FLOWSERVE™

Valtek Guardian II

Metal Bellows Seal Control Valves

Valtek Guardian II Metal Bellows Seal

Design Features

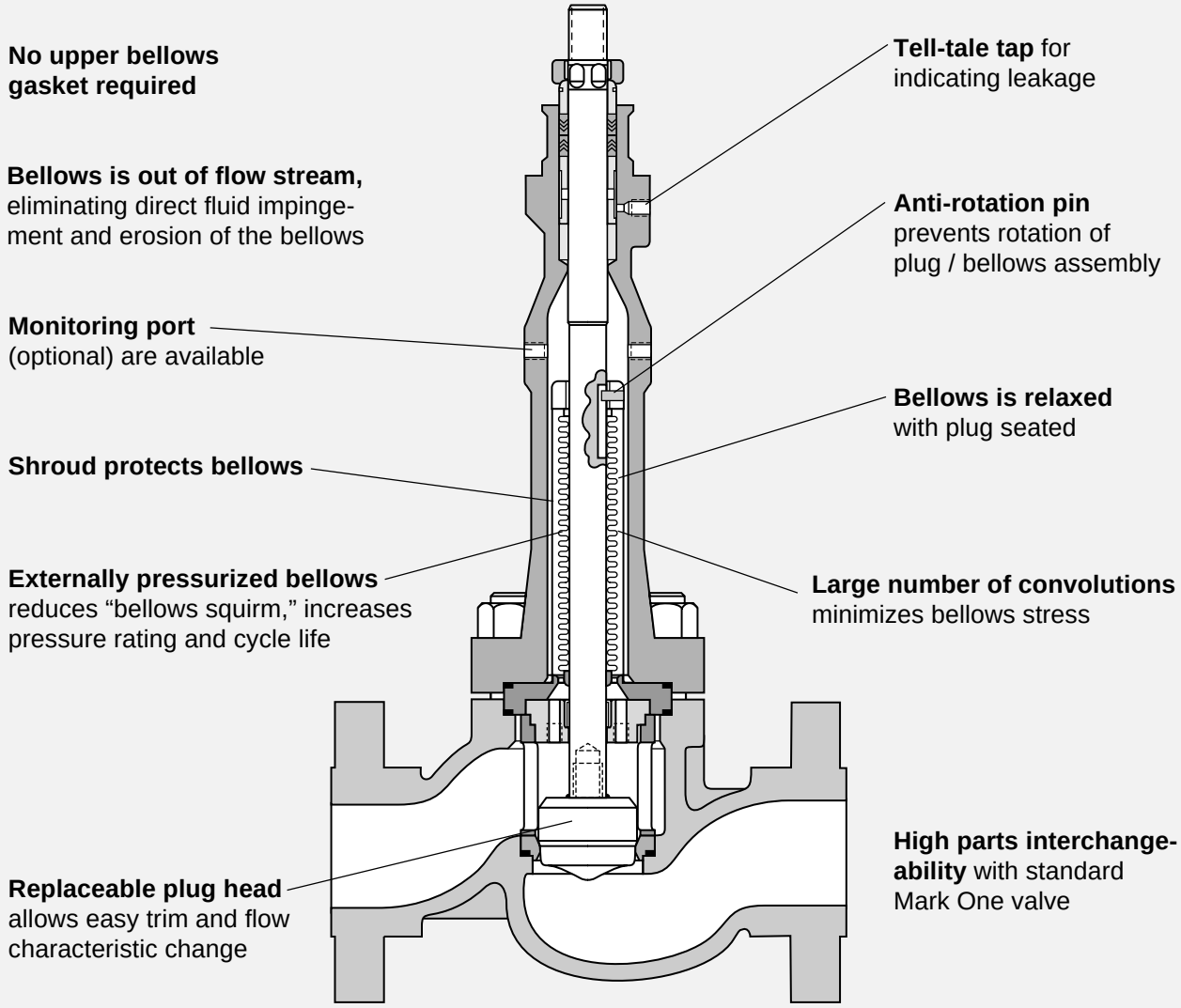

Figure 1: Guardian II Metal Bellows Seal Valve

Wasted material, employee safety, environmental concerns and EPA regulations: all good reasons for today's plant operators to be concerned about fugitive emissions from hazardous processes. To stop packing leakage from control valves, Flowserve offers the Valtek® Guardian II™ Metal Bellows Seal control valve.

