IMAGINATION SOLAR LTD

Installation Guide B3

Vented & Unvented Cylinders

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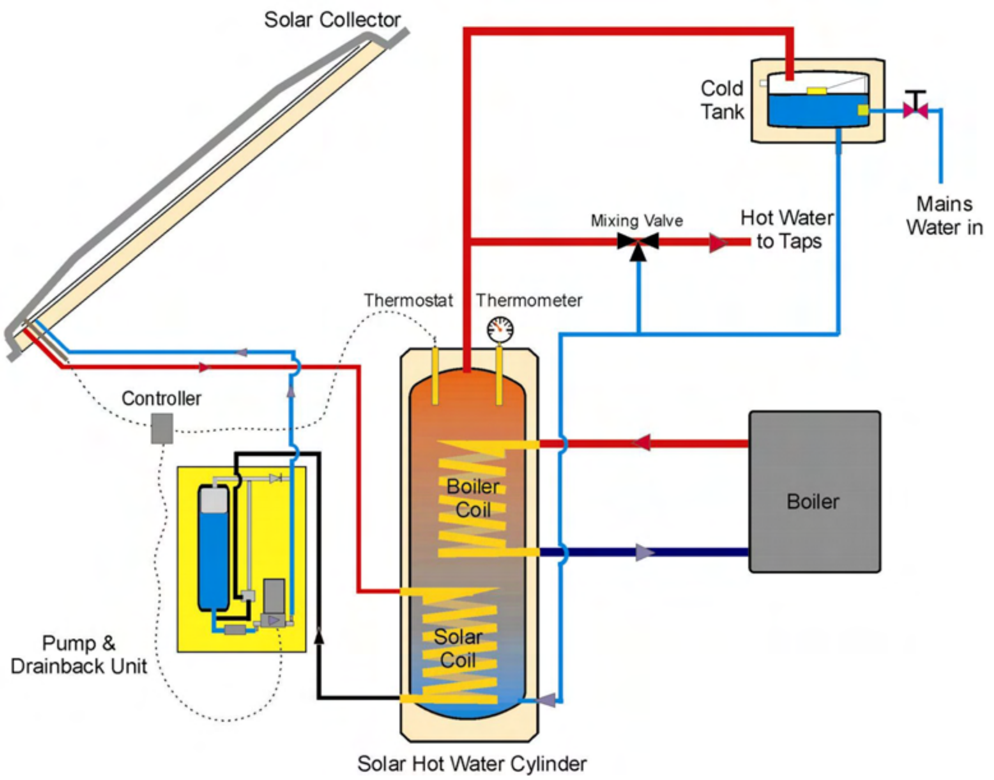
B3.1 Connecting to a Standard ISL Hot Water Cylinder (microbore coil)

In the Imagination 'low flow' solar system microbore pipe is used for circulation and for construction of the solar coil in the lower part of the hot water cylinder. Pipework is usually 8mm (o.d.) for a single panel system and 10mm for a twin panel system. Only larger multi-panel systems will require conventional 15mm and 22mm pipework (see section B2.4 for pipe sizes).

The first advantage of this arrangement is that with the correct match of flow rate and pipe size, the velocity of the water is such that all air is expelled from the system, regardless of whether there are any kinks or loops present. In fact the water flow can drive air downwards, without the air bubbling up and around the water flow, which could otherwise cause an airlock. This makes it possible to connect the hot flow pipe from the solar panel to the <u>top</u> of the solar 10mm coil and not the bottom, without risk of an airlock. We connect this way whenever possible to enhance the stratification effect in the cylinder.

The second advantage is that when the Imagination solar system drains down it can use the unique 'thermosiphon' drainback system to drain all water from the pipework in a single strand of water. Rather like a continuous rope over the top of a pulley the water is actually pulled upwards over the high point of the solar panel before dropping down into the drainback vessel.



