Last revised 05/2009 art. no. TDMA 020 EN

SOLUS II

The combined systems for maximum energy savings

COMFORT: SOLUS II 550, SOLUS II 800, SOLUS II 1000, SOLUS II 800 PM, SOLUS II 800 S, SOLUS II 1000 PM, SOLUS II 1000 S.

COMFORT PRO: SOLUS II 560 L, SOLUS II 850 L, SOLUS II 1050 L, SOLUS II 2200 L, SOLUS II 560 NFL.

Application • Use

- Solar water heating and heating support
- Buffering for gas, oil and solid fuel boilers as well as heat pumps
- Hygienic water heating via instantaneous heating

Special advantages

- Buffer water heated with solar energy can be used for direct space heating.
- Boiler water and heating water can be charged to the storage tank without a heat exchanger restricting the performance. This results in long boiler running time and standstill time with low emissions.
- Particularly low heat loss
- Various heating circuits can be connected according to temperature.
- Hydraulic separation of heating and boiler supplies.
- SOLUS II 560 L low storage tank height for rooms with low ceilings

Technical documentation

INSTALLATION AND OPERATING INSTRUCTIONS

IMPORTANT NOTES:

- **Only transport the storage tank vertically in vehicles**
- **Use diffusion-resistant pipes for heating**
- **Support sleeves must be used when using soft Cu pipes.**
- **The storage tank may only be run with water without additives.**
- **The max. permitted storage tank inlet temperature of the solar heat exchanger is 110 °C.**

1 Description of the combined storage tank

The SOLUS II series is a combined storage tank with internal heat exchangers for solar charging and hygienic water heating.

The series was designed specifically for combining solar power systems with oil, gas, pellet or solid fuel boilers. The connection of the buffer storage tank to the boiler avoids frequent activation and deactivation, thus reducing emissions.

COMFORT line: SOLUS II 550, SOLUS II 800 and SOLUS II 1000

These storage tanks are highly efficient and convenient, while also offering excellent economy. They are suitable for most applications, but not for heat pumps with a supply temperature of max. 55 °C.

SOLUS II 800 S / SOLUS II 1000 S

SOLUS II 800 S / SOLUS II 1000 S storage tanks do not have hot water heat exchangers. This is useful for operation with an existing water storage tank or transfer station, for example. Otherwise, the storage tanks are the same as the SOLUS II 800.

SOLUS II 800 PM / SOLUS II 1000 PM

This buffer module does not have integrated heat exchangers. Otherwise, the dimensions and connections are the same as for the SOLUS II 800 / SOLUS II 1000. This allows the storage tank capacity to be increased simply in conjunction with the SOLUS II 800, 850 and 1000 , e.g. for solid fuel boilers. See section 5.3, page 11 for connection instructions.

COMFORT-PRO line:
SOLUS II 560 L / 850 L / 1050 L / 2200 L

The SOLUS storage tanks in the COMFORT-PRO line offer other advantages, which make them the leading edge technology for combined solar storage tanks:

- Designed for particularly high hot water tap output. Therefore, they are even suitable for apartment buildings, or the temperature of the hot water stand-by volume can be kept to a minimum. This facilitates increased solar utilisation and is a requirement for operation with heat pumps.
- Heat loss is minimised via the aluminium reflector in the cylinder and the PP inserts for practically complete prevention of microcirculation losses via the storage tank connections.

SOLUS II 560 NFL

On request, the SOLUS II 560 L is also offered with an additional heat exchanger as a local and district heat transfer station with a solar heat exchanger and integrated water heater. It is also well suited for system separation for underfloor heating systems. Further information available on request.

1.1 Special advantages

Consolar stratified conduction system:

In the patented thermosiphon heat exchangers, optimised flow control and the chimney effect result in very low-loss heat transfer in the counter-flow. The heat transfer is considerably better than with free-flow heat excangers with the same surface area.

Hygienic water heating:

Conventional hot water storage tanks can have hygiene problems (legionella). In the
SOLUS II series, the hot water is heated in a continuous flow, and is therefore in a perfect hygienic condition even at temperatures under 60 °C.

Rapid availability thanks to stratified charging:

The riser tube with chimney effect and the
Consolar control logic ensure that the storage tank water is immediately heated to a usable hot water temperature and stratified to the top. If the irradiation is low, the middle storage tank area is charged, or feeding is implemented via an automatic ball valve for pre-heating the lower storage tank area.

High storage capacity through stratified discharging:

Stratified discharging significantly increases the thermal capacity of the SOLUS II storage tanks compared with conventional combined storage tanks with fresh water helical tubes. This results in less frequent backup heating and longer availability.

Reduced system costs:

The small pipe diameter required in the solar circuit, and the integrated boiler supply switching valve reduce the installation costs for the system.

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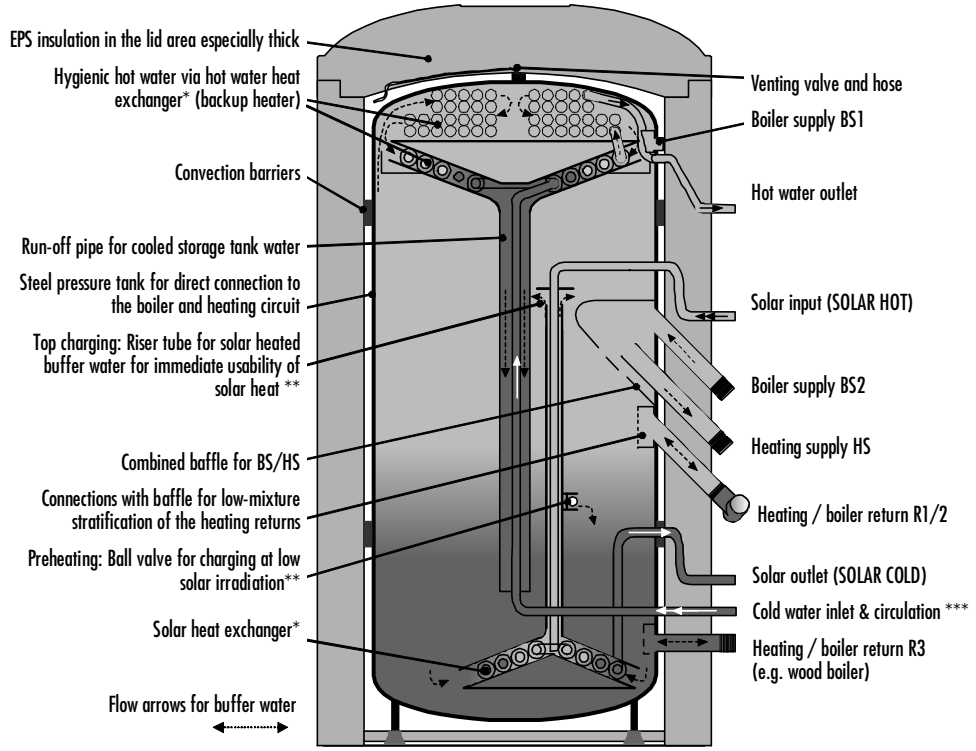
COMFORT PRO Line SOLUS II 1050 L / 2200 L***

