Installation

FWS-HE Fresh Water Station

For use in SolvisVital systems

FWS-20, 40, 80, 120-HE

- Installation
- Start-up
- Maintenance

Wärme. Leben. Zukunft.

Contents

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.

Using these instructions

Additional documentation

Additional documentation, see ➔ *sec. "Scope of Delivery", p. 5.*

The following documents, which may be required, are also referred to in these instructions:

- SolvisStrato – Installation Instructions (MAL-SR-7)
- SolvisVital – Operating Instructions for System Operators (BAL-SV-3-K)
- SolvisVital – Operating Instructions for Installers (BAL-SV-3-I)
- SolvisVital – System Diagrams (ALS-SV-3)
- Charging Lance – Installation Instructions (MAL-BLL)

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.

2 Notes

Observe the safety notes

This is for your own safety.

- Make sure that you are familiar with the safety notes before beginning work.
- Observe and adhere to the relevant safety regulations and the valid accident prevention regulations.
- You should also follow the safety notes and any other notes from the available system documentation.

2.1 Features and applications

A key feature of the SolvisVital fresh water system (➔ *Fig. 1*) is the centralised, hygienic and economical production of hot water with a particular focus on demand-based coverage of the circulation load.

The system diagram depends on the application, see ➔ *System diagram for SolvisVital (ALS-SV-3)*.

The SolvisVital fresh water system is designed for optimal application in multi-storey apartment buildings, sports facilities, hotels, guest houses, and care facilities. A thermal solar power system can be added to the system.

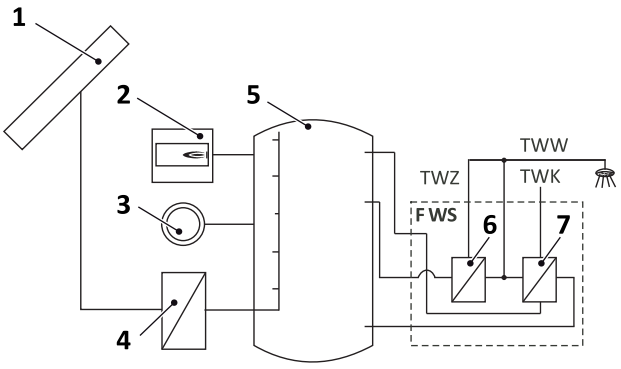

Fig. 1: Structure of the SolvisVital fresh water system

1	*Solar collectors, standard*
2	*Heat generator*
3	*Heating circuit(s)*
4	*Solar heat transfer station*
5	*SolvisStrato buffer tank*
6	*Plate heat exchanger for drinking water circulation*
7	*Plate heat exchanger for hot drinking water*
FWS	*Fresh water station*
TWK	*Drinking water, cold*
TWW	*Drinking water, hot*
TWZ	*Drinking water circulation*

2.2 Functional description

The heat is held in the buffer tank. When hot water is delivered, the plate heat exchanger for drinking water is used to heat the cold drinking water to the target temperature in a continuous process. The cooled heating water on the primary side of the plate heat exchanger is returned to the lower, cold layer of the stratified buffer tank.

The separate plate heat exchanger for circulation also heats the circulation return of the on-site hot drinking water supply back to the target temperature in a continuous process. The primary-side return of this plate heat exchanger is separately returned to the middle layer of the stratified buffer tank.

A circulation pump can be controlled using a 0-10 V interface based on time and temperature as needed. The overall distribution network is efficiently brought to the usage temperature and maintained there.

The separate, 2-stage recirculation of the returns to the stratified buffer tank prevents blending. Combined with the patented charging lances, this creates layers with different temperature levels. A maximum cold water volume is produced in the lower layer, which allows for an increased efficiency of the heat generator or a more effective operation of the solar system (for example).

The minimal water content in the fresh water station provides ideal conditions for hygienic operation of the connected hot drinking water network.

During times when no water is drawn off, e. g. at night, legionella can be thermally prevented. To do this, the entire hot drinking water network is raised to a higher temperature level. You can select the temperature level and the duration of this function as needed. This means that they can also be adapted optimally to the differing requirements of various distribution networks.

The heat generator charges the buffer tank for hot water standby. You can use the system controller to control the boiler (e. g. via a 0-10 V signal) with an optimised boiler return temperature and demand-based volume flow and regulate up to 3 mixed heating circuits.

