APEX VALVES
A WATTS Brand
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Training Update February 2021

How a limiting valve works

This month I thought it would be a good idea to take a closer look inside a limiting valve in the same way we did with tempering valves back in November last year.

Function of the limiting valve

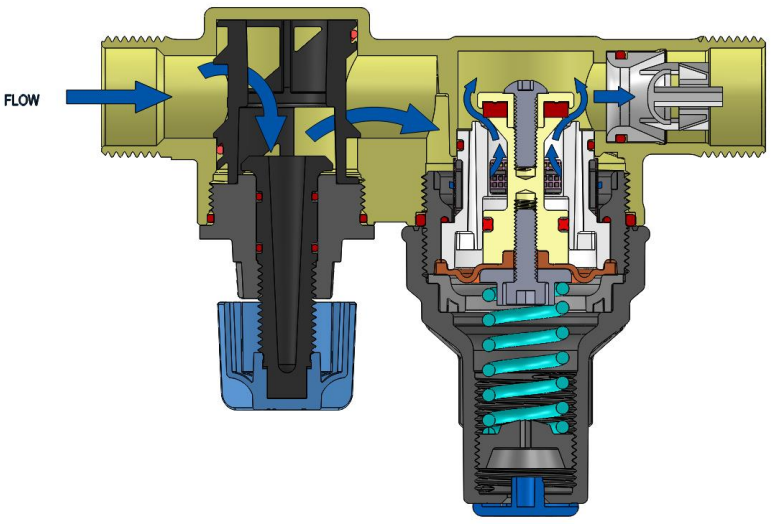
The water pressure of reticulated (mains) water supplies in New Zealand vary a great deal. Pressures in Dunedin are around 2,000 kPa while in parts of Hamilton they are only 600 kPa. The supply to the factory in Auckland is somewhere in between at around 800 kPa. At night, when there is minimal water use, reticulated supply pressures are usually higher.

Fittings such as ceramic disc tapware and showers have a pressure requirement of 500 kPa so in most installations a pressure limiting valve is required to limit the supply pressure to protect downstream components.

For energy conservation, a cold water expansion valve is mandatory on any new installation of a storage hot water cylinder and it is important that the water pressure at the inlet of the cylinder is matched to the cold water expansion valve relief pressure. The limiting valve performs this function.

700 kPa cold water expansion valve (most common) matches a 500 kPa limiting valve
500 kPa cold water expansion valve matches a 350 kPa limiting valve

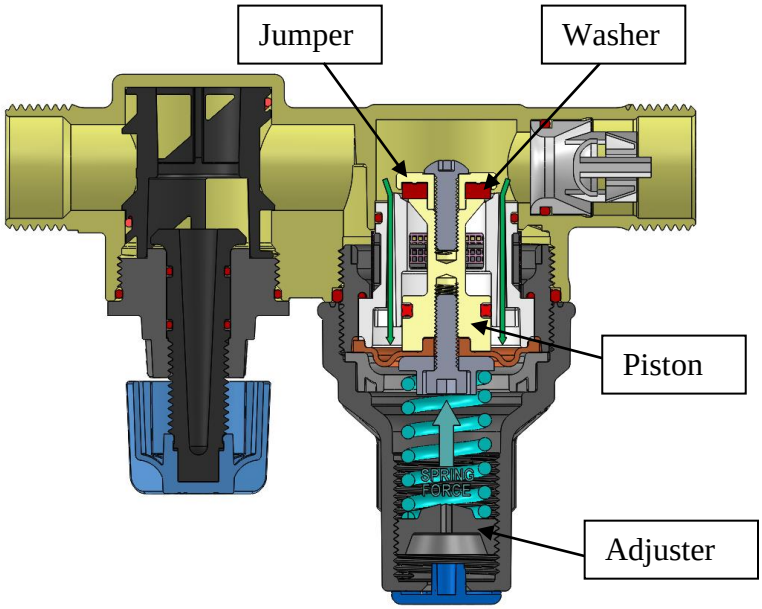
How it works



The image to the left shows the water flow path through an LSV when the valve is partially open.

Let's say the inlet pressure is 1000 kPa, the LSV has a blue cap so it is set at 500 kPa.

If the outlets supplied by the LSV are closed, there will be no flow and the outlet pressure will rise creating back pressure on the cartridge.



The back pressure shown by the green arrows in the image to the right is communicated to the underside of the diaphragm. This pressure, multiplied by the area of the diaphragm creates a force in this direction. ↓

This force pulls the central piston and jumper assembly towards the valve seat.

The spring provides an opposing force in this direction ↑

When these 2 forces are equal and opposite, the washer will be forced against the valve seat, the valve will be closed and have limited the outlet to the required pressure controlled by the adjuster setting.

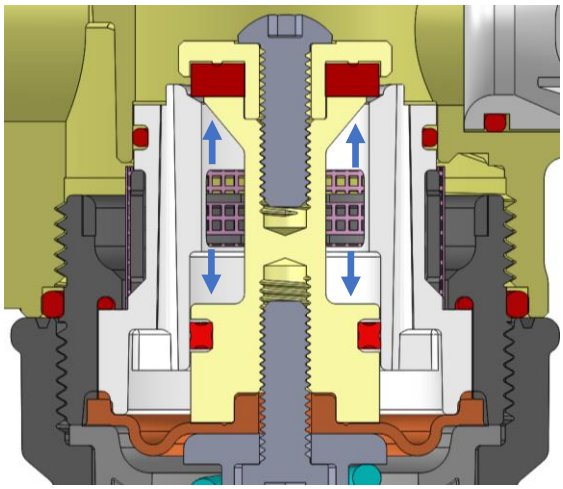
For those with enquiring minds and some knowledge of the pressure compensated Apex feed valve, yes this valve is also pressure compensated.

A little revision……

Imagine stopping the flow from a hose with your thumb against a pressure of 800 kPa. If the inlet pressure was to increase to 1500 kPa, you would need more force to hold back the water.

Going back to our LSV above, if the inlet pressure increases, we will need more force to hold the valve closed at the 500 kpa setting. The closing force can only be generated by the back pressure along those green arrows so to get a higher force, we need more back pressure which means a higher outlet pressure and valve setting creep – <u>not good!</u>

Fortunately the Apex design is pressure compensated. In the high pressure part of the cartridge shown to the right, the inlet pressure acts on the jumper in this direction ↑ and on the piston in the opposite direction ↓.



If the inlet pressure increases (and more force is required to hold the valve closed just like the thumb example) the force is generated by the increased pressure on the piston – <u>pressure compensation.</u>