

M&J VALVE

AN SPX BRAND

DANFLO Liquid Surge Relief Valve



SPX[®]

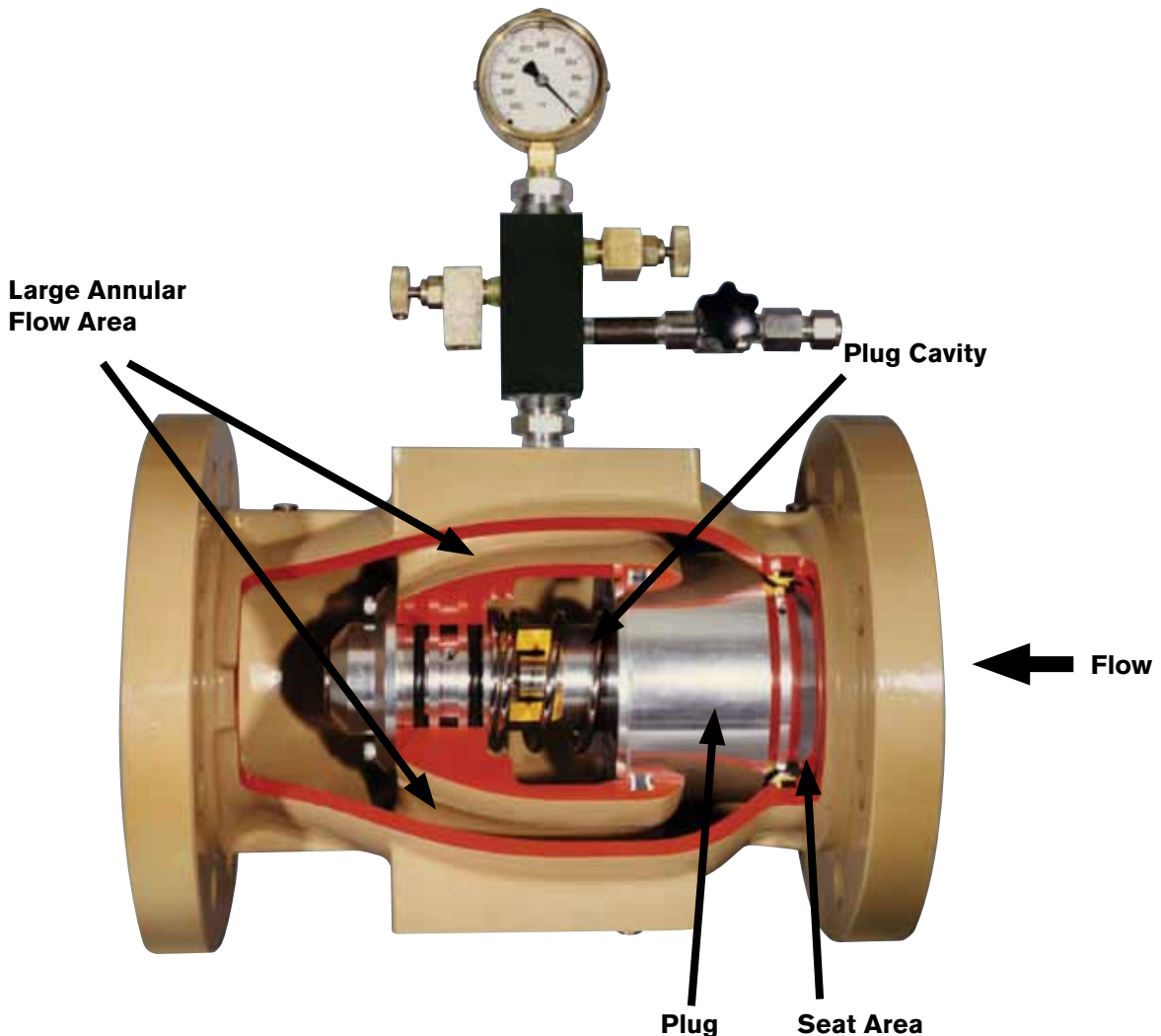
DANFLO Surge Relief Valves

DANFLO Surge Relief Valves are engineered to track unabated surge-wave pressure transients-open quickly, then closes without slamming shut. The “speed of response” in surge valves is defined as the ability of the valve/valves to relieve peak wave surge flow in the time stated in a hydraulic transient surge analysis. Although this time varies with each application, timed responses of 100 milliseconds or less are not unusual. DANFLO surge relief valves meet these criteria.