The system controller and the special SolvisStrato stratified buffer tank allow you to combine the system with a combined heat and power plant or to simply enhance the system with a thermal solar system.

3 Scope of Delivery

Fresh water station (FWS-xx)

In the SolvisVital system, fresh water stations are available in these four sizes: -20, -40, -80 and -120. More information on the stations is included in the “Technical Data” section.

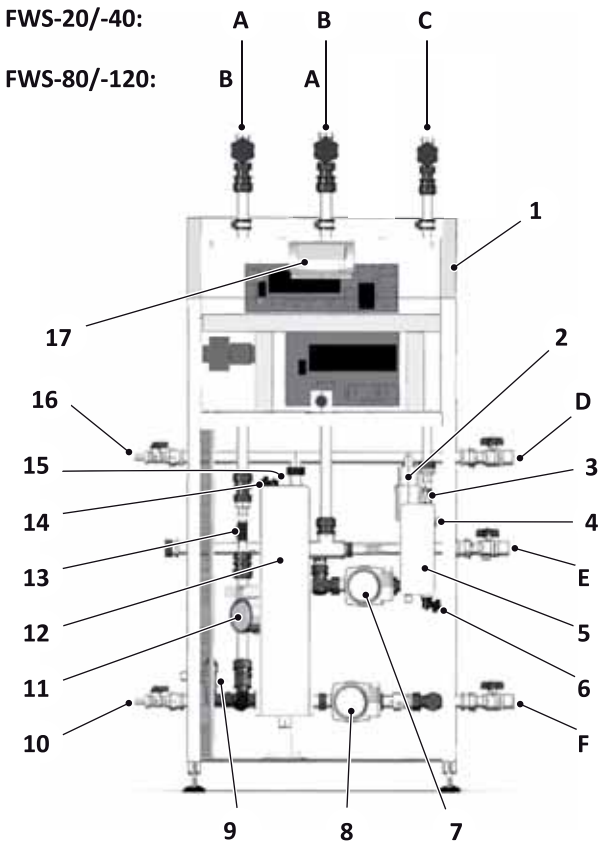

Fig. 2: Fresh water station

A *“Cold drinking water” connection*
B *“Hot drinking water” connection*
C *“Drinking water circulation” connection*
D *“FWS flow” connection**
E *“FWS hot return” connection**
F *“FWS cold return” connection**
1 *Housing with insulation*
2 *Microbubble air separator*
3 *Circulation temperature sensor*
4 *TWZ volume flow/temperature sensor*
5 *Plate heat exchanger for circulation*
6 *Boiler filling and emptying valve*
7 *Circulation pump, primary*
8 *Drinking water heating pump*
9 *Drinking water safety valve, 10 bar*
10 *Boiler filling and emptying valve*
11 *Compensation pump*
12 *Plate heat exchanger for hot drinking water*
13 *TWK volume flow/temperature sensor*
14 *Boiler filling and emptying valve*
15 *Temperature sensor for hot water delivery*
16 *Boiler filling and emptying valve (shut-off ball valves in separate package)*
17 *System controller (see documents BAL-SV-3-K and BAL-SV-3-I)*

** Can also be switched to the left connection side.*

Also included in the scope of delivery (not shown)

- Blow out tube
- Insulating caps
- SolvisVital operating instructions (BAL-SV-3-K, BAL-SV-3-I)
- Fresh water station installation instructions (this document)

4 Installation

CAUTION

Plan carefully before beginning work

Be sure to clarify which system diagram is to be used for the specific project, as well as the specific details regarding the hot water priority control system.

Prerequisites for proper installation

- Correctly install the storage tank
- Correctly install the drinking water installation
- A drinking water connection that complies with technical regulations

For information on setting up the SolvisStrato stratified buffer tank, see ➔ *Installation Instructions (MAL-SR-7).*

4.1 Placement

CAUTION

Please note during transport

Leaks or damage possible.

- Do not use the pipes for carrying.

The station is delivered fully assembled in an insulated housing. The installation site should be selected so that the length of the connection pipes to the buffer tank does not exceed 5 m; otherwise, the rated output will not be achieved.

During installation, take the total filled weight of the station into account. See ➔ *the "Technical Data" section*.

The clearance between the rear of the unit and the wall should not be less than 50 cm, because the cables are inserted from the rear.

4.2 Electrical and hydraulic connection

4.2.1 Hydraulic Connection

A diagram for this text is presented in ➔ *figure 6 on page 14*.

