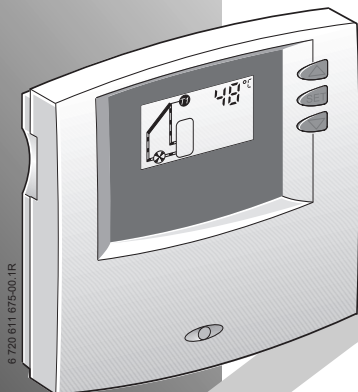


# TDS 10

SOLAR SYSTEM CONTROLLER

FOR WORCESTER SOLAR HEATING SYSTEMS



 **WORCESTER**  
Bosch Group

**INSTALLATION,  
USER INSTRUCTIONS &  
CUSTOMER CARE GUIDE**

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## Safety precautions

- ▶ To ensure the equipment functions properly, always follow the instructions in this manual.
- ▶ This accessory may only be fitted by an approved installer and must not be commissioned until the solar heating system has been installed and filled.
- ▶ Always install and commission equipment in accordance with the relevant instructions.

### Usage

- ▶ This accessory should only be used in conjunction with a solar heating system. Electrical connections must be made according to the wiring diagram.

### Electrical equipment

- ▶ Before installing this accessory: Disconnect the power supply (230 V AC).
- ▶ Do not install this accessory in damp areas.

### Explosive and easily combustible materials

- ▶ Do not use or store easily combustible materials, liquids or gases near to this accessory.

## Symbols



**Safety instructions** in this document are identified by a warning-triangle symbol and are printed on a grey background.

Signal words indicate the seriousness of the hazard in terms of the consequences of not following the safety instructions.

- **Caution** indicates that minor damage to property could result.
- **Warning** indicates that minor personal injury or serious damage to property could result.
- **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.



### 1 Product details

The TDS 10 is a controller for use with thermal solar heating systems that use heat from the sun to heat a hot water tank or intermediate heat store.

#### 1.1 Intended use

This accessory may only be used in the types of system specified above. Any other type of use is beyond the purpose for which this device is intended. The manufacturer will not be liable for any loss or damage resulting from such use.

#### 1.2 Standard package

- Solar system controller TDS 10.
- 2 PTC-type temperature sensors:
  -  Solar-panel temperature sensor.
  -  Storage tank temperature sensor for lower tank zone.

### 1.3 Technical data


<b>Device dimensions (LxWxH)</b>	136x133x37 mm
<b>Weight</b>	250 g
<b>Power supply</b>	230 V (±15%) 50 Hz
<b>Power consumption</b>	≤1 W
<b>Temperature-sensor inputs</b>	2 x PTC
<b>Output for solar heating system pump</b>	230 V AC max. 800 W
<b>Permissible ambient temp.</b>	0...+45 °C
<b>Internal fuse</b>	4 A MT, 250 V
<b>Ingress Protection rating</b>	IP 20/ DIN 40050
<b>Temperature sensor: Sensor Lead (silicon) Range</b>	PTC, Ø6 mm 1.5 m up to 180 °C
	

Table 1

#### Temperature sensor readings (PTC)

°C	0	10	20	30	40	50
Ω	1000	1039	1078	1117	1155	1194
°C	60	70	80	90	100	110
Ω	1232	1271	1309	1347	1385	1423
°C	120	130	140	150	160	170
Ω	1461	1498	1536	1573	1611	1648

Table 2

## 1.4 Description of function

For a simplified diagram of the system, refer to Figure 2 on page 16.

### Temperature differential regulator

The temperature differential regulator controls the operation of the solar heating system pump.

- The solar heating system pump is switched on when the difference between the solar panel temperature  $T_1$  and the storage tank temperature  $T_2$  exceeds the ON threshold of 8 K (°C).

The display shows the sun symbol and the  $\otimes$  symbol moves (Fig. 3).

- The solar heating system pump is switched off when the difference between the solar panel temperature  $T_1$  and the storage tank temperature  $T_2$  falls below the OFF threshold of 4 K.

The sun symbol disappears from the display and the  $\otimes$  symbol stops moving (Fig. 3).

**ON threshold** for solar heating system pump:

$$T_1 - T_2 \geq \text{temperature difference of 8 K}$$

**OFF threshold** for solar heating system pump:

$$T_1 - T_2 \leq \text{temperature difference of 4 K}$$

### Storage tank temperature limiter

The storage tank temperature limiter prevents the domestic hot water becoming too hot:

Normal setting  $T_2 = 60^\circ\text{C}$ .




**Warning:** Risk of scalding from storage tank temperatures over 60 °C!

- Fit a thermostatic mixer to the hot water draw off pipe and set to 60 °C max.

