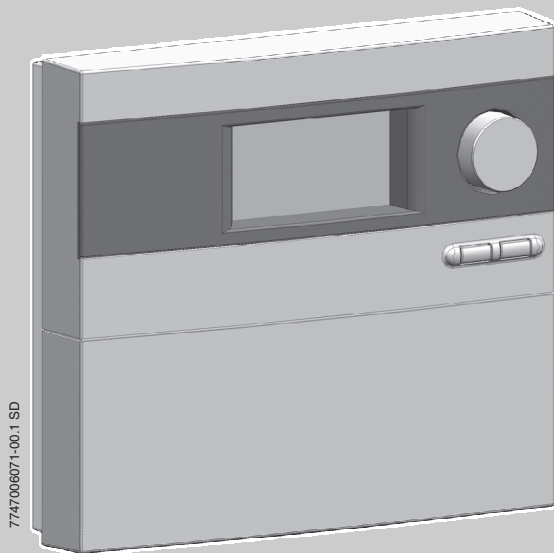


Installation and operating instructions

Solar thermal controller



Logamatic SC20

For the Heating Engineer/Owner

Please read carefully prior to installation and operation.

Buderus

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1 Safety instructions and explanation of symbols

1.1 General safety instructions

About this manual

This manual contains important information for the safe and correct installation and operation of the solar thermal controller.

This manual is intended for both general users and qualified heating technicians. Sections intended only for qualified heating engineers are marked with the words "For heating technicians only".

- Read this manual carefully.
- Leave these instructions with the customer.
- Always observe the safety instructions to prevent injury and damage to property.

Intended use

The differential temperature controller (referred to from now on as the "controller") may only be used for the operation of solar thermal systems under the ambient conditions specified (→ Section 2.4).

The controller must not be used outdoors, in damp rooms or in rooms where easily combustible gas mixtures could form.

- Only operate the solar thermal system as intended and when it is in proper working order.

Electrical connections

Any work that requires the controller to be opened may only be carried out by a qualified electrician.

- The electrical supply must be connected by a qualified electrician.
- Make sure that a fused spur or other mains isolating device compliant with EN 60335-1 for disconnection from the power supply is fitted.
- Isolate the controller from the mains power supply before opening.

Domestic hot water temperature

- To limit the DHW outlet temperature to max. 60 °C: fit a thermostatic blending valve.

Standards and guidelines

- Ensure that installation and operation of the device conforms to the local standards and guidelines.

Disposal

- Dispose of packaging in an environmentally responsible manner.
- When replacing components, dispose of the old parts in an environmentally responsible manner.

1.2 Symbols



Warnings are indicated by a warning triangle and a grey background.

The terms indicate the seriousness of the ensuing risk if measures for minimising damage are not taken.

- **Caution** indicates that minor damage to property could result.
- **Warning** indicates that minor injury or severe damage to property may occur.
- **Danger** indicates that serious personal injury could result. In particularly serious cases, lives could be at risk.



Notes are identified by the symbol shown on the left. They are bordered by horizontal lines above and below the text.

Notes contain important information in cases where there is no risk of personal injury or damage to property.

2 Details of the product

2.1 EU Declaration of Conformity

The design and operation of this product conform to the applicable European directives and supplementary national requirements. Conformity has been demonstrated.



2.2 Package contents

- Controller SC20
- Collector temperature sensor NTC 20K (FSK)
- Storage cylinder temperature sensor NTC 10K
- Power cable
- Fixings and cable clamps (for wall-mounting)

If the controller is factory fitted into a solar pumping station, the cables will have been partly pre-wired.

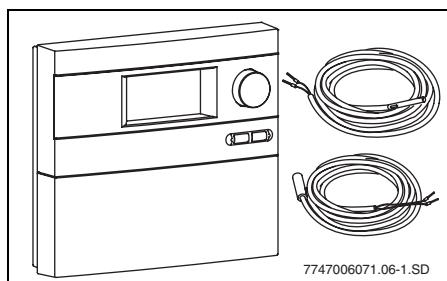



Fig. 1 Controller SC20 with temperature sensors

2.3 Product description

The controller is designed for use with a solar thermal system. It can be wall-mounted or factory fitted into a solar pumping station.