Hydraulically connecting the fresh water station

1. Install the shut-off ball valves and boiler filling and emptying valves and caps.
2. If necessary, attach the included valve to the cold drinking water connection (**A**).
3. If necessary, install the included ball valve on the hot drinking water connection (**B**).
4. Connect the blow out tube to the bush of the safety valve.
5. Connect the station to the buffer tank and the drinking water supply, and then fill it.
6. Install a bleeder at the highest point in the "FWS flow" connection pipe (**D**).
7. Install a charging lance (accessory; please order separately) in the connection on the storage tank (e. g. **5**) before you connect the "FWS hot return" circulation return (**E**) to the storage tank; see the relevant system diagram from ALS-SV-3.
8. After start-up and a pressure test, insulate the pipe lines and station ball valves (see German Energy Conservation regulations (EnEv)).

For information on how to install the charging lance, see ➔ *Installation Instructions (MAL-BLL)*.

Boiler-side pipe dimensioning (see ➔ *Fig. 6, page 14*)

Item	Diameter			
	FWS-20	FWS-40	FWS-80	FWS-120
D and F	DN25	DN25	DN40	DN50
E	DN20	DN20	DN25	DN25

4.2.2 Electrical connection

CAUTION

Complete the hydraulic connection

Do not make the electrical connection until you have completed the hydraulic connection.

DANGER

Risk of electrical shock

Damage to health, cardiac arrest possible.

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

CAUTION

Country-specific regulations

Regulations can differ depending on the country and the region.

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

WARNING

In the event of incorrect mains connection

Contact voltages can be extremely hazardous.

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

CAUTION

Prevent the system from being influenced by electromagnetic fields.

Risk of heating system malfunction or failure.

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

CAUTION

Criteria for line installation

Malfunction or failure of heating system possible.

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

CAUTION

Criteria for line length

Risk of heating system fault or failure.

- The total cable resistance for the sensor cables must not exceed 2.5 ohms. For cables with a cross section of 0.25 mm², this corresponds to a length of up to 5 m.
- For cross sections of 0.5 or 0.75 mm², the maximum cable length is 15 or 50 m.
- Sensor cables for temperature sensors should not be unnecessarily long. For very long cables, sensor correction can be performed to minimise the systematic variance errors.
- The sensor cable for volume flow encoders should not be longer than 10 m.

CAUTION

Observe ambient conditions

Malfunction or failure of system possible.

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

CAUTION

Avoid contaminants

- Water, oil, grease, solvent, dust, foreign bodies, aggressive vapours and other contaminants must be kept away from the system and the units.
- Cover the system and the units when performing construction or other work in the area to protect them from dirt and contaminants.

Connecting the sensors

1. Open the control console on the station. To do so, loosen and remove the screws on the front cover.
2. Apply heat conducting paste to temperature sensors S1, S3, S4, S7 and S9 on the supplied cable tree and plug them into the appropriate sleeves on the buffer tank in accordance with the system plan.
3. Run the cable tree to the control console and connect it to the appropriate inputs on the mains circuit board. If necessary, extend it using a suitable 10-wire cable (e.g. FK-10ADRIG).
   The cables are inserted at the rear of the station and routed up to the control.
4. Secure the cable tree with a strain relief device.
5. After you have finished with the wiring, put the foam plugs back into the cable channel to reduce the heat flow to the control.
6. Connect additional sensors in accordance with the system plan (e.g. for solar heat recovery or for control of a heating circuit or boiler). When you do so, follow the relevant installation instructions.

Connecting the actuators

1. Connect the power cable of the on-site circulation pump to “A5” on the mains circuit board.

2. Connect the 0-10 V control line of the on-site circulation pump to “O-6” on the mains circuit board.
3. Connect additional pumps and actuator drives (e.g. for the solar system, heating circuits and/or boilers) in accordance with the system plan. When you do so, follow the relevant installation instructions.

Connecting the voltage supply

1. Connect the system controller to the proper voltage supply (clamp connections L, N, and PE to the rows on the left).
2. If a fixed mains connection is used, provide an emergency stop switch.