Function:

- The solar heating system pump is switched off if the storage tank temperature sensor reading  $T_2$  exceeds the set temperature. The  $\otimes$  symbol stops moving and **max** flashes (Fig. 4, page 16).
- The solar heating system pump is switched on again as soon as the storage tank temperature drops below the set temperature limit by 4 K. The  $\otimes$  symbol moves and **max** disappears from the display (Fig. 4, page 16).

### Solar panel high-temperature cut-out (fixed setting)


- Above a temperature of 130 °C at the solar panel temperature sensor **T1** the solar heating system pump switches off.  
The display shows the hot panel/evaporation symbol and the  symbol stops moving (Fig. 5, page 16).
- The solar heating system pump does not switch on again until the solar panel temperature has dropped below 127 °C and the storage tank temperature sensor **T2** calls for heat.
- At temperatures above 140 °C the convector fluid evaporates in the solar panel.

### Indication of excessive temperature difference (fixed setting)

- If the temperature difference **T1** - **T2** is greater than 80 K, this can be a sign that there is air in the system or that the solar heating system pump is defective.  
Display error message: **SYS**.

## 1.5 Key to illustrations in Appendix

### Key to Figures 1 to 10 on pages 16 to 18:

	Solar heating system pump
<b>T1</b>	Solar panel temperature sensor (PTC)
<b>T2</b>	Storage tank temperature sensor (PTC)
<b>T3</b>	No function
<b>1</b>	Top fixing hole
<b>2</b>	Bottom fixing holes
<b>230 V AC</b>	Power supply connection
<b>3</b>	Spare fuse, 4 A MT, 250 V
<b>4</b>	Fuse 4 A MT, 250 V
<b>5</b>	Cable exits to rear
<b>6</b>	Cable exits to underneath
<b>7</b>	Inner programmer cover (protects electronics)
<b>S</b>	Mode selector switch
<b>Si</b>	Fuse, 4 A MT, 250 V
<b>TDS 10</b>	Solar heating system programmer

## 1.6 Unvented DHW Cylinders

When connecting the Greenskie's Solar Heating System to an un-vented hot water storage cylinder, it is recommended that the electrical supply to the solar control system is taken via the thermal cut-out device on the cylinder.

## 2 Regulations

This accessory conforms to the relevant EN regulations.

The following regulations and requirements must be observed:

- Requirements and regulations of the relevant local electricity supplier
- Trade and fire safety requirements and regulations.

The installation of the Worcester Solar System and controller must be carried out in accordance with the relevant requirements for safety, current IEE wiring regulations, local building regulations, building standards (Scotland) (Consolidation) regulations, health and safety document No 635 (Electricity at Work Regulations 1989), BS 5918: Latest version.

## 3 Installation



**Danger:** risk of electric shock!

- ▶ Before installing this accessory:  
Disconnect the power supply (230 V AC).

- ▶ Insert screw into hole.
- ▶ Locate top fixing hole in controller backplate over screw.
- ▶ Mark position of bottom fixing holes.
- ▶ Remove controller again.
- ▶ Drill bottom fixing holes.
- ▶ Relocate programmer over top screw.
- ▶ Insert screws in bottom holes and fix programmer in position.
- ▶ Refit top part of programmer.

### 3.1 Installing the controller

When installing the controller, refer to Figs. 6 and 7 on page 17.

- ▶ Select a suitable installation site.



The controller can be fitted directly onto cable trunking.

- ▶ Remove the top part of the controller cover.
- ▶ Drill the top fixing hole.

### 3.2 Installing the temperature sensors



Use only genuine PTC-type temperature sensors (see Section 1.3).

To install immersion sensors  $T_1$  and  $T_2$ :

- ▶ Insert temperature sensor  $T_1$  in the pocket on the solar panel flow side and screw in place. The sensor and lead must be inserted to a depth of 170 mm into the panel and screwed in tightly.
- ▶ Insert temperature sensor  $T_2$  in the lower pocket on the hot water storage tank and fix in place.

### 3.3 Electrical connections



**Danger:** risk of electric shock!

- ▶ Before making any electrical connections, disconnect the power supply (230 V AC) to the heating system.

For details of electrical connections, refer to Figs. 8 to 10 on page 18.

- ▶ Sensor leads can be up to 100 m long. 1.5 m is supplied.

