



Valtek Guardian Control Valves

Guardian Metal Bellows Seal

Design Features

Fugitive emissions, via packing leakage to the atmosphere, pose a major problem for processes involving hazardous fluids. The Valtek™ answer is: The Guardian™ metal bellows seal.

The compact Guardian metal bellows seal assembly is Valtek's first choice of bellows seals for installation in Valtek Mark One valves. The Guardian can handle temperatures between -320 and 650 degrees Fahrenheit and pressures to 400 psi. The typical cycle life for Valtek's basic design when throttling between 25 and 75 percent open is 200,000 cycles. Figure 3 shows the life expectancy of a bellows in a throttling valve in relationship to working pressure.

When control valves are used in on/off applications, the cycle life of a metal bellows is 60,000 cycles. Figure 2 presents a pressure/cycle chart, outlining the estimated cycle life based on certain working pressures.

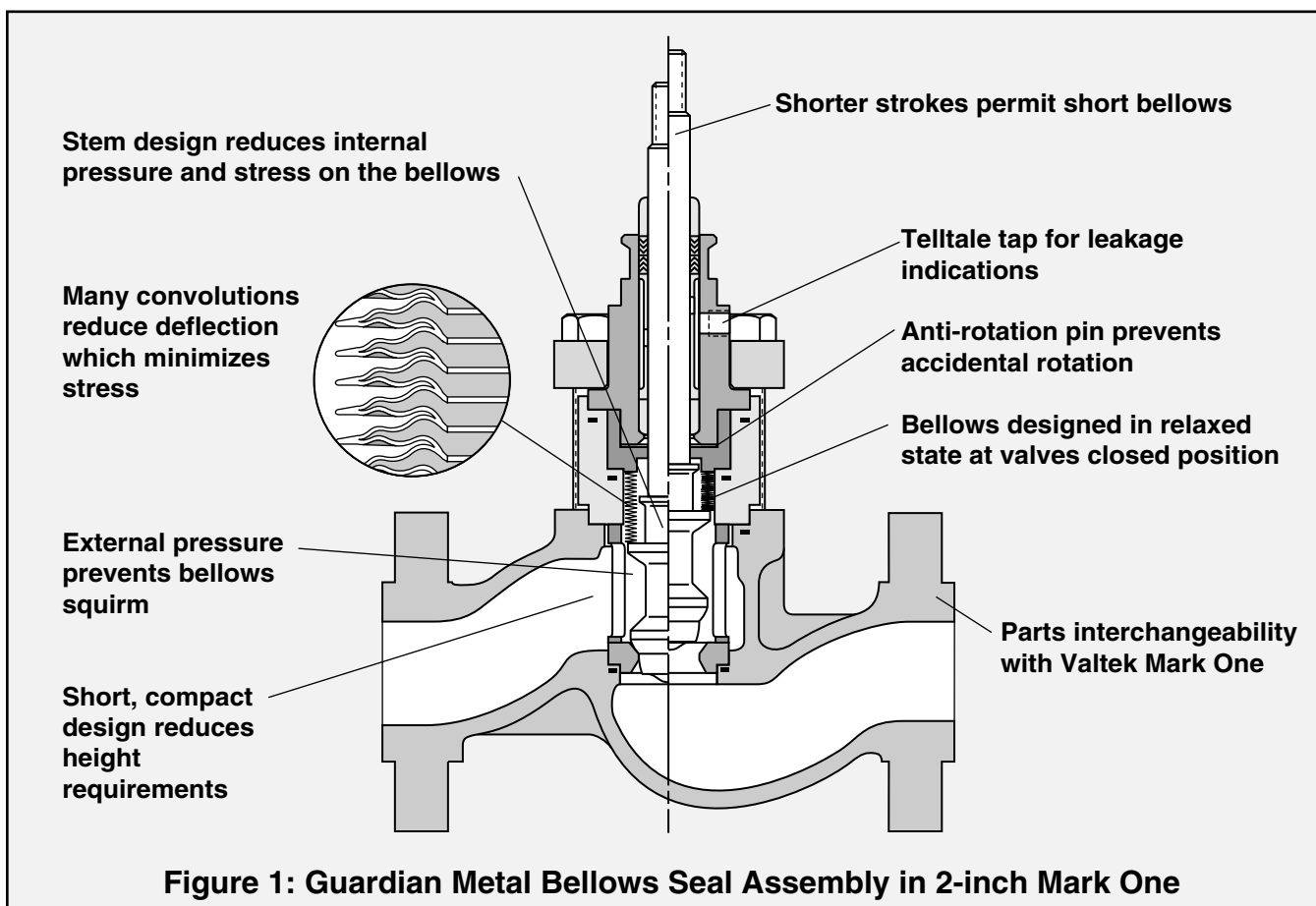
Bellows life is affected by the unequal loads applied to

the bellows, called "bellows squirm." The Guardian is designed with three features that reduce bellows squirm:

- ✧ Shorter strokes, avoiding the need for long bellows while increasing bellows life
- ✧ External pressure provides a stable pressure load on the bellows
- ✧ Stem design reduces internal pressure and stress on the bellows

Other features which help prolong bellows life include:

- ✧ Bellows is in a relaxed state at valve's closed position, which reduces stress during throttling
- ✧ Anti-rotation pin prevents accidental rotation of the plug and bellows housing which will cause bellows failure
- ✧ Large number of convolutions minimizes the amount of bellows stretch and compression resulting in lower stress



Guardian Metal Bellows Seal Life Expectancy / C_v Data

Additional Bellows Features

- ¥ Compact, lightweight design allows bellows valve to be installed in minimal area
- ¥ Precision formed Inconel 625 bellows with 316L stainless steel end rings (standard)
- ¥ Interchangeable off-the-shelf parts are available in sizes 1/2 through 4-inch
- ¥ Bellows plug assembly includes: plug, bellows, anti-rotation pin, upper/lower end rings
- ¥ Wide temperature range accommodates -320 to 650 degrees Fahrenheit (standard)
- ¥ Lighter, shorter design allows bellows assembly to operate in valves mounted horizontally
- ¥ Rings are welded together with fillerless TIG welding
- ¥ Helium leak tested for zero leakage performance
- ¥ 30,000 nominal full stroke cycle life, can be increased to more than 100,000 with throttling cycles
- ¥ Telltale tap in bonnet to indicate bellows leakage

Table I: C_v Data

Valve Size (inches)	Trim Number	Stroke (inches)	Full C _v
1/2	.50	.38	4.0
	.31	.38	2.5
3/4	.72	.38	7.0
	.50	.38	5.6
	.31	.38	2.8
1	.81	.38	10.8
	.50	.38	6.6
	.31	.38	2.9
1 1/2	1.25	.75	30
	1.00	.75	24
	.81	.75	18
2	1.62	.75	51
	1.25	.75	38
	1.00	.75	28
	.81	.75	19
3	2.62	1.00	117
	1.62	1.00	70
4	3.50	1.50	198
	2.25	1.50	131

Other Trim Numbers available (in equal percent and linear flow characteristic), contact factory.

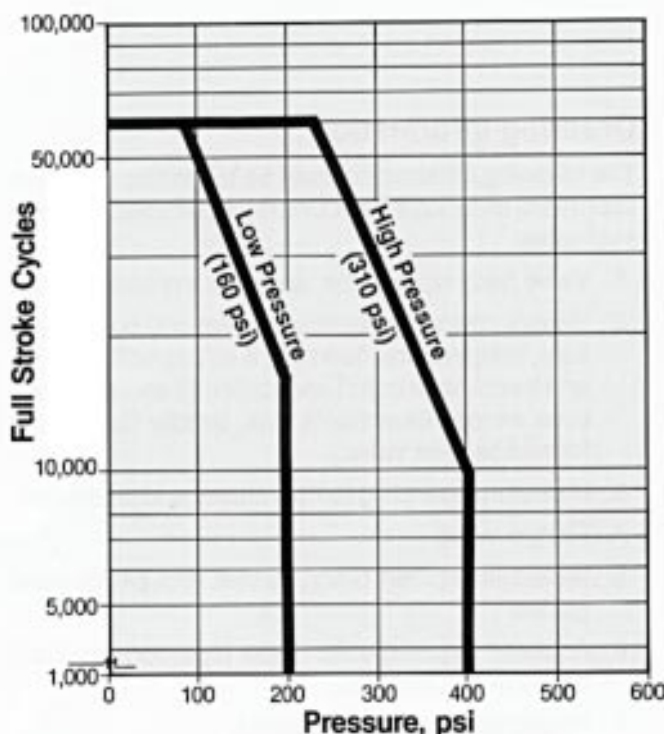
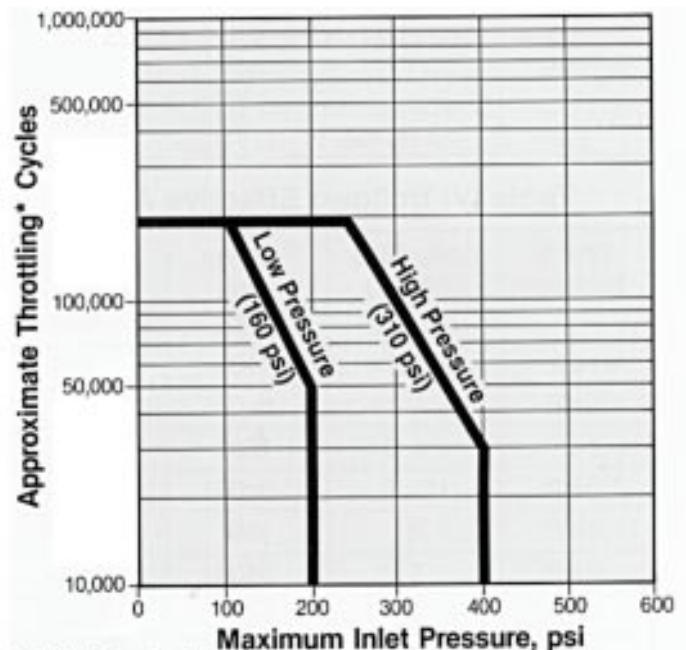