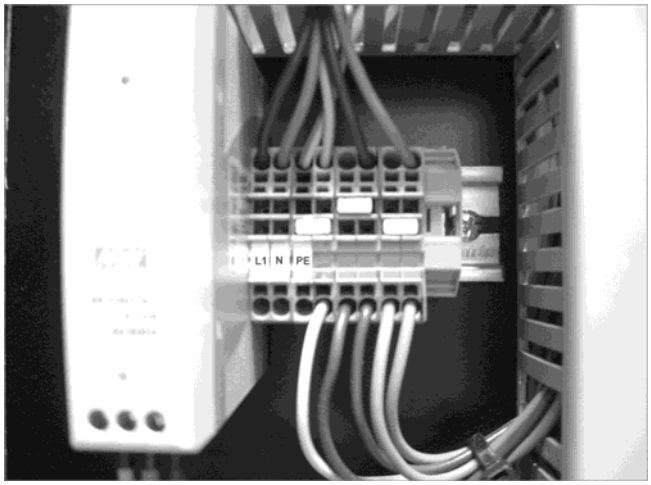

Fig. 3: Connecting the voltage supply

5 Start-Up

CAUTION

Always open the ball valves slowly.

Otherwise, the volume flow encoders may be damaged.

- To prevent damages due to hydraulic shock, make sure that you slowly open the ball valves on the drinking water side (**A**), (**B**) and (**C**).

CAUTION

Clarify the auxiliary heating requirement for hot water

Before startup, clarify the details regarding auxiliary heating for hot water.

For information on system handling, see ➔ *Solvis-Vital – Operating Instructions (BAL-SV-3-K)*

A diagram for this text is presented in ➔ *figure 6 on page 14*.

Filling and flushing the system on the drinking water side

1. **Slowly** open the “Cold drinking water” (**A**), “Hot drinking water” (**B**) and “Drinking water circulation” (**C**) valves.

The pressure from the connected drinking water supply causes the fresh water station and hot drinking water (circulation) supply to be filled.

2. Bleed the hot drinking water (circulation) network.
3. Check all connections for leaks and insulate the connection pipes and ball valves in accordance with German Energy Conservation regulations (EnEv).

Filling and flushing the system on the heating side

1. Open the “FWS flow” (**D**), “FWS hot return” (**E**) and “FWS cold return” (**F**) ball valves on the fresh water station.
2. Position gravity brakes behind the pumps (**8** and **9**; slot in the adjusting screw is at a 90° angle to the direction of flow).
3. Connect a flushing hose to the boiler filling and emptying valve (**20**), run it into a suitable container, and open the bleeding valve.
4. Use the boiler filling and emptying valve (**21**) to fill the buffer tank and fresh water station with treated heating water (observe VDI 2035 guideline).
5. Bleed the storage tank and pipe lines to the fresh water station and heat generator, and close the ball valves (**E** and **F**).
6. Connect the filling hose from the boiler filling and emptying valve (**21**) to the pressure connection of a suitable filling pump.
7. Run an additional hose with a screen filter into the container and connect it to the suction connection of the filling pump.
8. Fill the container with treated water.
9. Thoroughly flush the heat exchanger (**13**) from the boiler filling and emptying valve (**21**) to the boiler filling and emptying valve (**20**).
10. Close the ball valve (**D**) and open (**E**).
11. Thoroughly flush the heat exchanger (**6**) from the boiler filling and emptying valve (**21**) to the boiler filling and emptying valve (**20**).
12. After any dirt has been discharged, close the boiler filling and emptying valve (**20**).
13. Set the gravity brakes behind the pumps (**8** and **9**) to automatic mode (slot in the adjusting screw is in the direction of flow).
14. Open the ball valves (**D**, **E** and **F**).

Performing a pressure test

The system is still cold.

1. Use the connected filling pump to further increase the pressure via the boiler filling and emptying valve (**21**) and perform a pressure test.
2. After achieving a successful pressure test, close the boiler filling and emptying valve (**21**) and remove the flushing hoses.
3. Re-install the front cover of the station.
4. Use the supplied insulating caps to insulate the side boiler filling and emptying valves and caps.
5. Insulate the pipe lines and ball valves in accordance with German Energy Conservation regulations [EnEV].

Starting up the system

1. Start up the system in accordance with the (BAL-SV-3-K, BAL-SV-3-I) instructions and the boiler manufacturer’s instructions.
2. Also follow the instructions for additional system components (e. g. solar heat transfer system, heating circuit station) in accordance with the system plan.

6 Maintenance

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

6.1 General maintenance

Checking the general condition

1. Check the general condition.
2. Remove dirt with a damp cloth. Do not use caustic or solvent-based cleaners.

Checking the controller

1. Check that the system controller functions flawlessly (sensor values, operating modes and set values).
2. Check that hot water production and the circulation controller function properly.