Using a formed metal bellows design with minimal welded joints, the Guardian II has a full-cycle life of up to 5 million cycles. This ensures years of safe and reliable operation in hazardous processes ranging from -320° to 1000° F (-196° to 538° C) and pressures to 1100 psi (75.8 Bar).

A metal shroud envelopes the bellows acting as a pressure boundary in service, allowing use of a single, pressurized gasket seal and preventing fluid contact with the bellows housing during normal operation. External pressurization of the bellows increases cycle life and the maximum allowable pressure, while eliminating "bellows squirm." The replaceable plug head allows trim changes without changing the bellows assembly.

The Guardian II can be retrofitted to a standard Mark One valve by changing the plug and bolting, adding a bellows assembly, bellows housing and lower guide assembly.

Valtek Guardian II Metal Bellows Seal

Advantages and Features

Advantage	Feature
Eliminates fugitive emissions	Zero-leakage stem seal
Broad range of fluid compatibilities	Available with Inconel or Hastelloy C bellows
No bellows tension	Bellows is in a relaxed state at valve's closed position
Protected from external damage	Shroud envelopes the bellows, protecting it during handling, installation and operation
No bellows erosion/fluid impingement	Bellows is out of flow stream
Minimal bellows stress	Large number of convolutions minimizes the amount of bellows movement
Reduced failure potential	Anti-rotation pin prevents accidental rotation of plug and bellows, a major cause of bellows failure
Easy trim/flow characteristic changes	Replaceable plug head
Fast detection of bellows failure	A tell-tale tap located in bellows housing may be monitored visually, electronically or by pressure
Minimum seals to monitor	One-gasket design reduces potential leak paths
No special packing requirements	Uses standard packing materials
Multiple temperature applications	Temperature range from -320° to 1000° F (-196° to 538° C)
Tolerates particle-entrained fluids	Bellows has large convolutions
Long cycle life	Formed bellows has low mechanical stress and minimal welds
Assured integrity	Bellows assembly is helium leak tested
High parts interchangeability	Most Guardian II parts are interchangeable with standard Mark One valve parts
Conservative size	A Guardian II valve with pneumatic actuator is shorter than a comparable diaphragm actuated valve

Table I: Guardian II Cycle Life*

Valve Size (inches)	ANSI Pressure Class	Full Stroke Cycles at 70° F (21° C)			
		150 psi (10.3 Bar)		600 psi (41.4 Bar)	
		Minimum	Average	Minimum	Average
½, ¾, 1	150, 300	2,000,000	5,000,000+	125,000	780,000
1½, 2	150, 300	2,000,000	5,000,000+	90,000	500,000
3	150, 300	520,000	2,000,000	40,000	250,000
4 4	150 300	500,000 275,000	2,500,000 1,400,000	— 33,000	— 160,000
6 6	150 300	200,000 100,000	1,300,000 550,000	— 17,000	— 90,000
8 8	150 300	375,000 56,000	1,350,000 350,000	— 21,000	— 110,000

*Bellows life is affected by unequal loads applied to the bellows, called "bellows squirm." With the Guardian II design, the outside of the bellows is pressurized, providing a stable pressure load on the bellows and reducing bellows squirm. External pressurization also increases the maximum allowable pressure rating of the bellows.

Valtek Guardian II Metal Bellows Seal
Specifications

Table II: C_v Data (=% Trim, Flow Over)

Valve Size (inches)	Trim Number	Stroke (inches)	Full C_v
½	.50	.50	4.2
	.31	.50	2.3
¾	.72	.50	7.5
	.50	.50	5.4
	.31	.50	2.6
1	.81	.50	11.0
	.50	.50	5.7
	.31	.50	2.6
1½	1.25	1.00	30
	1.00	.75	22
	.81	.75	18
2	1.62	1.00	44
	1.25	1.00	33
	1.00	.75	23
	.81	.75	19
3	2.62	1.50	107
	1.62	1.50	49
4	3.50	2.00	206
	2.25	2.00	113
6	5.00	2.50	405
	3.50	2.50	236
8	6.25	3.00	698
	5.00	3.00	474