DANFLO surge valve operation is simple. The cavity behind the valve plug is filled with nitrogen gas to affect proper relief set pressure of the valve. This cavity loading force seats the valve and opposes the force generated by line pressure in front of the valve. The valve remains closed until surge wave pressure exceeds the force behind the plug (set pressure). The DANFLO surge valve then opens quickly to track the unabated surge wave. The closing cycle responds directly to pressure decay in the upstream piping in front of the DANFLO surge valve.

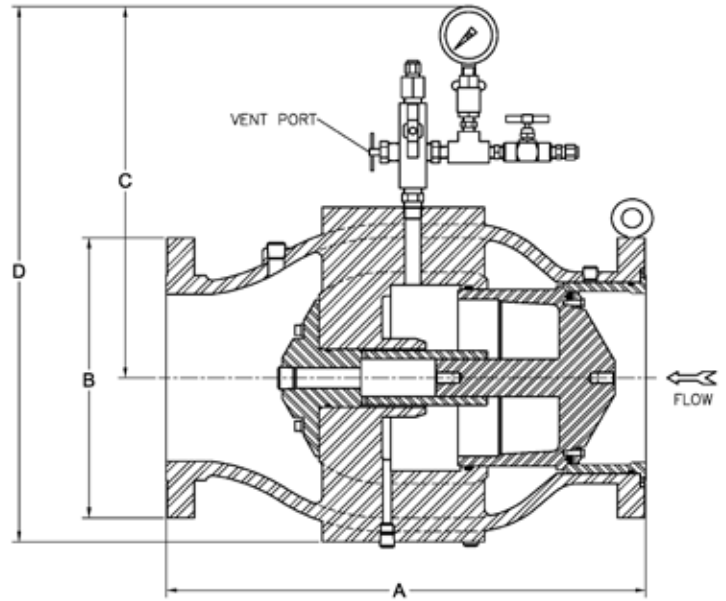
A M&J Valve DANFLO surge relief system consists of the appropriate quantity of specific sizes of gas-loaded valves to handle requested flow conditions. High flow coefficients (Cv) of DANFLO surge valves usually mean fewer and/or smaller size valves to meet user requirements.

Operation at recommended settings provides flow reserve for protection against surges larger than expected. Problems such as nitrogen loss through permeable elements, valve failure due to tube splits caused by contaminant flow, or tubes taking a permanent set which prevents valve operation- are all eliminated with the DANFLO design.