Checking the pumps

1. Check that the pumps function flawlessly (drinking water circulation pump and hot water pumps).

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.
- Apply the specified safety measures.

For information on the required maintenance work for the stratified buffer tank, see ➔ *SolvisStrato – Installation Instructions (MAL-SR-7).*

For information on the required maintenance work for the solar system, see ➔ *Solar Heat Transfer Station SÜS-S – Installation Instructions (MAL-SUES).*

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.

6.2 Other care measures

Care instructions

In between annual maintenance work, we recommend that you check the general condition of the system on a regular basis. This helps to conserve the value of the system and ensure continuity of supply.

7 Technical Data

7.1 Fresh water station

General data about the fresh water station

Name	Unit	FWS-20	FWS-40	FWS-80	FWS-120
Rated discharge output	[kW]	69	139	277	416
Rated volume flow at 60 °C outlet temperature*)	[l/min]	20	40	80	120
Maximum circulation power	[kW]	12	20	30	30
Plate heat exchanger, drinking water, cold	–	CB60-30H	CB60-60H	CB112-50M	CB112-80M
Plate heat exchanger, drinking water, circulation	–	CB16-25H	CB16-50H	CB30-24M	CB30-24M
Capacity: drinking water	[l]	3	5	8	12
Total weight (filled)	[kg]	86	96	177	185
Primary pump, circulation (A6)	–	Yonos RS 15/7.0		Stratos-PARA 15/1-7	
Water heating pump (A2)	–	Yonos RS 15/7.0	Yonos RS 15/7.5	UPMXL GEO 32-125 180 PWM	
Compensation pump (A19)	–	Ecocirc PRO 15-1/65			
Maximum permitted operating pressure	[bar]	Buffer tank: 6; drinking water circuit: 10			
Permitted media temperature	[°C]	95, at a max. ambient temperature of 40			
Control	–	SC-FWS control console (SolvisControl system controller)			
Electrical voltage supply	–	230 V AC/50 Hz			
Maximum power consumption: fresh water station**)	[W]	136	166	301	301

*) *Temperatures: FWS flow = 72 °C, FWS cold return = 20 °C, cold drinking water = 10 °C, hot drinking water = 60 °C.*
**) *To determine the total power consumption, take the connected components (e. g. solar heat transfer station, heating circuit station, etc.) into account.*