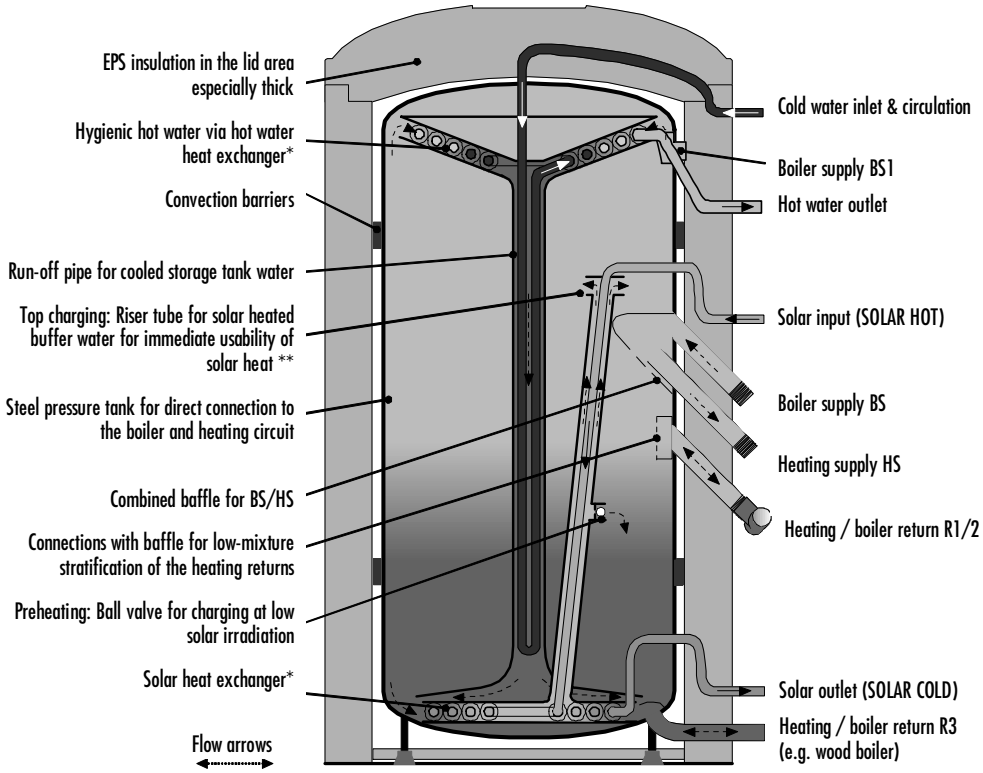


** The heat exchangers are particularly effective and rely on the counterflow principle.*

*** Efficient storage tank management via optimised control using CONTROL series*

**** 560 L and 850 L: Top cold water connection*

COMFORT Line SOLUS II 550 / 800 / 1000



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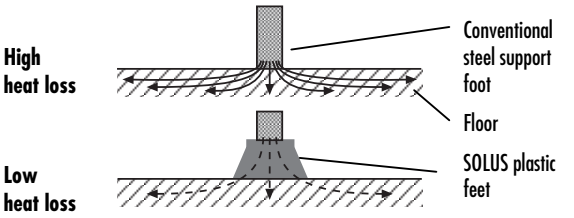
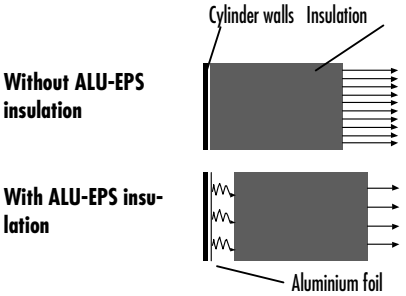
Plastic feet (except SOLUS II 2200 L):

Specially developed plastic feed reduce heat conduction to the floor.



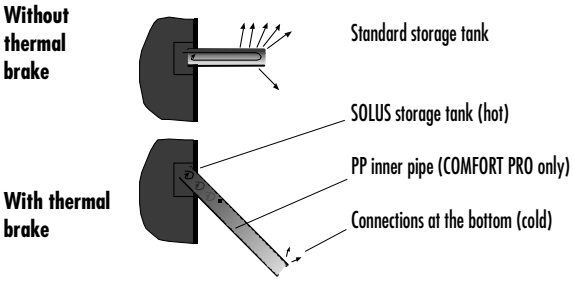
ALU-EPS insulation (reflector only included in COMFORT-PRO Line):

ALU-EPS insulation greatly reduces heat losses. The cylinder reflector significantly reduces dissipation losses. The EPS foam used has a good insulating value.



Connections with thermal breaks:

Due to the siphoned fitting of the copper and steel connections to the cylinder, the otherwise high heat losses are greatly reduced. Special baffles are fitted in the tank to preserve the feeding stratification.



Combined baffle:

SOLUS combined storage tanks type 2008 have been specially developed for efficient operation in conjunction with heat pumps.

The combined baffle is used for low turbulence stratification of large heat pump supplies, designed for 30 l/min (higher flow rates result in a larger mixing zone).

2 Planning aid

2.1 Transport

The storage tanks may only be transported vertically in vehicles. For carrying, there are handles on the storage tanks. Storage tanks may only be lifted freely if all handles are used simultaneously.

2.2 Connection to the drinking water supply

Hot water circulation:

The circulation line is connected to the cold water connection of the storage tank. As in all water heaters, hot water circulation entails significant heat losses. This also gradually reduces stratification. The circulation pump should not run continuously, as otherwise unnecessarily high heat losses result in the piping system. For this reason, we recommend operating the circulation pump with temperature control or in interval mode (most CONTROL controllers contain this function).

Mixed installation:

When the SOLUS II storage tanks are connected to a galvanised steel hot water pipe, the steel pipe may be corroded when newly installed in particular due to the electrochemical series. If you want to avoid this risk, you should not use the storage tanks. If you are in doubt,
the Consolar support team will be happy to advise you.

Water quality:

The quality of the water used to fill the tank must comply with VDI 2035 for heating water.

NOTE:

Suitable measures (flushing the system, filters etc.) must be taken to ensure that existing components in the heating system do not allow other materials and substances (e.g. sludge, leak sealant, anticorrosive agents etc.) to enter the storage tank.

The pH value of the drinking water connected to the hot water heat exchanger must be between 7.4 and 9.5. If the pH value is between 7.0 and 7.4 the TOC value may not exceed 1,5 mg/l (g/m^3) (in accordance with DIN 50930-6). If the water hardness is 8° dH or more, rinsing taps are recommended for the cold water inlet and the hot water outlet. For use with water high in limescale, limescale experts recommend limescale conversion or water treatment processes for all solar heating systems with 14° dH and upwards (hard water). You can ask your local water supply company to find out the water hardness. Ask your installer for advice on this matter.

Expansion vessel:

Volume compensation vessels, which compensate for thermal expansion, are not necessary for the SOLUS II series,

due to the low heat exchanger volume for the hot water circuit. A water-shock damper is recommended to prevent safety valve dripping.

Increasing the pouring capacity:
To further increase the pouring capacity,
SOLUS II storage tanks can be operated with a hot water storage tank and a recirculation pump
(see CONUS 502 technical documentation).

Hot water mixer:
To prevent scalding at high storage tank temperatures, a hot water mixer must be provided downstream of the storage tank outlet. A hot water mixer is available as an accessory (item no. ZB001).

2.3 Connection to the solar power system

Collector:
The SOLUS II series is equally suitable for operation with flat and evacuated tube collectors. The technical data (page 12) contains recommended values for collector surface areas. Smaller surfaces do not charge the tank fully, larger surfaces increase the solar yield which can be used for heating support in particular, but lead to frequent system system standstills in the summer, when the heat cannot be dissipated elsewhere.

Pipe diameters and pump:
The circulation of the solar circuit is run with reduced flow compared to conventional solar power systems. The required pipe diameters must be calculated in conjunction with the collector data and the selected pump.

Controller:
Operation of the SOLUS II storage tanks with a CONTROL-series controller ensures optimal stratified charging. If third party controllers are used, the maximum permissible inlet temperature at the solar heat exchanger must be observed. This temperature is 110 °C; the solar controller must be deactivated at the corresponding collector temperature.

See the connection information (from p. 6) or the controller connection information for the CONTROL series for information on possible connections and controller connections.

2.4 Connection to the boiler and heating circuit

Boiler:
The SOLUS II storage tanks allow a range of heating circuits and heat generators to be connected to points in accordance with their temperatures. Boiler and heating circuits are connected directly to the storage tank. This allows boiler outputs of up to 80 kW to be transferred. The SOLUS II storage tanks are designed for low return temperatures. When using boilers which are sensitive to low return temperatures, appropriate precautions must be taken, especially when connection R3 is used.

The target temperature for the hot water standby portion set on the boiler or solar controller must be approx. 10-15 K greater than the hot water temperature actually required, depending on the tap output required. The boiler supply temperature for backup heating must be a further 5 K above the described target temperature of the storage tank. For this purpose, it may be necessary to throttle the boiler supply.

Connections:
The SOLUS II storage tank connections are in the vertical line of the insulation seal strip. They are equipped with baffles for low turbulence stratification up to 20 l/min. The baffle of boiler supply 2 is suitable for up to 30 l/min.

Heating circuit:
All connected heating circuits must be diffusion-resistant. If that is not guaranteed, the systems must be separated.

NOTE:

In heating circuits where sludge deposits are to be expected, we recommend the installation of a sludge filter or separator (vendor e.g. Spiro).

We recommend the use of a heating circuit mixer to guarantee the supply temperature, which is dependent on the external temperature. This allows the energy consumption to be reduced significantly. A complete heating circuit station is available as an accessory.

2.5 Parallel connection of two SOLUS II storage tanks

Parallel connection of the heat exchanger and storage tank connections allows the storage tank capacity and the output of hot water and solar heat exchangers to be doubled, while halving pressure losses. The temperature sensors are connected to one of the two storage tanks.

2.6 Electrical backup heating

An electrical heating rod sleeve with 1 1/2" male thread is positioned such that heat can be used for space heating via the heating supply.

Electrical backup heating should be avoided where possible due to the low efficiency of the power stations.

However, in exceptional cases, it can make sense for the few backup heating hours in summer, e.g. in conjunction with a solid fuel burner operated in winter only.

Heating rods must be fitted with a safety temperature limiter in accordance with EN 60335 Parts 1 and 2.

2.7 Materials

The most commonly used materials are as follows, in the order of their weight shares: steel, copper, EPS foam (melamine resin foam as a cover for SOLUS II 2200), poly-

propylene, brass and EPDM. The SOLUS II series is free of PVC, CFC, HFCs and fibreglass insulation.

2.8 Standards

The SOLUS II series of storage tanks are vertical units made of St 37-2, in accordance with DIN 17100 with quality certification. The cylinders comply with DIN 4753 for hot water storage for heating systems with supply temperatures of up to
90 °C, in accordance with DIN 4751 Part 1.

2.9 Return acceptance statement

At the end of their long service life, Consolar takes back the storage tanks and reuses the materials. For this purpose, the storage tank is to be fastened to a pallet, and sent back to Consolar. Upon arranged handling through Consolar, the storage tank is to be put in position and made ready to be loaded onto an HGV with a lifting platform, and Consolar is to be informed for collection.