B3 Figure 1: Colour Coded Pipe Connections (standard microbore solar coil)

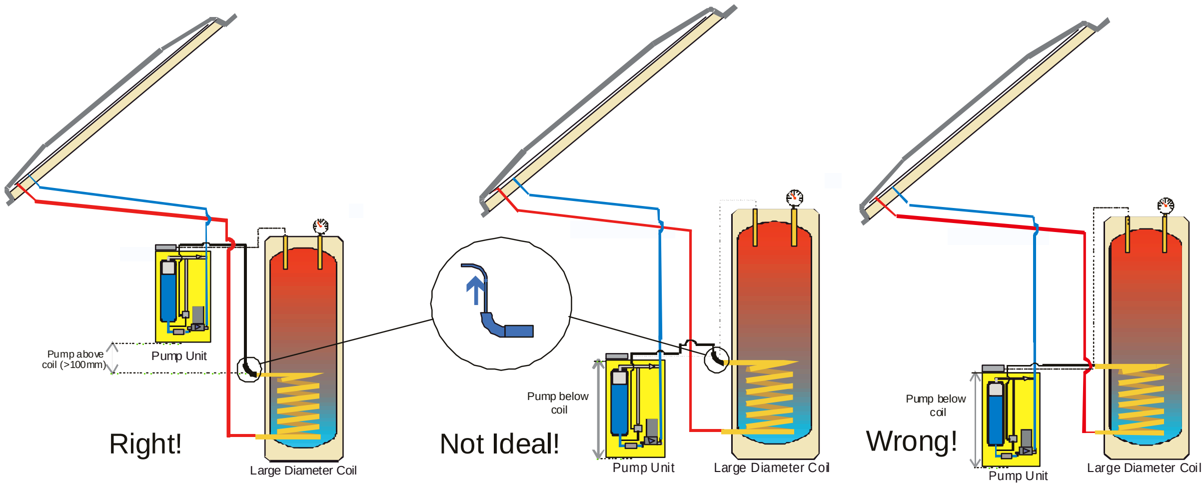
- *The **red** pipe from the collector should go to the <u>top</u> connection of the solar coil on the hot water cylinder.*
- *The **blue** pipe from the collector should go to the **blue** John Guest push fit connection on the drainback unit.*
- *The **black** John Guest push fitting from the drainback unit should go to the <u>bottom</u> connection of the solar coil on the hot water cylinder*

N.B. A drain cock is fitted to the DBU as standard with an extension tube also supplied; use this to attach a pressure test pump to test joints to 2 bar whilst the pump is running. It may also be useful to add a draincock to the bottom of the solar coil, such that water can be drained from the coil should there be a need to disconnect the solar system or change the cylinder.

B3.2 Connecting to a Large Diameter Solar Coil

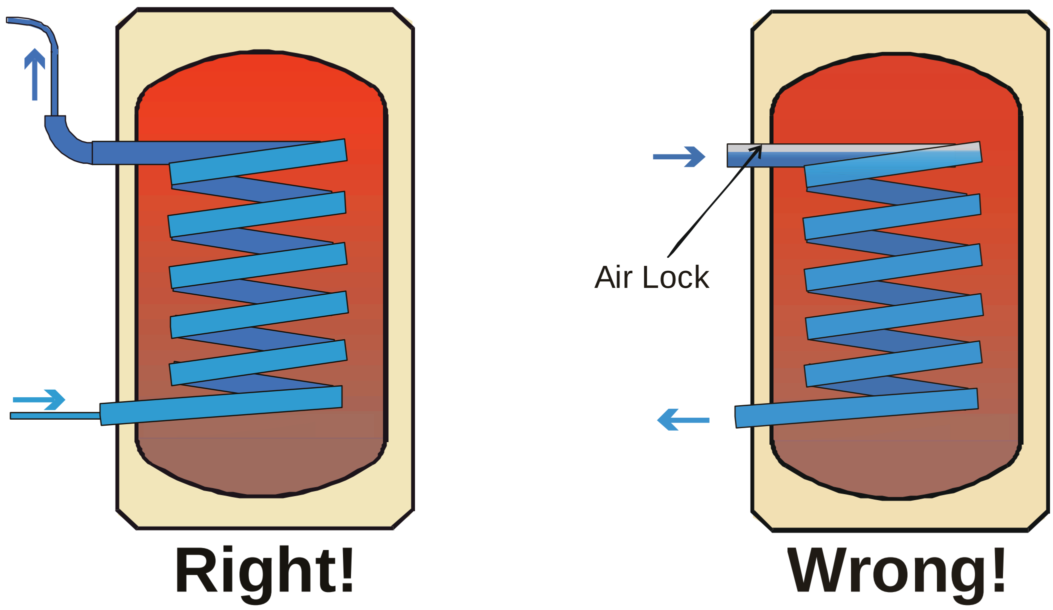
In certain cases large diameter solar coils are present, typically 22mm. This may be because the system is being installed into a 'solar ready' house, where the client wants to provide their own cylinder or where we are obliged to use an off-the-shelf cylinder – for example with an unvented cylinder, where the coil has been part of the approval procedure. There is no problem using this type of coil but certain modifications must be made to the design to prevent airlocks occurring which will prevent drainback:

1. The DBU should be placed above the highest point of the solar coil, which will mean that there is always water in the coil, ensuring hydraulic continuity, without any air pockets. This means the water never drains out of the coil, which also means a larger drainback vessel is not required to hold this additional water. It is essential that the 22mm return pipe is elbowed vertically before reducing to microbore in order to purge the air out of the coil. If the DBU is not placed above the solar coil, a larger capacity drain back vessel will be required.

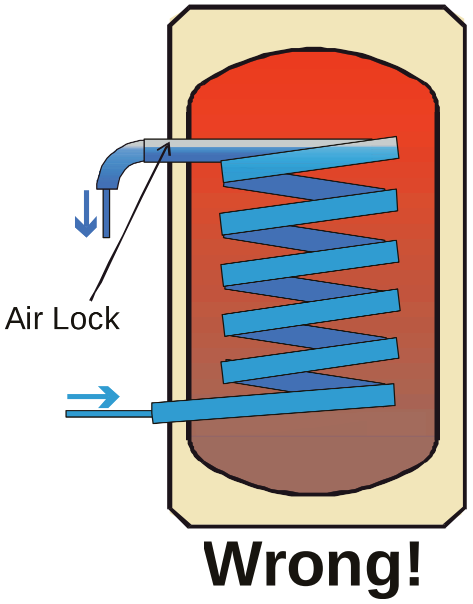


B3 Figure 2: Drainback unit positioning with a large diameter solar coil: DBU should be higher than solar coil.

2. The hot flow pipe from the solar panel must be connected to the bottom of the solar coil and not the top, allowing air to rise ahead of the water line as the system is filled for the first time.

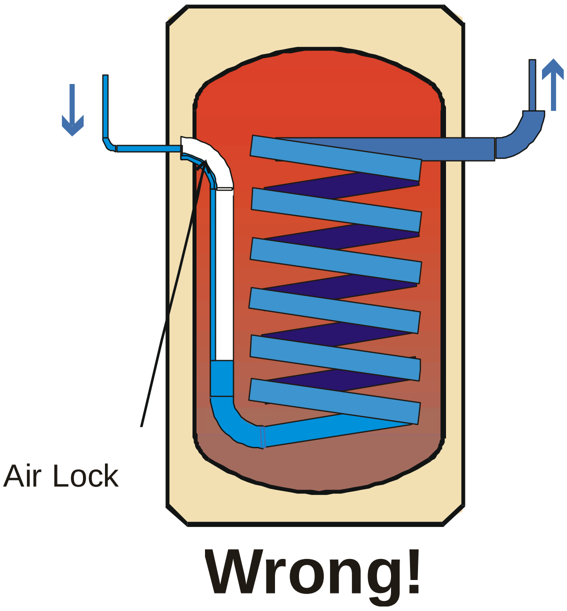


B3 Figure 3: Flow direction to prevent air pocket developing in a 22mm helically wound coil.



3. The top connection to the solar coil (flow out of coil) should have a 22mm elbow fitted facing upward, before being reduced to 8mm or 10mm microbore. This prevents small air pockets being formed in the top of the coil which will cause an airlock and prevent drainback.

B3 Figure 4: Elbow should be directed upwards to prevent air pocket developing.



