



**Barilla Solar**



English

Installation and Commissioning Instructions

Solar Stations SenCon Basic





Item no. 996342100BRL0x – Version V02 – Issued 2010/06

Translation of the original instructions

We reserve the right to make technical changes without notice!

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Contents

<b>1</b>	<b>General information</b> .....	<b>4</b>
1.1	About these instructions.....	4
1.2	About this product.....	4
1.3	Designated use.....	5
<b>2</b>	<b>Safety instructions</b> .....	<b>6</b>
<b>3</b>	<b>Assembly and installation [specialist]</b> .....	<b>8</b>
<b>4</b>	<b>Commissioning [specialist]</b> .....	<b>10</b>
4.1	Flushing and filling the solar circuit.....	11
4.2	Preparations before flushing.....	13
4.3	Flushing and filling.....	13
4.4	Setting the solar system.....	16
<b>5</b>	<b>Maintenance [specialist]</b> .....	<b>17</b>
5.1	Draining the solar system.....	17
5.2	Deinstallation.....	17
<b>6</b>	<b>Spare parts</b> .....	<b>18</b>
<b>7</b>	<b>Technical data and pressure drop characteristics</b> .....	<b>19</b>
<b>8</b>	<b>Function: check valves</b> .....	<b>21</b>
<b>9</b>	<b>Commissioning report</b> .....	<b>23</b>



## 1 General information



Carefully read these instructions before installation and commissioning.

Save these instructions in the vicinity of the installation for future reference.

### 1.1 About these instructions

These instructions describe the installation, commissioning, function and operation of the SenCon Basic solar stations. The chapters called [specialist] are intended for specialists only. For other components of the solar system such as collectors, tanks, expansion tanks and controllers, please observe the instructions of the corresponding manufacturer.

### 1.2 About this product

The station is a premounted fitting group checked for leakage used to circulate the solar fluid in the solar circuit. It is mounted on a wall bracket and fixed with clips. The solar station is optionally equipped with a premounted controller in an insulating shell.

It contains important fittings and safety devices for the operation of the installation:

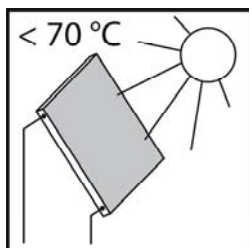
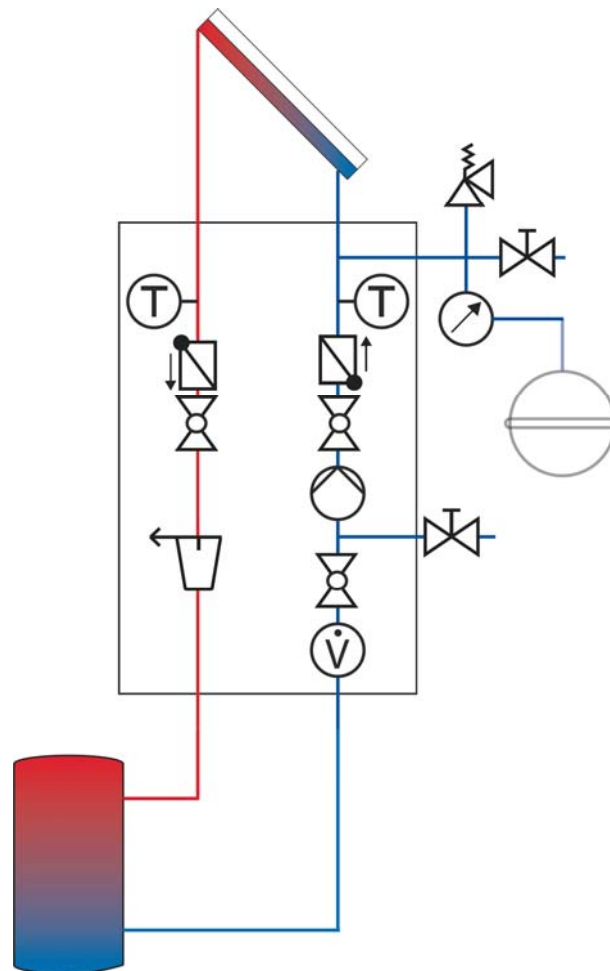
- Ball valves in the flow and return line with exchangeable spindle
- Check valves in the flow and return ball valves
- Thermometers in the flow and return line
- Pressure gauge to display the installation pressure
- Flowmeter to display the flow rate
- Ball valve to restrict the flow rate
- Solar pressure relief valve
- Airstop to easily vent the solar circuit
- Flush and fill connections



### 1.3 Designated use

The solar station may only be used as a pump station in the solar circuit taking into consideration the technical limit values indicated in these instructions. Due to its design the station must be mounted and operated as described in these instructions!

Improper usage excludes any liability claims.





When the sun shines, the collector can become very hot. The solar fluid in the circuit can heat up to more than 100 °C.



Only flush and fill the solar circuit when the collector temperatures are below 70 °C.