NOTE:

The information and diagrams in this technical documentation do not claim to be complete, and are no replacement for professional planning. Subject to technical modifications and errors.

3 Connection with boiler buffering

Application, use

- Solar heating support
- Buffering for gas, oil, pellet and solid fuel boilers
- Water heating

3.1 Advantages, limits

- Solar heat can be used for space heating, especially if the heating circuit supply temperatures are lower than the hot water standby temperature.
- Even great boiler outputs are buffered. This facilitates longer runtimes and standstill times with low emissions. Even in modulating boilers, buffering may be beneficial for the non-modulating partial load range.
- The boiler can cool down during standstill.

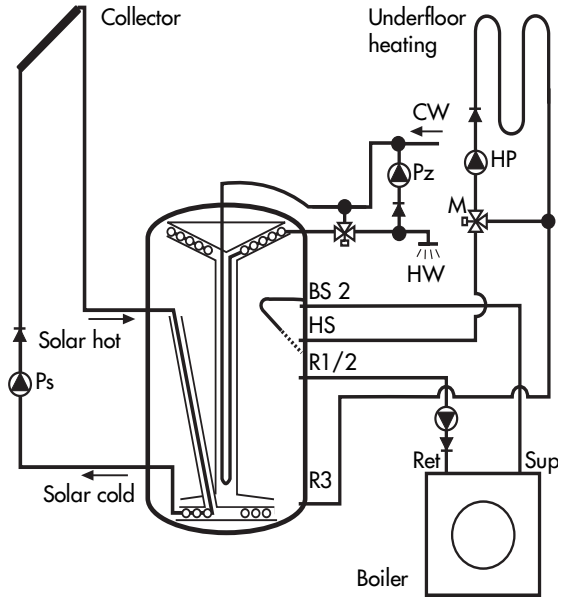
3.2 Connection rules

- The heating circuit supply is generally fitted to the corresponding storage tank connection (HS), the boiler supply is connected to BS.
- The boiler return is connected to R1/2. It is only connected to R3 for wood-fired boilers which require a large buffer volume.
- The heating circuit return is generally connected to the same connection as the boiler return. A T connector is provided for this on storage tank connection R1/2 to prevent wrong circulation through the boiler when the boiler pump is at standstill.
- If the return temperature of the heating circuit is low (wall or underfloor heating), the lowest connection on the SOLUS II is selected.
- The flow for hot water recharging must be set such that the boiler supply temperature is approx. 5 K above the hot water backup heating temperature set.

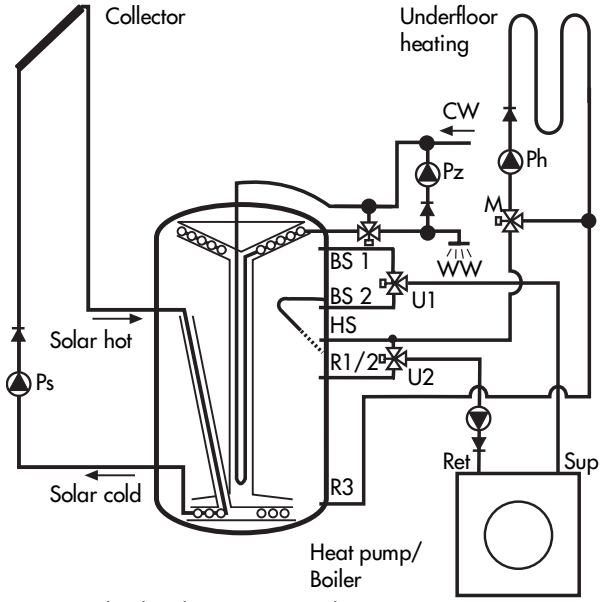
A sample system diagram with collectors and hot water connection is provided below. In the other diagrams, only the boiler and heating circuit are shown. The diagrams are incomplete to make them clearer - e.g. safety equipment is not shown.

Detailed connection diagrams are provided from section 0 on page 12, as well as in the technical documentation for the CONTROL series.

3.3 System diagram with solar power system and hot water circuit

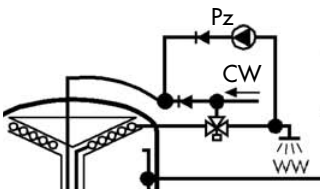


Connection for heat pumps and generally for optimised solar yield:



Hot water backup heating: U1 and U2 up.
Heating operation: U1 and U2 down.

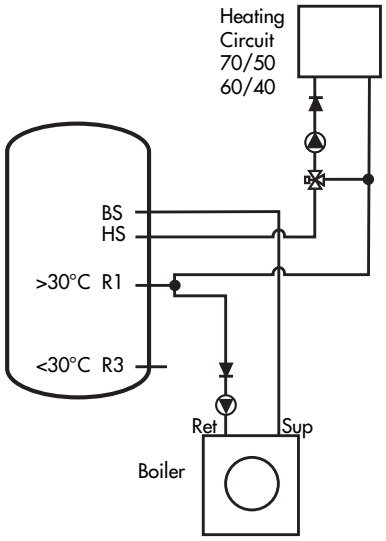
Circulation switching version for thermal disinfection of the circulation line:



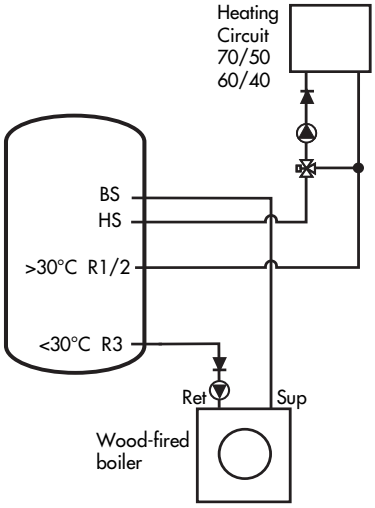
3.4 Connection assignment for boiler and heating circuit

3.4.1 One boiler, one heating circuit

See also diagram 0 on page 12.



Example 1:Heating circuit 70/50 to 60/40



Example 2: Solid fuel boiler

For solid fuel boilers (e.g. firewood), the boiler return is connected to R3 to utilise the entire storage tank capacity. If the heating circuit return is also connected to R3, the full capacity is available for heating purposes. However, there may be higher temperatures in the bottom of the storage tank, which decreases the solar utilisation.

3.4.2 One boiler, two heating circuits

See also diagram 0 on page 12.

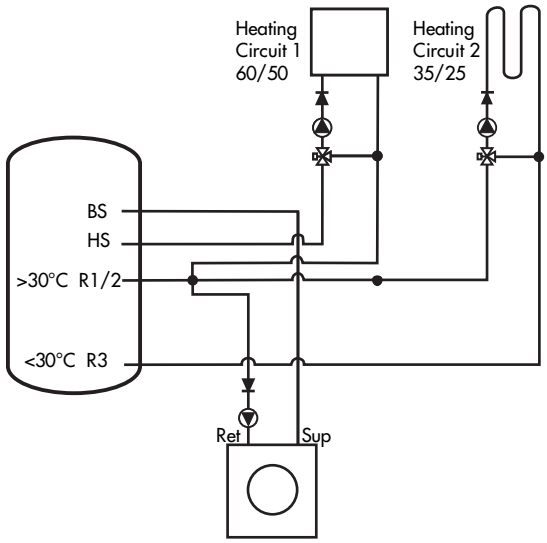
3.4.2.1 Standard connection

The supply of the two heating circuits is fitted to the heating supply connection.

3.4.2.2 Cascade connection

Two heating circuits with different temperature levels (e.g. radiators and underfloor heating) can be connected as a cascade. This way, solar heat is optimally used, which leads to particularly good solar yields.

The requirement is that the radiator circuit is circulated constantly when the floor circuit is in operation or that the boiler controller can monitor two target temperatures at different storage tank positions. See the technical documentation for CONTROL 701



Example 3: Heating circuits 60/50 and 35/25

3.4.3 Two boilers, one or two heating circuits

See also the diagrams 0 on page 12 and 0, page 12.
Connection of each boiler return:

Assignment of the heating circuit returns

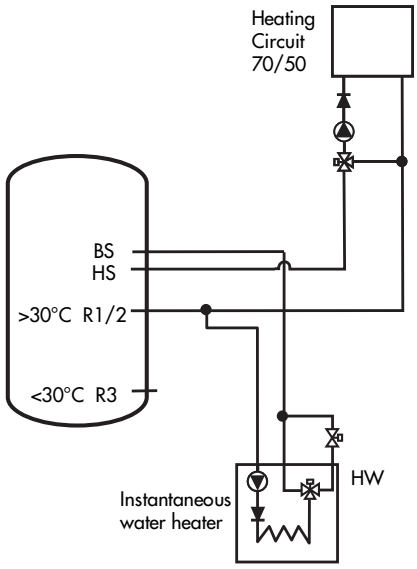
The heating circuit returns are connected as for a boiler without a solid fuel boiler (see section 3.4.1).