4. In the case of certain, usually unvented, cylinders (e.g. Range Tribune) both connections may be at the same height, with the coil spiralling down and then up to the same point again. Hydraulically the coil is effectively a 22mm 'U' tube so drainback will not occur and in this case the antifreeze provided must be added and serviced. This is because an air pocket will be formed which interrupts the continuity of the siphon, which is required for drainback. The system will work but will not drainback.

B3 Figure 5: An air pocket will form with double helix U tube heat exchangers.

B3.3 Installation of the Solar Hot Water Cylinder

The hot water cylinder is installed as per any standard hot water cylinder with the boiler connected to the top coil where applicable. It should only be installed by a competent plumber with a full understanding of hot water supply. The solar circuit only contains a few litres of water so leaks are unlikely to be disastrous whilst poor installation of the hot water cylinder can result in major water damage. **An unvented cylinder must be installed by a 'competent' person as outlined in G3 of The Building Regulations. If installing an unvented cylinder see B3.8.**

B3.4 Connection of the Solar Coil

Referring to section B 2.4 determine the correct size pipes to connect to the top and bottom of the coil.

If you have an ISL standard vented cylinder the microbore solar coil connections are 10mm compression, so a reducer from that to the 8mm pipe will be needed for a single collector system. DHW flow/return and boiler coil connections are 22mm compression.

For 22mm solar coils on un-vented cylinders, reducers from 22mm to the microbore pipe size, will be needed.

B3.5 Installing the Cylinder Thermometer

Imagination Solar do not supply a mechanical cylinder thermometer, unless specially ordered. The Deltasol BS controller has a temperature readout and a digital thermometer should be used with the ATON controller, with sensors placed into dry cylinder pockets.

B3.6 Insulation to Building Regulations Standard

- All pipes of a solar primary system should be insulated throughout the circuit.
- All other pipes connected to hot water storage vessels, including the vent pipe, should be insulated for at least 1m from their points of connection to the cylinder (or they should be insulated up to the point where they become concealed).

The 13mm wall Vidoflex insulation supplied exceeds the requirements of the Domestic Heating Compliance Guide for both 8mm and 10mm pipe.

B3.7 Safety

We recommend the installation of a thermostatic mixing valve on your hot water supply. On bright sunny days hot water could reach 80°C, which could cause scalding, if this is not fitted. The mixing valve may reduce dynamic pressure to the taps, which in some cases may not be acceptable (e.g. showers with a low head of water). If this is the case then the cold-water tank may need to be raised on a platform, a booster pump may be required or a pumped shower may be used to replace a simple mixer shower. A better option would be to fit an un-vented solar cylinder if this is likely to be a problem. Alternatively the cylinder maximum temperature can be set lower, e.g. 65°C, although this wastes some of the available solar energy.