In normal operating mode, the display screen on the controller stays illuminated in green/yellow for 5 minutes after the last button was pressed (activated by pressing the rotary selector , for example).

The display shows the following:

- Pump status (as a simple schematic diagram)
- System values (e.g. temperatures)
- Selected functions
- Fault messages

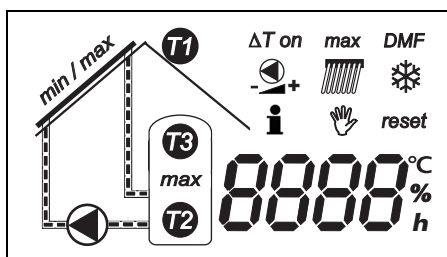


Fig. 2 Possible indications on the display

Diagram of solar thermal system

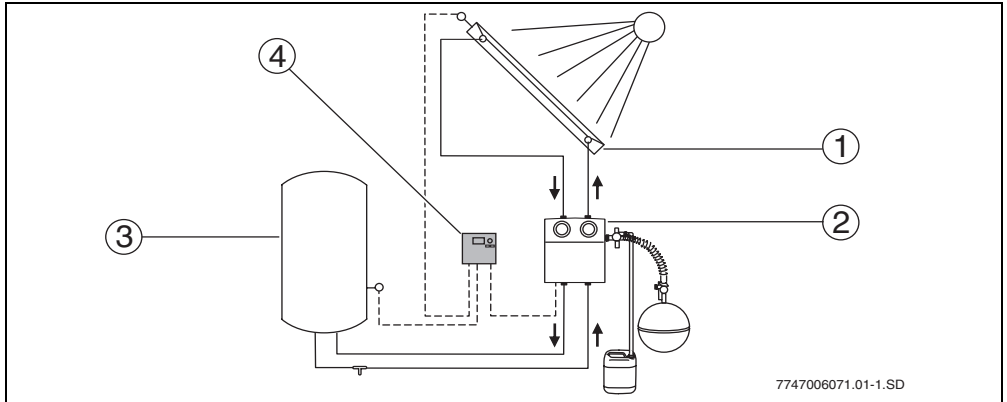


Fig. 3 System diagram

- 1 Collector array
- 2 Solar pumping station
- 3 Solar system cylinder
- 4 Controller SC20

Main components of the solar thermal system

Collector array	– Consists of flat plate collectors
Solar pumping station	– Consists of the pump together with safety valves and shut-off valves for the solar thermal circuit
Storage cylinder	– Used for storing the collected solar energy – There are three different types: <ul style="list-style-type: none"> – Domestic Hot Water (DHW) cylinder – Thermal Store (for space heating function) – Combination cylinder (for DHW and space heating)
Controller SC20	– Includes two temperature sensors

Tab. 1

Operating principle

If the set temperature difference between the collector array (→ Fig. 3, item 1) and the storage cylinder (→ Fig. 3, item 3) is exceeded, the pump in the solar pumping station is switched on.

The pump transports the solar fluid through the collector array to the storage cylinder. There is a heat exchanger storage cylinder. This transfers the free heat collected from the sun and transfers the heat from the solar fluid to the water intended for washing or heating.

2.4 Specifications

Controller SC20	
Power consumption	1 W
Enclosure rating	IP20
Supply voltage	230 V AC, 50 Hz
Operating current	I_{max} : 1.1 A
Max. current consumption at pump output	1.1 A (connect one pump only!)
Sensing range	-30 °C to +180 °C
Permissible ambient temperature	0 to +50 °C
Collector temperature sensor	NTC 20K with 2.5 m cable
Storage cylinder sensor	NTC 10K with 3 m cable
Dimensions H x W x D	170 x 190 x 53 mm

Tab. 2 Specifications

Temperature sensor T1 NTC 20K (collector)				Temperature sensor T2/T3 NTC 10K (cylinder)			
T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)
-20	198.4	60	4.943			60	2.49
-10	112.4	70	3.478			70	1.753
0	66.05	80	2.492	0	32.56	80	1.256
10	40.03	90	1.816	10	19.86	90	0.915
20	25.03	100	1.344	20	12.487	100	0.677
30	16.09	110	1.009	30	8.060	110	0.509
40	10.61	120	0.767	40	5.331	120	0.387
50	7.116	130	0.591	50	3.606	125	0.339

Tab. 3 Resistances of the temperature sensors



The temperature sensors must be disconnected from the controller for their resistances to be measured.