3.4.4 Increased hot water requirement

If a volume greater than the maximum hot water standby volume is required, the heating supply can be connected to R1. The hot water sensor is then inserted into sensor sleeve FH D (small buffer bottom)

3.4.5 Instantaneous water heaters with integrated switching valve or with two integrated pumps

The hot water and heating supply are connected to one another downstream of the instantaneous water heater for instantaneous water heaters with integrated valve or a second switching pump for hot water backup heating. Instantaneous water heaters without suitable control of the supply temperature can be equipped with a throttle valve to reach the required supply temperature for hot water backup heating.

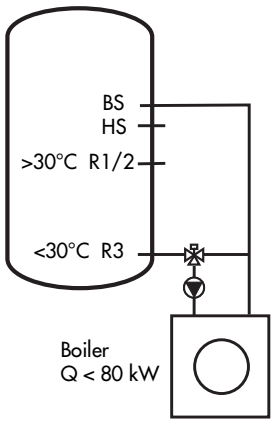


Otherwise, the connection is as described above.

Example 4: Instantaneous water heater with integrated switching valve

3.4.6 Solid fuel boiler or low temperature boiler with minimum return temperature

A thermostatic mixer guarantees a minimum return temperature.



Example 5: Integration of a solid fuel boiler with return temperature increase via thermostatic mixer

4 Connections with return increases

Application, use

- Solar heating support
- Water heating
- In particular for boilers which do not require buffering (e.g. modulating boilers or boilers with large capacities).

4.1 Advantages, limits

- Simple connection (no intervention in existing heating control required)
- Solar heat is used for space heating, even if the temperatures in the collector are not sufficient for direct heating.
- Maximum use of the solar energy due to the low collector and storage tank temperatures required.

4.2 Connection rules

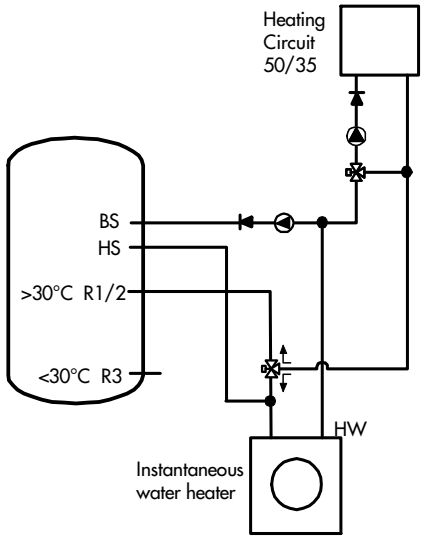
- The return from the storage tank to the boiler is connected to the HS.
- The lower the return temperature of the heating circuit, the lower the connection on the SOLUS II.

Return from heating circuit to storage tank:	
Max. return temperature	Return connection
> 40 °C	R1
< 30 °C	R3

Table 5

4.2.1 Return increase with boiler

See also diagram 0 on page 12.

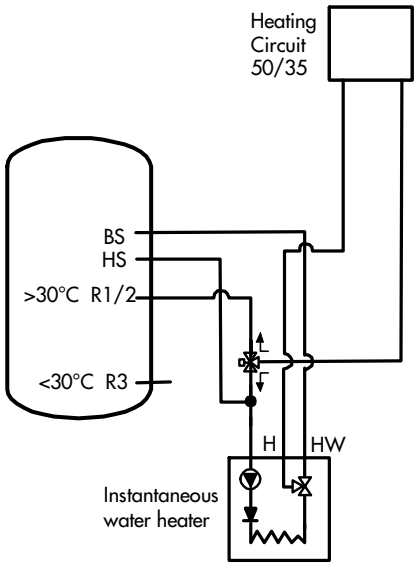


Example 6: Heating circuit 50/35

4.2.2 Instantaneous water heaters with integrated switching valve or with two integrated pumps

With instantaneous water heaters with integrated valve or second integrated pump for switching for hot water storage tank backup heating, storage tank charging pump P_{Sp} and heating circuit pump P_H are not required. In this case, however, a mixed heating circuit cannot be implemented.

Therefore the collector surface area selected should not be too large in order to prevent excessive heating supply temperatures. Unmixed heating circuits cannot be used for underfloor heating systems if the permitted operating temperatures of the underfloor heating systems are exceeded.

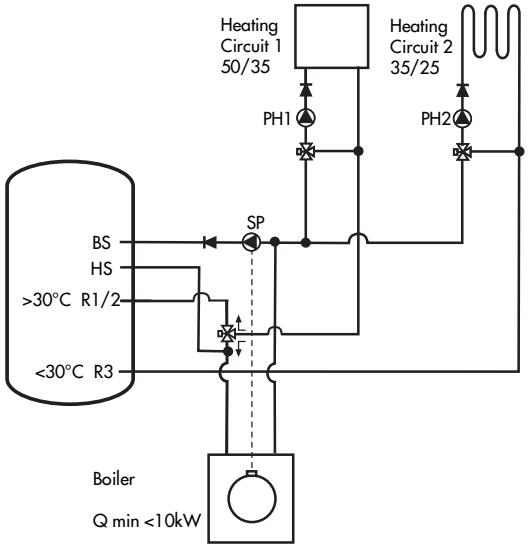


Example 7: Instantaneous water heater with integrated switching valve

4.2.3 Two heating circuits

The supply of the two heating circuits is fitted to the boiler supply. The return from heating circuit 2 (lower temperature level) is connected to the storage tank in accordance with table 5, but without a switching valve.

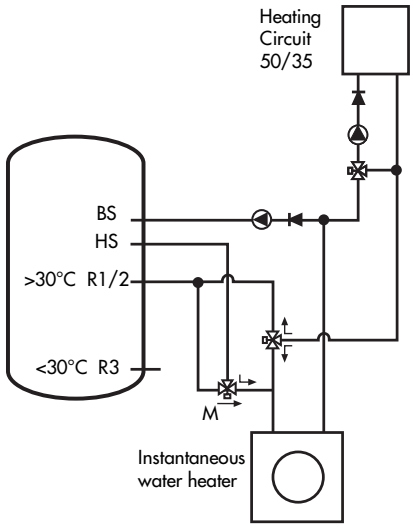
The return from heating circuit 1 is connected in accordance with table 5.



Example 8: Heating circuit 1: 50/35, Heating circuit 2: 35/25

4.2.4 Limiting the boiler return temperature

In boilers or instantaneous water heaters with a maximum permitted boiler return temperature, the return temperature can be restricted via a thermostatic mixing valve M.



Example 9: Limiting the boiler return temperature

5 Connections for expanding capacity

Application, use

- Solar heating support for larger systems
- Buffering solid fuel boilers
- Double capacity for hot water and solar heat exchangers for two SOLUS II storage tanks.

5.1 Advantages, limits

- Simple expansion of the storage tank capacity via parallel connection with a buffer storage tank
- Greater storage tank volume possible even with restricted access conditions.
- Retrofitted connection possible.

5.2 Connection rules

5.2.1 Parallel connection of two SOLUS II storage tanks (2nd storage tank: standard or buffer module)

- All connections connected to the boiler or heating circuit are joined horizontally
- The following connections must always be connected in parallel, even if no boiler or heating circuit is connected: BS1, HS, R3
- Diameter and length of the connecting pipes: Max. 0.5 m at 1", max. 1,2 m at 1 1/4"
- Otherwise, the storage tank connected in parallel and buffer are connected in accordance with the connection rules which apply for SOLUS II storage tanks.
- The Solus II 1000 PM is an extension of the Solus II 1000 and can be connected together in parallel.

Attention:

Due to differing heights, connection combination of the Solus II 1000 PM and the Solus II 1050 l is not possible.

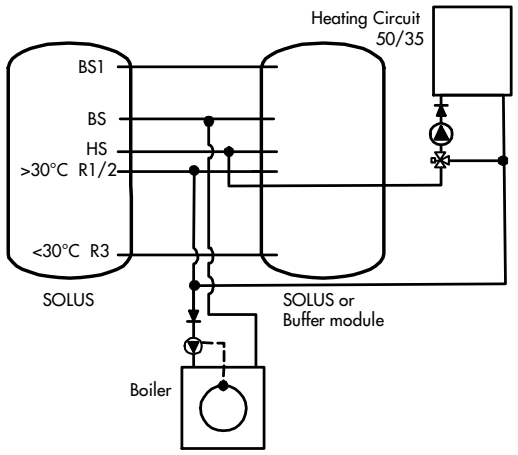
General rules:

The boiler and heating circuit are connected in the middle with downward siphons to the connection lines.