Table III: Bellows Effective Area and Maximum Pressure*

Valve Size (inches)	Bellows Rating Class	Effective Area (sq. in.)	Maximum Pressure					
			psig at -320° to 100°F	Barg at -196° to 38°C	psig at 500° F	Barg at 260° C	psig at 1000° F	Barg at 538° C
½, ¾, 1	150, 300	0.75	1100	75.8	858	59.2	825	56.9
1½, 2, 3	150, 300	1.35	770	53.1	601	41.4	578	39.9
4, 6	150	2.38	425	29.3	332	22.9	319	22.0
4, 6	300	2.18	770	53.1	601	41.4	578	39.9
8	150	4.53	350	24.1	273	18.8	263	18.1
8	300	4.75	1050	72.4	819	56.5	788	54.3

* Maximum bellows pressure maybe more than valve body capability. Consult ANSI B16.34 for maximum body pressure capabilities.

Table IV: Body Specifications

Sizes	½, ¾, 1, 1½, 2, 3, 4, 6, 8
Forms	Globe, angle, expanded outlet
Characteristics	Equal percentage, linear, quick-open
Bellows Material	Inconel 625 (std.), Hastelloy C-22, other materials
Bonnet	One-piece including bellows housing
Packing	Double set
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: stainless steel / Grafoil
Guides	Glass-loaded Teflon, Grafoil, bronze, Stellite

Table V: Actuator Specifications

Actuators	Spring cylinder: Sizes 25, 50, 100, 200, 300, 400, 500, 600 sq. in. Manual handwheel: sizes 9, 12, 18, 24-inch diameters Hydraulic: as required
Positioner Signals	Pneumatic: 3-15, 6-30 psi (0-1,0.4-2.1 Bar) Electro-pneumatic: 4-20, 10-50 mA

Ordering Information

The following information must be taken into consideration when ordering a Guardian II 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 II's limit, contact factory.)
3. Maximum operating temperature and pressure
4. Flange rating
5. Materials required: body, bellows, bellows housing assembly, trim, packing and guides
6. Actuator required: type (cylinder, hydraulic, manual), failure action and size
7. Positioner signal requirements
8. Accessories requirements

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Dimensions

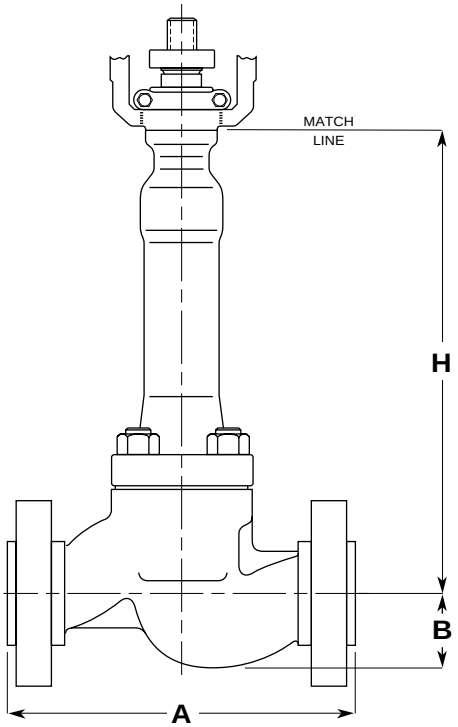

Table VI: Dimensions (inches / mm)

Valve Body Size (inches)	A								B		H		Clearance Height for Disassembly	
	ANSI		ANSI/ISA											
	Class 150, 300, 600		Class 150		Class 300		Class 600							
½, ¾	8.5	216	7.3	184	7.6	194	8.1	206	1.5	38	12.1	307	3.3	83
1	8.5	216	7.3	184	7.8	197	8.3	210	1.8	44	12.1	307	3.3	83
1½	9.5	241	8.8	222	9.3	235	9.9	251	2.3	59	16.5	420	5.0	127
2	11.5	292	10.0	254	10.5	267	11.3	286	2.3	57	16.5	420	5.5	140
3	14.0	356	11.8	298	12.5	318	13.3	337	3.4	86	19.0	483	7.0	178
4	17.0	432	13.9	353	14.5	368	15.5	394	5.2	133	27.2**	691**	9.3	235
6			17.8	451					5.5	139	29.1**	738**	11.5	292
6					18.6	473	20.0	508	5.8	146	29.1	738	11.5	292
8			21.4	543					7.1	180	35.3	896	12.0	305
8					22.4	568	24.0	610	7.5	190	35.3	896	12.8	324

** For 2.88 inch spud diameter subtract 0.6 inch (16 mm).

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