F9000 SurgeFlow

Liquid Surge Relief Valves

Brochure# SURGE0416

"EXPERTS IN SOFT SEAT VALVE TECHNOLOGY"

CONTENTS

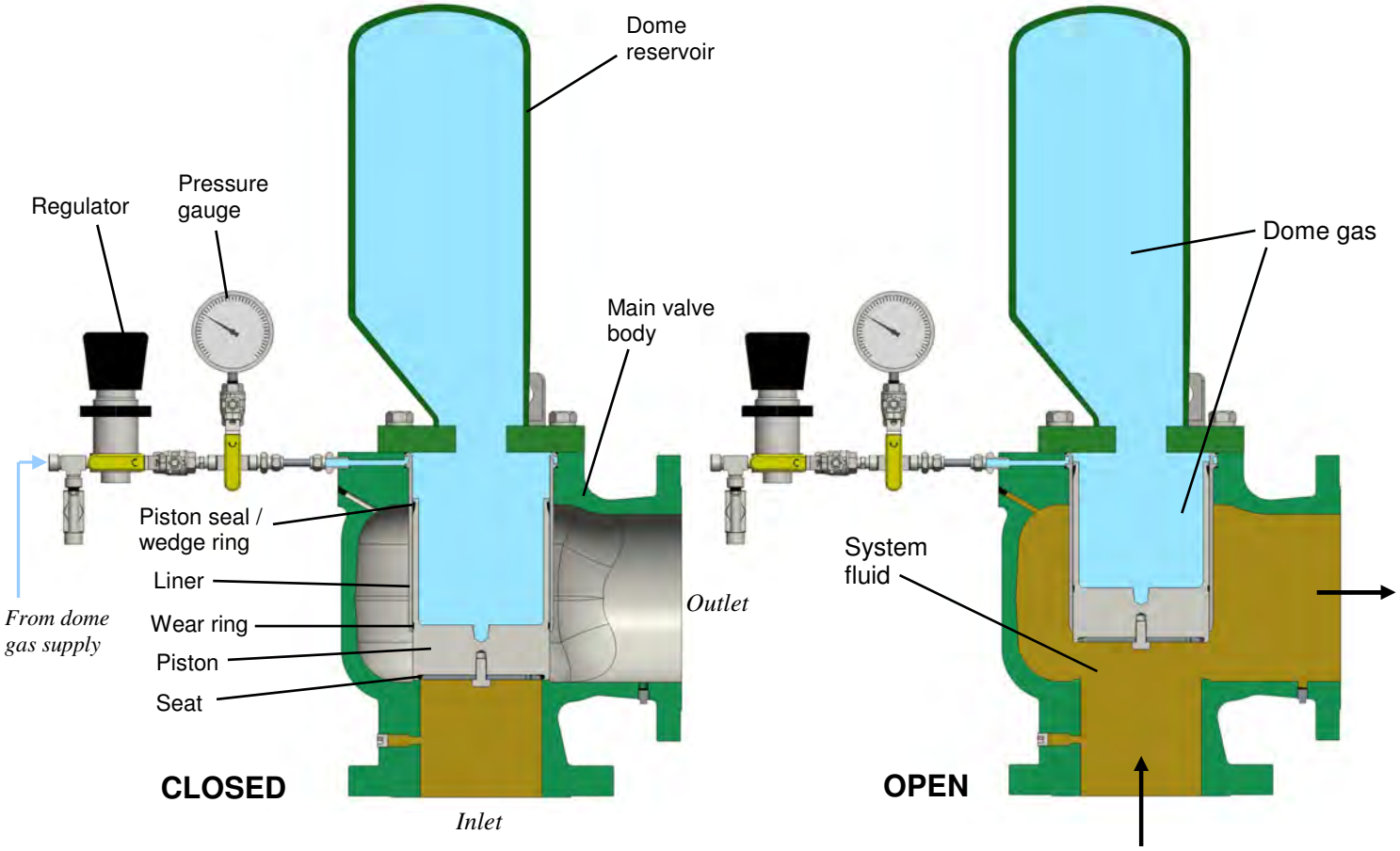
INTRODUCTION AND FEATURES

F9000 SurgeFlow design features include:

- Direct pressure setting of main piston without pilot or other controls that must vent or change state
- Furnished with precision self-relieving regulator for steady control of set pressure
- Superior flow capacities based on 3rd-party tests at high-capacity water test lab
- Side discharge for easy, cost-effective installation
- Repeatable leak-tight soft seat design
- Top entry for low-cost maintenance and low cost of ownership
- Standard 316 SS trim for superior corrosion resistance
- Piston dampening ring for chatter-free performance
- Self-draining and repairable in-line
- -20 to 500 ℉ (-29 to 260 ℃) temperature range