- ▶ Wiring run lengths and cross-sectional areas for low-voltage wiring:

Length up to 50 m	0.75 mm <sup>2</sup>
Length up to 100 m	1.5 mm <sup>2</sup>

Table 3

- ▶ For the 230 V power supply use general duty, 300-500 V PVC coated, 0.75 mm<sup>2</sup> electrical cable.
  - ▶ Route all low-voltage leads separately from 230 V or 400 V cables in order to avoid inductive interference (minimum separation 100 mm).
  - ▶ If there is a likelihood of external inductive interference, e.g. from high-power cables, tram power lines, electricity substations, radio and television equipment, amateur radio transmitters, microwaves or the like, shielded low-voltage leads should be used.
  - ▶ To ensure the programmer complies with the IP 20 Ingress Protection rating:
    - Only break open as many cable exits as absolutely necessary.
    - Only make the holes just big enough for the cables used.
    - Cable exits to underneath: Cut a slot on each side with a suitable tool and break off from the programmer casing (Fig. 8)
- or**



Cable exits to rear:  
Break open with a suitable tool through the programmer casing backplate (Fig. 6).



On fine wire leads:

- ▶ Use cable-end sleeves.

Cable exit to underneath:

- ▶ Secure cable with cable grip.

Cable exit to rear:

- ▶ Provide means of securing cable outside programmer casing.
- ▶ Use a screwdriver to lock the snap-fit terminals (Fig. 9).



Maximum lead cross-section  $2.5 \text{ mm}^2$  for each snap-fit terminal.

- ▶ Make all electrical connections (see Fig. 10).



The sensors **T1** and **T2** have to be connected before the TDS 10 will function.

## 4 Commissioning



Check that the solar heating system has been filled and vented according to the instructions for the solar panel and the solar pump station.

- ▶ Switch on power supply.
- ▶ Set mode selector switch **S** to automatic mode.  
**AUT** briefly appears on the display and the controller is set to automatic mode.

## 5 Operation



Information to be given to the user by the installer:

- ▶ Explain to the user how to operate the controller.
- ▶ Give the user all the documents supplied with the controller.

### 5.1 General information

The TDS 10 basic settings are already pre-programmed to suit the most common applications.

### 5.2 Controls

For overview of controls, see Fig. 1 on page 16.














Control	Description	Display Factory setting
	<b>S set to automatic mode AUT</b>	E.g.  <b>48 °C</b>  moves / stops Display backlighting yellow
	<b>S set to manual mode, solar heating pump ON</b>	<b>ON</b> flashes  moves Display backlighting red
	<b>S set to manual mode, solar heating pump OFF</b>	<b>OFF</b> flashes  stops Display backlighting red
	Changes display to next setting or increases figure	
	Press and hold: switches to maximum storage tank temperature setting Press and release: saves settings and switches to automatic mode	
	Changes display to previous setting or reduces figure	

Table 4

## 5.3 Settings


### 5.3.1 Storage tank temperature limit

- ▶ Press and hold the  button for approx. 2 seconds until the flashing symbol  **max** appears on the display (Fig. 11).
- ▶ Set the maximum storage tank temperature using the  buttons.



**Warning:** Risk of scalding from storage tank temperatures over 60 °C!


- ▶ Fit a thermostatic mixer to the hot water draw off pipe and set to 60 °C max.

- ▶ Save setting by pressing the  button.




### 5.3.2 Manual mode

Switching on the solar heating system pump, e.g. for commissioning or servicing:

- ▶ Set the mode selector switch **S** to solar heating pump **ON**.
  - The solar heating system pump will run continuously.

- The display backlighting is red, **ON** flashes and the  symbol moves (Fig. 12).

### 5.3.3 Viewing temperature readings


- ▶ Pressing the  button allows you to view the following readings:
  - Solar panel temperature 
  - Storage tank lower-zone temperature .

### 5.3.4 Power failure

- None of the settings are lost if there is a power failure.
- When the power is restored, the TDS 10 automatically starts working again according to the set programme.

## 6 Maintenance

When carrying out maintenance work on the system:

- ▶ Set the mode selector switch **S** to solar heating pump **OFF**.
  - The solar heating pump will stop.
  - The display backlighting is red, **OFF** flashes and the  symbol stops moving (Fig. 13).
- ▶ Switch off the power supply.

