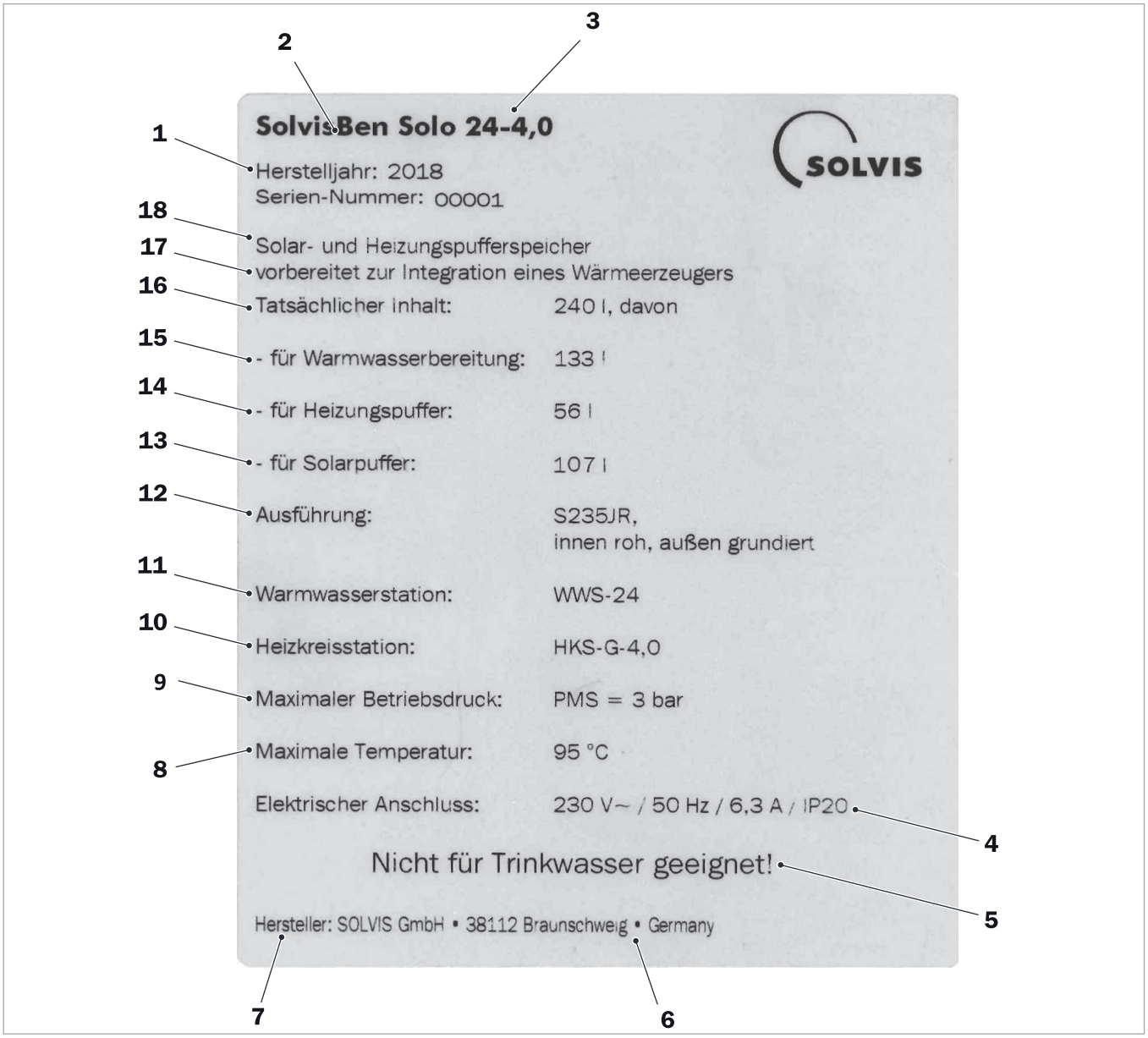


Fig. 106: SolvisBen Solo sample nameplate

1	*Year of manufacture*
2	*Type designation*
3	*WWS/HKS type size*
4	*Electrical connection data/protection class*
5	*Container content, no drinking water*
6	*Place of manufacture*
7	*Manufacturer*
8	*Maximum temperature in [°C]*
9	*Maximum operating pressure in [mbar]*
10	*Heating circuit station type (if installed)*
11	*Hot water station type*
12	*Container wall material design*
13	*Solar buffer volume*
14	*Heating buffer volume*
15	*Hot water buffer volume*
16	*Actual water content*
17	*Prepared for the integration of a heat generator*
18	*Solar and heating buffer storage tank*

12 Index

Art.-Nr.: 31130 - MAL-BEN-LI-SL-EN - Dokument-Nr.: 31130-3e / Redaktioneller Stand: 05.23 - Technischer Stand: 07.22

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