Figure 2:

Full Stroke Cycle Life / Pressure Curve

(At temperatures between -20 and 650°F)



* 25 to 75 percent open

Figure 3:

Throttling Cycle Life / Pressure Curve

Guardian Metal Bellows Seal Specifications

Table II: Body Specifications

Sizes	1/2, 3/4, 1, 1 1/2, 2, 3, 4-inch
Forms	Globe, Angle, Expanded Outlet
Characteristics	Equal percentage, linear
Bellows Material	Inconel 625 (standard), Hastelloy C, other weldable materials
Bonnets	Standard, Extended, Cryogenic
Packing	Standard, Twin seal
Packing Material	Teflon V-ring, Glass-filled Teflon, asbestos free packing w/Inconel wire, Grafoil, others as required
Gasket Types	Flat: Teflon, Kel-F Spiral wound: 304 stainless / asbestos free 316 stainless / asbestos free 316 stainless / Grafoil
Guides	Glass-loaded Teflon, Grafoil, bronze, Stellite

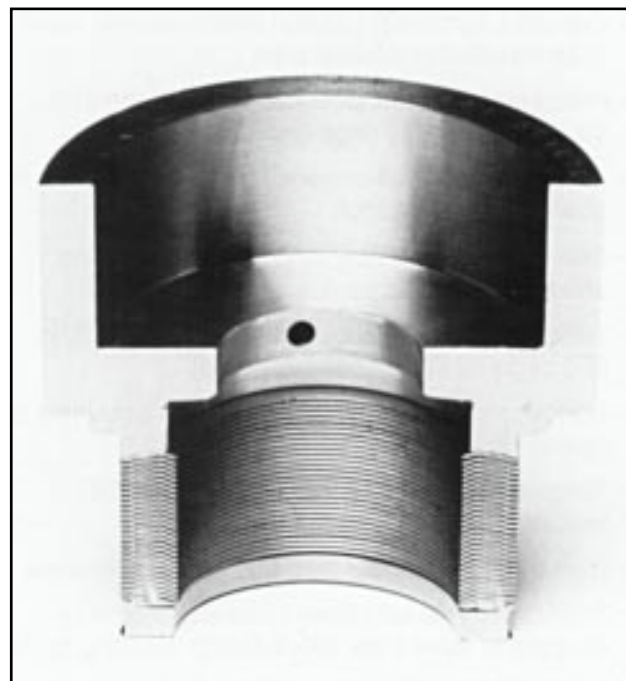
Table III: Actuator Specifications

Actuators	Spring cylinder: Sizes 25, 50, 100 sq.in. Hydraulic: Bore size 2 1/2-inch Manual handwheel: sizes, 9, 12-inch diameters
Positioner Signals	Pneumatic: 3-15, 3-9, 9-15, 3-7, 7-11, 11-15 psi Electro-pneumatic: 4-20, 4-12, 12-20, 10-50 mA

Table IV: Bellows Effective Area*

Model Number	Body Size (inches)	Bellows psi Rating	Effective* Bellows Area
1-LP	1/2, 3/4, 1	160	.886
1-HP	1/2, 3/4, 1	310	.886
2-LP	1 1/2, 2	160	1.916
2-HP	1 1/2, 2	310	1.916
3-LP	3	160	2.835
3-HP	3	310	2.835
4-LP	4	160	3.343
4-HP	4	310	3.343

* Effective bellows area should be used for actuator sizing instead of 4 stem area.