## 7 Troubleshooting

### 7.1 Faults indicated on the display

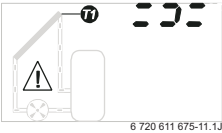
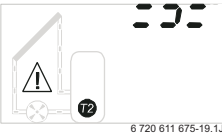
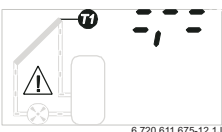
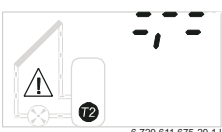
Display shows (flashing red/yellow)	Cause	Remedy
 <p>6 720 611 675-11.1J</p>	Short circuit on sensor lead to solar panel temperature sensor <b>T1</b>	Check sensor lead <b>T1</b> .
 <p>6 720 611 675-19.1J</p>	Short circuit on sensor lead to solar panel temperature sensor <b>T2</b>	Check sensor lead <b>T2</b> .
 <p>6 720 611 675-12.1J</p>	Break in sensor lead to solar panel temperature sensor <b>T1</b>	Check sensor lead <b>T1</b> .
 <p>6 720 611 675-20.1J</p>	Break in sensor lead to solar panel temperature sensor <b>T2</b>	Check sensor lead <b>T2</b> .

Table 5

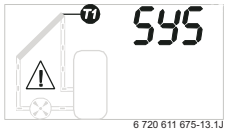
Display shows (flashing red/yellow)	Cause	Remedy
 <p>6 720 611 675-13.1J</p>	Indication of a fault in the system, e.g. shut-off valves closed, air in the system or defective solar heating system pump.	Check that the shut-off valves are open.
		Check the system. If necessary have the system bled.
		Check whether the solar heating system pump is working (see Section 5.3.2).

Table 5

## Deleting displayed faults

- ▶ To delete a displayed fault, press any button.

### 7.2 Faults not indicated on the display

Problem	Cause	Remedy
Display blank, solar heating system pump not running even though storage tank temperature is below solar panel temperature.	No power supply, fuse blown or power lead defective.	Have electrical system checked by qualified electrician.
Solar heating system pump not running even though storage tank temperature is below solar panel temperature.	Solar heating system pump switched off by mode selector switch <b>S</b> .	Set mode selector switch <b>S</b> to automatic mode.
	Storage tank temperature $T_2$ is close to or above the set maximum storage tank temperature, storage tank temperature limiter has switched off solar heating system pump.	As soon as the storage tank has cooled down or sufficient water is drawn off, the solar heating system pump will switch on again.
	Solar panel temperature $T_1$ is above 130°C, solar panel temperature cut-out has switched off solar heating system pump.	Solar heating system pump is not switched on again until solar panel temperature has dropped below 127 °C $T_1$ .

Table 6



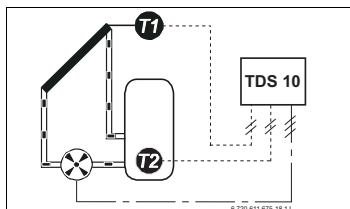
Problem	Cause	Remedy
Solar heating system pump not running even though  symbol on the display is moving.	Break in connecting lead to solar heating system pump or lead not connected.	Check lead.
	Fuse (SI, Fig. 10) has blown.	Check fuse and replace if necessary.
	Solar heating system pump defective.	Check solar heating system pump and replace if necessary.
 symbol on display is moving, solar heating system pump is "humming".	Pump is jammed.	Unscrew slotted-head bolt from pump cover and free pump shaft with a screwdriver. Do not strike the pump shaft!
Temperature sensor shows incorrect reading.	Temperature sensor not fully inserted in pocket or excessive temperature loss at point of measurement.	Push temperature sensor all the way into pocket and fix in position. Provide insulation if necessary.
Domestic hot water too hot	Storage tank temperature limit set too high.	Set lower storage tank temperature limit.
Domestic hot water not hot enough (or not enough domestic hot water).	Hot water temperature control on boiler or heating programmer is set too low.	Set temperature according to the relevant operating instructions (recommended max. 60 °C).