Dimensions for Surge Relief Valves

Valve Size (in)	DIN (mm)	ANSI	A In (mm)	B In (mm)	C In (mm)	D In (mm)
2	50	150	11 ¹ / ₂ (292)	6 (152)	13 ¹ / ₅ (335)	16 (406)
		300	11 ¹ / ₂ (292)	6 ¹ / ₂ (165)	13 ¹ / ₅ (335)	16 ¹ / ₄ (413)
		600	11 ¹ / ₂ (292)	6 ¹ / ₂ (165)	13 ¹ / ₅ (335)	16 ¹ / ₄ (413)
		900	12 ¹ / ₂ (318)	8 ¹ / ₂ (216)	13 ¹ / ₅ (335)	17 ¹ / ₄ (438)
3	75	150	12 ¹ / ₂ (318)	7 ¹ / ₂ (191)	13 ¹ / ₂ (343)	16 ³ / ₄ (425)
		300	12 ¹ / ₂ (318)	8 ¹ / ₄ (210)	13 ¹ / ₂ (343)	17 ¹ / ₈ (435)
		600	13 ¹ / ₄ (292)	8 ¹ / ₄ (210)	13 ¹ / ₂ (343)	17 ¹ / ₈ (435)
		900	-	-	13 ¹ / ₂ (343)	-
4	100	150	13 ⁵ / ₁₆ (354)	9 (229)	14 ¹ / ₂ (368)	17 ¹ / ₂ (445)
		300	13 ⁵ / ₁₆ (354)	10 (254)	14 ¹ / ₂ (368)	18 (457)
		600	15 (381)	10 ³ / ₄ (273)	14 ¹ / ₂ (368)	18 ³ / ₈ (467)
		900	17 ¹ / ₄ (438)	11 ¹ / ₂ (292)	14 ¹ / ₂ (368)	18 ³ / ₄ (476)
6	150	150	17 ³ / ₄ (451)	11 (279)	16 ¹ / ₂ (419)	18 ¹ / ₂ (470)
		300	17 ³ / ₄ (451)	12 ¹ / ₂ (318)	16 ¹ / ₂ (419)	19 ¹ / ₄ (489)
		600	19 ¹ / ₈ (486)	14 (356)	16 ¹ / ₂ (419)	20 (508)
		900	20 ³ / ₄ (527)	15 (381)	16 ¹ / ₂ (419)	20 ¹ / ₂ (467)
8	200	150	22 ¹ / ₄ (565)	13 ¹ / ₈ (333)	18 ¹ / ₈ (460)	19 ⁹ / ₁₆ (497)
		300	22 ¹ / ₄ (565)	15 (381)	18 ¹ / ₈ (460)	20 ¹ / ₂ (521)
		600	22 ³ / ₄ (603)	16 ¹ / ₂ (419)	18 ¹ / ₈ (460)	21 ¹ / ₄ (540)
		900	26 (660)	18 ¹ / ₂ (470)	18 ¹ / ₈ (460)	22 ¹ / ₄ (565)
10	250	150	30 ¹ / ₈ (765)	16 (406)	20 (508)	21 (533)
		300	30 ¹ / ₈ (765)	17 ¹ / ₂ (445)	20 (508)	21 ³ / ₄ (552)
		600	30 ⁵ / ₁₆ (770)	20 (508)	20 (508)	23 (584)
		900	32 (813)	21 ¹ / ₂ (546)	20 (508)	23 ³ / ₄ (603)
12	300	150	35 (889)	19 (483)	22 (559)	22 ¹ / ₂ (572)
		300	35 (889)	20 ¹ / ₂ (521)	22 (559)	23 ¹ / ₄ (591)
		600	36 ³ / ₄ (933)	22 (559)	22 (559)	24 (610)
		900	36 ³ / ₄ (933)	24 (610)	22 (559)	36 ¹ / ₄ (921)
16	400	150	44 ¹ / ₂ (1130)	23 ¹ / ₂ (597)	27 ¹ / ₂ (660)	43 ¹ / ₄ (1099)
		300	44 ¹ / ₂ (1130)	23 ¹ / ₂ (597)	27 ¹ / ₂ (660)	43 ¹ / ₄ (1099)
		600	44 ¹ / ₂ (1130)	27 (686)	31 ¹¹ / ₁₆ (805)	47 ⁷ / ₁₆ (1205)
		900	45 (1143)	27 ³ / ₄ (705)	32 ¹ / ₈ (816)	48 ⁵ / ₁₆ (1227)