## 2 Safety instructions

The installation and commissioning as well as the connection of electrical components require technical knowledge commensurate with a recognised vocational qualification as a fitter for plumbing, heating and air conditioning technology, or a profession requiring a comparable level of knowledge [specialist]. The following must be observed during installation and commissioning:

- Relevant local and national regulations
- Accident prevention regulations of the professional association
- Instructions and safety instructions mentioned in this manual

	 <b>WARNING</b>
	<p><b>Danger of scalding due to vapour escape!</b></p> <p>With pressure relief valves there is risk of scalding due to vapour escape. During installation, check the local conditions and if a discharge line must be connected to the safety group.</p> <p>➤ Observe the instructions regarding the pressure relief valve.</p>

	 <b>CAUTION</b>
	<p><b>Personal injury and damage to property due to overpressure!</b></p> <p>By closing the two ball valves in the primary circuit you isolate the pressure relief valve from the heat exchanger. A rise in temperature in the storage tank will cause high pressures and could result in personal injury or damage to property!</p> <p>➤ Only close the ball valves for service and maintenance.</p>

**NOTICE****Material damage due to mineral oils!**

Mineral oil products cause lasting damage to seals made of EPDM, whereby the sealant properties are lost. We do not assume liability nor provide warranty for damage to property resulting from sealants damaged in this way.

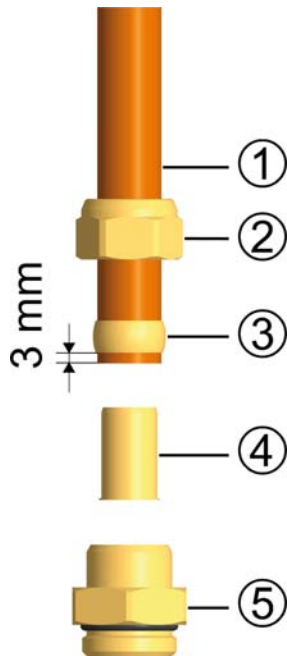
- It is imperative to avoid that EPDM gets in contact with substances containing mineral oils.
- Use a lubricant based on silicone or polyalkylene and free of mineral oils such as Unisilikon L250L and Syntheso Glep 1 of the Klüber company or a silicone spray.

**NOTICE****Material damage due to high temperatures!**

Install the fitting group at a sufficient distance from the collector field, since the solar fluid may be very hot near the collector. It may be necessary to install an intermediate tank in order to protect the expansion tank.



### 3 Assembly and installation [specialist]



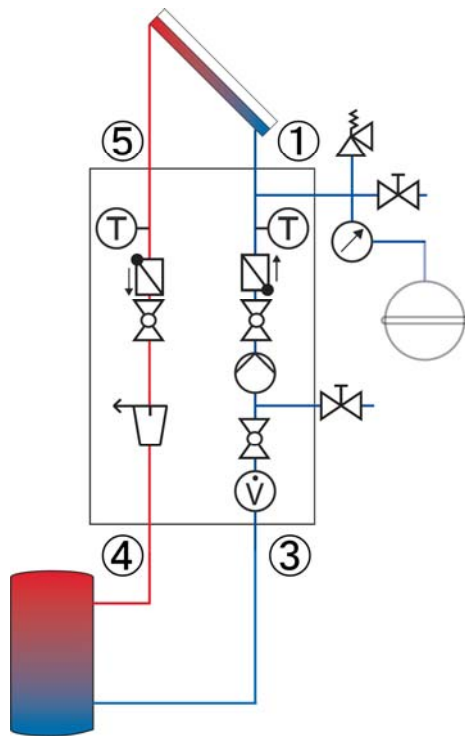
Not included in the scope of delivery!

#### Accessories: compression fitting

1. Push the union nut ② and the cutting ring ③ onto the copper pipe ①. The pipe must protrude at least 3 mm from the cutting ring in order to ensure the force transmission and the sealing.
2. Insert the support sleeve ④ into the copper pipe.
3. Insert the copper pipe with the plugged-on individual parts (②, ③ and ④) all the way into the housing of the compression fitting ⑤.
4. First screw the union nut ② manually.
5. Tighten the union nut ② by rotating one full turn. Secure the housing of the compression fitting ⑤ against distort in order to avoid damaging the sealing ring.



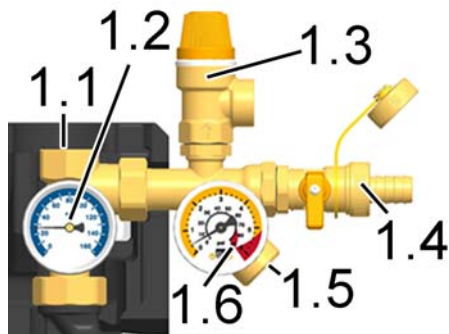
1. Remove the insulating front shell.
2. Copy the mounting holes of the solar station besides the thermometers to the mounting surface.
3. Drill the holes and mount the solar station to the wall with the enclosed wall plugs and screws.



4. Connect the solar station to the installation
  - ⑤ flow from the collector field
  - ① return to the collector field
  - ④ flow to the storage tank
  - ③ return from the storage tank

All screw connections have  $\frac{3}{4}$ " internal threads.