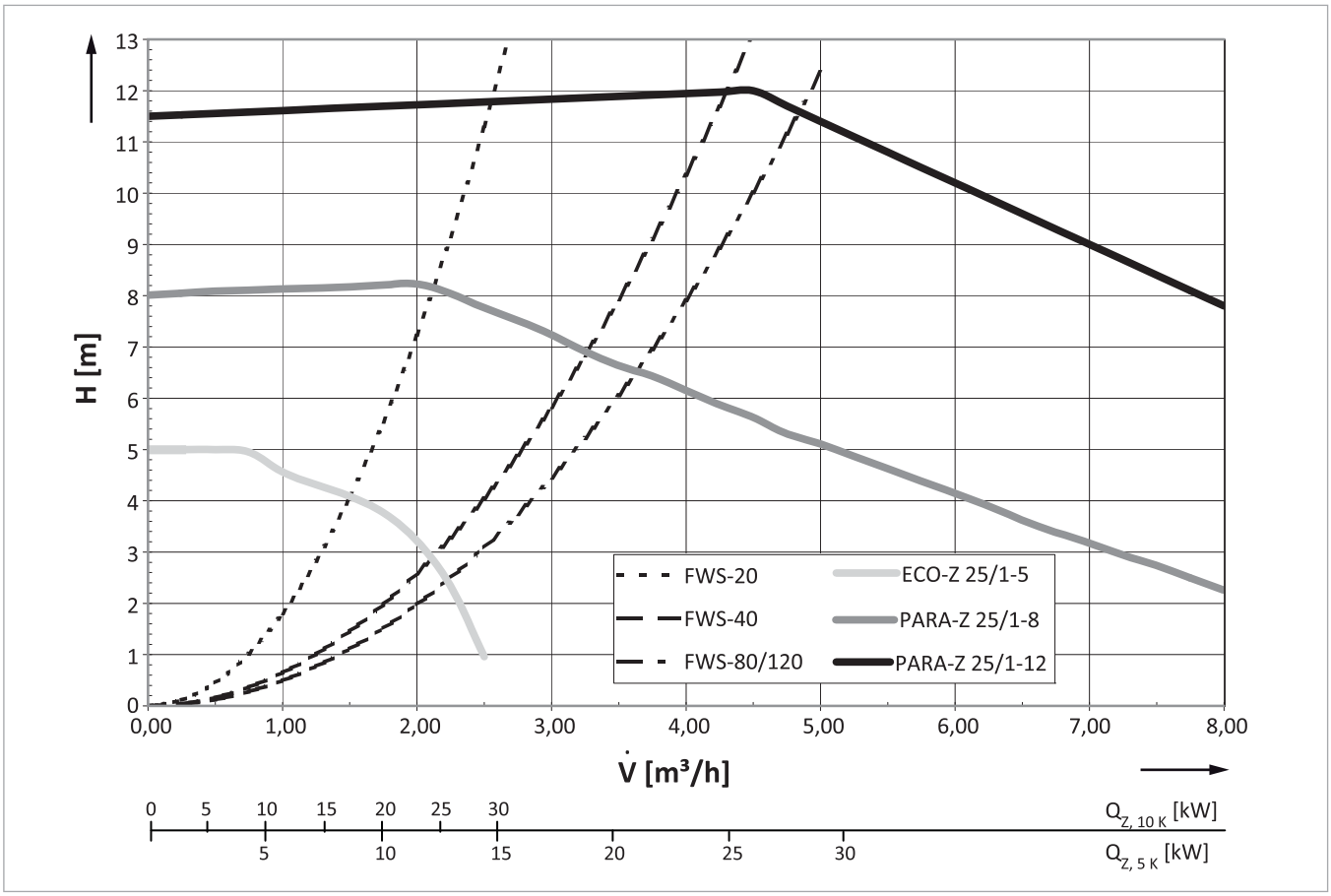

Fig. 4: Pressure loss curves for drinking water circulation of the fresh water stations and pump characteristic curves for accessory pumps

H *Pump height in [m]*
$\dot{V}$ *Flow in [m³/h]*
$Q_{Z,5K}$ *Circulation power at a difference of 5 K* [kW]*
$Q_{Z,10K}$ *Circulation power at a difference of 10 K* [kW]*
**Difference between the hot water flow temperature and circulation temperature*

