The differences between pressure actuated
& trapped pressure unloader valves

The Unloader Valve in Action
The unloader valve diverts water flow into bypass when the trigger gun valve is closed. Unloaders may be designed to respond to either an increase in pressure or a change in flow. The unloader valve may also be used for variable pressure adjustment.
The trigger gun and unloader valve make up a two-part valve system that directs water into bypass back to the pump inlet or the float tank. The trigger gun shuts off the flow of water, causing the unloader valve to re-circulate the water back into the inlet side of the pump. This is called sending the water into bypass. Pressure-actuated unloaders are opened by the increase in pressure occurring when the valve in the gun closes. Flow-actuated unloaders divert water to bypass when there is a sufficient reduction or stoppage of water flow.

How The Pressure-Actuated Unloader Works (ST261, ST280 & VRT3)
The pressure-actuated unloader responds to an increase in pressure, which generally indicates a stoppage of water flow through the system. The pressure-actuated unloader is a simple valve and spring arrangement set in a metal (usually brass) body. A channel drilled through the body gives water access to the backside of the piston cup. When pressure against the piston cup increases to a point where spring tension is overridden, flow is ported past the valve ball and into bypass. If the trigger gun is closed, all of the water will flow into bypass.

How the Flow-Actuated/Trapped Pressure Unloader Works (Interpump K Series & Speck UL Range)
The flow-actuated unloader simply responds to stoppage of flow, which will also be manifested as an increase in internal pressure. Where the pressure-actuated unloader has the check valve in the discharge port, which helps divert water to press the piston down and open the valve ball allowing water to bypass, the flow-actuated unloader has an orifice.
When the trigger gun valve closes and water flow stops, system pressure is increased rapidly at all points in the system past the orifice. A small channel in front of the orifice allows the increased pressure to travel up the channel to the piston assembly, pushing it down. The rest of the water flow is diverted through the bypass port and back to the float tank or pump inlet.

Normal Bypass Volume
Many unloaders are designed for operation with 5% to 10% of flow in bypass at all times. This is particularly true of pressure-actuated unloaders, which generally require about 10% of water capacity in bypass. This small amount of water will provide a cushion of water between the seat and valve ball to lessen the shock resulting when the two metals are forced together during valve operation.

Overheating in Bypass
A machine should not be run in bypass mode continuously. When a machine is in bypass mode the temperature of the water in the closed loop increases rapidly due to friction in the crankcase, which is passed on to the water. It is undesirable for most pumps to handle water in excess of 60℃. Occasional discharge at the gun replaces water in the loop and prevents pump damage from high temperatures.
A temperature-sensitive switch or pump protector on the bypass line can provide even more permanent pump protection.
The flow unloader's diversion to bypass, functions on a pressure differential between the inlet flow and discharge flow across the balance orifice. Flow goes in the direction of least resistance or through the port where the least amount of effort is required. This will be the port with the least pressure.

Flow Variations Will Cause Problems with Flow-Actuated/Trapped Pressure Unloaders (K Series)
Using a flow unloader with a weep gun will cause unloader cycling. Do not use a flow unloader in this system configuration. A clogged nozzle that is too small or inadequate flow through the orifice being used will also cause problems with a flow-actuated unloader. An accumulator used as a pulsation dampener will not coexist well in a system with a flow-actuated unloader.
This tendency to cycle is one reason many service personnel do not like to work with flow-actuated unloaders. The system must be functioning properly and maintaining the correct flow for the unloader to function smoothly. However, since the flow unloader does not trap pressure in the outlet side of the system, it has safety advantages over the pressure-actuated unloader.

Using the Unloader Valve to Regulate Pressure
Pressure and flow-actuated unloader valves can both control pressure to a certain extent by adjusting the tension on the spring holding the piston in the valve body in place. The difference is that tightening the spring on a flow unloader reduces pressure while the same action increases pressure on a pressure unloader.
When the adjusting bolt on the flow-actuate unloader is loosened, this causes the piston controlling the cone valve to right, allowing more flow through the spray nozzle and a consequently higher operating pressure.
When the adjusting bolt on the pressure-actuated unloader is loosened, this causes the spring tension on the piston assembly to lessen, allowing less flow to be forced out of the spray nozzle and a lower operating pressure results.

Where to Use an Unloader Valve
Pressure actuated unloader valves such as the ST261, 280 & VRT3's, are most commonly found on stand alone pressure washers, as they are particularly suited to single inlet, single user applications and allow the use of post pump chemical injectors.
The Interpump K Series flow actuated unloaders can be used on stand alone pressure washers, and are seen as a safer alternative to the pressure actuated valves as they release all of the pressure from the line, when the trigger valve is closed. However they should not be used where a post pump injector is required and also in conjunction with a pulsation damper/accumulator.
Specks UL Series of unloader valves can be used to control several spray guns simultaneously. Several pumps can also be connected to a common discharge line. *(Taken from Specks website)*