

**Solving Overpressure Protection Challenges  
With Conventional & Pilot Operated Pressure Relief Valves**

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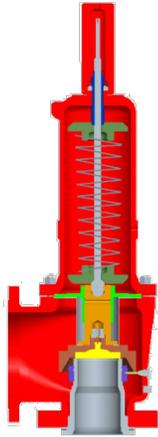
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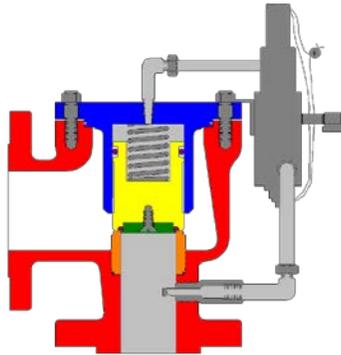
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## Solving Overpressure Protection Challenges with Conventional and Pilot Operated PRVs

Pressure relief valves can be categorized into two primary groups – conventional spring-operated valves, and pilot operated valves (PORV). This post will outline the basics of their operation and some advantages and disadvantages to consider when evaluating which type may be best suited for an application.

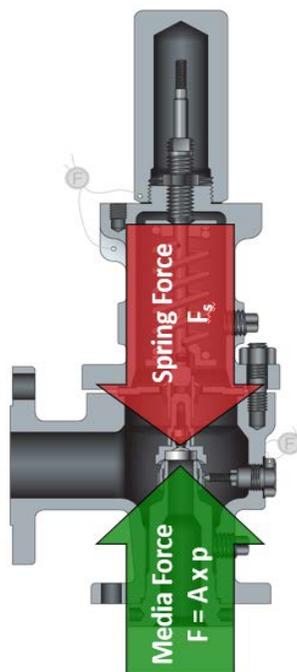


Conventional PRV



Pilot Operated PRV

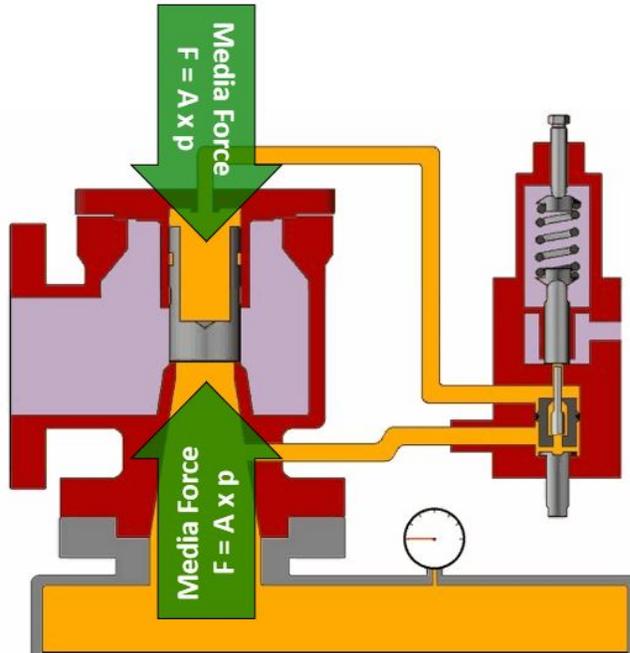
A conventional valve uses a spring to keep the valve closed until the process nears the set pressure. The spring force pushes the valve's disc against the nozzle seat keeping the valve closed. Process pressure exerts an opposing force on the disc. When the process pressure force on the disc overcomes the opposing spring force, the disc lifts and the valve begins to relieve pressure.



In contrast, a pilot operated valve uses process pressure to keep the valve closed until set pressure is reached. PORVs include a main valve that relieves the required capacity of process media and a pilot valve that controls the main valve. Until set pressure is reached, both the top and bottom of the valve's piston are exposed to process pressure forces. The surface area on top of the piston is larger than the surface area of the bottom of the piston at the nozzle. Because of the difference in area and pressure being equal, the force on the top of