5. Connect the pipe for the expansion tank below the pressure gauge [1.5] and fix the bracket for the expansion tank.



6. Pressurise the expansion tank as specified by the manufacturer and connect the expansion tank. Observe the separate instructions regarding the expansion tank!

7. Check all screw connections and tighten them if necessary.




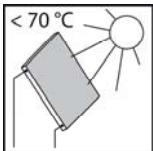
Optionally available!

The assembly of the solar station is completed and you can put the station into operation.



## 4 Commissioning [specialist]

Observe the following safety instructions regarding the commissioning of the station:

<b>⚠ WARNING</b>	
	<p><b>Risk of burning and scalding!</b></p> <p>The fittings can heat up to more than 100 °C. Therefore, do not clean or fill the system with the collectors heated (intense sunshine). Please note that hot solar fluid can leak from the pressure relief valves in case of too high system pressure!</p>
	<p>During venting the solar fluid may escape as vapour and cause scalding!</p> <ul style="list-style-type: none"><li>➤ Only flush and fill the installation when the collector temperatures are below 70 °C.</li></ul>

### NOTICE

#### Risk of frost!

It often happens that the solar system cannot be completely drained after flushing. Thus, there is risk of frost damage when flushing with water. Therefore, do only use the solar fluid used later to flush and fill the solar system.

- Use a water and propylene glycol mixture with max. 50 % propylene glycol as a solar fluid.

### NOTICE

#### Note regarding the commissioning sequence

- When putting the system into operation, first fill the heating circuit and then the solar circuit. This guarantees that heat that may possibly be absorbed by the collectors during commissioning can be dissipated.

#### 4.1 Flushing and filling the solar circuit

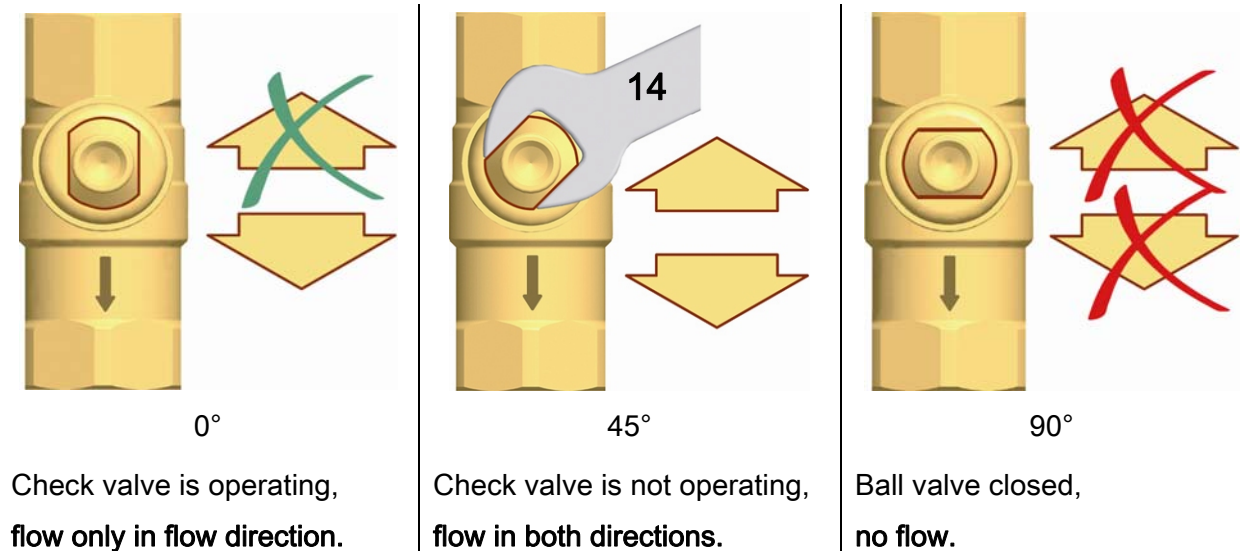
The fill and drain connections required to flush and fill are integrated in the solar station.

To prevent that the dirt particles in the solar thermal system are flushed into the expansion tank, some manufacturers recommend to disconnect the expansion tank from the solar circuit before flushing and filling. Please observe the instructions of the manufacturer.

To flush the dirt particles out of the installation, only use flush and fill stations with fine filters.

##### Ball valve with integrated flow check valve

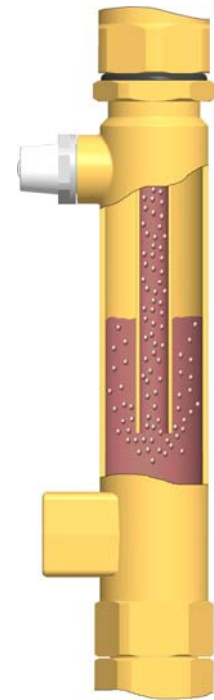
(normal flow direction in the figure below: downwards)





## Airstop

The Airstop with manual vent valve is used to vent the solar system. To ensure perfect deaeration of the solar circuit, the flow velocity must be at least 0.3 m/s in the flow line.

