

THERMOSTATS FOR WATER HEATING

Almost all hot water systems rely on a thermostat to control the temperature of the water they deliver. Unlike most other types of hot water systems, however, only solar water heaters provide the facility for saving energy by switching OFF the thermostat.

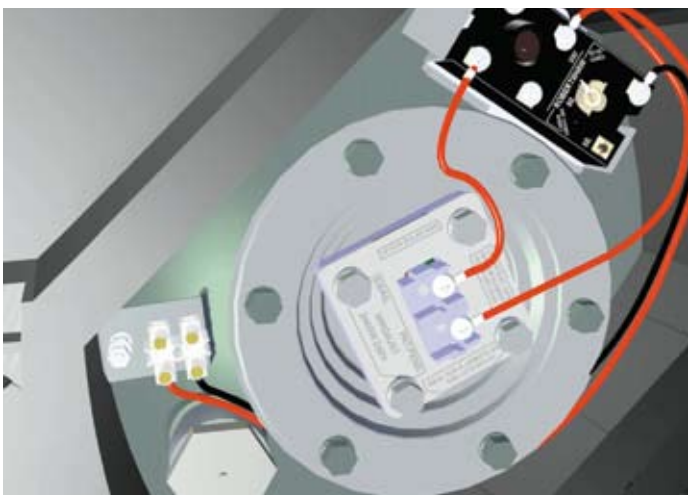
This fact file describes how thermostats work and how you can work with them to get the most out of your solar water heater.



- What does a Thermostat do?
- What is a Thermostat?
- How does a Thermostat work?
- Why does a Solahart have a Thermostat?
- What is the Solahart booster switch used for?
- How should the booster switch be used?
- Technical specifications

What Does a Thermostat Do?

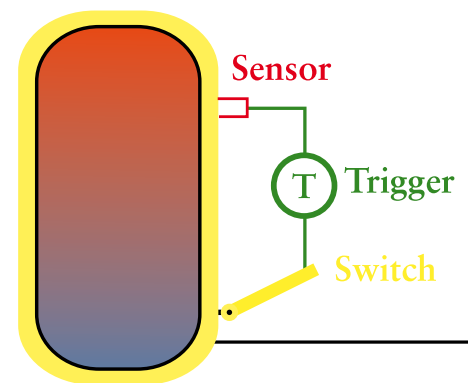
Whether you own a gas, electric, oil or solar hot water system, chances are it has a thermostat. Thermostats are very simple devices which you will find inside most appliances which provide some form of heating or cooling. For example, electric jugs have thermostats to switch the power OFF once the water boils. A simple way to think of a thermostat is to liken it to a float-valve on a water tank. A float-valve lets make-up water into the tank if the water level is low and stops the make-up water flow once the set point level is reached. A heater thermostat lets energy flow into the water if the temperature is low and stops the energy flow once the thermostat temperature is reached. Just as a float valve does not consume water, a thermostat does not consume energy.



What is a Thermostat?

A thermostat is made up of three simple parts, a:

- sensor to detect temperature
- trigger that moves once the temperature is at the set point
- switch that opens or closes to control the energy flow.



Using the float-valve analogy:

The float is like the sensor of a thermostat - it detects the water level. The float arm is like the trigger - it moves with the float position. The control valve is like the switch - it opens and closes to control the make-up water flow.

In both the thermostat and float valve, the parts are pure mechanical. They derive their individual properties from the way they are made. They work together because of the way they are arranged - they do not need power or any other input to make them work.

How Does a Thermostat Work?

The purpose of a thermostat in a hot water system is to ensure the water at the taps is at the right temperature. For storage types of water heaters, this usually means keeping the water in the tank at the set point temperature.

In a conventional gas, oil or electric storage water heater, the thermostat sensor is either a strip or disk made from two, bonded metals or a pellet of wax. As gas or oil is fired through the burner or electricity consumed by the heating coil, the water in the tank is heated and therefore its temperature rises. The sensor detects this and when the set point is reached, the sensor changes position - the strip or disk flips to a new shape or the wax pellet expands. The trigger reacts to the change in the sensor and acts upon the switch to open it and thereby turn OFF the flow of gas, oil or electricity. Once OFF, there is no further energy usage until the thermostat detects that the water temperature is low and that heating is again required. When this happens, the sensor returns to its original position, the trigger reacts and acts to close the switch. Gas, oil or electricity is again free to flow to the heating element.

Why does a Solahart Have a Thermostat?

The way a thermostat works in a Solahart solar water heater is basically the same as for a gas, oil or electric storage water heater. The big difference is the Solahart thermostat is used only for controlling the flow of auxiliary or boosting energy. The thermostat does not regulate a Solahart's prime energy source: solar energy. This means that during much of the year, the thermostat is not required.

Provided the storage tank water temperature does not fall below the set point, the thermostat switch will never close and therefore, auxiliary energy will never be used.

Often, however, after a period of large hot water usage, the water temperature in parts of the tank falls to below the set point. This occurs because as the hot water is drawn from the top of the tank, it is replaced by cold water fed into the bottom. Initially there is a hot/cold boundary where the existing hot water meets the new cold water. Over time this boundary disappears as the hot and cold water mix. If the thermostat detects that the water is below the set point temperature, it will close the switch and call for heating. This will occur despite the presence of sufficient solar energy to heat the water back to the set point. It will also occur if the water temperature falls below the set point during the night.

What is the Solahart Booster Switch Used For?

To avoid unnecessary auxiliary energy use and to allow Solahart owners to realise maximum savings a manual booster switch or timer can be fitted to our electric boosted systems.

Booster or timer switches control the flow of electricity to the Solahart. They are usually located in a convenient position and work ahead, and independently, of the thermostat.

Returning to our float-valve analogy, a booster or timer switch can be likened to a stop-cock that sits between the float-valve and the make-up water supply. Regardless of the float-valve state, no make-up water can enter the tank if the stop-cock is closed. In the same way, regardless of the thermostat state, no boosting energy can be used if the booster or timer switch is in the 'OFF' position.

The Solahart thermostat is in fact two thermostat devices in one. The first device controls the temperature of the water in the storage tank as described in this fact file. The second device is an over temperature cut-out mechanism.

How Should the Booster Switch be Used?

The simplest way to use the Solahart booster switch is to leave it turned 'OFF' during prolonged periods of sunny weather and 'ON' during prolonged periods of poor weather. This gives a good balance between maximising energy savings and avoiding the inconvenience of insufficient hot water.

To automate booster control a time clock can be fitted to the system such that time and duration of booster availability are simply controlled by the owner to suit their specific requirements.

The most important thing to remember is that just because the booster switch is 'ON', this does not mean that the solar water heater is using auxiliary energy. The thermostat itself does not use power and only if the water temperature is below the set point will the thermostat be calling for auxiliary energy to the heating element.