

## **Excess Flow Valves**

**Excess flow valves are an added safety feature for gas feed lines.**

The attached data sheet describes the Swagelok XS Series, Industrial Excess Flow Valves. We believe these are an added safety feature some of our customers may wish to install in their gas feed lines. These valves are designed to close when there is a sudden increase in the flow rate of gas stream.

Perhaps an unfortunately true story will illustrate the type of protection these valves can afford. A customer was hydrogenating an oil in a two gallon reactor. He was using a constant pressure regulator to automatically feed hydrogen to the reactor. He had installed a one-way check valve in the hydrogen supply line so that his reactants could not backup into the hydrogen supply tank and regulator. This precaution is doubly important when gas is fed through the dip tube since this will pump liquid back up the supply line.

The operator made a tragic mistake and set the control temperature to 400°C instead of the intended 200°C. At one point he noticed that the reaction temperature was well above the normal set point, but he did not shut the reaction down or correct the set point. At some temperature well above 300°C, the rupture disc let go; releasing superheated hydrogen, organic vapors, etc., to the air where they immediately ignited.

With the drop in pressure in the vessel, hydrogen began flowing through the feed line and dip tube to the bottom of the vessel. It bubbled up through the hot oil carrying oil with it to feed the fire. The burning oil splashed off the back wall of the hood and onto the operator who received major burns over most of his body. Fortunately he survived, but had to endure multiple skin grafting operations and has permanent scarring.

Had an excess flow valve been available and installed in the hydrogen supply line, it would have immediately shut-off the hydrogen supply when the rupture disc failed and eliminated the percolating of the hot oil out of the vessel.



While we are analyzing this unfortunate accident, there are two other safety features which were not used that could have protected the operator from his mistake. The discharge of the rupture disc assembly was not connected to a line which would have carried the discharge to the roof, a barrel of water, or some other safe place. Perhaps, if the system had been equipped with a high temperature module, the operator would not have set the wrong temperature on the backup controller. And finally, if the system had been equipped with the pressure display module, a maximum pressure well below the rupture disc rating could have been set. At this set point the heater would have been shut off and the entire problem avoided.

The excess flow valves are simply one more safety device available for these high pressure systems. These valves are available either from us or your local Swagelok dealer.

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## Industrial Excess Flow Valves