Pipe diameter [mm]		Flow rate at 0.3 m/s	
∅ outside	∅ inside	l/h	l/min
15	<b>13</b>	~ 143	~ 2.4
18	<b>16</b>	~ 217	~ 3.6
22	<b>20</b>	~ 339	~ 5.7

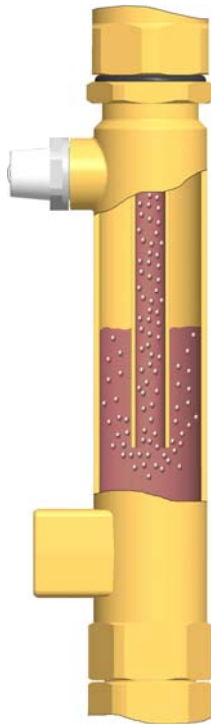
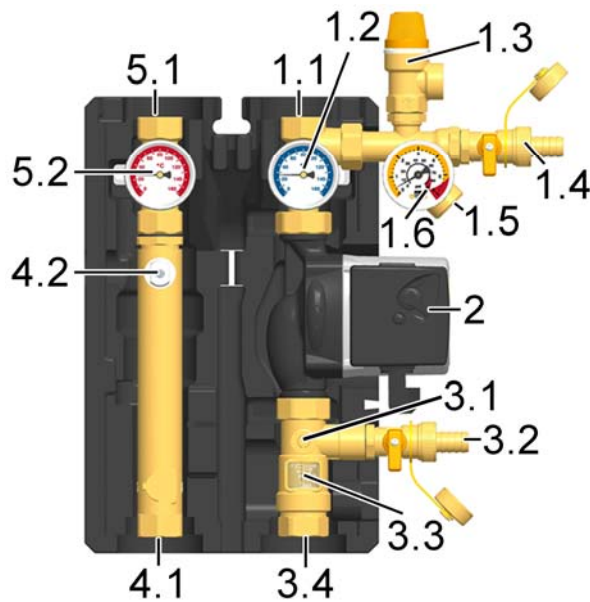


The air liberated from the solar fluid is collected in the upper part of the Airstop and can be released at the vent plug [4.2].

	 <b>WARNING</b>
	<p><b>Danger of scalding due to vapour escape!</b></p> <p>The escaping medium can have a temperature of more than 100 °C and cause scalding.</p>

## Venting the solar system after commissioning

At the beginning, vent the solar system daily and then weekly or monthly, depending on the vented air quantity. Thus, an optimum operation of the solar installation is ensured. Check the system pressure after venting and increase it to the specified operating pressure, if necessary.



#### 4.2 Preparations before flushing

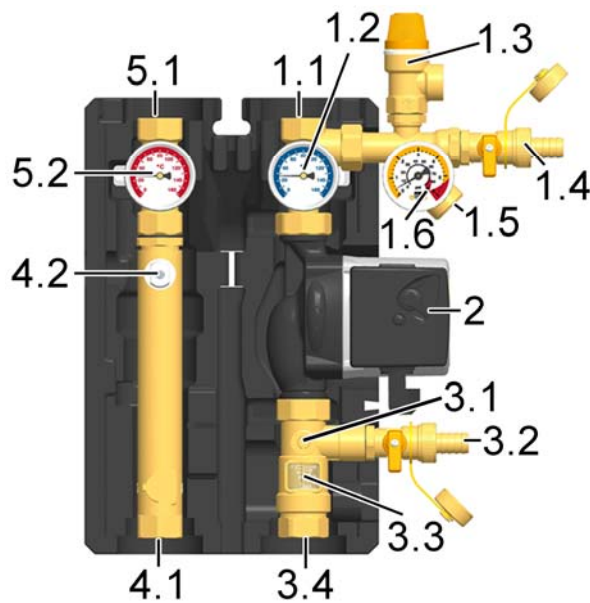
The solar circuit is flushed in the direction of flow.

1. Disconnect the expansion tank from the solar system. Please observe the instructions of the manufacturer.
2. Turn the check valve in the flow ball valve [5.2] to operating position (0°, see page 11).
3. Close the return ball valve [1.2] (90°, see page 11).
4. The ball valve [3.1] must be open.
5. Connect the fill station to the solar station:
  - Pressure hose to the fill connection [1.4]
  - Flush hose to the drain connection [3.2]

#### 4.3 Flushing and filling

1. Open the fill and drain valves [1.4|3.2].
2. Put the flush and fill station into operation and flush the installation until clear solar fluid exits.

Vent the solar system several times at the vent plug of the Airstop [4.2] until the solar fluid exits without bubbles (see page 12).





3. Slowly open the return ball valve [1.2] (0°, see page 11) to vent the pump section, then close the valve again.
4. Close the drain valve [3.2] with the filling pump running and increase the system pressure to about 5 bars. The system pressure can be read on the pressure gauge. Close the fill valve [1.4] and switch off the pump of the flush and fill station.



5. Check the pressure gauge to see whether the system pressure reduces and eliminate leaks where necessary.
6. Reduce the pressure at the drain valve [3.2] to the operating pressure.

Consider the pressure relief valve (6 bars)!