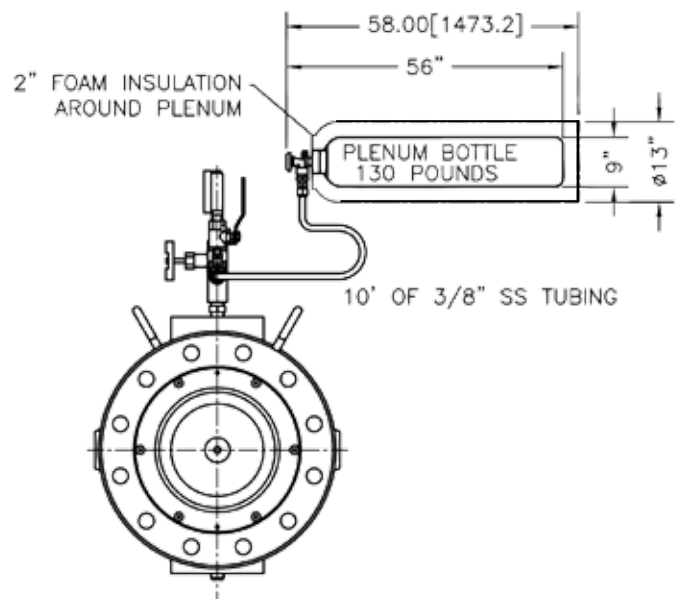


Maximum Valve Cv for delta P 25 >= psi

Valve Size (in)	DIN (mm)	Maximum Valve Cv For delta P 25 >= psi
2	50	120
3	75	330
4	100	480
6	150	1200
8	200	1900
10	250	3100
12	300	4200
16	400	7630

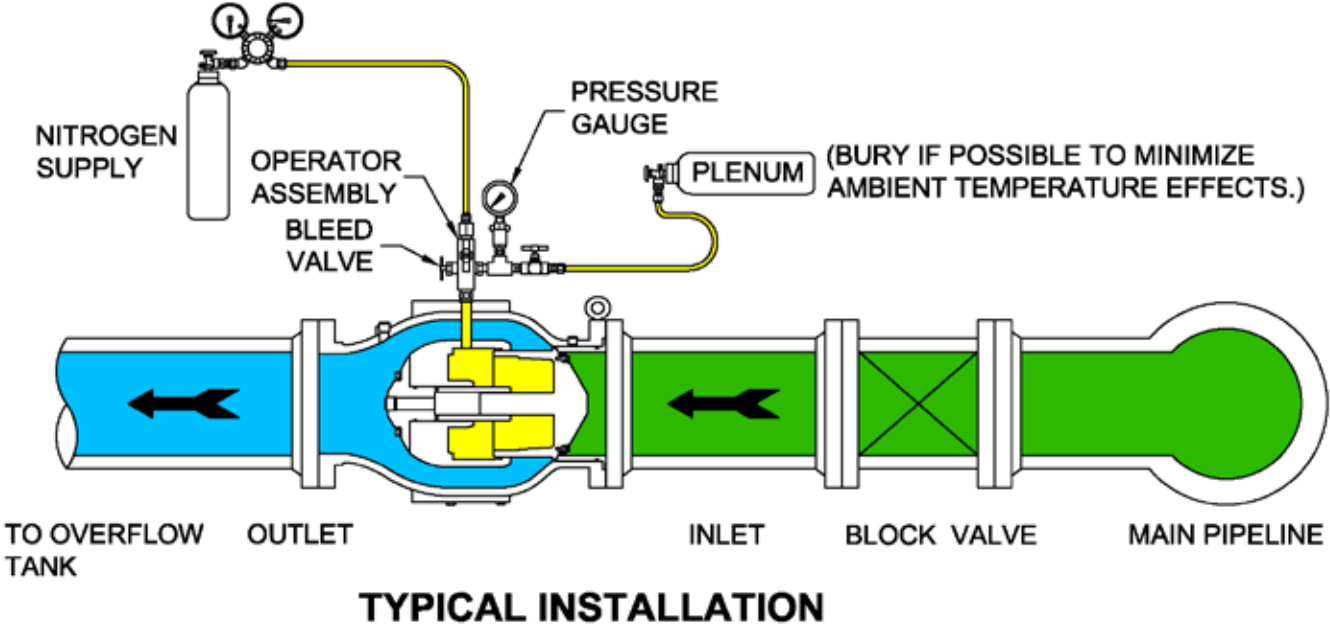
Approximate Shipping Weight & Dimensions