Stop uncontrolled release of system media  
if downstream line ruptures



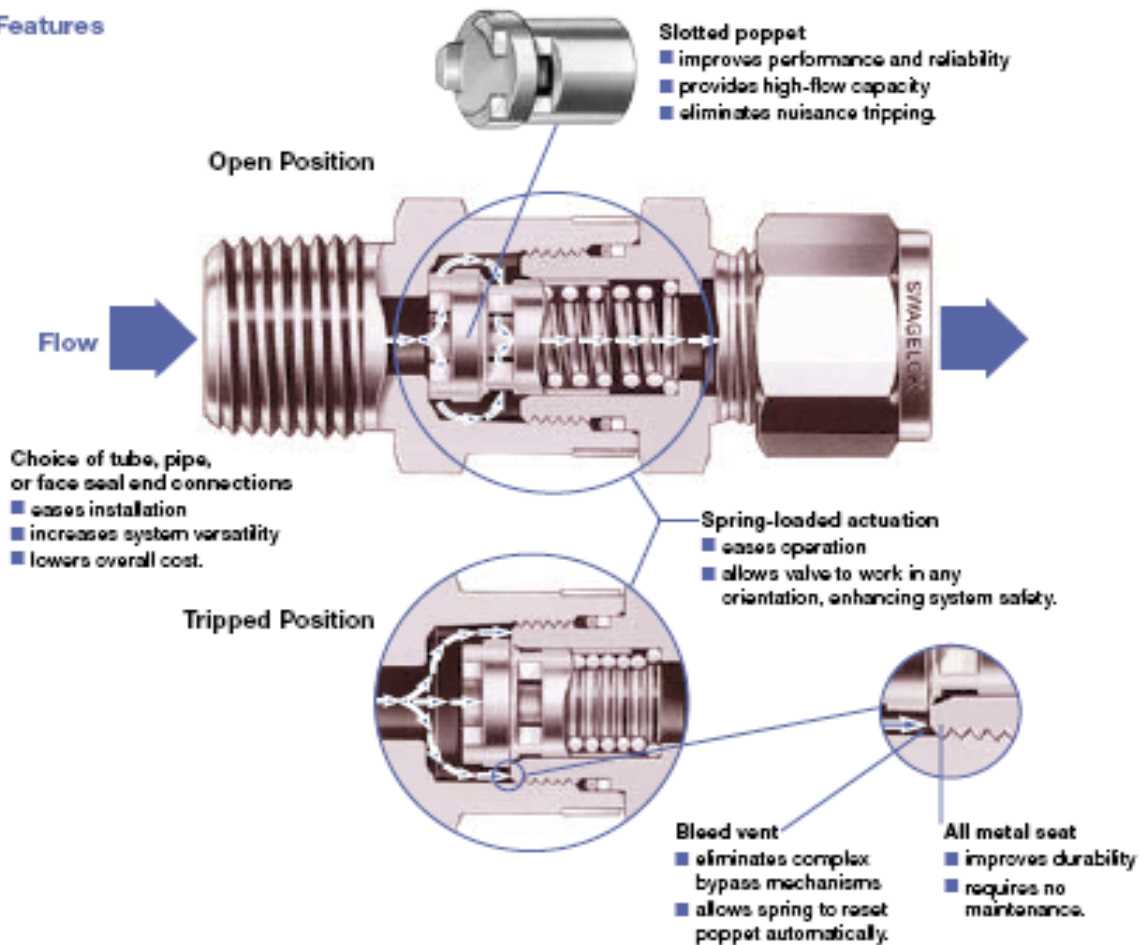
### XS Series

- Pressures up to 8000 psig (413 bar)
- Temperatures up to 400°F (204°C)
- 1/8 to 1/2 in. and 6 to 12 mm end connections
- Stainless steel construction

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## 2 Industrial Excess Flow Valves

### Features



### Operation

The spring-loaded poppet remains in the open position during normal system operation. Should an excess flow condition occur downstream, the poppet rapidly moves to the tripped position, stopping uncontrolled release of system media. When the system pressure equalizes through the bleed vent, the spring automatically resets the poppet to the open position. The flow through the bleed vent is less than 1 % of the flow rate in the trip range.

### Pressure-Temperature Ratings

Ratings based on fluorocarbon FKM O-rings. See *Optional O-ring Materials*, page 4. Ratings limited to:

- 5000 psig (344 bar) for XS series valves with 3/8 in. female NPT end connections.
- 4000 psig (316 bar) for XS series valves with 1/2 in. female NPT end connections.

ASME Class	2500
Material Group	2.2
Material Name	316 SS
Temperature, °F (°C)	Working Pressure, psig (bar)
-10 (-23) to 100 (37)	6000 (413)
200 (93)	5160 (355)
250 (121)	4910 (338)
300 (148)	4660 (321)
400 (204)	4290 (294)

For more information about valves with tube fitting and connections, see *Swagelok® Tubing Data*, MS-01-107. Pressure ratings of valves with VCR® or VCO® fitting and connections are based on the ratings of the mating fittings; see the *Swagelok VCR Metal Gasket Face Seal Fittings* catalog, MS-01-24, or the *Swagelok VCO O-ring Face Seal Fittings* catalog, MS-01-25.

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**Materials of Construction**



Component	Material Grade/ ASTM Specification
1 Inlet body	S16 SS/A479
2 Identification ring	Polyetherimide
3 Poppet	S16 SS/A479
4 Spring	302 SS/A313
5 O-ring	Fluorocarbon FKM
6 Backup ring	PTFE/D1710
7 Outlet body	S16 SS/A479
Lubricant	Silicone-based

Wetted components listed in *italics*.  
 Ⓢ PEEK also available; see Ordering Information, page 4.

**Testing**

Every XS series valve is factory tested for proper operation.