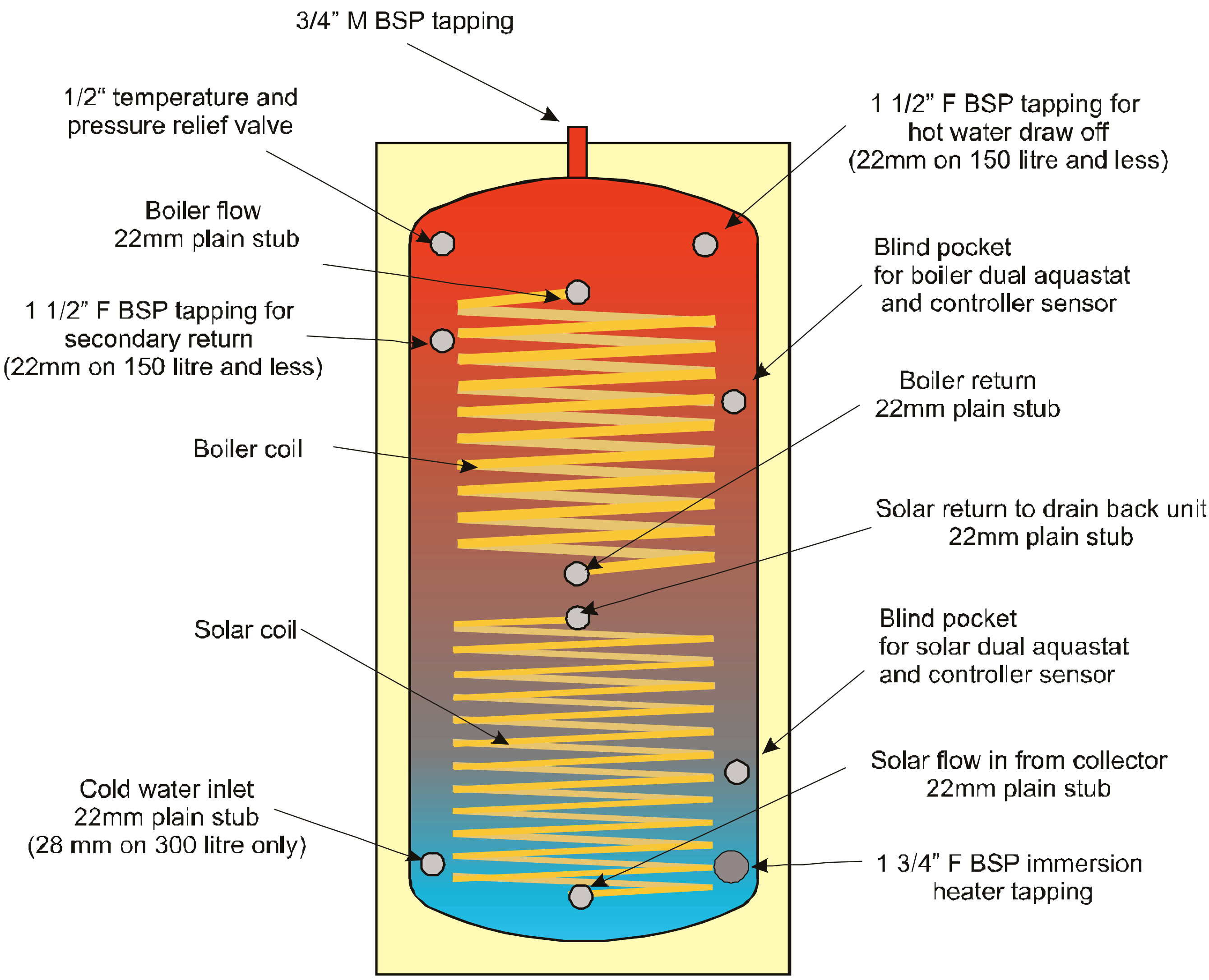
B3.8 Unvented cylinders

Pre-installation surveys must include measurements of mains water supply pressure and flow rate, usually at the kitchen sink tap. Whilst an un-vented cylinder will work efficiently under any water flow and pressure conditions, the full potential of a mains pressure system is unlikely to be achieved unless the supply static pressure is at least 1.5 bar and a flow rate of at least 25 l/min can be reached. Mains water pipework to the cylinder should be a minimum of 22mm diameter.

Each unvented cylinder is supplied with a safety controls listed below.

Expansion vessel (size varies according to cylinder capacity)
Inlet controls (pressure reducing valve, non return valve, pressure relief valve and tundish)
1 x Temperature and pressure relief valve
1 x 22mm 2 port valve
1 x Dual Aquastat (for boiler DHW primary circuit)
1 x Dual Aquastat for solar circuit

The diagrams below shows the location of all the tappings and pockets that should be included with the unvented cylinder.



B3 Figure 6: The location of all the tappings and pockets for the **Ferroli** unvented cylinder.