Size	Shipping Cube	Weight
2"	300# 0.92 Cu. Ft. (0.026 M³)	80 Lbs. (36 Kg.)
	600# 1.01 Cu. Ft. (0.029 M³)	86 Lbs. (39 Kg.)
	900# 1.02 Cu. Ft. (0.029 M³)	125 Lbs. (57 Kg.)
3"	300# 1.27 Cu. Ft. (0.036 M³)	123 Lbs. (55 Kg.)
	600# 1.35 Cu. Ft. (0.038 M³)	129 Lbs. (58 Kg.)
4"	300# 1.57 Cu. Ft. (0.045 M³)	154 Lbs. (70 Kg.)
	600# 1.88 Cu. Ft. (0.053 M³)	180 Lbs. (81 Kg.)
	900# 2.24 Cu. Ft. (0.063 M³)	420 Lbs. (190 Kg.)
6"	300# 3.01 Cu. Ft. (0.085 M³)	368 Lbs. (167 Kg.)
	600# 3.32 Cu. Ft. (0.094 M³)	412 Lbs. (187 Kg.)
	900# 3.78 Cu. Ft. (0.107 M³)	650 Lbs. (295 Kg.)
8"	300# 5.42 Cu. Ft. (0.153 M³)	560 Lbs. (254 Kg.)
	600# 5.74 Cu. Ft. (0.163 M³)	630 Lbs. (286 Kg.)
10"	300# 9.43 Cu. Ft. (0.267 M³)	970 Lbs. (440 Kg.)
	600# 9.49 Cu. Ft. (0.269 M³)	1100 Lbs. (500 Kg.)
12"	300# 14.45 Cu. Ft. (0.409 M³)	1625 Lbs. (737 Kg.)
	600# 17.36 Cu. Ft. (0.492 M³)	1820 Lbs. (825 Kg.)
16"	150# 25.61 Cu. Ft. (0.725 M³)	4500 Lbs. (2041 Kg.)
	300# 25.61 Cu. Ft. (0.725 M³)	4500 Lbs. (2041 Kg.)
	600# 26.0 Cu. Ft. (0.736 M³)	4500 Lbs. (2041 Kg.)
	900# 27.54 Cu. Ft. (0.780 M³)	5000 Lbs. (2268 Kg.)



M&J Can Supply the Whole Package

We can-and usually do-supply complete fabricated skids and nitrogen-control packages which can be temperature compensated for wide ambient temperature changes.



M&J can supply everything from surge relief valves to complete systems. DANFLO Surge Relief Systems provide the most effective way to protect your pipeline and equipment from unabated transient pressure surge waves (“water hammer”).



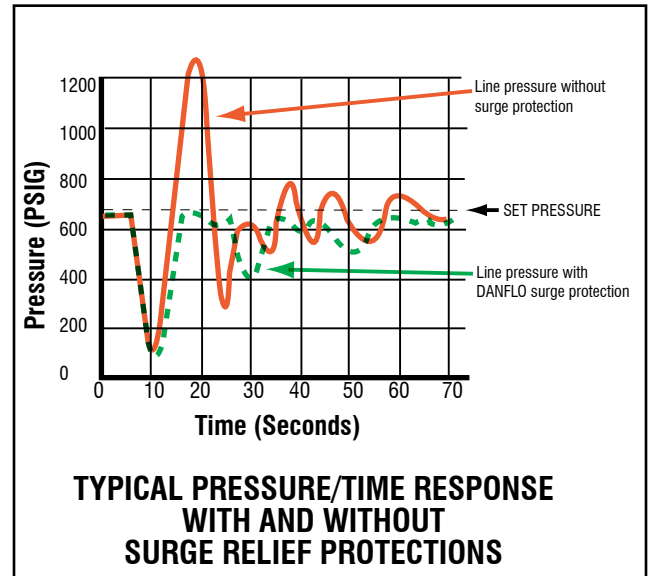
Track Transient Pressure Surges Precisely for Maximum Protection ⁽¹⁾

A pressure surge is generated in a pipeline system when there is any change in the rate of flow of liquid in the line. The surge pressure can be dangerously high if the change is too rapid.