3 Regulations

This device complies with the applicable EN requirements.

- Observe the following regulations and guidelines:
 - Local regulations and requirements of the electricity supplier concerned.
 - Commercial/industrial codes and regulations and fire regulations.

4 Installation (for heating technicians only)

4.1 Wall mounting the controller

The controller is attached to the wall by three screws.



Caution: Risk of injury and damage to the casing if incorrectly fitted.

- Do not use the rear panel of the casing as a drilling template.

- Drill a hole in the wall and insert a wall plug. (→ Fig. 4, item 1). Drive in a screw leaving the head proud by 5 mm. Slacken the screw at the bottom of the controller and remove the cover. Hang the controller on the wall by means of the slot in the rear panel. Mark out the lower mounting holes (→ Fig. 4, item 2), drill the holes and insert wall plugs. Straighten the controller and screw firmly in place through the lower mounting holes, left and right.

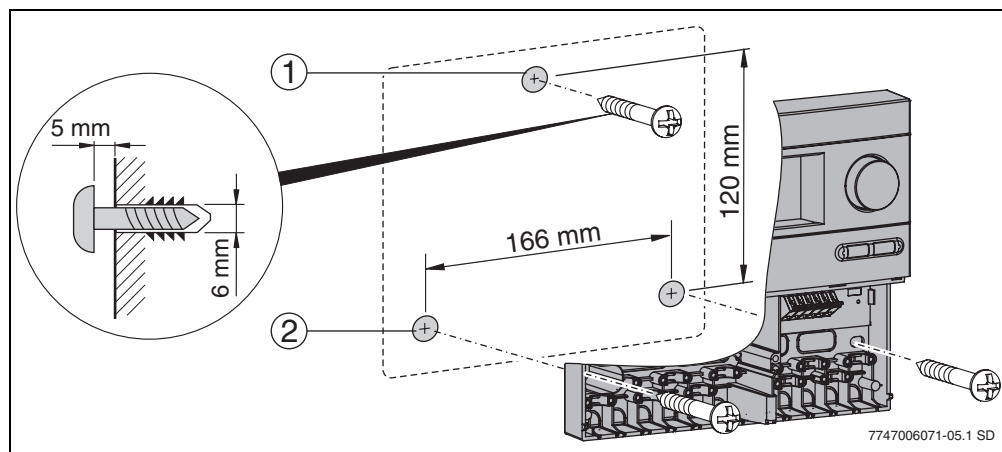


Fig. 4 Mounting the controller on a wall

- Top fixing hole
- Bottom fixing holes

4.2 Electrical connections



Danger: Risk of death from electric shock.

- Before opening the device, isolate the power supply (230 V AC).
- Secure the cable with the cable grip.

4.2.1 Preparing cable entry

The cables can either be fed into the housing from behind (→ Fig. 5, item 4) or from below (→ Fig. 5, item 3).

- Maintain IP 20 protection when installing:
 - Cut open only the cable entries required.
 - Cut open the cable entry only as much as required.
- Use a knife to cut open the cable entry (→ Fig. 5) without leaving any jagged edges.
- Secure cables with the appropriate cable grips (→ Fig. 5, item 2). The strain relief clamp can also be fitted in the reverse position (Fig. 5, item 1).