The policy of FLOW SAFE and its authorized assemblers is a commitment to value through:

- Environmentally compatible products
- Cost-efficient design with minimal parts
- Quality products, readily available
- Flexibility to meet unique customer needs
- “No-hassle” service



Liquid product pipelines must be protected from liquid surges that may be caused by pump failure, rapid block valve closing, non-return check valve hard-shutting, emergency shutdown of a tank or loading system, or even a pump coming on or tripping. The magnitude of surge pressures varies, some virtually undetectable to those severe enough to cause major damage. These propagating waves, either increasing or decreasing rapidly, are commonly known as hydraulic transient surge or water hammer that can cause severe damage to liquid product pipelines, vessels, flanges, valving, and associated equipment.

The Flow Safe SurgeFlow series has been developed exclusively for liquid surge protection. These valves are extremely simple and 100% reliable. The dome cavity volume on top of the main valve piston is filled with nitrogen gas to effect proper set pressure of the valve. Dome gas pressure is set according to the characteristic piston seat-to-seal area ratio for the given valve size (see Page 4). This dome load forces the main valve into a closed position using a soft elastomer seat, providing 100% tight shut-off. When surge pressure is sensed, the SurgeFlow valve piston opens immediately as the liquid fluid force acting under the piston overcomes the force from the dome gas acting on top. The piston continues to lift in proportion to the pressure surge, slightly compressing the dome gas. The closing cycle responds directly to pressure decay in the piping upstream of the SurgeFlow surge relief valve.

SurgeFlow series valves are designed for accurate and repeatable performance. They will handle both minimum and/or maximum surge cases when called upon to relieve. Flow Safe suggests all surge relief valves be located nearest the point where maximum pressure can occur in the main pipeline, for optimal safety purposes.

MATERIALS OF CONSTRUCTION

Pressure range	100 to 3705 psig (6.9 to 255 barg)
Temperature range	-20 to 500 °F (-29 to 260 °C)
Valve body material	SA-216 WCB or SA-352 LCC
Dome reservoir material	SA-106B, SA-53 E/B, or SA-234 WPB
Trim[1] material	316/316L stainless steel
Seat / piston seal material	Buna-N, Viton, EPR, or as requested
Wedge / wear ring material	Graphite-filled PTFE

[1] Internal wetted parts and gas control components
Contact factory for availability of other materials or lower set pressures.
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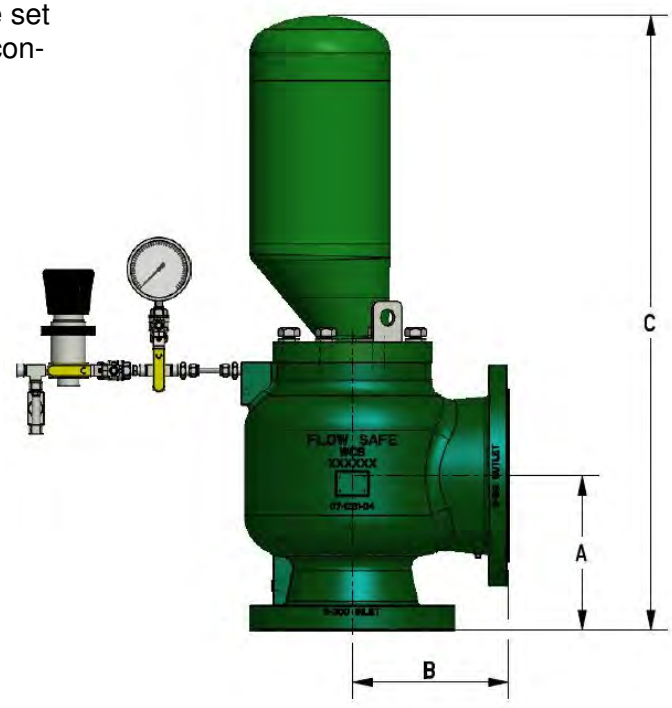
PRESSURE SETTING DATA

Set pressure of valve multiplied by listed dome ratio gives corresponding regulated dome pressure value.

Superimposed backpressure will reduce effective set pressure based on standard dome ratio setting; contact factory for adjustment.

Valve Size	Dome Ratio [1]
1 x 2	0.45
1-1/2 x 3	0.58
2 x 3	0.64
3 x 4	0.73
4 x 6	0.74
6 x 8	0.79
8 x 10	0.83
10 x 12	0.77
12 x 16	0.72

[1] Baseline values - may be adjusted based on actual test or operational experience. Ratio equals seat area divided by piston seal area.