Surge pressures are created from:

- (a) closure of an automatic emergency shutdown device (ESD valve)
- (b) rapid closure or opening of a manual or power operated valve
- (c) slamming shut of a non-return valve
- (d) starting or stopping of a pump

Surge pressure may vary in magnitude from virtually undetectable to sufficient severity to cause a major disaster. Prevalent problems from insufficient surge protection include axial separation of flanges, pipe fatigue at welds or longitudinal splits of the pipe, pumps knocked out of alignment, severe damage to piping and piping supports as well as damage to specialized components such as loading arms, hoses, filters, bellows, etc.



One of the first phases of a hydraulic-surge package should be a complete surge analysis. Part of the results of such analysis is the determination of how much flow will need to be relieved and at what set pressure. These two design criteria will help select a properly sized surge-relief package which will reduce surge pressure to an acceptable level during unsteady-state flow conditions.

Surge relief valves must respond rapidly yet operate very smoothly. They should open quickly to “track” the large initial pressure rise, then close in direct response to pressure decay at the valve inlet. The relieved flow is usually dumped into a large storage vessel and later returned to the product line.

(1) From Hydraulic Analysis, Ltd., Mill House, Hawksworth Rd., Horsforth, Leeds, LS18 4JP, England. Telephone (44) 0532 581622.

Soft Goods-Temperature Limits

Soft Good	Min Deg°F	Max Deg°F	Min Deg°C	Max Deg°C
Viton A	0	400	-18	204
Buna-N (Nitrile)	-20	250	-29	121
EPDM	-40	400	-40	204
Viton-GFLT	-20	300	-29	149
Buna-N LT	-65	225	-54	107
Nylon	-60	250	-51	121



M&J Valve surge relief system protects pipelines from transient pressure surges

Ordering Information

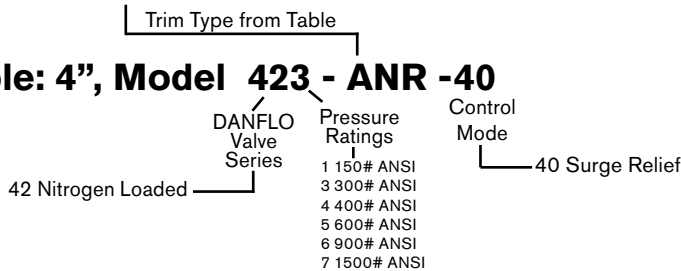
M&J has established a standard numbering system for DANFLO Surge Relief Valves.

Materials of Construction

Service	Trim No.	Body Material ⁽¹⁾	Metal Trim Components						Seats & Seal	
			Plug	Retainer	Seat Ring	Guide Sleeve	Spring ⁽⁴⁾	Internal Bolting	Seat	O-Rings
Non-Corrosive Service -20 to 400 F	A	ASTM A-216 WCC	ASTM A-216 WCC (ENP) ⁽²⁾	ASTM A-216 WCC (ENP)	316 SS	ASTM A-216 WCC/ Impreglon I.D.	Chromium Vanadium (Alloy Steel)	18-8 SS	Standard: Nylon Available: Viton A, Viton GFLT, Buna-N, EPDM, LT-Buna-N	Available Choices: Viton A Viton GFLT, Buna-N (Ni- trile), EPDM, LT-Buna-N
Non-Corrosive Service Low Temp -50 to 240 F	B	ASTM A-352 LCC	ASTM A-352 LCC (ENP)	ASTM A-352 LCC (ENP)	316 SS	ASTM A-352 LCC/ Impreglon I.D.	17-4PH SS	18-8 SS		
Mild-Corrosive Service -20 to 400 F NACE MR0175(3)	AN	ASTM A-216 WCC	ASTM A-216 WCC (ENP)	ASTM A-216 WCC (ENP)	316 SS	ASTM A-216 WCC/ Impreglon I.D.	17-4PH SS	18-8 SS		
Mild-Corrosive Service Low Temp. -50 to 240 F NACE MR0175	BN	ASTM A-352 LCC	ASTM A-352 LCC (ENP)	ASTM A-352 LCC (ENP)	316 SS	ASTM A-352 LCC/ Impreglon I.D.	17-4PH SS	18-8 SS		
Corrosive Service -20 to 400 F	E	ASTM A-216 WCC (ENP)	17-4PH SS	17-4PH SS	316 SS	17-4PH SS/ Impreglon I.D.	Inconel X750	18-8 SS		

