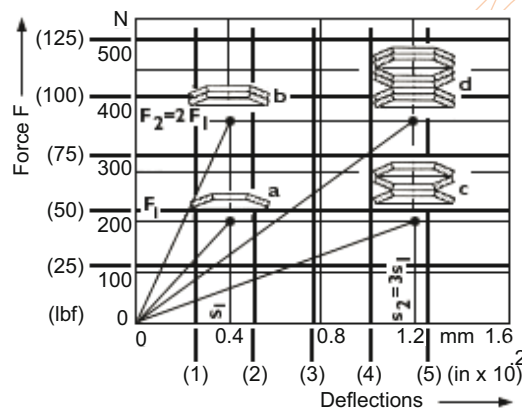


APV BALL VALVES LIVE-LOADED STEM SEALS

APV Ball Valves fitted with a 'direct mount pad' often utilise a stem seal arrangement where the seals are retained by a stem or packing nut, with 'live-loading' of the stem seals. This live loading is accomplished by the addition of Belleville (also known as disc) springs below the packing nut. The purpose of live loading the stem seals is to maintain the initial sealing load on the seals as they wear, or as they compress further, reducing or eliminating the need for frequent packing nut adjustments. The Belleville springs perform this function by storing compressive force as the packing nut is tightened, and releasing this force as packing wear or compression occurs.

In the cases where they are supplied on APV valves, the springs are installed in "series", or stacked with outer diameters touching, rather than in "parallel", where the dished springs would be nested together. The arrangement of 2 springs in series provides essentially the same pre-load as a single spring when compressed, and a spring stroke double that of a single spring. Where 2 (or more) springs are installed in parallel, the spring load is the multiple of a single spring times the number in parallel, but the spring stroke is still that of a single spring. For examples, see the following:

CHARACTER LINES FOR SPRING STACKS WITH SPRINGS OF THE SAME SIZE ARRANGED IN DIFFERENT ORDER

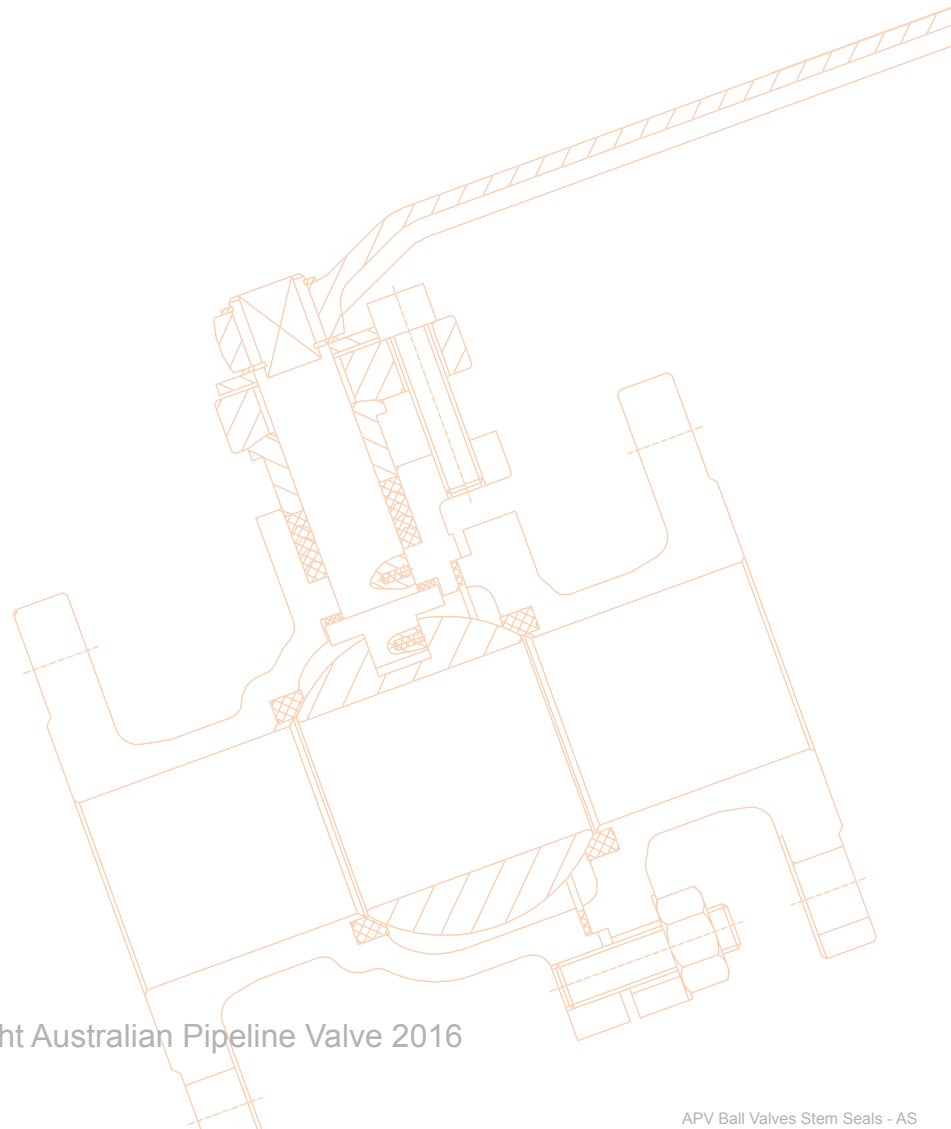


- a) Single disc
- b) Two discs stacked in parallel (double force at same deflection)
- c) Spring column with three* single springs stacked in series (triple deflection)
- d) Spring column with three* parallel pairs arranged in series (double force, triple deflection)

* Used in very high pressures or severe service.

Unless otherwise specified, 2 springs in series is used for live loaded stem seal arrangements. The springs have been designed and sized to provide the packing load required when the springs are compressed, and the series arrangement provides sufficient spring travel to ensure that a suitable compressive force remains applied as the stem seals wear, or compress. Manual lever operated valves fitted with 'direct mount pads' are supplied with 2 Belleville springs mounted in series, to provide superior stem sealing for critical service applications and lower maintenance. The other reason is, valves fitted with direct mount pads are often utilised for direct mounting of actuators and as accessing the stem packing would require actuator removal, a live loaded packing system avoids or reduces maintenance (however, open brackets can be fitted allowing room to adjust packing). For very large sizes in higher pressure classes we often use 4 springs in series.

Adding more springs in series is generally not required (a longer stroke is not needed), as in smaller sizes & lower pressure classes APV use quality 301 grade heavy gauge Belleville springs so even if using a direct mount actuator the 2 spring series usually requires none or very infrequent adjustment.



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APV Ball Valves Stem Seals - AS