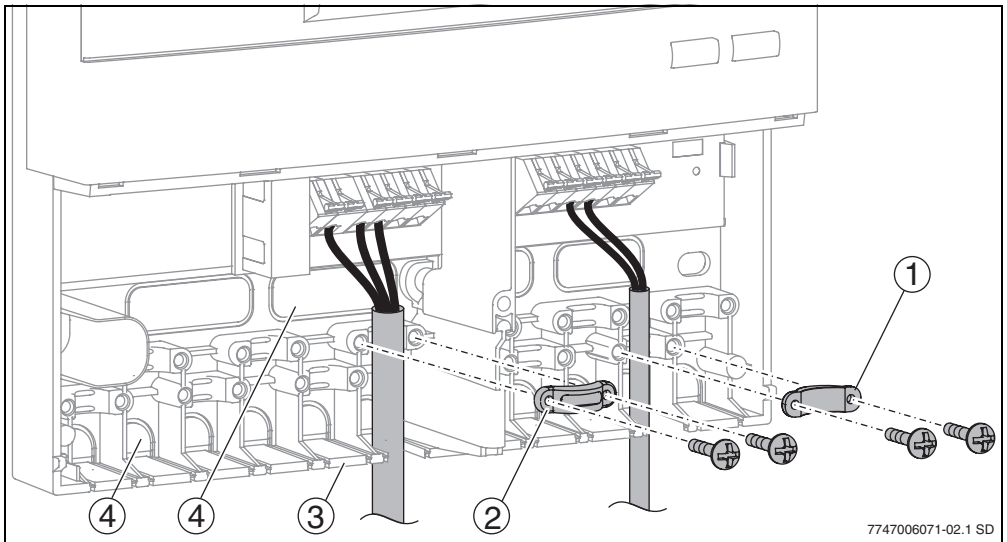


Fig. 5 Feeding in and securing cables

- 1 Cable grip reversed
- 2 Cable grip
- 3 Cable entry from below
- 4 Cable entry from the rear

4.2.2 Connecting the leads

Observe the following when connecting the cables:

- Comply with local regulations, such as protective earthing tests etc..
 - Use only accessories supplied by Buderus. Other makes possible upon request.
 - Protect the controller from overloads and short-circuits.
 - The power supply must match the specifications on the rating plate.
 - Connect only 1 lead to each terminal (max. 1.5 mm²).
 - The temperature sensor leads can be connected either way round. The sensor leads can be up to 100 m long (up to 50 m length = 0.75 mm², up to 100 m = 1.5 mm²).
 - Route all sensor leads separately from cables carrying 230 V or 400 V to avoid inductive interference (minimum separation 100 mm).
 - Use shielded low-voltage cables if external inductive interference is expected (e.g. from power substations, high-voltage power cables, microwaves).
 - For the 230 V connection, use a cable of at least type H05 VV-... (NYM...).
 - Ensure that structural fire safety features are not impaired.
- Connect the cables in accordance with the terminal diagram (→ Fig. 6).
 - Use a screwdriver to open and close the quick-connect terminals.
 - After completing the work, close the controller by replacing the cover and the securing screw.

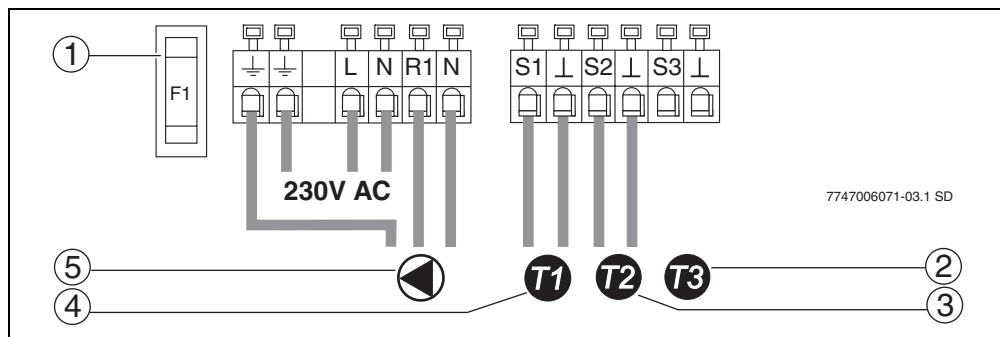


Fig. 6 Terminal diagram

- 1 Fuse 1.6 A slow blow
- 2 Temperature sensor T3 for displaying temperature in storage cylinder middle/top (accessory)
- 3 Temperature sensor T2 for displaying temperature and control value for storage cylinder bottom
- 4 Temperature sensor T1 for displaying temperature and control value for collector
- 5 Solar pumping station (max. 1.1 A)

5 Operation

Notes for the user

Your heating technician will set the solar thermal system when commissioning it, and it will run automatically.