Last revised 05/2009

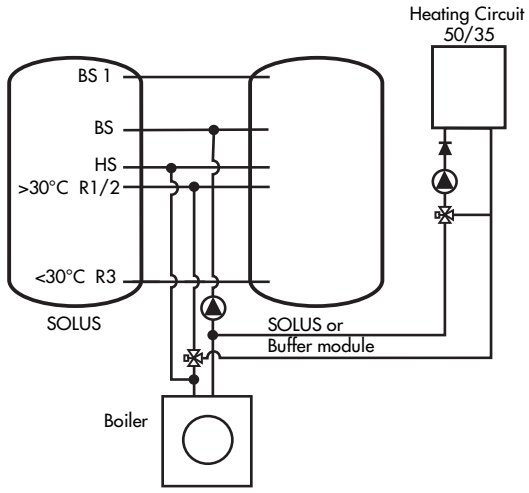
5.3 Connection examples for parallel connection

5.3.1 Boiler buffering



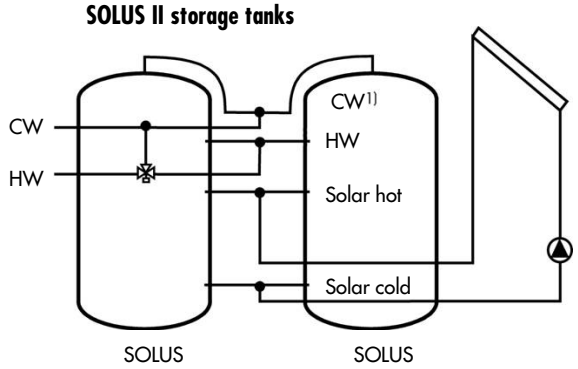
Example 10: Heating circuit 50/35, oil boiler

5.3.2 Return increase



Example 11: Heating circuit 50/35, oil or gas boiler

5.3.3 Parallel connection of the heat exchangers of two SOLUS II storage tanks

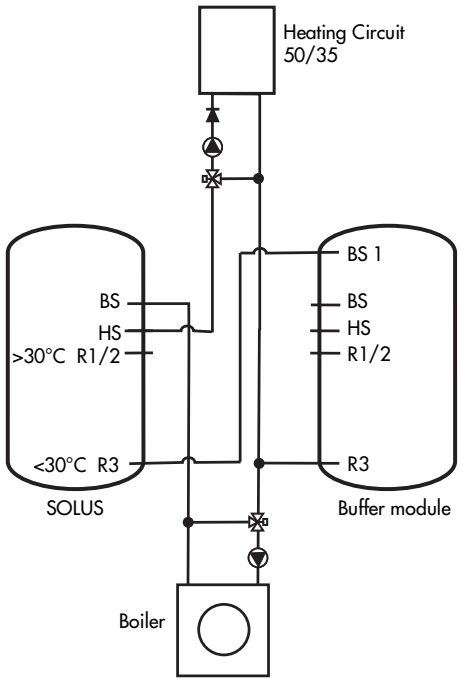


Example 12: Connections for water and the solar power system

1)On the SOLUS II 1050 L and SOLUS II 2200 L the cold water connection is under the solar cold connection.

5.4 Connection example for cascade connection

For solid fuel boilers, the buffer volume can be increased with a buffer module by cascade connection of a SOLUS. The buffer module is charged by the solid fuel boiler and discharged by the heating circuit. The solar power system charges the SOLUS, which is discharged via hot water tapping, with the result that the buffer module remains cold in the summer.



Example 13

6 Technical data

Storage tank volumes, weight:	Unit	SOLUS II 550 / SOLUS II 560 L / NFL	SOLUS II 800/ SOLUS II 850 L	SOLUS II 1000/ SOLUS II 1050 L	SOLUS II 2200 L
Cylinder material acc. to DIN 17100	-	S 235 JR (St 37-2)	S 235 JR (St 37-2)	S 235 JR (St 37-2)	S 235 JR (St 37-2)
Empty weight (approx.)	kg	137/147/157	175/190	225/255	395
Total weight, full	kg	700/710/720	992/1007	1245/1275	2620
Capacity	l	550	800	1000	2200
Max. permissible temperature	°C	90	90	90	90
Maximum permissible cylinder pressure	bar	6	6	4	4
Solar heat exchanger:	**Unit**	**550/560 L, NFL**	**800/850 L**	**1000/1050 L**	**2200 L**
Material	-	Cu	Cu	Cu	Cu
Surface area[1)]	m^2	2	2	2/3,1	3,1
Capacity	l	0,8	0,8	0,8/1,9	1,9
k x A value (for water)	kW/K	0,4[2)]	0,8[3)]	0,8[3)]/0,95[4)]	0,95[4)]
Specific volume flow[5)]	l/m^2 h	25	25	25/20	20
Minimum solar flow	l/min	1,7	3	3	3
Pressure loss (for water)	mbar	19[2)]	58[3)]	58[3)]/70[4)]	70[4)]
kvs (for water)	m^3/h	1	1	1/1,3	1,3
Max. permissible temperature	°C	110	110	110	110
Max. permissible operating pressure	bar	8	8	8	8
[1)] Significantly better performance than conventional heat exchangers due to chimney effect with equal surface area, [2)] 2,3 l/min, [3)] 4 l/min, [4)] 5,7 l/min, [5)] relative to the collector surface area					
Hot water heat exchanger:	**Unit**	**550/560 L, NFL**	**800/850 L**	**1000/1050 L**	**2200 L**
Material	-	Cu	Cu	Cu	Cu
Surface area[1)]	m^2	3,1/4,1	3,1/4,8	3,1/6	6
Capacity	l	2,2/7,1	2,2/10,4	2,2/14,7	14,7
k x A value	kW/K	1,7/2,0[2)]	2,0[2)]/2,4[2)]	2,0[2)]/4,5[3)]	4,5[3)]
Output range	kW	30-45/40-55	40-55/45-60	40-55/50-70	50-70
Pressure loss	mbar	220/280[2)]	220[2)]/300[2)]	220[2)]/360[2)]	360[2)]
kvs	m^3/h	1,28/1,1	1,28/1,1	1,28/1,0	1,0
Max. permissible temperature	°C	90	90	90	90
Max. permissible operating pressure	bar	8	8	8	8
[1)] Significantly better performance than conventional heat exchangers due to chimney effect with equal surface area, [2)] 10 l/min, [3)] at 15 l/min					
Thermal insulation:	**Unit**	**550/560 L, NFL**	**800/850 L**	**1000/1050 L**	**2200 L**
Material	-	EPS/ALU-EPS [1)]	EPS/ALU-EPS [1)]	EPS/ALU-EPS [1)]	ALU-EPS [1)], [4)]
Side insulation thickness	cm	10+2,5	10+2,5	10+2,5	10+2,5
Lid insulation thickness	cm	14	14	14	14
EPS heat conductivity[2)]	W/mK	0,037	0,037	0,037	0,037
Heat loss3)	W/K	2,5/2,3	3,1/2,9	3,4/3,1	4,5
Standby portion losses[3)]	W/K	0,7/0,5	0,8/0,6	0,9/0,7	1,2
Cooling 24 h[3)]	°K	3,5/3,3	3,0/2,7	2,8/2,6	1,9
1) Sealing surfaces partially soft PU foam, 2) lambda values 40 °C, 3) calculated values in laboratory conditions (storage tank heated through) storage tank 60°C /room 20 °C, 4) lid melamine resin foam.					
Dimensioning:	**Unit**	**550/560 L, NFL**	**800/850 L**	**1000/1050 L**	**2200 L**
Max. withdrawal rate at 45 °C [1)]	l/min	16/18	20/25	20/30	30
NL performance indicator (10 kW boiler) [2)]	-	1,0/1,7	1,0/4,2	1,8/5,7	7,3
NL performance indicator (30 kW boiler) [2)]	-	1,4/2,6	1,5/6,4	3,1/6,9	7,3
Apartments[3)]	-	1/1-2	1-2/1-2	1-2/1-4	1-4
Collector surface area (flat plate) [3)]	m^2	5-10	8-16	8-16/11-22	11-22
Collector surface area (evacuated tube) [3)]	m^2	4,5-9	7-14	7-14/10-20	10-20
Solar piping diameter[3)]	mm	12-15	15-18	15-22	15-22
Max. boiler output	kW	80	80	80	80
[1)] Charged standby portion 60 °C, [2)] values applied for a charged standby portion at 60 °C, higher values are possible when fully charged or at higher temperatures. As there is no calculation method for NL performance indicators for combined storage tanks, the values are only for orientation purposes [3)] recommended reference values					

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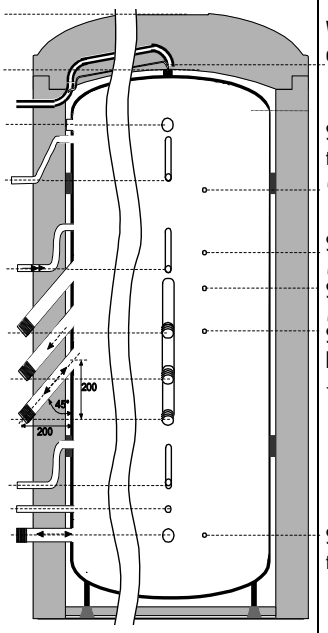
7 Dimensions