**Cleaning and Packaging**

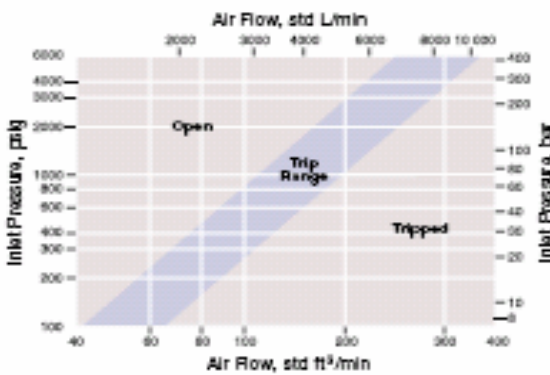
Swagelok XS series valves with VCR or VCO end connections are processed in accordance with Swagelok *Special Cleaning and Packaging (SC-1)*, MS-06-03, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C.

Swagelok XS series valves with other end connections are processed in accordance with Swagelok standard cleaning and packaging specification (*SC-10*), MS-06-02; special cleaning and packaging are available as an option.

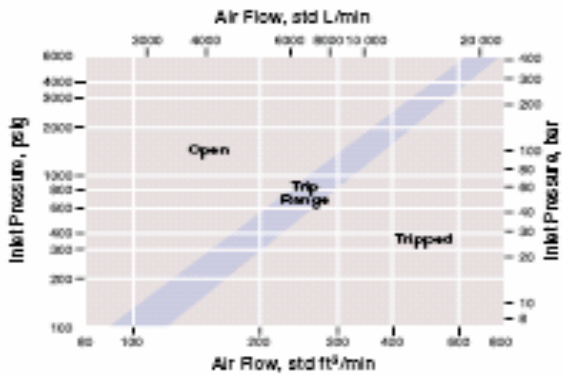
**Flow Data at 70°F (20°C)**

Springs with lower trip ranges are available. See the Swagelok *XS Series Excess Flow Valve* technical report, MS-05-11.

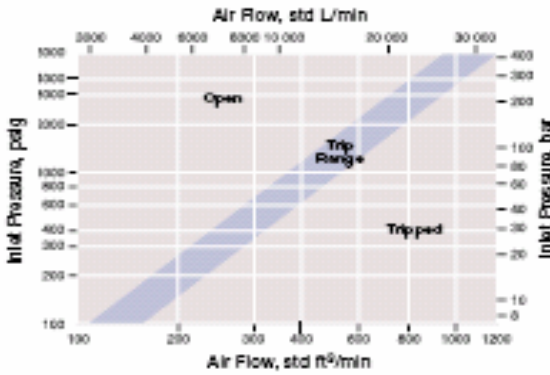
**XS4 Series Air**



**XS6 Series Air**



**XS8 Series Air**



**XS4, XS6, XS8 Series Water**

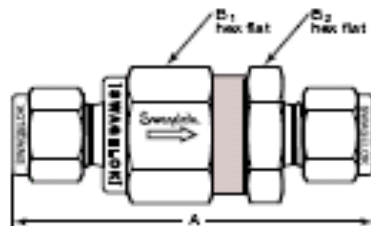
Series	C <sub>v</sub>	Trip Range U.S. gal/min (L/min)
XS4	0.5	3.9 to 5.8 (14.7 to 21.9)
XS8	1.1	8.2 to 10.0 (31.0 to 37.8)
XS8		11.2 to 14.9 (42.3 to 56.3)



## Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

Select an ordering number.



### Optional O-ring Materials

Fluorocarbon FKM O-rings are standard. For an optional O-ring material, add a designator to the ordering number.

O-ring Material	Designator	Temperature Rating °F (°C)
Buna N	-BU	-40 to 250 (-40 to 121)
Ethylene propylene	-EP	-50 to 300 (-45 to 149)
Kalrez®	-KZ	-10 to 400 (-23 to 204)
Neoprene	-NE	-40 to 250 (-40 to 121)

Example: SS-XSS4-BU

### PEEK Backup Ring

For a PEEK backup ring, add -PK to the ordering number.