7. Connect the expansion tank to the solar circuit and set the operating pressure of the solar system by means of the flush and fill station (see instructions regarding the expansion tank).
8. Close the fill and drain valves [1.4|3.2].
9. Turn the check valves in the ball valves [1.2 | 5.2] to operating position (0°, see page 11).

	 <b>WARNING</b>
	<p><b>Risk to life and limb due to electric shock!</b></p> <ul style="list-style-type: none"> <li>➤ Prior to commencing electrical work on the controller, pull the mains plug!</li> <li>➤ Only after completing all installation work, plug the mains plug of the controller into a socket. This avoids an unintentional start of the motors.</li> </ul>

10. Connect the optional controller to the mains and set the solar circuit pump to ON in the manual mode according to the controller instructions. Let the solar circuit pump run at maximum rotation speed for at least 15 minutes.

Meanwhile vent the solar system several times at the vent plug of the Airstop until the solar fluid exits without bubbles (see page 12).

If necessary, increase the system pressure to the operating pressure.



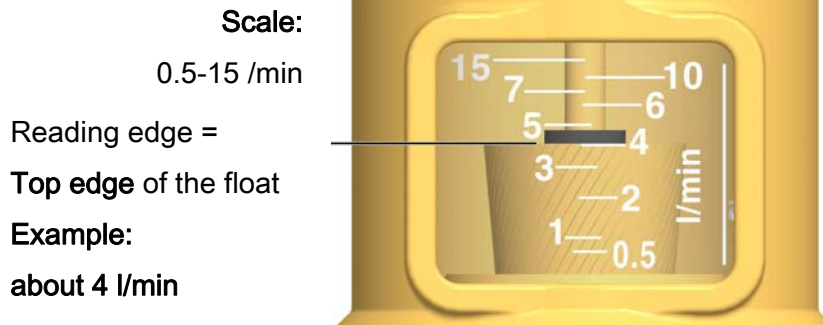
11. Remove the hoses of the flush and fill station and screw the sealing caps onto the fill and drain valves.

The sealing caps only serve to protect the valves against dirt. They are not designed to take up high system pressures, the ball valves must be closed.



#### 4.4 Setting the solar system

Observe the specifications of the collector manufacturer for the correct adjustment of the flow rate.



##### Standard solar pump (3-speed)

1. Set the desired maximum flow rate by adjusting the speed level of the solar pump. The controller sets the corresponding rotation speed. If necessary, the flow rate can be adjusted at the ball valve [3.1].

##### High-efficiency pump (PWM)

Wilo-Stratos TEC ST 15/7

Wilo-Stratos TEC ST 15/1-11.5

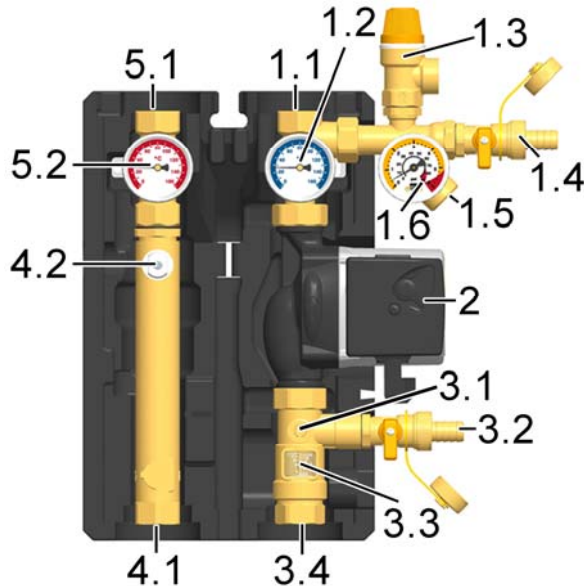
Grundfos Solar PM 15-85

1. Set the desired maximum flow rate at the controller.



2. Mount the insulating front shell to the solar station.
3. Switch the controller to automatic mode (see controller instructions).

## 5 Maintenance [specialist]

### 5.1 Draining the solar system



1. Switch off the controller and make sure that a restart is not possible.
2. Open the check valves in the flow and return ball valve [5.2|1.2], by turning them to position 45° (see page 11).
3. Connect a heat-resistant hose to the lowest drain valve of the solar system (or to drain valve [3.2]).  
Make sure that the solar fluid is collected in a heat-resistant container.

	<b>WARNING</b>
	<p><b>Danger of scalding due to hot solar fluid!</b></p> <p>The escaping medium may be very hot.</p> <ul style="list-style-type: none"> <li>➤ Place and fix the heat-resistant collecting container so that people standing nearby are not endangered when the solar system is being emptied.</li> </ul>

4. Open the drain valve at the lowest point of the solar thermal system.
5. Open a vent valve that may be present at the highest point of the solar system.
6. Dispose of the solar fluid observing the local regulations.