550/ 560L/ NFL	800 850L S /PM	1000 S / PM	1050L	2200L	Connections
1790	2090	2290	2100	2160	Min. hight of sealing
1630	1940	2350	1970	2130	Diagonal height
1750	2050	2245	2060	2060	Height with insulation
1670	1980	2180	1990	1990	Height without insulation
1405	1630	1830	1680	1680	Cold water + circulation** 22 Cu
1470	1685	1885	/**	/**	BS1 (short)*** 1" f. t.
1215	1430	1630	1480	1480	Hot water 22 Cu
1115	1260	1315	1280	1280	Solar input 15 Cu
775	1065	1060	960	960	BS (boiler supply) 1" m.t.
655	950	940	840	840	HS (heating supply) 1" m.t.
500	770	790	680	680	R1 (return > 45 °C) 1" m.t.
190	190	190	460	460	Solar output 15 Cu
/	/	/	400	400	Cold water + circulation 22 Cu
95	95	95	270	270	R3 (return < 35 °C) 1" m.t.
700	790	790	850	1300	Ø without insulation
960	1060	1060	1110	1560	Ø with insulation

Clearance for attaching the lid: 40..100 mm



Connections/ Sensor sleeves	Unit	550/ 560L/ NFL	800 850L S/PM	1000/ S/ PM	1050L	2200L
Suitable for 6 mm sensor						
Venting valve and hose						
Sensor sleeve A hot water, small	mm	1245	1535	1560	1425	1425
(Storage tank sensor top)	*(I)*	*100*	*120*	*220*	*220*	*550*
Sensor sleeve B hot water	mm	1045	1335	1340	1225	1225
(Storage tank sensor top)	*(I)*	*175*	*220*	*330*	*330*	*820*
Sensor sleeve C buffer top *(Storage tank middle)*	mm	925	1220	1210	980	980
Sensor sleeve D buffer bottom + sensor E	mm	720	990	1010	930	930
Sensor sleeve F storage tank sensor bottom	mm	215	240	240	250	250

Explanations:

Dimensions in mm from the ground

15/22 Cu: 15/22 mm copper pipes with Conex screw fittings

f.t: female thread

m.t: male thread

*** The cold water and circulation connection on the SOLUS II 1050 L and SOLUS II 2200 L are under the solar cold connection.*

**** Connection BS1 is 15 mm long and intended for parallel connection with a buffer module.*

(): Information within brackets is conform to sensor description of Control line

1) For assembly of insulation when ceiling height is low, the boiler's stand supports have to be screwed in completely to assemble the insulation top. Please do so before assembling edge insulation! Otherwise additional 6 cm of ceiling height are required for assembly and dismantling of insulation top.

8 Installation

8.1 Before connecting

NOTE:

Adherence to these specifications is a prerequisite for the upholding of warranty claims.

Please refer to the current technical documentation for detailed technical information on designing and planning a system with SOLUS II storage tanks.

8.1.1 Heating, water quality

Use the storage tank in closed heating systems only. In heating circuits which are not 100% sealed - e.g. plastic underfloor heating systems -, a hydraulic separation of storage tank and heating circuits is required to protect against oxygen which is diffused into the heating water.

Please ensure that you comply with the instructions on water quality in the technical documentation (no addition of substances to the heating water; if necessary, sludge separators or filters must be fitted).

8.1.2 Hot water pipelines, water quality

The heat exchangers in SOLUS II storage tanks are made of copper. The pipes connected to them should therefore also be made of copper, stainless steel or plastic to prevent corrosion of the pipes (see "Mixed installation" in the technical documentation). The water quality regulations for copper piping must be observed (see water quality, tech. documentation).

8.1.3 Solar pipes, solar fluid

For solar piping, we recommend copper pipes due to the low resistance and the low heat loss compared with stainless steel corrugated pipes. Consolar high-performance collectors make greater demands of the temperature resistance of the lines, which is why Consolar recommends IsoConnect HT Cu.

Do not use larger pipe diameters than necessary, as otherwise heat losses rise sharply. See "Technical Data" in the technical documentation for recommended guideline values.

Use antifreeze approved for solar power systems based on propylene glycol in the prescribed mix ratio only. We recommend Tyfocor LS (ready mixed) which can be purchased from Consolar. The antifreeze must be checked regularly in accordance with the regulations (see also the technical documentation for CON-SOLARSTATION and "Acceptance and maintenance protocol").

8.1.4 Pipe insulation:

The insulation of the pipelines has a major influence on the energy savings which can be achieved with the solar power system. It is therefore recommended to use considerably thicker insulation on all pipes (solar, hot water, heating pipes) than is required in accordance with the German Heating System Ordinance (HZAnlV), e.g. with 125 % to 150 % instead of 100 % insulation thickness.

8.1.5 Space requirements

Install the storage tanks so that they can be accessed for maintenance, to guarantee access to temperature sensors and connections. This allows the insulation to be attached and adjusted even after the system has been connected. If the ceiling is low, the lid insulation can be fitted while the tank is tilted and before it is positioned on the feet. To save space, the lid insulation and the cover can also be separated.

8.2 Transport

The storage tank must always be kept upright during transport!

It can be transported horizontally by hand. Heavy vibration and impact should be avoided.

8.3 Storage

SOLUS II storage tanks may only be stored and installed in rooms protected against frost.

8.4 Installation

- Installation and commissioning may only be realised by a specialist company approved by the local water supply company. This specialist company thus assumes responsibility for correct fitting work.
- Contact with materials (e.g. some solvents) which can affect the polystyrene or other components of the storage tank is to be avoided.
- When installing and operating the SOLUS II storage tank, keep a minimum distance of 0.5 m from hot objects (>90 °C) (e.g. stovepipes, brazing torchs).

Place the storage tank on the plastic feet before you start fitting the piping (except SOLUS II 2200 L).

- To do so, refit the bolts which held the storage tank on the wooden pallet. Insert the 3 plastic feet from beneath into the bolt heads.

- Align the storage tank before it is filled: Adjust plastic feet on the side flat areas using a size 30 open-ended spanner. Check using a spirit level.
  The average distance between the lower edge of the vertical ring and the floor must be 40 mm to allow the insulation to be fitted!
  The surface pressure by the feet is between 2.0 and 3.5 N/mm² depending on the storage tank size. Check the floor structure - if necessary, the local pressure must be reduced by increasing the contact surface:

- After installing the storage tank (see p. 2), push the round floor insulation under the cylinder (tilt the storage tank slightly):

8.5 Hydraulic connection

The storage tank is connected to the different circuits in accordance with the planning aids and a connection diagram described in the technical documentation of the CONTROL unit.

Connection: Comply with regulations of the local water supply companies and DIN standards. Make all connections pressure resistant. All circuits must be completely sealed, so that no atmospheric oxygen can enter the system.

8.5.1 Boiler and heating circuit

The connections can also be piped to the side: with 90° bends, e.g. with union nuts and flat gaskets.

Recommendation: Sludge filter on the heating circuit return.

8.5.2 Solar circuit

Do not connect the solar circuit and operate the solar pump until the storage tank has been filled.

Recommendation: Smoothing section at the lowest point of the solar circuit supply, so that corrosion products caused by oxygen leaks are deposited there.

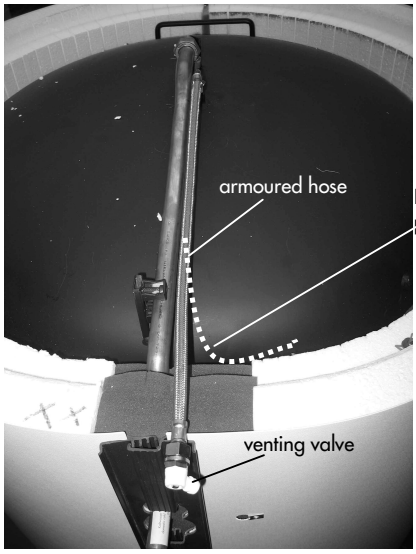
8.5.3 Cold and hot water connection

Make all connections in accordance with the respective regulations, in particular in accordance with the DIN standards (see the diagram and designations below).

The cold water connection bend is enclosed with models SOLUS II 560 L, SOLUS II 800/850 L and SOLUS II 1000 to prevent transport damage. Remove the protective sleeve (in the centre on the upper cylinder lid), fit the connection bend with the clamp screw fittings. Align with the other connections.

Safety devices: Install the component-tested safety devices in accordance with DIN 4753 Part 1 Par. 6.3.1 in the cold water supply pipe.

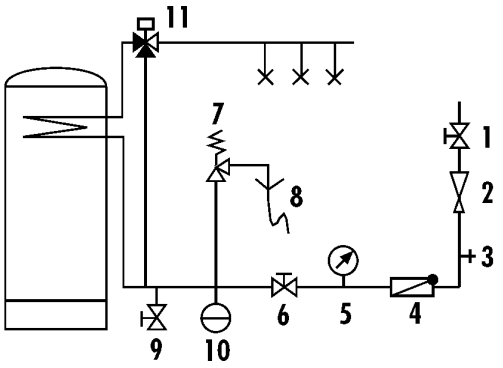
Venting valve



The venting valve is fitted to the 3/8" connection provided for this purpose via the armoured hose (incl. 2 x flat seals) included in the scope of supply. Insert the venting valve between tank and insulation before fitting the insulating lid.