- Do not switch off the solar thermal system during long absences (e.g. when going on holiday). When installed according to the manufacturer's specifications, the solar thermal system is intrinsically safe.
- Do not modify the controller settings.
- After a power failure or a long absence, check the operating pressure on the pressure gauge of the solar pumping station. See next section for pressure gauge location (→ Section 8.4, page 22).

Notes for heating technicians

- Hand all documents to the customer.
- Explain to the user how the device works and how to operate it.

5.1 Elements of the solar pumping station

The main components of the solar pumping station are:

- Thermometers (→ Fig. 7, items 1 and 3): The built-in thermometers display the temperatures of the solar return (blue) from the solar cylinder to the collector field and flow (red) from the collector field to the solar cylinder.
- Pressure gauge (→ Fig. 7, item 2): The pressure gauge displays the operating pressure.

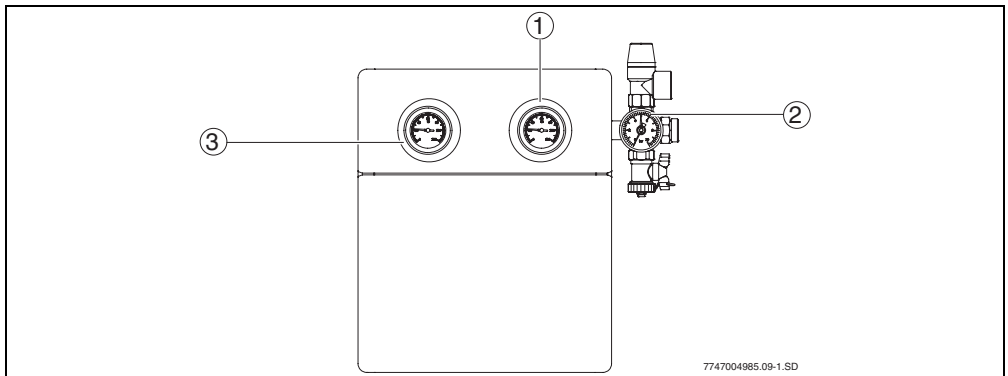


Fig. 7 Solar pumping station

- 1** Display of temperature for solar return
- 2** Pressure gauge
- 3** Display of temperature for solar flow

5.2 Elements of the controller

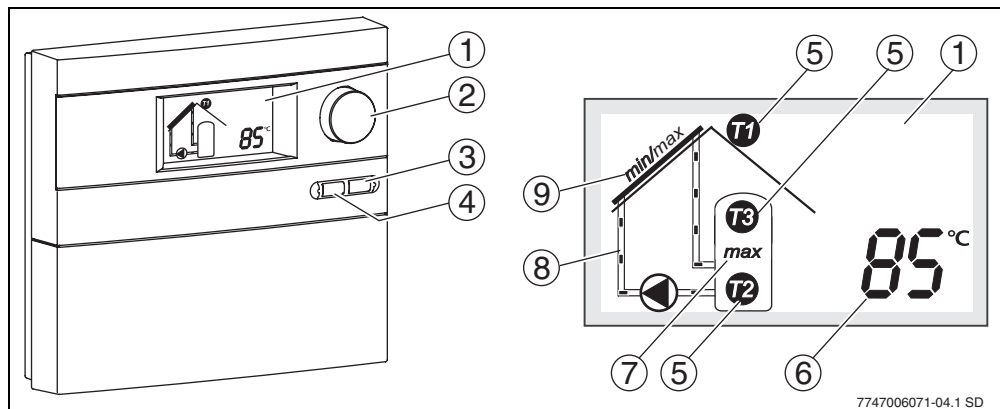


Fig. 8 controller and display

- 1 Display
- 2 Rotary selector
- 3 Back button
- 4 OK button
- 5 Symbol for temperature sensor
- 6 Displays of temperatures, hours of operation, etc.
- 7 Indication for "Cylinder maximum temperature reached"
- 8 Animated solar pumping circuit
- 9 Indication for "Collector minimum/maximum temperature reached"

5.3 Operating modes

Automatic mode

When the activation temperature difference between the two temperature sensors is exceeded, the connected pump starts running. The transport of the solar fluid is shown by the animation on the display (Fig. 8, item 8).