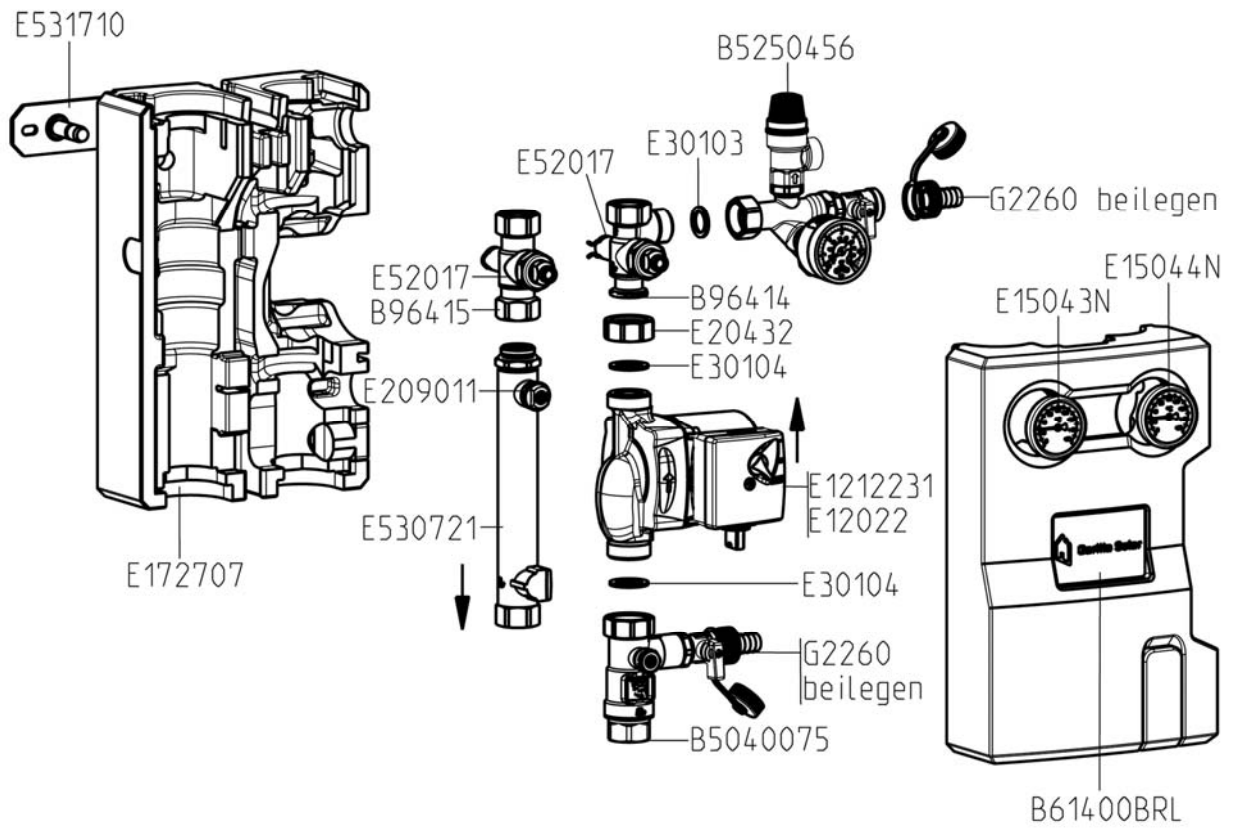
### 5.2 Deinstallation

To remove the solar station from the mounting plate, pull the clips to the side using a screwdriver. Then you can take off the station (consider the tubing!).



### 6 Spare parts

In case of a complaint, please fill out completely the commissioning protocol on page 23 and send it back to us.