Membrane safety valve requirements

- Spring loaded
- Component tested
- Connection diameter DN 20 (up to max. permitted heating output 150 kW)
- Cannot be seald off by the hot water storage tank



Component designations:

1. Shut-off valve
2. Pressure-reducing valve (if the network pressure is greater than 8 bar and there is no pressure-reducing valve at the building connection)
3. Test valve
4. Non-return valve
5. Manometer connection with manometer
6. Shut-off valve
7. Safety valve
8. Drain funnel
9. Drainage valve
10. Sanitary expansion vessel, e.g. water-shock damper
11. Thermostatic hot water mixer

Safety valve (7):

- No dirt traps or other constrictions may be fitted in the supply pipe.
- Close at a pressure drop of 20 % of the response pressure.
- To be installed in an easily acessible location, so that it can be opened during operation. A warning notice with the following text must be displayed at the safety valve or at its blow-off line: "For safety reasons, water may escape from the blow-off line during heating! Do not close".
- Install appropriately to ensure that no-one is endangered by hot water or steam from the valve.

Blow-off line:

- The minimum size is the diameter of the safety valve outlet
- Max. 2 bends, 2 m in length
- Max. 3 bends, 4 m length possible if one size larger.
- Laying with gradients
- The drain pipe downstream of the drain funnel must have at least twice the diameter of the valve.

Water-shock damper:

Thermal expansion of the hot water in the heat exchanger causes water loss through the safety valve. Optional remedy: Mount water-shock damper downstream of the non-return valve or at any point in the hot water pipe.

Non-return valve (4):

The requirements pertaining to the fitting of a non-return valve, and its design (approval), are contained in DIN 1988 and DVGW worksheet W 376.

Pressure reducing valve (2):

In accordance with DIN 3320, a system operating pressure should be assigned to the permitted operating overpressure of the hot water heat exchanger. If the pressure in the cold water supply pipe leading to the solar storage tank is over 8 bar, a pressure reducer (which has been tested and approved as compliant with DVGW worksheet W 375) must be installed to reduce the cold water pressure to max. 8 bar. If mixer taps are used, a centralised pressure reducer must be fitted.

Drainage valve (9):

Water heating systems must be fitted with a device (usually at the cold water connection) which facilitates draining the system as completely as possible without dismantling.

Fine filter:

If the water quality is poor or if the pipelines are old, a fine filter must be installed upstream of the storage tank inlet.

Deliming method

If the water hardness is 8° dH or more, rinsing taps are recommended for the cold water inlet and the hot water outlet. For use with water high in limescale, limescale experts recommend limescale conversion or water treatment processes for all solar heating systems with 14° dH and upwards (hard water). You can ask your local water supply company to find out the water hardness. Ask your installer for advice on this matter.

Circulation line:

Connect the circulation line to the cold water connection of the storage tank and fit a check valve to prevent short circuit flows of cold water into the hot water network. Operate the circulation pump for short periods only (minutes) to prevent high heat losses and a gradual mixing of the storage tank. CONTROL units provide suitable switching functions for this.

8.5.4 Thermostatic hot water mixer (11)

A thermostatic hot water mixer must be installed to restrict the maximum hot water temperature, as there is no temperature limiter fitted in the storage tank.

8.5.5 Electric heating rod

To install an electric heating rod, break out the pre-drilled hole in the PS insulating shell and use a sharp knife (spray the cutting surface with silicone grease) to cut the EPS insulation along the edge of the drilled hole.

After the electric heating rod has been installed, close the hole with the cover provided for this purpose (delivered with the electric heating rod).

8.5.6 Clamp screw fittings

Hot water and solar circuit connections are fitted with clamp screw fittings as standard. First position the union unit, then the compression fitting onto the connection pipes.

- **NOTE:**

Support sleeves must be inserted for connection lines made of soft copper piping.

Insert the end of the pipe fully into the clamp screw fitting. Tighten the union nut by hand and then one more turn using a spanner (or 3/4 of a turn for 22 mm).

8.6 Filling

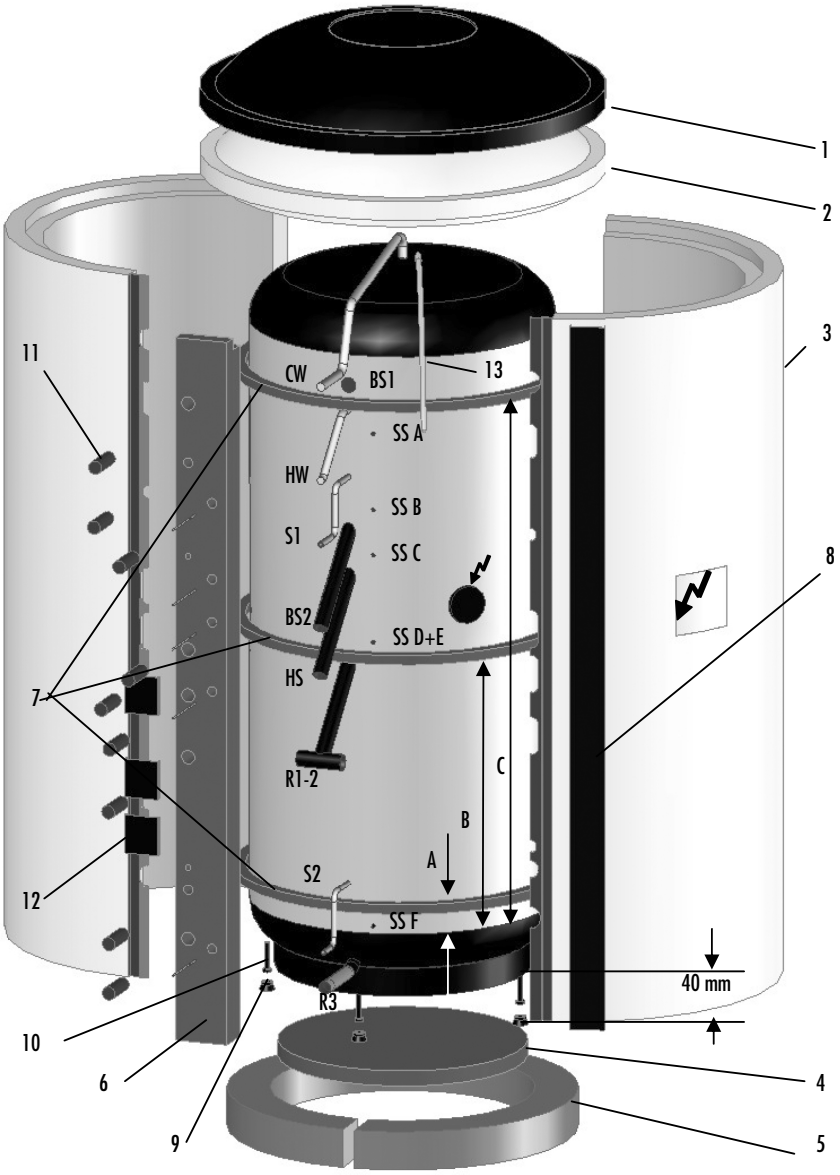
- Flush the water and heating circuits.
- Fill the storage tank - open the venting valve while you do so.
- A small quantity of water may escape from the inner piping before the air escapes.
- Fill the water and heating circuits.
- Vent the heating circuits. While doing so, run the corresponding pumps.
- See MA/TD CONSOLARSTATION for information on flushing and venting the solar circuit.

Afterwards, check all clamp screw fittings again and tighten them if necessary.

8.7 Installing the insulation

Thermal insulation consist of:	
1	Cover (SOLUS II 2200 L: flat disk)
2	Insulating lid (SOLUS II 2200 L: 2 flexible insulating plates.
3	2 side parts (SOLUS II 2200 L: 3)
4	Floor insulation, round
5	Foam strips 100 x 100 for cylinder vertical ring
6	Connection foam strips, pierced
7	3 foam strips, self-adhesive (Convection limiter)
8	Sensor cover
9	Plastic feet
10	Screw M12x50 (=screwing storage tank and pallet)
11	6 foam plugs for sensor holes ∅ 35
12	8 plastic clips (installation aid)
13	Hose with venting valve

CW	Cold water + circulation
HW	Hot water
S1	Solar input
S2	Solar output
BS1	boiler supply (top)
BS2	boiler supply
HS	heating supply
R1_2	return > 45 °C
R3	return < 35 °C
SS A…E	Sensor sleeve



Before fitting the side parts:

Attach the three enclosed long foam strips (7) with self-adhesive tape to the storage tank.

Close each strip to a ring.

mm	SOLUS II 550 / 560	SOLUS II 800/850	SOLUS II 1000	SOLUS II 1050	SOLUS II 2200
A	240	260	260	310	325
B	610	860	890	760	820
C	1400	1580	1780	1580	1520

NOTE

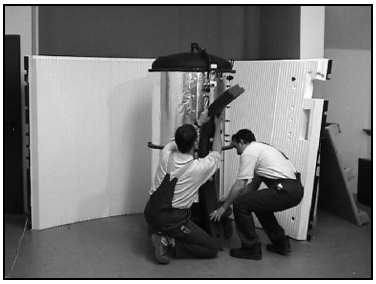
Store all small parts carefully until they are required for installation.

TIP

Installation is easier if you use 2 tension belts (not included).