When the cut-out temperature difference is reached (half of the cut-in temperature difference), the pump is switched off.

To protect the pump, it is automatically switched on for about 3 seconds after approximately 24 hours of inactivity.

Function test, manual mode

This operating mode is only accessible from the Service level menu for heating technicians.








5.4 Displaying temperature values

In automatic mode, you can use the rotary selector  to display various system values (temperature values, operating hours, pump speed).



Temperature values are matched to their source by the location numbers on the pictogram.

5.5 Service level menu (for heating technicians only)




The Service level menu is used to set the controller to suit the specifics of the solar thermal system.

- To switch to the Service level menu: simultaneously press the  and  buttons.
- Use the rotary selector  to select the desired setting or function.
- To change the setting: press and hold the  button and turn the rotary selector  to obtain the new setting.
- To save the new setting: release the  button.
- To exit the Service level menu: press the  button.


If no entry is made for more than 60 seconds, the controller exits the Service level menu.

Display	Function	Setting range [default]	Set to
ΔT on	cut-in temperature difference When the set cut-in temperature difference (ΔT) between the cylinder and the collector array is reached, the pump cuts in. If the temperature difference drops below half the set figure, the pump cuts out.	7-20 K (°C) [10 K (°C)]	
max	Cylinder maximum temperature When the temperature detected by the cylinder temperature sensor reaches the maximum cylinder temperature, the pump is switched off. "Max" flashes on the display and the temperature detected by the cylinder temperature sensor is displayed.	20-90 °C [60 °C]	
	Pump speed modulation This function increases the efficiency of the solar system. It attempts to keep the temperature difference between the temperature sensors T1 and T2 at the cut-in temperature difference. Buderus recommends leaving this setting activated.	on/off [on]	
	Minimum speed for pump speed modulation This function specifies the minimum pump speed thus enabling adaptation of the speed modulation function to suit the particular solar system configuration.	30-100 % [50 %]	

Tab. 4 Service level functions

Display	Function	Setting range [default]	Set to
<i>min / max</i>	<p>Collector maximum and minimum temperature</p> <p>If the collector maximum temperature is exceeded, the pump is switched off.</p> <p>If the temperature falls below the collector minimum temperature (20 °C), the pump will not cut in even if the other conditions for switching on are met.</p>	100-140 °C [120 °C]	
	<p>Evacuated tube collector function</p> <p>To pump hot solar solar fluid to the sensor, when the collector array temperature is greater than 20° C, the pump is switched on for 5 seconds every 15 minutes.</p>	on/off [off]	
	<p>Mediterranean climate function This function is intended solely for higher temperature regions and not the UK or IE.</p>		
DMF	<p>Double Match Flow (only with temperature sensor T3)</p> <p>The pump speed modulation function be set to [ON] if this function is to be used.</p> <p>This function is used for fast charging of the top part of the cylinder to 45° C to prevent reheating of the domestic hot water by the boiler. It attempts to keep the temperature difference between the temperature sensors T1 and T2 to 15 K (°C) or 30 K (°C) depending on the temperature at T3.</p>	on/off [off]	
	<p>Information</p> <p>This function displays the software version.</p>		