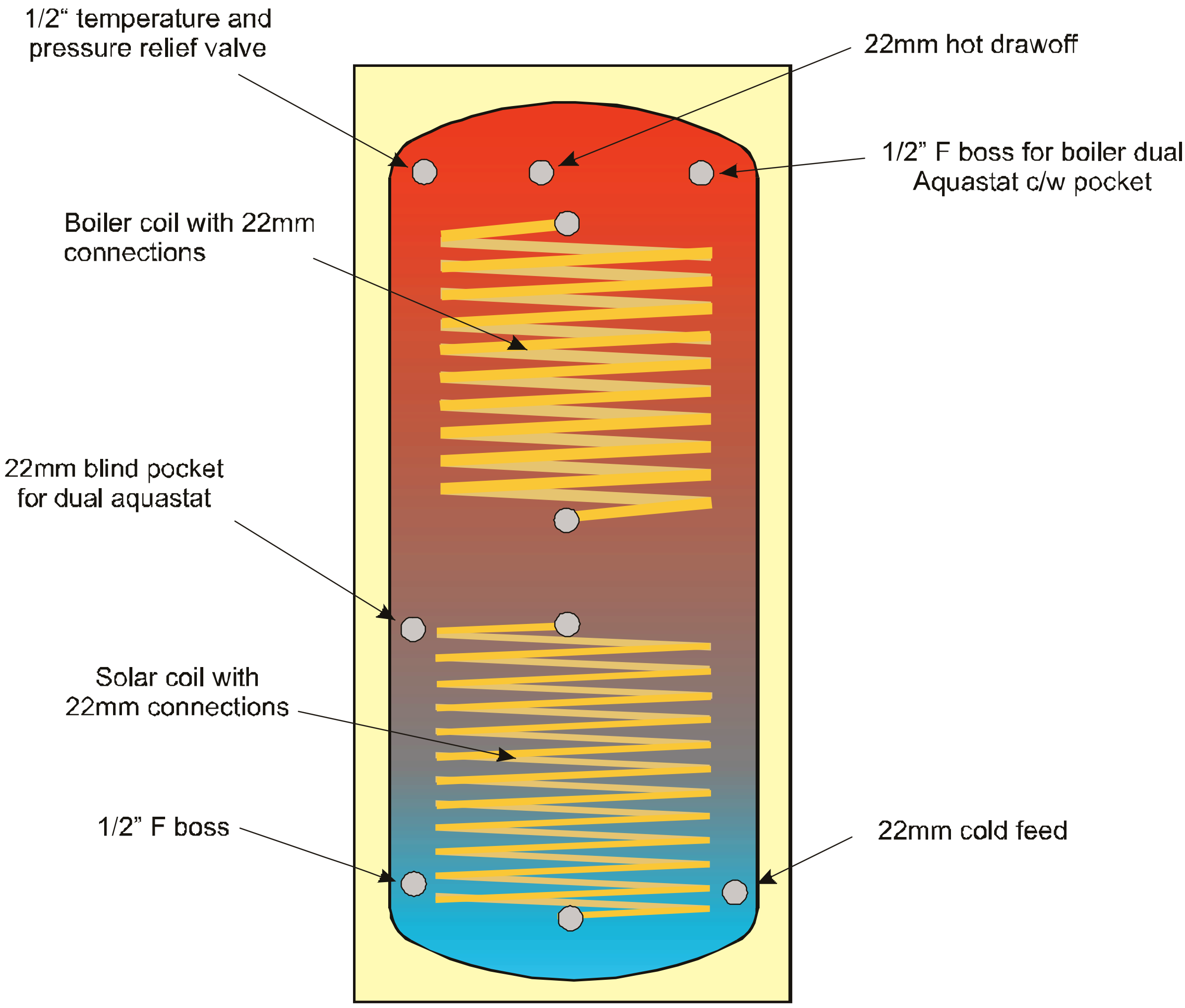
Installers please note:

Quantum Cylinders 200, 250 and 300 litre come with $1^1/_2$" tappings on hot water outlet and secondary return.