- (1) Where internal body corrosion is unacceptable with WCC material, consult factory for body recommendation.
- (2) ENP=Electroless Nickel Plated
- (3) NACE Trim meets MR01-75 Latest Edition
- (4) Spring is not required for nitrogen loaded Danflo valves

Example: 4", Model 423 - ANR -40



Nitrogen Usage Formula

For Surge Relief Systems with DANFLO Valves and Self-Relieving Regulators

- Daily surge relief valve usage, SCFD

$$V = 35.92 (P_R \times 0.75) V_T \left(\frac{1}{T_1} - \frac{1}{T_2} \right) n$$

- Usable nitrogen supply per "K" bottle, ft³

$$N = 235 - \left[\frac{(P_1 + 100)}{14.7} \times V_P \right]$$

- Days supply available per "K" bottle

$$D = \frac{N}{V} \text{ (See Notes)}$$

Where: V=daily surge relief valve usage, SCFD

n=number relief valves per location

P_R=relief valve set pressure, psia

P₁= relief valve cavity set pressure, psia=P_R x 0.75

V_T=relief valve changer volume=(I+V_p) ft³ (see table)

I=relief valve plug cavity volume, ft³ (see table)

V_P=plenum volume empty, ft³=1.55 ft³

T₁=average low temperature, °R=°F+460

T₂=average high temperature, °R=°F+460

V_N=initial volume of "K" bottle at 2200 psi, ft³=253ft³

NOTES: Because of valve internal construction, nitrogen set pressure should be approximately 75% of desired valve relief pressure; the formula shown above takes this into account. Also, care should be taken in calculating the term involving the difference of the reciprocals of temperatures (Formula 1 above). Since the term expresses the differences of two similar numbers, it should be calculated to 4 significant figures.

Example:

Nitrogen usage for Four 12" 150# DANFLO Valves in a Surge Relief System

Set Pressure (P_R)=190 psig or 204.7 psia

T₁=50°F or 510°R

T₂=86°F or 546°R

- Daily Surge Relief Valve Usage, SCFD

$$V = 35.92 (204.7 \times 0.75) 1.95 \left(\frac{1}{510} - \frac{1}{546} \right) 4$$