DIMENSIONS & WEIGHTS

F9000 SurgeFlow

Inlet Connection	Outlet Connection	Orifice Diameter, in (mm)	Flow Area, in^2 (mm^2)	Dimensions, in (mm)[1]			Approx. weight, lb (kg)
				A	B	C, approx.	
1" FNPT	2" FNPT	0.957 (24.3)	0.719 (464)	5.06 (129)	3.00 (76)	16 (406)	40 (18)
1"-150#	2"-150#			4.13 (105)	4.50 (114)	15 (381)	43 (20)
1"-300#	2"-150#			4.38 (111)	4.50 (114)	15 (381)	44 (20)
1"-600#	2"-150#			4.38 (111)	4.50 (114)	15 (381)	44 (20)
1"-900#	2"-300#			4.94 (126)	4.75 (121)	16 (406)	55 (25)
1"-1500#	2"-300#	0.815 (20.7)	0.521 (336)	4.94 (126)	4.75 (121)	16 (406)	55 (25)
1-1/2" FNPT	3" FNPT	1.500 (38.1)	1.767 (1140)	4.63 (118)	3.75 (95)	16 (406)	53 (24)
1-1/2"-150#	3"-150#			5.13 (130)	4.88 (124)	17 (432)	58 (26)
1-1/2"-300#	3"-150#			5.13 (130)	4.88 (124)	17 (432)	63 (29)
1-1/2"-600#	3"-150#			5.13 (130)	4.88 (124)	17 (432)	63 (29)
1-1/2"-900#	3"-300#	1.337 (34.0)	1.404 (906)	6.38 (162)	6.75 (171)	18 (457)	88 (40)
1-1/2"-1500#	3"-300#			6.38 (162)	6.75 (171)	18 (457)	88 (40)
2"-150#	3"-150#	1.939 (49.3)	2.953 (1905)	5.38 (137)	4.88 (124)	23 (584)	85 (39)
2"-300#	3"-150#			5.38 (137)	4.88 (124)	23 (584)	90 (41)
2"-600#	3"-150#			5.38 (137)	4.88 (124)	23 (584)	90 (41)
2"-900#	3"-300#	1.689 (42.9)	2.241 (1446)	6.56 (167)	6.75 (171)	24 (610)	110 (50)
2"-1500#	3"-300#			6.56 (167)	6.75 (171)	24 (610)	110 (50)
3"-150#	4"-150#	2.900 (73.7)	6.605 (4261)	6.13 (156)	6.38 (162)	29 (737)	135 (61)
3"-300#	4"-150#			6.13 (156)	6.38 (162)	29 (737)	145 (66)
3"-600#	4"-150#			6.38 (162)	6.38 (162)	29 (737)	145 (66)
3"-900#	4"-300#	2.624 (66.6)	5.408 (3489)	7.50 (191)	7.13 (181)	30 (762)	175 (79)
3"-1500#	4"-300#			7.50 (191)	7.13 (181)	30 (762)	190 (86)
4"-150#	6"-150#	3.816 (96.9)	11.437 (7379)	7.75 (197)	8.25 (210)	31 (787)	195 (88)
4"-300#	6"-150#			7.75 (197)	8.25 (210)	31 (787)	195 (88)
4"-600#	6"-150#			7.75 (197)	8.25 (210)	31 (787)	200 (91)
4"-900#	6"-300#	3.624 (92.0)	10.315 (6655)	9.81 (249)	9.19 (233)	33 (838)	265 (120)
4"-1500#	6"-300#			9.81 (249)	9.19 (233)	33 (838)	265 (120)
6"-150#	8"-150#	5.760 (146.3)	26.06 (16813)	9.44 (240)	9.50 (241)	38 (965)	360 (163)
6"-300#	8"-150#			9.44 (240)	9.50 (241)	38 (965)	360 (163)
6"-600#	8"-150#			9.69 (246)	9.50 (241)	38 (965)	415 (188)
8"-150#	10"-150#	7.625 (193.7)	45.66 (29458)	10.88 (276)	11.00 (279)	41 (1041)	500 (227)
8"-300#	10"-150#			10.88 (276)	11.00 (279)	41 (1041)	500 (227)
8"-600#	10"-150#			11.63 (295)	11.00 (279)	42 (1067)	560 (254)
10"-150#	12"-150#	9.565 (243)	71.85 (46355)	11.63 (295)	13.00 (330)	44 (1118)	1000 (454)
10"-300#	12"-150#			11.63 (295)	13.00 (330)	44 (1118)	1050 (476)
12"-150#	16"-150#	11.935 (303)	111.87 (72174)	11.92 (303)	15.56 (395)	73 (1854)	1600 (726)
12"-300#	16"-150#			12.67 (322)	15.56 (395)	74 (1880)	1700 (771)

[1] See diagram on Page 4. Dimensions subject to change without notice. Contact Flow Safe for submittal drawing whenever specific dimensions are needed for construction.