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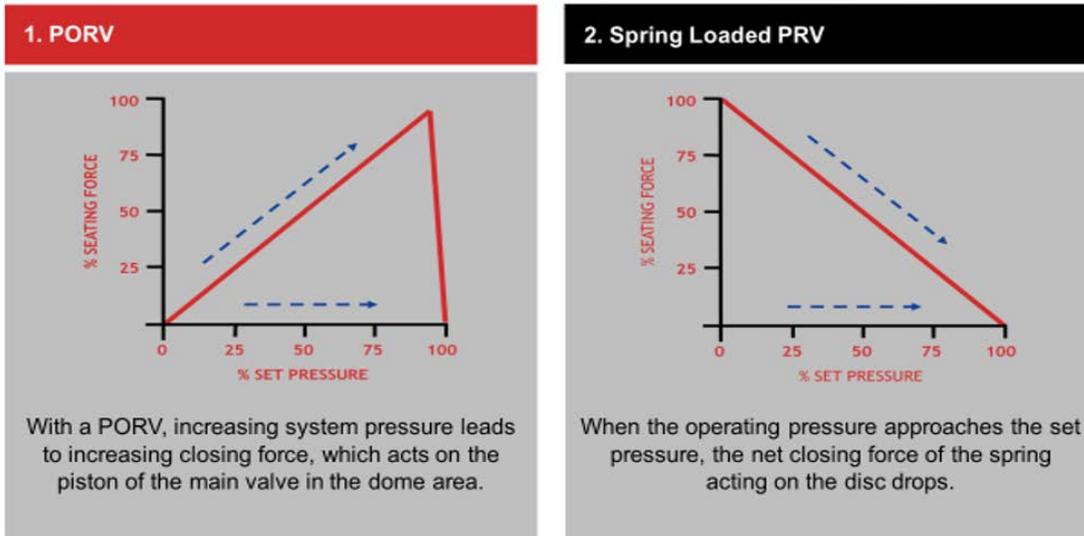
the piston is greater than the force on the piston at the nozzle. As a result, as process pressure increases, the sealing force of the piston increases as well. When set pressure is reached, the pilot valve relieves the pressurized fluid from the dome area atop the piston, allowing process pressure at the nozzle to force the piston upward from its seat, which allows the valve to relieve system pressure.



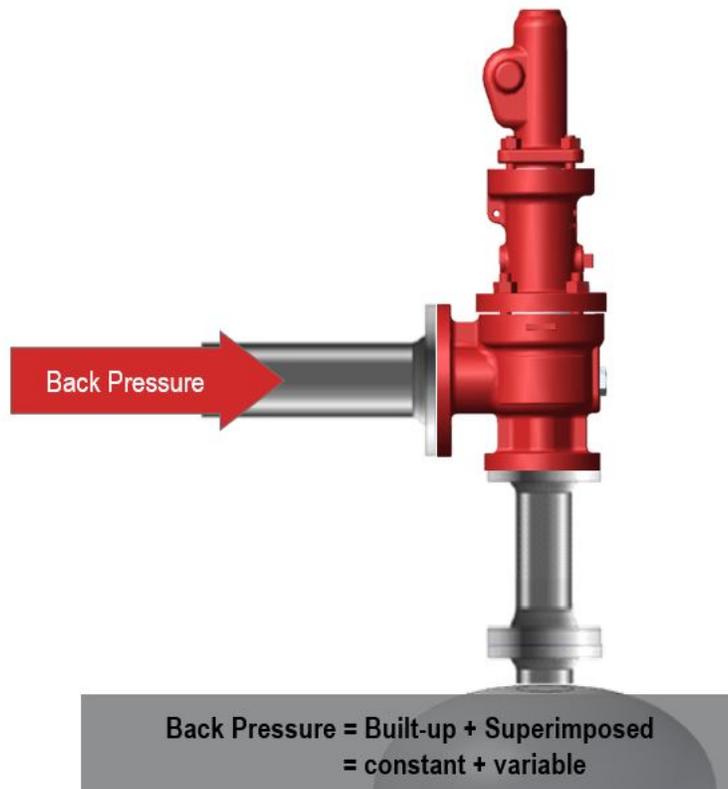
Conventional relief valves can be the best fit for applications that will expose the valve to high temperatures, highly viscous, or dirty services. In smaller sizes they are generally lower cost than PORVs, and most designs will follow standard API 526 center-to-face flange dimensions.

Conventional PRVs may not be well suited for applications requiring maximum seat tightness / sealing, minimal simmer, or applications with high or variable back pressures. Measures can be taken to mitigate these shortcomings; however they bring limitations of their own. For example, a conventional valve can be constructed with a soft seat to improve sealing, but this will generally introduce temperature limitations. To reduce the effects of back pressure a conventional PRV can be outfitted with a bellows. However, a bellows has lower back pressure tolerance than a PORV and can be more costly to maintain.

## Closing Forces: PORV vs. Spring Loaded PRV



The PORV is designed to mitigate many shortcomings of a conventional valve but has its own limitations. PORVs are well suited to applications requiring maximum seat tightness when approaching set pressure, applications with superimposed back pressure and built-up back pressure, and high relieving capacity applications with physical size limitations, to name a few. PORVs can also have set pressure capabilities that go beyond API 526 set pressure limitations associated with conventional PRVs.



However, PORVs suitability is limited in high temperature applications, as their construction typically includes several soft seals. Due to the small flow paths in the pilot valve and tubing, PORVs may not be a good fit for

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process medias that are highly viscous or contain high levels of particulate. In smaller sizes, PORVs are typically higher cost than conventional valves but can offer significant cost savings in larger sizes.



There are several configurations available for both conventional and pilot operated pressure relief valves, so each application should be considered carefully when selecting and specifying a pressure relief valve. AWC's team of trusted resources is here to assist with application review, selection, sizing, training, maintenance, and asset life cycle management to help ensure a safe, successful installation over the lifetime of the valve.