

HEATBASE FACTSHEET 7

Expansion Vessels and system pressure

The most important thing a customer with a sealed/pressurised system can do is to regularly check the pressure in their system. Sealed or pressurised systems require regular attention from the householder. Although theoretically the pressure should never drop under normal circumstances, in reality most systems will lose pressure over a given period of time and unless this has been checked on a regular basis and in the correct manner, no one can be sure at what rate the pressure drop is occurring. If the pressure becomes too low the water will become excessively hot, air gaps will form within the water and steam can also be produced. The components of the boiler such as circulating pumps, diverter valves, and auto air valves are not designed to be run dry, or be used under excessive temperatures and in effect become overheated or boiled. This will lead to failure or weakening of components, and if left unchecked will lead to an endless stream of callouts and replacement parts.

The pressure should only be checked when the boiler is fully cold; this is the only point at which the pressure is constant and therefore is the only way to ensure the correct pressure has been set. Dependant on various parameters, the system will need to be topped up to a specific pressure. The standard setting is 1 bar cold, but depending on the design of the system etc., it may differ.

Once the system pressure has been set with the boiler cold, and the boiler is turned on, the water within it will start to heat and expand. This causes the pressure to rise within the system and is perfectly normal. On an old Open vented system (with a header tank) the water would expand up the Cold feed and expansion pipe and into the Cold feed and expansion tank (header tank). With a sealed/pressurised system the expansion vessel takes over this situation. An expansion vessel is a unit of two halves separated by a diaphragm. One side is charged with air, the other side is empty which allows water to expand into it during the heating process. The diaphragm and air charge act like a shock absorber. When the system cools the pressure will drop, the water contracts and the diaphragm will push the water back into the system.

The size of expansion vessel required is dependent on the volume of water within the boiler, radiators and associated pipework and coil of the cylinder, as well as the Initial air charge of the vessel and the pressure the system is charged to when cold. There is then a calculation to determine the correct size required. The installation to connect the vessel to the system would then be made at the coolest point; which is usually the return pipework from the heating circuit (It is still connected to the circuit if you are not using your heating). The problem with combi boilers and purposely designed system boilers is that the expansion vessel supplied is rarely big enough to cope, but it is all that they can fit within the boiler casing; meaning you have to fit another one external to the boiler to make up the

difference. Also the connection of the expansion vessel to the system tends to be on the boiler shell, which in fact can be the hottest part of the system. Excessive prolonged heat will damage the diaphragm resulting in a reduced life of the vessel. The diaphragm will be stretched excessively if the vessel is not big enough for the system, again reducing the life of the vessel. Through time the diaphragm will distort or split. Once it splits the vessel will need to be replaced, if it distorts the vessel can be recharged, but it will have effectively become a smaller vessel as the diaphragm has either lost its elasticity or ability to absorb the pressure rise.

Oil boilers are high water content compared to gas boilers and therefore a larger vessel will be required for the equivalent system using Oil, otherwise the pressure within the system will run at a higher level. It is common to see an oil combi run at 2 ½ Bar when fully hot from a cold water charge of 1 Bar. This poses a problem as due to wear and tear on the vessel the pressure in the system will increase further. If the pressure reaches 3 Bar on most boilers and 2 ½ Bar on Grant boilers, the pressure relief valve will open to drop the pressure and protect the system. This would indicate a larger vessel may be needed, or a lower cold water charge may be required.

If after regular routine checking of the system pressure, the pressure is regularly found to be dropping it would most likely indicate an undersized or faulty expansion vessel, a blockage in the expansion pipe, or a leak on the boiler or system. Leaks can be so slight they may not be visible even in slightly warm conditions. Sometimes a boiler and system may need turned off and left to stand a minimum of 24 hours before the slightest of leaks become noticeable.

The problem with fitting two separate vessels is that they may wear at different rates causing more stress on the other, leading to a vicious circle of replacing one then the other and so on. Under sizing the expansion required on a system will cause problems; over sizing it will not.

Care should be taken if you have to regularly top up the system pressure as this will dilute corrosion inhibitors as well as introducing fresh oxygenated water into the system which can lead to corrosion, which in turn will lead to loss of efficiency, leaks and reduced life of the boiler and components as well as localised boiling conditions; which will cause higher pressures, too much heat on components and the circle begins again.