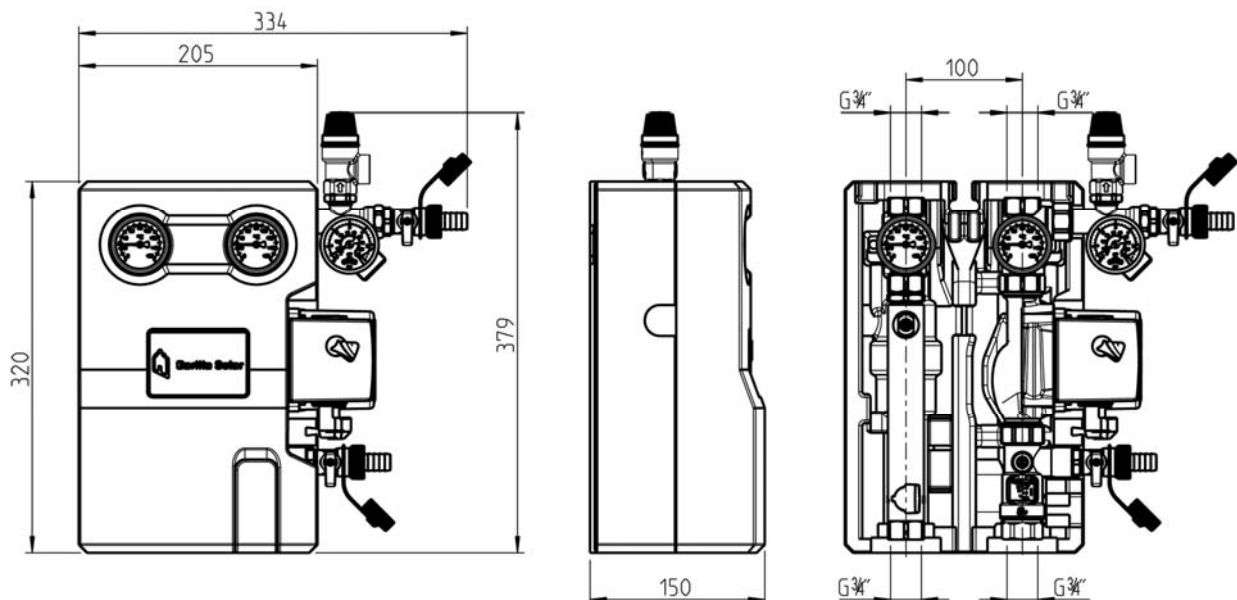
#### Connection of the pumps

	Wilo-Stratos TEC ST15/1-7 PWM Wilo-Stratos TEC ST15/1-11.5 PWM Grundfos PM 15-85
<b>PWM</b>	brown
<b>GND</b>	blue



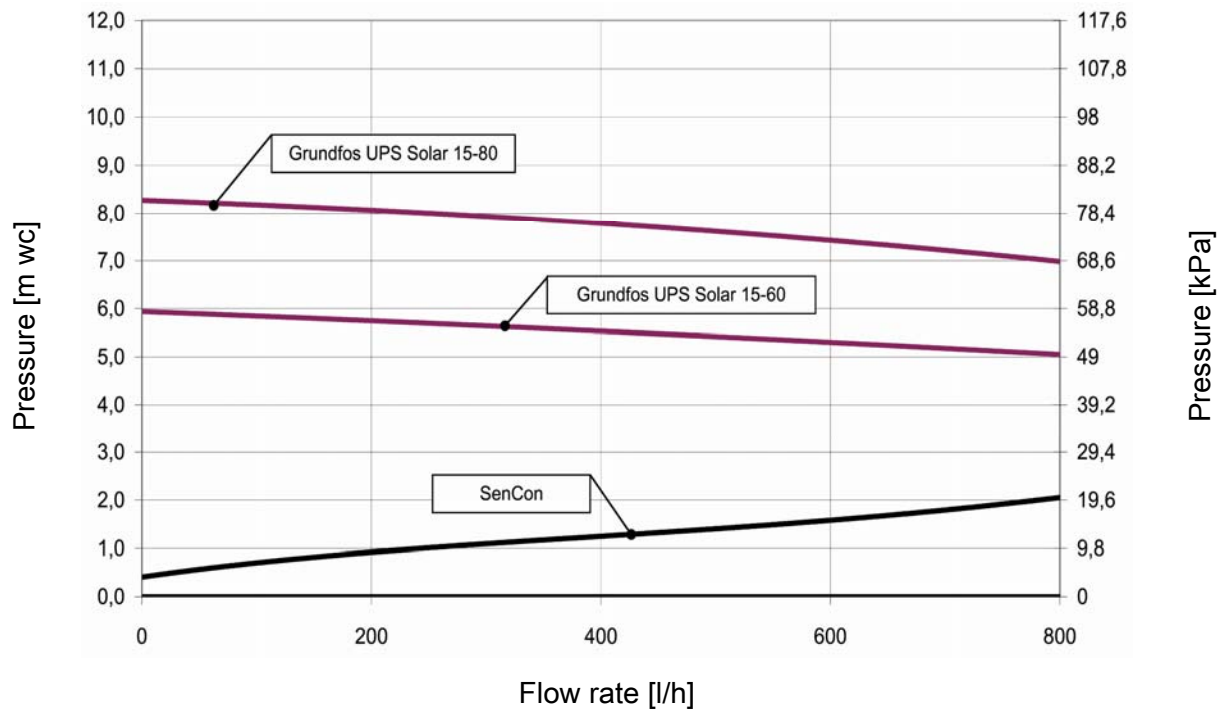
## 7 Technical data and pressure drop characteristics

<b>Dimensions:</b>	Total height (without controller)	380 mm
	Total width	334 mm
	Depth	150 mm
	Centre distance flow/return	100 mm
	Pipe connections	3/4" internal thread
	Connection for expansion tank	3/4" external thread, flat sealing
	Outlet pressure relief valve	3/4" internal thread
<b>Operating data:</b>	Max. admissible pressure	PN 10
	Max. operating temperature	120 °C
	Max. short-time temperature	160 °C, < 15 minutes
	Max. propylene glycol content	50 %
<b>Equipment:</b>	Pressure relief valve	6 bars
	Pressure gauge	0–6 bars
	Check valves	2 x 200 mm wc, can be opened
<b>Materials:</b>	Valves and fittings	Brass
	Gaskets	EPDM
	Check valves	Brass
	Insulation	EPP, $\lambda = 0.041 \text{ W/(m K)}$





Pressure drop characteristics



## 8 Function: check valves

Within their application range, the check valves in this station prevent unwanted gravity circulation. The efficiency of the check valves depends on:

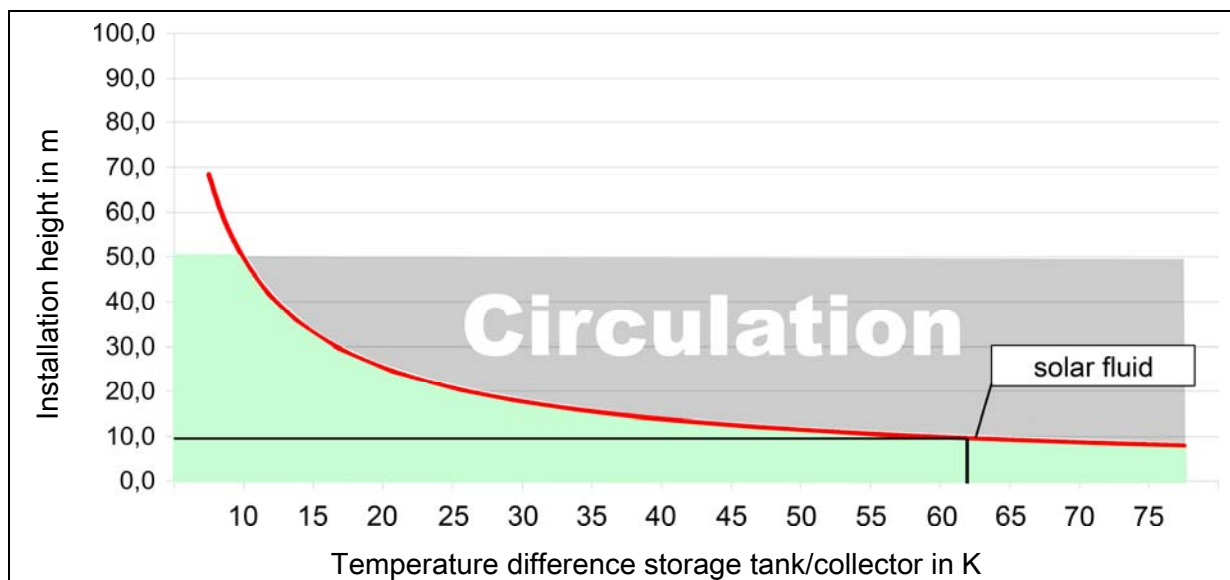
- the installation height
- the temperature difference between the storage tank and the collector
- the type of heat transfer medium

In the diagram below you can see whether the check valves integrated in the station are sufficient. If the check valves are not sufficient, you need to install additional components to prevent gravity circulation. You can mount, for example, syphons ("heat traps"), 2-way valves (zone valves) or additional check valves.

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### Example:

- The station comprises two check valves (2 x 200 mm wc = 400 mm wc).
- You use a mixture of water and 40% of propylene glycol as a **solar fluid**.
- The installation height between the collector and the storage tank is **10 m**.



### Result:

The check valves prevent gravity circulation up to a temperature difference of about **62 K**. If the temperature difference between the collector and the tank is larger, the difference in density of the solar fluid will be so large, that the check valves are pushed open.



## Do you need to know it exactly?

The density of the solar fluid decreases with rising temperature. In high installations with large temperature differences, the difference in density will cause gravity circulation. This circulation can cool down the storage tank.

**Calculation example:  $\Delta p = \Delta \rho * g * h$**

Collector temperature: 5 °C → Density solar fluid  $\rho_1 = 1042 \text{ kg/m}^3$

Storage tank temperature: 67 °C → Density solar fluid  $\rho_2 = 1002.5 \text{ kg/m}^3$

$\Delta \rho = \rho_1 - \rho_2 = 39.5 \text{ kg/m}^3$

$g = 9.81 \text{ m/s}^2$

Installation height  $h = 10 \text{ m}$

$\Delta p = 3875 \text{ Pa} = 395 \text{ mm wc}$

The two check valves in the station (2 x 200 mm wc) are sufficient for an installation height of 10 m and a temperature difference between the collector and the tank of up to 62 K.



### 9 Commissioning report

Installation operator \_\_\_\_\_

Location of installation \_\_\_\_\_

Collectors (number / type) \_\_\_\_\_

Collector surface \_\_\_\_\_ m<sup>2</sup>

Installation height \_\_\_\_\_ m (Difference in height between station and collector field)

Pipes  $\varnothing =$  \_\_\_\_\_ mm | = \_\_\_\_\_ m

Venting (collector field)  Manual vent valve  Automatic deaerator  
 No  Vented

Airstop (station)  Vented

Solar fluid (type) \_\_\_\_\_ % glycol

Antifreeze tested up to: \_\_\_\_\_ °C

Flow rate \_\_\_\_\_ l/m

Pump (type) \_\_\_\_\_

Pump speed level (I, II, III) \_\_\_\_\_

System pressure \_\_\_\_\_ mbar

Expansion tank (type) \_\_\_\_\_

Initial pressure \_\_\_\_\_ mbar

Pressure relief valve  Checked

Check valves  Checked

Serial numbers	
Station	
Controller	
Software version	
Restrictor position:	

Plumbing company

Date, signature

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