The correct SurgeFlow size is determined by matching the flow coefficient Cv of available valves, tabulated below, to the Cv required for the application at a specified "rise over set" (overpressure or accumulation). This table is valid for set pressures of 100 psig (7 barg) and greater; contact the factory for lower set pressure requirements.

Valve Size	ASME Inlet Rating	Max. Cv (Full Open)	Rise over Set 10% **Cv**	20% **Cv**	25% **Cv**
1 x 2	NPT, 150 - 900	18.2	8.4	16.0	18.2
	1500	13.2	6.1	11.6	13.2
1-1/2 x 3	NPT, 150 - 600	44.6	20.5	39.2	44.6
	900/1500	35.1	16.1	30.9	35.1
2 x 3	150 - 600	75	34.1	65.6	75
	900/1500	56	25.8	49.3	56
3 x 4	150 - 600	176	61.6	118	144
	900/1500	137	58.2	112	137
4 x 6	150 - 600	290	133	255	290
	900/1500	262	121	231	262
6 x 8	150 - 600	662	232	444	543
8 x 10	150 - 600	1159	371	713	863
10 x 12	150 - 300	1824	511	1003	1222
12 x 16	150 - 300	2840	838	1605	1960

$Q = Cv \sqrt{(P_1 - P_2) / SG}$

$Cv = Q \sqrt{SG / (P_1 - P_2)}$

where: Q = flow rate (gpm)
SG = specific gravity
P_1 = inlet pressure w/accumulation (psig)
P_2 = backpressure (psig)

Example: A capacity of 4000 bbl / hr of 40° API crude oil (SG = 0.825) is required at 500 psig set pressure, zero backpressure; system design pressure is ASME Class 300; max. desired line pressure = 550 psig (10% rise over set)

1. Determine required Cv:

$Q = (4000 \text{ bbl / hr}) (\text{hr / 60 min}) (42 \text{ gal / bbl})$
$= 2800 \text{ gpm}$

$Cv = 2800 \sqrt{0.825 / (500*1.10 - 0)}$
$= 108.4$

2. Select valve from table above with Cv = 108.4 or greater at 10% rise over set.

   Choose 4"-300# x 6"-150# with Cv = 133.

PART NUMBERING

P 9 0 5 0 - 0 4 R F 3 - 0 6 R F 1 - C S - S S - V V N

Options:
N = NACE trim
Y = Swagelok tube fittings

Seals:
B = Buna-N
V = Viton ('A')
E = EPR / EPDM
U = Polyurethane
X = Perfluoroelastomer[1]
Y = HNBR
H = AED Viton
A = Aflas

MV Seat: O-ring material from 'Seals' above

Trim material: See "Body material" below, plus
SM = SS + Monel

Body material:
CS = Standard carbon steel
CL = Low-temperature CS
SS = 316 SS / CF8M
SL = 316L SS / CF3M
D4 = 22% Cr duplex SS
D6 = 25% Cr duplex SS
N5 = Inconel 625
N0 = Inconel 600
6M = 6 Mo (254 SMO)
MO = Monel
C3 = LC3 CS
H2 = Hastelloy C / C22
H6 = Hastelloy C276

Outlet size / connection type / rating: See "Inlet" data below, plus
16 = 16"

Inlet rating: 0 = Threaded
1 = 150#
2 = 300#
3 = 600#
4 = 900#
5 = 1500#

Inlet connection type:
FN = Female NPT
RF = RF flange (ASME)
RJ = RTJ flange (ASME)
EF = RF flange (metric)
EJ = RTJ flange (metric)

Inlet size: 01 = 1" 02 = 2" 04 = 4" 08 = 8" 12 = 12"
15 = 1-1/2" 03 = 3" 06 = 6" 10 = 10"

0 for F9000

Model + Pilot + MV Seat type: 9 = F9000 + 0 = No pilot + 5 = O-ring seat

P = Pilot-operated or surge relief valve

[1] If not specified, will include appropriate Kalrez, Chemraz, Perlast, or similar grade.

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