Tab. 4 Service level functions

Display	Function	Setting range [default]	Set to
	<p>Manual mode “on” Manual mode “on” switches the pump on for a maximum of 12 hours. The display alternates between “on” and the selected time. Circulation of the solar fluid is shown by the animation on the display (→ Fig. 8, item 8). Safety functions, such as maximum collector temperature, remain activated. After a maximum of 12 hours, the controller switches over to automatic mode.</p> <p>Manual mode “off” The pump is switched off and circulation of the solar fluid stops. The display alternates between “off” and the selected time.</p> <p>Manual mode “Auto” If the cut-in temperature difference between the two temperature sensors is exceeded, the connected pump cuts in. Circulation of the solar fluid is shown by the animation on the display (→ Fig. 8, item 8). When the cut-out temperature difference is reached ($\frac{1}{2}$ of the cut-in temperature difference), the pump is switched off.</p>	on/off/Auto [off]	
reset	<p>Default settings All functions and parameters are reset to their default settings (except for operating hours). After resetting, all parameters should be checked and adjusted if required.</p>		

Tab. 4 Service level functions



Warning: Risk of scalding from high domestic hot water temperatures!

- To store the maximum amount of free energy from the sun, fit a thermostatic blending valve immediately after the DHW cylinder and increase the controller maximum storage cylinder temperature. Further thermostatic blending valves should be used to limit the DHW where it is used for washing and bathing.

6 Commissioning (for heating technicians only)



Warning: Risk of damage to pump if run dry.

- Make sure that the solar thermal system is filled with solar fluid (→ installation and maintenance instructions for solar pumping station).

- Follow the instructions in the technical documentation for the solar pumping station, the collectors and the storage cylinder when commissioning the solar thermal system.
- Only put the solar thermal system into operation when all pumps and valves are in proper working order.



Warning: System damage when commissioning due to vaporisation in the solar thermal circuit

- Shield the collectors from direct sunlight during commissioning (suitable covers are available from Buderus).
- Do not commission the solar thermal system at sub-zero temperatures.

Together with the solar pumping station, observe the following steps:

- Check the system is clear of air.
- Check and adjust the flow rate.
- Enter the controller settings in the commissioning and maintenance report (→ installation and operating instructions for the solar pumping station).



Warning: System damage due to incorrectly set operating mode.

To prevent undesired starting of the pump when the power supply is connected, the controller has been factory-set to manual mode “off”.





- For normal operation, set the controller to “Auto” (→ Section 5.5, page 14).

7 Faults

7.1 Faults indicated on the display

In the event of a fault, the display flashes red. In addition, the type of fault is indicated by symbols.

- **For the user:** if a fault occurs, contact your installer.

Display	Type of fault		
	Effect	Possible causes	Remedy
	Sensor failure (temperature sensor for collector or storage cylinder)		
	Pump is switched off	Temperature sensor not/ incorrectly connected. Temperature sensor or sensor lead defective.	Check sensor connections. Check the temperature sensor for damage or incorrect installation position. Replace the temperature sensor. Check the sensor cable.
	Collector temperature sensor short-circuit		
	Pump is switched off.	Temperature sensor or sensor lead defective.	Replace the temperature sensor. Check the sensor cable.
	Temperature difference between temperature sensors T1 and T2 is too great		
	No flow of fluid.	Air in the system. Pump is stalled. Valves or shut-offs are closed. Blocked line.	Vent the system. Check the pump. Check valves and shut-offs. Check line.
	Collector connections mixed up		
		The collector connections (return, flow) may be mixed up.	Check the flow and return pipes.

Tab. 5 Possible faults indicated on the display

Sensor faults are not displayed once the cause is eliminated.

- For other faults: press the button to switch off the fault display.