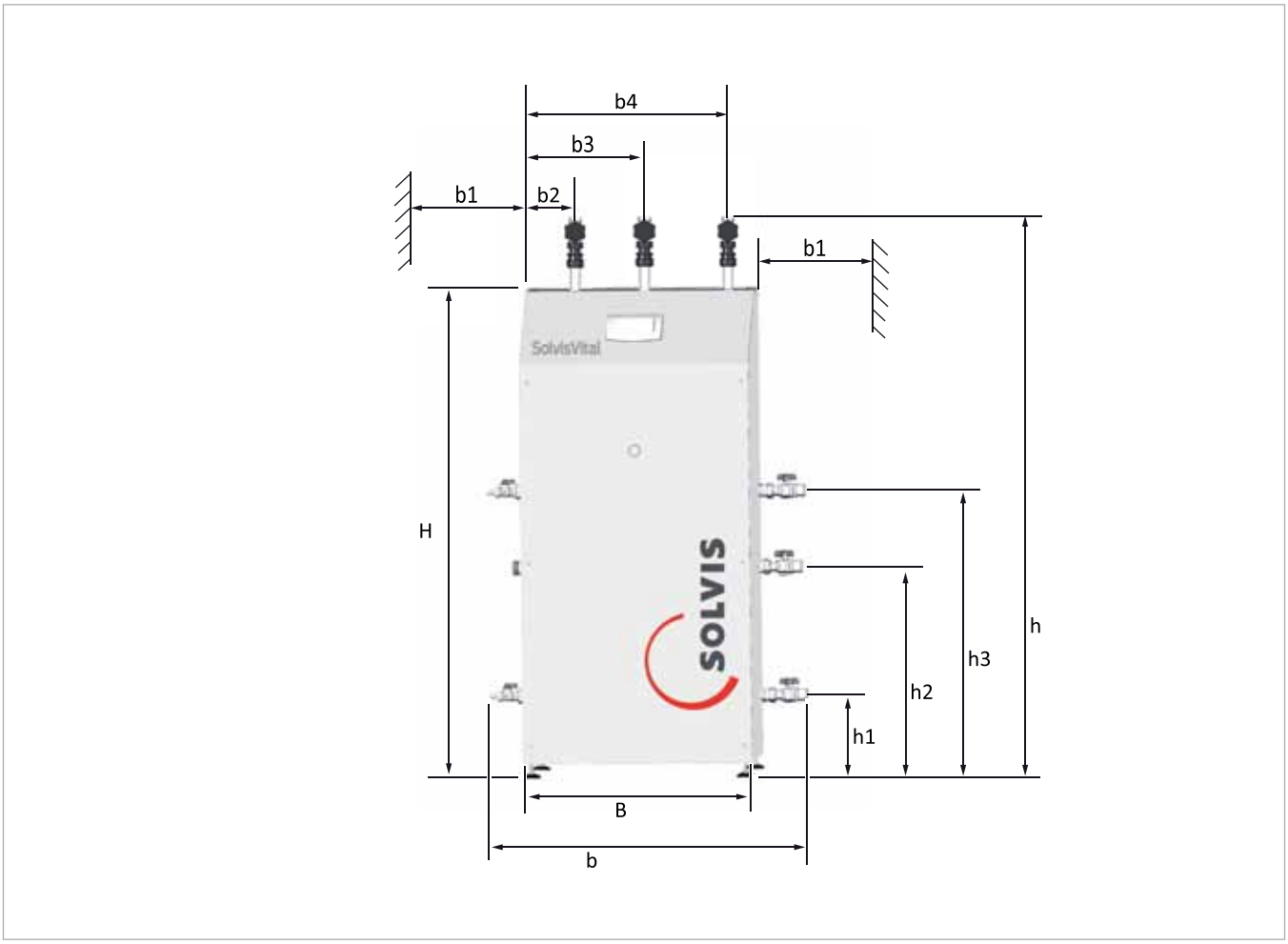

Fig. 5: Dimensions of the fresh water station

Dimensions of the fresh water station

Designation	FWS-20	FWS-40	FWS-80	FWS-120
B	615		1000	
H	1300		1300	
h	1510		1510	
T	400		415	
Clearance between rear of unit and wall	≥ 500		≥ 500	
b	870		1275	
b1 (clearance for maintenance, recommendation)	≥ 500		≥ 500	
h1	205		185	
h2	575		365	
h3	785		805	
b2	125		235	
b3	315		565	
b4	545		835	

Dimensions in [mm]

Fresh water station connection dimensions

Name	FWS-20	FWS-40	FWS-80	FWS-120
Drinking water, hot, cold, circulation	1" male thread		1½" female thread	
Flow	1" male thread		1½" female thread	
Return, cold	1" male thread		1½" female thread	
Return, hot	1" male thread		1" male thread	

7.2 Temperature sensor

Resistance measured values of the temperature sensors
Sensors that are not connected have resistance values that are shown in the table at various temperatures. The resistance values can be checked with a measuring device if a defective sensor is suspected.

Sensor types and their application
Pt 1000
Solar flow, solar return, collector sensor

KTY (2 kΩ)
All other sensors

Pt1000									
Temperature [°C]	–10	0	10	20	25	30	40	50	60
Resistance [Ω]	961	1,000	1,039	1,078	1,097	1,117	1,155	1,194	1,232
Temperature [°C]	70	80	90	100	110	120	130	140	150
Resistance [Ω]	1,271	1,309	1,347	1,385	1,423	1,461	1,498	1,536	1,573

KTY (2 kΩ)									
Temperature [°C]	- 10	0	10	20	25	30	40	50	60
Resistance [Ω]	1,495	1,630	1,772	1,922	2,000	2,080	2,245	2,417	2,597
Temperature [°C]	70	80	90	100	110	120	130	140	150
Resistance [Ω]	2,785	2,980	3,182	3,392	3,607	3,817	3,915	4,008	4,166

