

## The heat transfer system

### Which primary system should I choose ?

The components containing the heat transfer fluid, including the solar collector, pipes and heat exchanger, are generally termed the 'primary system'. This is opposed to the term 'secondary system' which refers to components holding the domestic hot water (DHW). Usually the DHW and primary system fluid are different and separated by a heat exchanger, hence forming an indirect system. This exchanger is normally a coil inside the hot water store but can be external. However, in the case where both the primary and secondary fluids are the same, i.e. without a heat exchanger, then the system is direct and the fluid in the collector is therefore plain water. Sometimes an indirect system can have more than one heat exchanger and use air as the transfer medium instead of liquid.

### Circulation

For heat to move from the collector to the store, there must be circulation. In normal operation one pipe will flow hot from the collector and the other pipe return cooler, forming a loop moving heat from one end to the other. Due to the layout of most houses, using a pump offers the best flexibility and response to intermittent weather conditions and can permit simple overheating and frost protection. In rare case, natural thermosiphon circulation can be used without a pump since warm water naturally becomes more buoyant than cold and the fluid moves upwards in the pipes without assistance. However, for this to work satisfactorily the collector must be below the store and the pipes must continually rise upwards towards the store. This arrangement is quite difficult to achieve in practice hence its rarity. Direct types of thermosiphon systems are seldom seen in the UK due to the risk of freezing of the safety vent which can not be reliably prevented. In addition, prevention of overheating is difficult with thermosiphoning. Overheating and loss of useful heat are drawbacks of using pumps directly coupled to a photovoltaic module without a temperature pump control.

### Primary fluid expansion

When water is heated, it will expand (whether stationary or moving) and it is especially important to allow for this in the system design. If there is a fault with circulation under hot/sunny conditions, liquid-based collectors may boil and the contents turn to vapour. There are three main methods of accommodating this safely, one of which must be used somewhere in the primary system:

- A vent to atmosphere into a header cistern (open vent)
- An expansion vessel and safety valve (sealed system)
- Switch-off pump and drain-away from collector into a vessel (drainback)

Collectors are normally specifically designed for using one of these methods but some can use either.

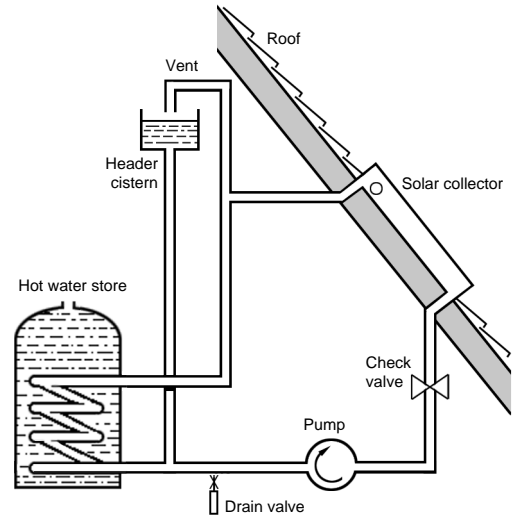


Fig. 6: A pumped, indirect, open vented primary system

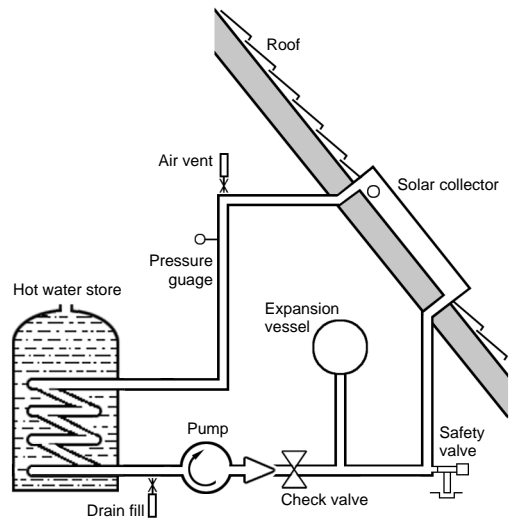


Fig. 7: A pumped, fully filled, indirect sealed primary system