- Fit the *100 x 100 foam strips* tightly around the cylinder vertical ring and the*floor insulation*. Use adhesive on the front faces:

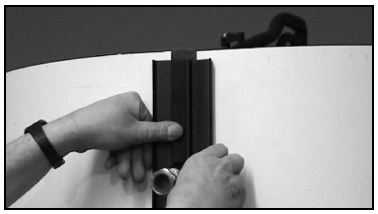
- Fit the *connection foam strips, pierced* over the connections:



- Connect the two *side parts* on the side of the connection pipes to one another:

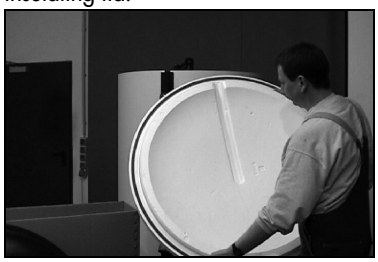
- Latch the terminal strip in the first hook first.
- If the cut-outs in the sides for the pipe feed-throughs are not quite centred, check the spacing between the vertical ring and the floor again and adjust using the feet.
- 3-4 Clip the *plastic clips* to secure the terminal strip connection.
- Connect the other sides of the side insulation to one another and secure them using the plastic clips to make installation easier:

- Check: Side parts without offset at the top? (So that the insulating foam lid can subsequently be fitted without gaps.)
- Latch the strip of hooks into the first hooks from top to bottom.



- Insert three short plastic clips onto the terminal strip between the four steel connections:

- Check that the foam seal is evenly spread around the insulating lid:



- Fit the *insulating lid* so that it is in contact with the entire surface of the side insulation and is gripped slightly. This is particularly important for a tight seal:

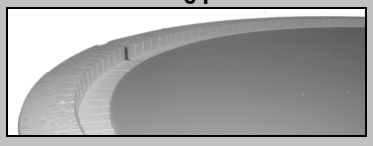
- Tighten all hook strips until the insulation is in tight contact with the lid.

- Finally fit the black *cover*:

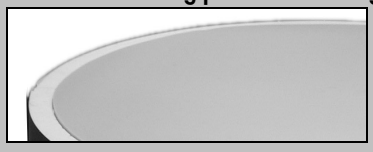
- **NOTE:**

On the SOLUS II 2200, the insulating lid consists of two flexible insulating plates.

- **Insert the insulating plate with the smaller diameter:**



- **Tighten the hook strip.**
- **Insert the insulating plate with the larger diameter:**

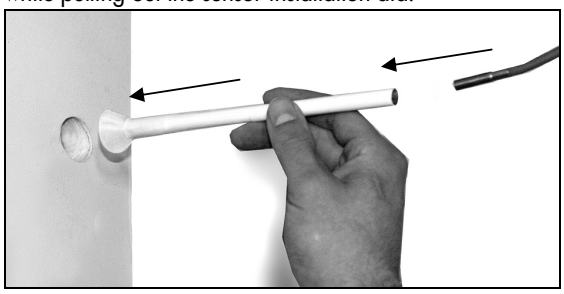


- **Place the flat black disk on top as a cover:**

8.8 Connecting the temperature sensors

Insert the temperature sensors through the openings from outside into the immersion sleeves:

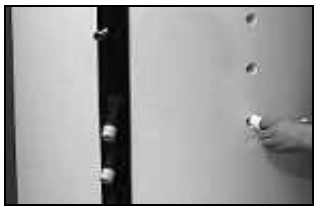
- Push the sensor installation aid through the hole in the insulation onto the immersion sleeve (as far as possible).
- Insert the sensor
- Hold the sensor in the immersion sleeve by the wire while pulling out the sensor installation aid.



- **IMPORTANT**

The sensors must be pushed in as far as possible

- Seal the holes carefully with the *foam plugs for sensors ∅ 35*.



- Screw the *sensor cover* over the openings.
- Connect the temperature sensors to the controller in accordance with the operating instructions of the corresponding controller.
- Route the sensor cables and 230 V cables in separate or partitioned cable conduits.
- Electrical installation work may only be performed by professionals.

9 Operating instructions

9.1 Commissioning

Before commissioning the storage tank, the following preconditions must be met:

- Hydraulic installation of the storage tank has been completed.
- The storage tank is completely filled and vented.
- All controller inputs and outputs are connected.
- All controller outputs have been checked for function.
- All inputs of the sensors have been checked and display plausible values.

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9.1.1 Boiler circuit flow

- Set the level of the boiler pump such that the spread between the boiler supply and return at maximum boiler performance is around 20 K.
- For hot water backup heating, the boiler supply temperature must be 2 ... 5 K above the target temperature of the backup heating sensor (switch-off value)! Rough setting: Volume flow (l/min) = 0.7 times the maximum boiler output (kW)

9.1.2 Solar circuit flow

- When commissioning the solar power system set the flow in accordance with the collector surface area (see technical documentation).

9.1.3 Settings on the solar controller

Maximum storage tank temperature: 90 °C.

In order to preserve the collector (avoiding system downtime), activate the cooling function from a storage tank temperature of 80-85 °C on the solar control unit.

If no temperature limit is implemented via the collectors, the controller must switch off the solar circuit pump at collector temperatures over 110 °C → Activate switch-off of the solar circuit pump at collector temperatures of over 110 °C.

9.1.4 Pressure of the solar power system

The heat exchanger for water heating guarantees that under no circumstances can heat transfer fluid reach the hot water system from the solar circuit. Therefore, the solar circuit can be run at a maximum pressure which is above that of the piping network.

9.1.5 Storage tank heating

If the lower section of the SOLUS II is still very cold, the thermosiphon flow starts relatively slowly on hot water withdrawal, and the hot water is heated less than is normal. We therefore recommend initial heating to 70 °C.

9.2 Operation and maintenance

9.2.1 Safety valve

The functionality of the safety valve is to be checked regularly by means of venting (1 to 2 times a month in accordance with DIN 4753). Recommended: Annual maintenance by installer. For safety reasons, water must escape from the blow-off line during heating of the hot water storage tank (if no expansion vessel is installed). The blow-off line must be open at all times.

9.2.2 Holiday

For extended breaks in usage during the summer:

- Preserve the solar collectors and storage tanks: Set the storage tank cooling function from 70 °C on the controller.
- Save pump energy: Remove the insulation lid.

9.2.3 Deliming the hot water heat exchanger

No limescale is built up in the storage tank cylinder on the outside of the ribbed pipe heat exchanger, just some limescale deposits on initial filling.

Limescale deposits may form on the inside of the hot water heat exchanger if the water is hard.

Deliming the hot water heat exchanger is easy: Via the rinsing taps on the cold and hot water connections with 10-15% citric acid. Do not use any other kinds of acids for deliming, as they could corrode the heat exchanger.

- **IMPORTANT**

If used inappropriately, acids can cause injuries and damage objects and floors.

The pump must run at all times during the deliming process! Otherwise, there is a danger of blockage.

- Acid-resistant pump
- 10-15 % citric acid
- 55 - 60 °C hot storage tank
- Pump into the rinsing tap of the cold water connection
- Collected again at the hot water connection
- Generally takes approx. 15 - 30 minutes
- Rinse out the heat exchanger with water.

If there are heavy limescale deposits, use sufficient acid; otherwise there is a risk of blockage.

9.3 Draining and changing water

Drain the SOLUS II storage tanks via return R3.

After commissioning, replace the storage tank water max. 2 - 3 times.

10 Troubleshooting

10.1 There is no hot water

Please check:

Is the mixer set too low?

Turn up the mixer toward the maximum.

Is the storage tank not filled to the top or vented?

Refill the storage tank and vent using the venting valve near the mixing valve.

Has the SOLUS II storage tank recently been filled with cold tap water and is only partially heated?

After a few hot water withdrawals or one-off heating of the upper storage tank area to approx. 70 °C, the hot water temperatures increase.

Is the upper part of the SOLUS II heated to 55 - 60 °C?

If the temperature is lower, activate backup heating.

Is the backup heating temperature sensor deep enough in the immersion sleeve?

If not, insert the sensor correctly.

Is your water high in limescale?

If you suspect that the heat exchanger is coated with limescale (inside), please call your installer to check and delime it if necessary (see maintenance). To check the heat exchanger, the clamping screw fitting of the hot water connection can be opened and the now open heat exchanger pipe can be inspected as a result. The heat exchanger should be delimed from a lime coating of 0.5 mm.

10.2 The heating temperatures are too low

Please check:

Is the temperature sensor for the heating buffer area in the immersion sleeve at the level of the heating supply?

10.3 The storage tank cools down quickly

Please check:

Are all connected pipes (solar, boiler , cold and hot water) at ambient temperature during standstilll?

If not, please ask your installer to conduct testing (and if necessary, installation) of non-return valves.

Is the insulation in close contact with the floor?

If not, seal the gap.

If, despite all of these measures, the hot water temperatures in the technical data of the SOLUS II cannot be achieved, please call your installation company.

▶ INFORMATION:

The statements made in the technical documentation and the information provided do not lay claim to completeness and do not replace professional planning. Changes and errors reserved.

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Last revised 05/2009