8 Appendix

8.1 Schematic view

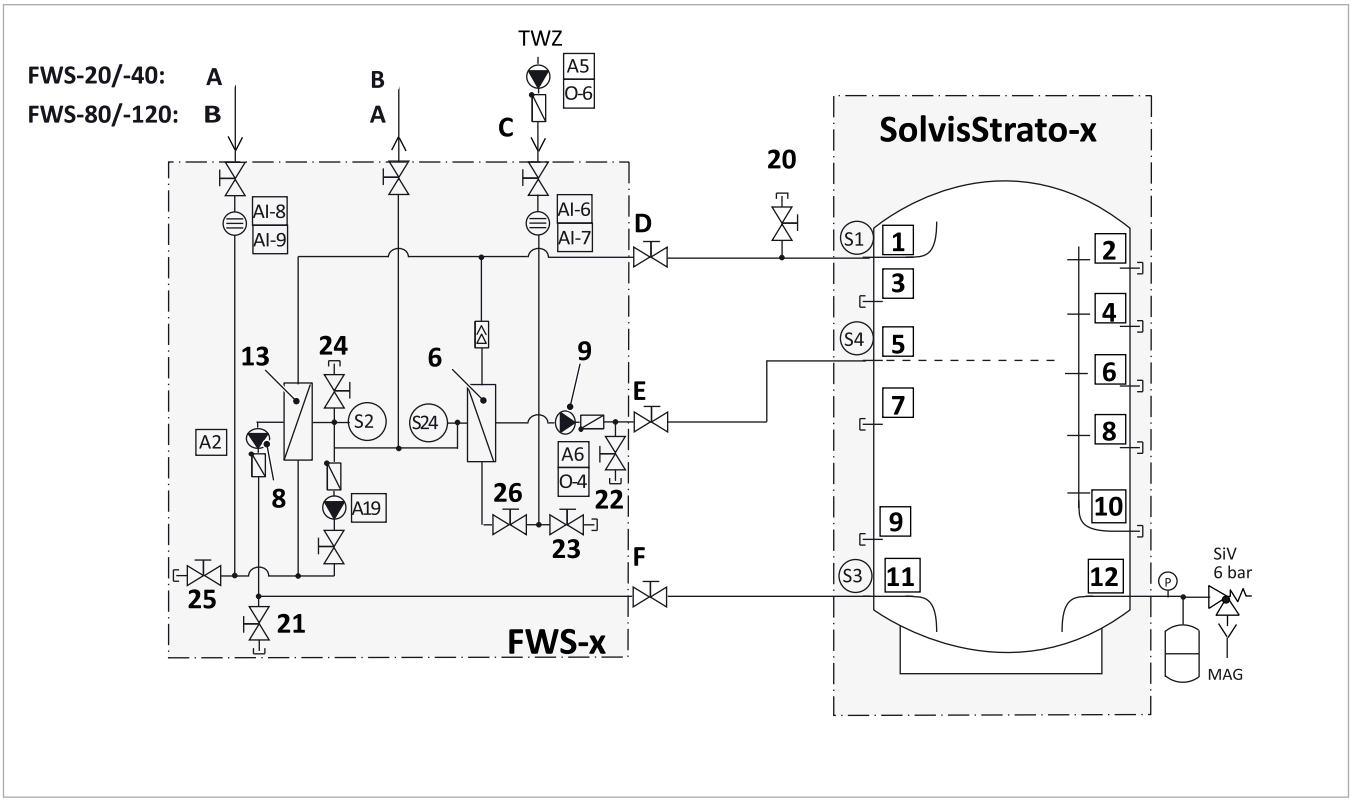

Fig. 6: Hydraulic connection of the fresh water station (single-tank system for the heating of drinking water, without solar connection)

Legend:

6	*Plate heat exchanger for circulation*
8	*Circulation pump, primary*
9	*Hot water production pump*
13	*Plate heat exchanger for hot drinking water*
20 - 25	*Boiler filling and emptying valve*
26	*Shut-off valve*
FWS-xx	*Fresh water station*
TWZ	*Drinking water, circulation*

For detailed system diagrams, see ➔ *document (ALS-SV-3-HE).*

Hydraulic connection of fresh water station FWS-xxx

Item	Connection name	Connect to	Item
A*	"Drinking water, cold"	Drinking water network, cold	TWK
B*	"Drinking water, hot"	Drinking water network, hot	TWW
C	"Drinking water circulation"	Drinking water network, circulation pipe	TWZ
D	"FWS flow"	SR, storage tank top	1
E	"FWS hot return"	SR, storage tank centre	5**
F	"FWS cold return"	SR, storage tank bottom	11

** On the FWS 80/120, the middle connection is for cold water and the left connection is for hot water.*
*** The exact position of the connection depends on which system type is used. See* ➔ "Connection and System Diagrams" document (ALS-SV-3).

8.2 Accessories

All accessories are listed in the Solvis price list.

Notes

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