$$V = 35.92 (153.5) (1.95) (0.00196 - 0.00183) (4)$$

$$V = 5.59 \text{ SCFD}$$

- Usable Nitrogen Supply per "K" Bottle, ft³

$$N = 235 - \left[\frac{(153.5 + 100)}{14.7} \times 1.55 \right]$$

$$N = 235 - (17.24) \times (1.55)$$

$$N = 208.3 \text{ ft}^3$$

- Days Supply Available per "K" Bottle*

$$D = \frac{208.3}{5.59}$$

$$D = 37.3 \text{ days/bottle}$$

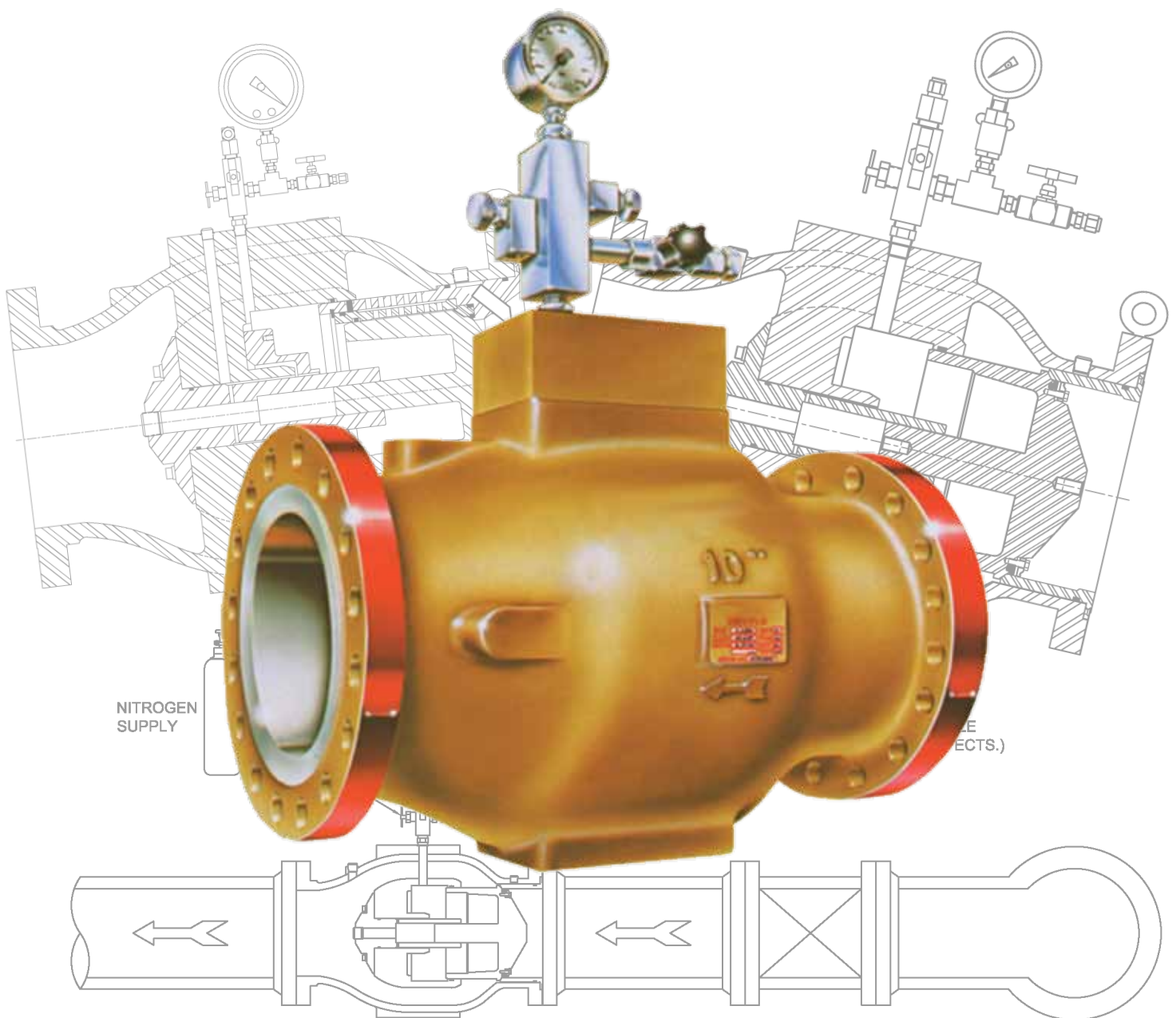
Table 1

DANFLO Plug Cavity (Volumes in Ft ³)			
Size	I	Vp*	VT=I+Vp
2"	0.004	1.55	1.55
3"	0.013	1.55	1.56
4"	0.017	1.55	1.57
6"	0.056	1.55	1.61
8"	0.118	1.55	1.67
10"	0.239	1.55	1.79
12"	0.401	1.55	1.95
16"	0.800	1.55	2.35

NOTE: This data for "K" sized bottle.
(Size 200, meets DOT Spec. 2265)

Major Benefits and Advantages of DANFLO Liquid Surge Relief Valves

- **High flow capacities (Cv) mean you can use smaller and/or fewer valves to provide the surge protection you need. Save on installation cost and save weight.**
- **Fast response-rapid open/closing without slamming shut-allows the valve to “track the surge.”**
- **Additional reserve flow capacity allows for unforeseen transient surge flow.**
- **Set pressure test port to meet Department of Transportation periodic-testing requirements. Reference U.S. Department of Transportation, Pipeline Safety Regulations, Hazardous Liquids Part 195, paragraph 195.428, Overpressure Safety Devices.**





SPX®

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For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.mandjvalve.com.

SPX Corporation reserves the right to incorporate our latest design and material changes without notice or obligation.

Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing.

Issued: 02/2011 MJ-1688

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