Example: SS-XSS4-PK

End Connections		Series	Ordering Number	Dimensions, In. (mm)		
Inlet/Outlet	Size			A	B <sub>1</sub>	B <sub>2</sub>
Fractional Swagelok tube fitting	1/4 in.	XS4	SS-XSS4	2.43 (61.7)	11/16	
	3/8 in.	XS6	SS-XSS6	2.75 (69.9)	1	
	1/2 in.	XS8	SS-XSS8	2.97 (75.4)	1	
Metric Swagelok tube fitting	6 mm	XS4	SS-XSS6MM	2.43 (61.7)	11/16	
	8 mm	XS6	SS-XSS8MM	2.70 (68.6)	1	
	10 mm	XS6	SS-XSS10MM	2.80 (71.1)	1	
	12 mm	XS8	SS-XSS12MM	2.98 (75.2)	1	
Female NPT	1/8 in.	XS4	SS-XSF2	1.87 (47.5)	11/16	
	1/4 in.	XS4	SS-XSF4	2.12 (53.8)	1	
	3/8 in.	XS6	SS-XSF6	2.55 (64.8)	1	
	1/2 in.	XS8	SS-XSF8	3.03 (77.0)	1 1/16	
Male NPT	1/8 in.	XS4	SS-XSM2	1.79 (45.5)	11/16	
	1/4 in.	XS4	SS-XSM4	2.17 (55.1)	1	
	3/8 in.	XS6	SS-XSM6	2.58 (65.5)	1	
	1/2 in.	XS8	SS-XSM8	2.73 (69.3)	1	
Male NPT/ Swagelok tube fitting	1/4 in.	XS4	SS-XSM4S4	2.30 (58.4)	11/16	
	3/8 in.	XS6	SS-XSM6S6	2.58 (65.5)	1	
	1/2 in.	XS8	SS-XSM8S8	2.85 (72.4)	1	
Male/female NPT	1/4 in.	XS4	SS-XSM4F4	2.13 (54.1)	11/16	
	3/8 in.	XS6	SS-XSM6F6	2.48 (62.5)	1	
	1/2 in.	XS8	SS-XSM8F8	2.89 (73.4)	1	1 1/16
Male ISO®	1/4 in.	XS4	SS-XSM4RT	2.17 (55.1)	11/16	
	1/2 in.	XS8	SS-XSM8RT	2.74 (69.6)	1	
Female ISO®	1/2 in.	XS8	SS-XSF8RT	3.29 (83.6)	1 1/16	
Male SAE/MS	1/2 in.	XS8	SS-XSM8ST	2.48 (62.5)	1	
Female SAE/MS	1/2 in.	XS8	SS-XSF8ST	2.74 (69.6)	1	
Male VCR fitting	1/4 in.	XS4	SS-XSVCR4	2.28 (57.9)	11/16	
	1/2 in.	XS8	SS-XSVCR8	2.73 (69.3)	1	
Male VCO fitting	1/4 in.	XS4	SS-XSVCO4	1.98 (50.3)	11/16	
	1/2 in.	XS8	SS-XSVCO8	2.38 (60.4)	1	

Dimensions shown with Swagelok nuts finger-tight.

® See specifications: ISO 71, BS EN 10226-1, DIN 2992, JIS B0203.

### Special Cleaning and Packaging

Swagelok XS series valves with VCR or VCO and connections are processed in accordance with Swagelok Special Cleaning and Packaging (SC-11), MS-06-03, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C.

To order special cleaning and packaging for XS series valves with other end connections, add -SC11 to the valve ordering number.

Example: SS-XSS4-SC11

#### Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

**Caution:** Do not mix or interchange parts with those of other manufacturers.

### Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, see the Swagelok Oxygen System Safety technical report, MS-06-13.

### Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit [swagelok.com](http://swagelok.com) or contact your authorized Swagelok representative.

Swagelok VCR, VCO—TM Swagelok Company  
Kalrez—TM DuPont  
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