7.2 Faults not indicated on the display

Type of fault		
Effect	Possible causes	Remedy
Display is blank. Pump not running although activation conditions are met.		
The solar storage cylinder is not being supplied by the solar thermal system.	No power supply; fuse or power cable faulty.	Check fuse and replace if necessary. Have electrical system checked by an electrician.
Pump not running although activation conditions are met.		
The solar storage cylinder is not being supplied by the solar thermal system.	<p>Pump switched off in “manual mode”.</p> <p>Storage cylinder temperature “T2” is close to or above the set maximum storage cylinder temperature.</p> <p>Collector temperature “T1” is close to or above the set maximum collector temperature.</p>	<p>Use the “manual mode” function to switch to automatic.</p> <p>When the temperature drops 3 K (°C) below the maximum cylinder temperature, the pump switches on.</p> <p>When the temperature drops 5 K (°C) below the maximum collector temperature, the pump switches on.</p>
Pump not running although the circuit animation is showing on the display.		
The solar storage cylinder is not being supplied by the solar thermal system.	<p>The line to the pump is interrupted or not connected.</p> <p>Pump is faulty.</p>	<p>Check the line.</p> <p>Check the pump and replace if necessary.</p>
Circuit animation running on the display; pump“ humming”.		
The solar storage cylinder is not being supplied by the solar thermal system.	The pump is stalled.	Unscrew and remove the slotted screw on the pump head and use a screwdriver to release the pump shaft. Do NOT strike the pump shaft.
Temperature sensor is displaying an incorrect figure.		
Pump is being activated/ deactivated too early / too late.	Temperature sensor not correctly installed. Incorrect temperature sensor installed.	Check position, installation and type of sensor; add heat insulation if necessary.
Domestic hot water is too hot.		

Tab. 6 Possible faults not indicated on the display

Type of fault		
Effect	Possible causes	Remedy
Risk of scalding	Storage cylinder temperature limit and thermostatic blending valve are set too high.	Set the cylinder temperature limit and hot water mixer to a lower setting.
Domestic hot water too cold (or hot water flow rate too slow).		
	Domestic hot water thermostat on heating appliance, on solar controller or on thermostatic blending valve is set too low.	Set the temperature as instructed in the applicable operating manual (max. 60 °C).
Temperature sensor T3 is not displayed as a symbol with a figure (Double match flow DMF switched on).		
Solar system can not be operated with DMF function.	Temperature sensor not/incorrectly connected. Temperature sensor or sensor lead defective.	Check sensor connections. Check temperature sensor for breakage or incorrect fitted position. Replace the temperature sensor. Check the sensor cable.

Tab. 6 Possible faults not indicated on the display

8 Notes for the user

8.1 Why is regular maintenance important?

Your solar domestic hot water system or domestic hot water and space heating system is virtually maintenance free.

We recommend that you have your system serviced every 2 years by your local qualified heating technician. In that way you can ensure smooth and efficient operation and early detection and elimination of any possible damage.

8.2 Important notes on solar fluids



Warning: Risk of injury from contact with solar fluid (water and propylene glycol mixture).

- If solar fluid comes into contact with eyes: hold eyelids wide open and thoroughly rinse eyes with running water.
- Keep solar fluid out of reach of children.

The solar fluid is biodegradable.

Your heating engineer has been instructed to ensure, when commissioning the solar thermal system, that the solar fluid provides protection against freezing at temperatures down to at least $-25\text{ }^{\circ}\text{C}$.

8.3 Checking the solar thermal system

You can contribute to the smooth functioning of your solar thermal system by doing the following:

- Checking the temperature difference between flow and return and between the collector and cylinder twice a year
- Checking the operating pressure for solar pumping stations
- Checking the heat quantity (if a heat meter has been installed) and/or the operating hours.



Enter the values in the log on page (which may also be copied). The completed log can help qualified technicians when checking your solar thermal system and performing maintenance.

8.4 Checking operating pressure, with possible re-adjustment



Pressure fluctuations in the solar thermal circuit due to temperature changes are normal and do not lead to faults in the solar thermal system.

- Check the system pressure on the pressure gauge (→ Fig. 7) when the system is cold (about 20 °C).

If pressure drops

A pressure drop can be caused by the following:

- There is a leak in the solar thermal circuit.
- An automatic air vent has expelled air or vapour.

If the pressure of the solar thermal system has dropped:

- Check whether solar fluid has collected in the holding tank under the solar pumping station.
- Call in a qualified heating engineer if the system pressure drops 0.5 bar below the level recorded in the commissioning log (→ Installation and servicing instructions for the solar station).

8.5 Cleaning the collectors



Danger: Risk of death by falling from roof

- Inspection, maintenance and cleaning work on the roof must only be carried out by qualified technicians.

Due to the self-cleaning glass the collectors are washed every time it rains. The collectors do not usually need cleaning.



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