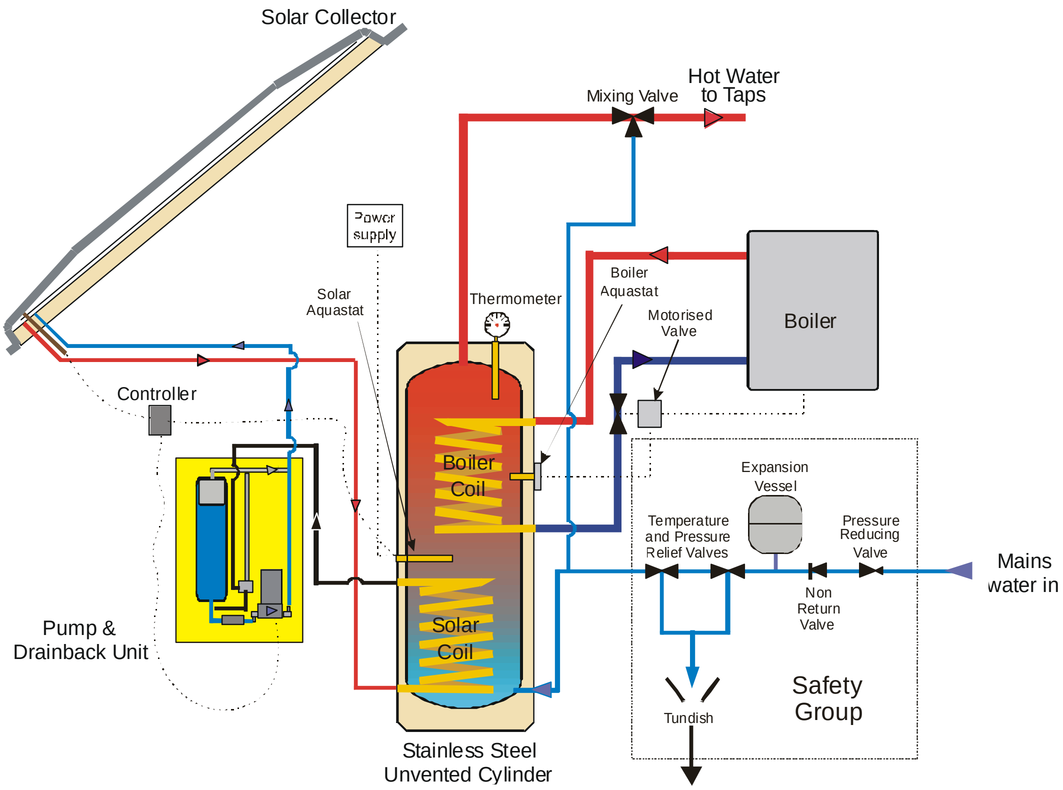
Installers will need to carry either of the following:

- 2 off $1^1/_2$" M to 22mm F reducers AND a 22mm M tapping blank

OR - 1 off $1^1/_2$" M to 22mm F reducer AND a $1^1/_2$" M tapping blank



B3 Figure 7: The location of all the tappings and pockets for the **Telford** unvented cylinder.



B3 Figure 8: A mains pressure (unvented) system. The system must be fitted with the safety devices. Note that the return from the panel is connected to bottom of solar coil so the direction of flow is upwards through a 22mm coil (see section B3.2 on connecting to a large diameter coil).

B3.9 Aquastat Wiring

In order to provide two levels of overheat protection the dual aquastat for the boiler DHW primary circuit should be wired to the two port valve as per the wiring diagram included with the cylinder.

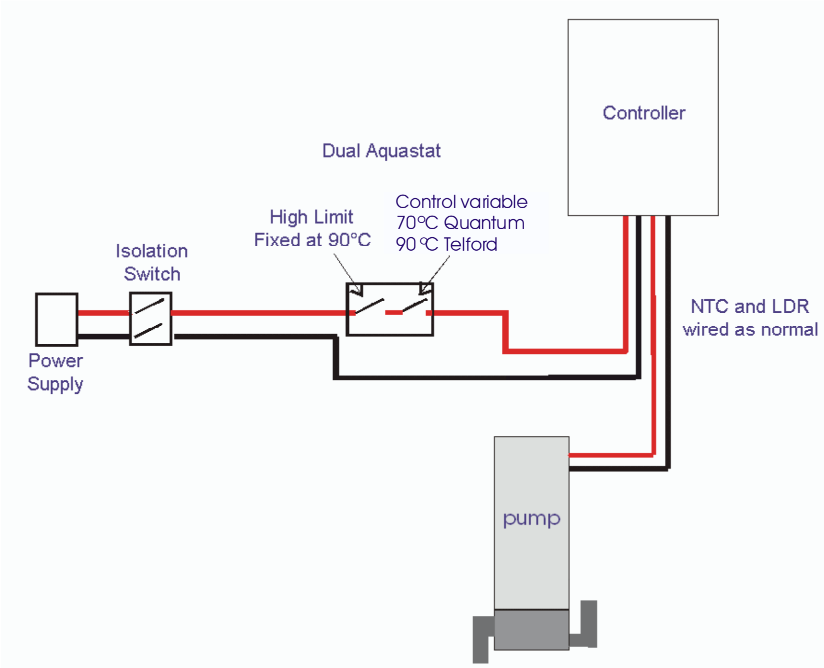
The power supply for the solar controller is wired via the solar dual aquastat to provide 2 levels of overheat protection:

- Solar controller maximum limit
- Aquastat maximum limit

As an alternative to wiring the controller power supply via the solar aquastat some installers prefer to wire only the switched power supply to the pump via the aquastat. This has the advantage that the Resol display can be used to read out cylinder temperatures. On the other hand the lack of display would flag up that there is a problem.

In either case the pump will stop and the system will drainback. Also if required the adjustable temperature aquastat probe may be wired in and used as an additional third means of limiting the cylinder temperature to a user defined maximum temperature. (Telford 90°C, Quantum 70°C)

The dual aquastat for the solar circuit should be wired as the two circuit diagrams in figures 8 and 9 if the user adjustable maximum temperature is required.

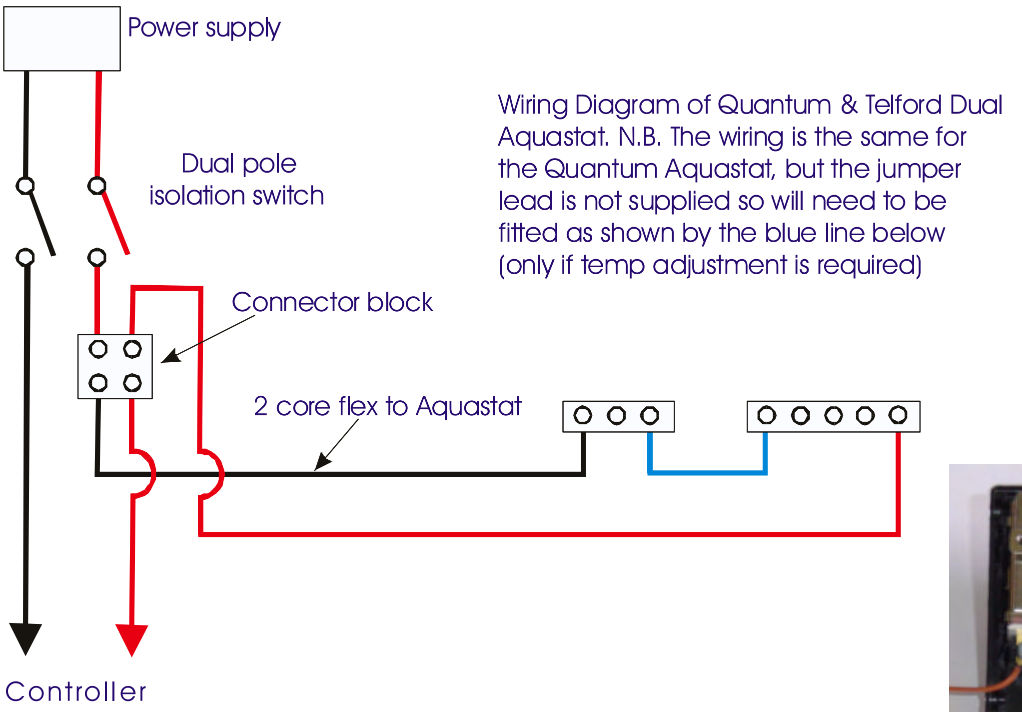


B3 Figure 9: Schematic electrical diagram of dual aquastat.

1. From the power supply wire into a dual pole isolation switch to enable the system to be switched off.

2. A “chocolate block” type connector can be used within the isolation switch enclosure to run a two core wire to the solar dual aquastat as shown below.

3. Wire the rest of the wires as per the standard system.



B3 Figure 10: Practical wiring diagram of dual aquastat.

The photograph shows the jumper lead position inside the Quantum dual aquastat.
Wire only the high limit stat on the left if you do not want the aquastat to control max solar temp.