Table 6

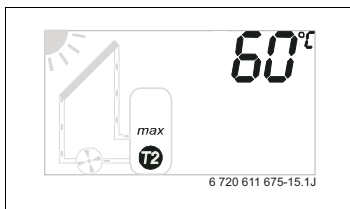
## Appendix



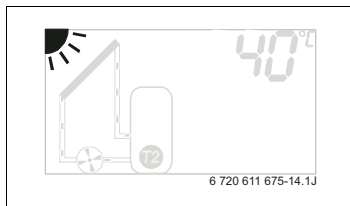
**Fig. 1**



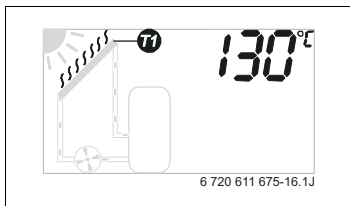
**Fig. 2**



**Fig. 4**

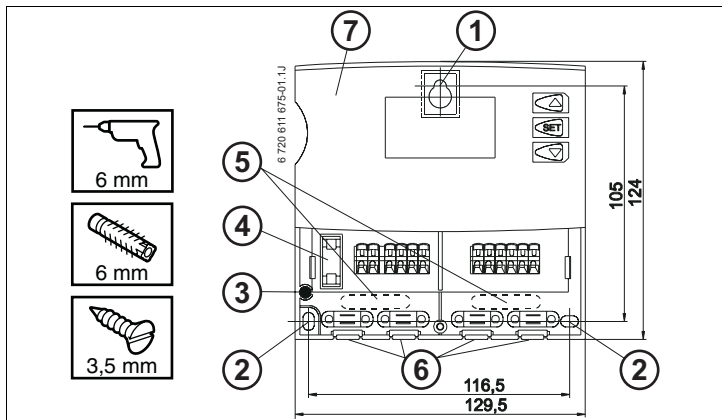


**Fig. 3**

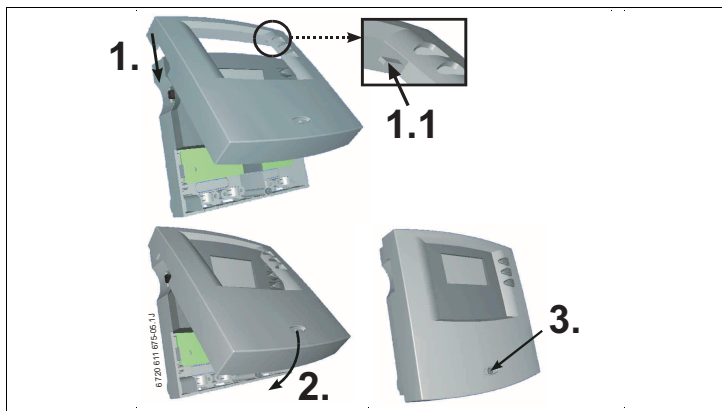


**Fig. 5**

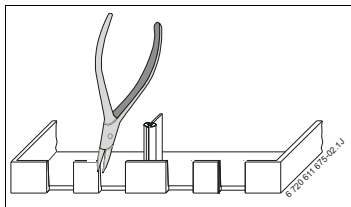




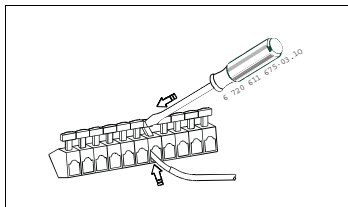
**Fig. 6**



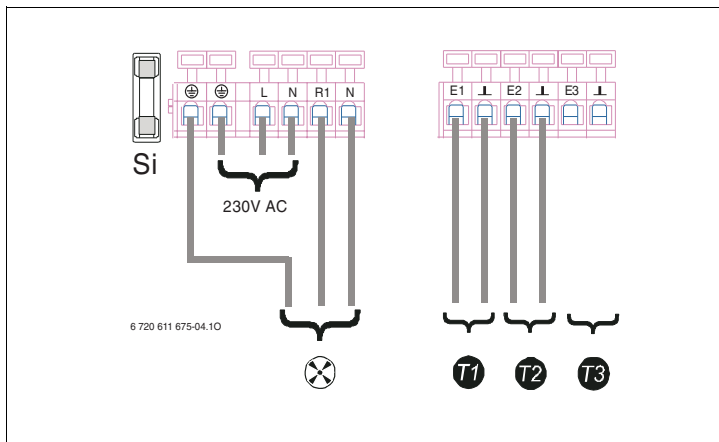
**Fig. 7**



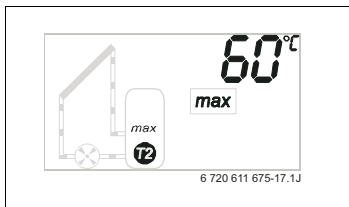
**Fig. 8**



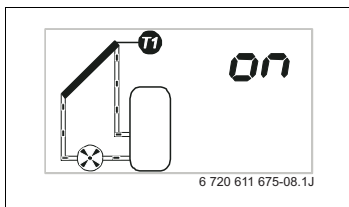
**Fig. 9**



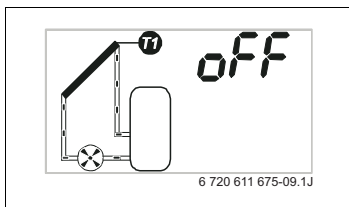
**Fig. 10**



**Fig. 11**



**Fig. 12**



**Fig. 13**

# **INSTALLATION, USER INSTRUCTIONS & CUSTOMER CARE GUIDE**

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