Cross section of Guardian metal bellows seal shows large number of convolutions and hole for anti-rotation pin.

Ordering Information

The following information must be taken into consideration when ordering a Mark One Guardian metal bellows seal valve:

1. Valve body type: globe, angle, or expanded outlet
2. Valve's operating conditions: inlet and outlet pressure, temperature, flow rate, fluid's specific gravity, and throttling or on/off application (If service conditions exceed Guardian's limit, specify Guardian II formed bellows valve.)
3. Maximum operating temperatures and pressures
4. Flange rating
5. Materials required: Body, bonnet, trim, packing and guides
6. Actuator requirements: Type (cylinder, manual), failure action and size
7. Positioner signal requirements
8. Accessories requirements

Guardian Metal Bellows Seal Dimensions

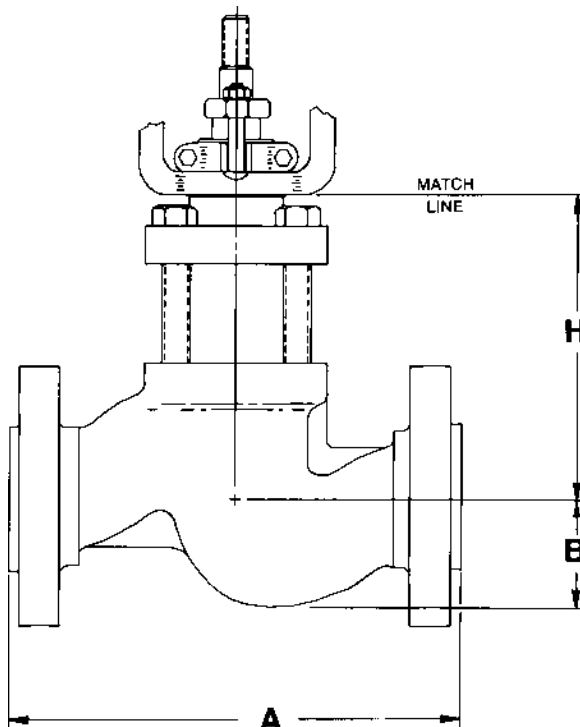


Table V: Dimensions (inches/mm)

Body	Bellows Rating (psi)	A								B		H		Clearance above actuator for disassembly	
		ANSI		ANSI/ISA											
		Class 150, 300, 600		Class 150		Class 300		Class 600							
1/2 - 3/4	160	8.5	216	7.3	184	7.6	194	8.1	206	1.5	38	5.8	146	4.0	102
1/2 - 3/4	310	8.5	216	7.3	184	7.6	194	8.1	206	1.5	38	6.5	165	4.0	102
1	160	8.5	216	7.3	184	7.8	197	8.3	210	1.8	44	5.8	146	4.0	102
1	310	8.5	216	7.3	184	7.8	197	8.3	210	1.8	44	6.5	165	4.0	102
1 1/2	160	9.5	241	8.8	222	9.3	235	9.9	251	2.3	58	8.0	203	5.3	133
1 1/2	310	9.5	241	8.8	222	9.3	235	9.9	251	2.3	58	8.4	213	5.3	133
2	160	11.5	292	10.0	254	10.5	267	11.3	286	2.3	58	8.2	208	6.0	152
2	310	11.5	292	10.0	254	10.5	267	11.3	286	2.3	58	8.6	219	6.0	152
3	160	14.0	356	11.8	298	12.5	318	13.3	337	3.4	86	9.9	251	7.3	184
3	310	14.0	356	11.8	298	12.5	318	13.3	337	3.4	86	10.4	264	7.3	184
4	160	17.0	432	13.9	353	14.5	368	15.5	394	5.2	133	13.8	351	10.0	254
4	310	17.0	432	13.9	353	14.5	368	15.5	394	5.2	133	14.8	376	10.0	254

NOTE: All dimensions are to be used for estimating only.
See factory for certified dimensional drawings.

Guardian Metal Bellows Seal



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