

3-5111/3-5161

■ The Company



A Strategic Alliance between Nacional Safety Valves and BS&B Pressure Safety Management

One of the most expansive markets to be found in the world today revolves around protecting industrial processes from damages caused by overpressure. To better serve this important need, the industry leaders of Nacional Safety Valves and BS&B Pressure Safety Management have teamed together to provide a “total solution approach” to overpressure relief needs. Through a strategic alliance, Nacional Safety Valves and BS&B Pressure Safety Management offers a variety of overpressure relief devices including safety valves, buckling pin valves, and rupture disk devices. The two companies will continue to operate as separate entities.

Both Nacional Safety Valves and BS&B Pressure Safety Management are established companies with decades of overpressure protection experience. Nacional has been designing and producing safety valves according to most recognized international standards for over four-decades. BS&B Pressure Safety Management has proven itself as a leading supplier of overpressure relief devices with a comprehensive portfolio of products and services that meet and exceed rigorous industry standards for quality and reliability.

As part of the strategic agreement established in 2017, BS&B Pressure Safety Management offers spring-loaded pressure relief valves manufactured by Nacional, under the combined brand name, “Nacional BS&B”. Nacional distributes a portfolio of overpressure relief devices supplied by BS&B Pressure Safety Management including rupture disk devices, safety relief valves, buckling pin valves, flame arresters, explosion protection, and wireless instrumentation.

About BS&B Pressure Safety Management

BS&B Pressure Safety Management is a solution provider company dedicated to supplying safety devices and systems according to customer defined application conditions. The company’s rich history spans more than 80-years with the BS&B name being well known for its innovative solutions in personal and property protection against dangerous overpressurizations and explosions within industrial settings. BS&B’s integrated solutions have been time tested and fine-tuned to deliver maximum value and greater efficiencies to individual engineering processes.

About Válvulas Nacional

VALVULAS NACIONAL, S.A. was established in Spain in 1976. The main target was to provide safety relief valves to the petrochemical and chemical industries emerging in Spain at that time. VALVULAS NACIONAL, S.A., has been designing and producing safety valves according to most recognized international standards and certifications: API 526 & 527, ASME B16.34 & ASME VIII DIV. 1, NB “UV” Stamps, ASTM and the European Directives 2014/68/EU (PED), PED Module B+D, 24/34 EU (ATEX), TR – CU, GOST U, and GOST TDS. The production process is accredited by ISO 9001.



■ Index

• GENERAL FEATURES	4
• PART LIST	5
• OPERATING CHARACTERISTICS TABLE	5
• BILL OF MATERIALS	6
• ACCESSORIES AND CONNECTIONS	7
• GENERAL DIMENSIONS 3-5111	8
• GENERAL DIMENSIONS 3-5161	9
• CORRECTION COEFFICIENTS CHARTS	10
• AIR DISCHARGE FLOW	11
• STEAM DISCHARGE FLOW	12
• LIQUIDS DISCHARGE FLOW	13
• DEFINITIONS (EN ISO 4126-1)	15

■ General features

SAFETY AND RELIEF VALVE 3-5111

The model 3-5111 is an angular type safety relief valve at 90° between the inlet and outlet connections. It is supplied with threaded or flanged connections, full nozzle, direct action, spring loaded, with full lift and fast opening.

DESIGN

- Valve body is the angular type at 90° between inlet and outlet. In the flanged version, these are integral with the casting (not welded). The smooth body section helps reduce turbulence so fluid discharge is improved.
- Full nozzle type, guided and screwed to the body, enabling precise alignment and easy disassembly.
- Disc is separate from disc-holder, making repair or replacement easy, even with alternate materials.
- Guide has a large disc holder area to prevent damage, ensuring precise alignment with all internal elements.
- Springs are designed with highly reliable software and manufactured with the correct material of construction for the process conditions, ensuring accurate valve openings.
- Used interchangeably as safety or relief valves, for both gases and liquids. It's typically used as thermal expansion valve and also used for relief of small flows.
- Upon request are available options such as a lifting lever, "test-gag", "O-Ring", heat jacket, opening sensor etc.

SAFETY AND RELIEF VALVE 3-5161

The model 3-5161, is created from the basic design model 3-5111, but differs by having bellows. This allows the valve to operate when the backpressure is variable. It also protects internal parts from corrosive gases during discharge pipelines. The bellows are manufactured so the average area is equal to the orifice area. This allows valve operation at maximum pressures and temperatures.

CODES AND STANDARDS

Valves have been designed and manufactured in compliance with the following directives, codes and standards:

Pressure and Temperature Limits:	API-526 & ASME B16.34
Tests:	API-527 & ASME B16.34
Design:	ASME VIII DIV.1 / EN ISO 4126-1
Materials:	ASTM/ASME & EN
Certifications:	PED MODULE B+D
Quality system:	EN ISO 9001:2008
European Directive:	97/23/CE (PED)
European Directive:	94/9/CE (ATEX)

SIZES AND RATINGS

Flanged and threaded options are available in both model 3-5111 and 3-5161. Standard sizes and ratings:

ASME / ANSI:	
Sizes:	½"x¾" to 1"x1"
Rating:	150# to 2500#
EN/ISO:	
Sizes:	DN-15xDN-25 to DN-25xDN-25
Rating:	PN-10 to PN-250

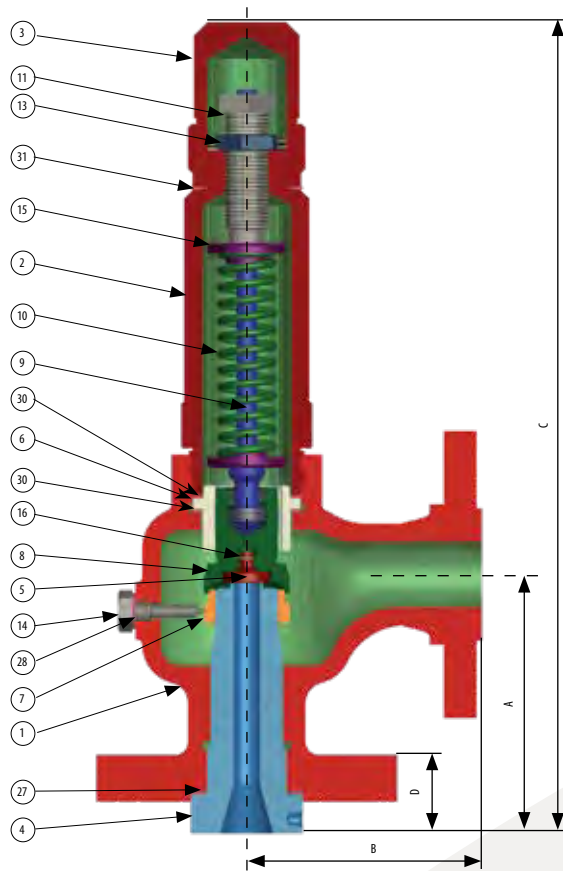
The safety valve is an automatic direct action device whose function is to relieve excessive overpressures in installations that it protects. Its main operation is to allow sudden fluid discharge with a complete and fast opening (pop).

The automatic valve opening is produced because of the additional push provided by the overpressure of the fluid overcoming resistance. Once the installation has recovered to its normal service conditions, the valve closes again.

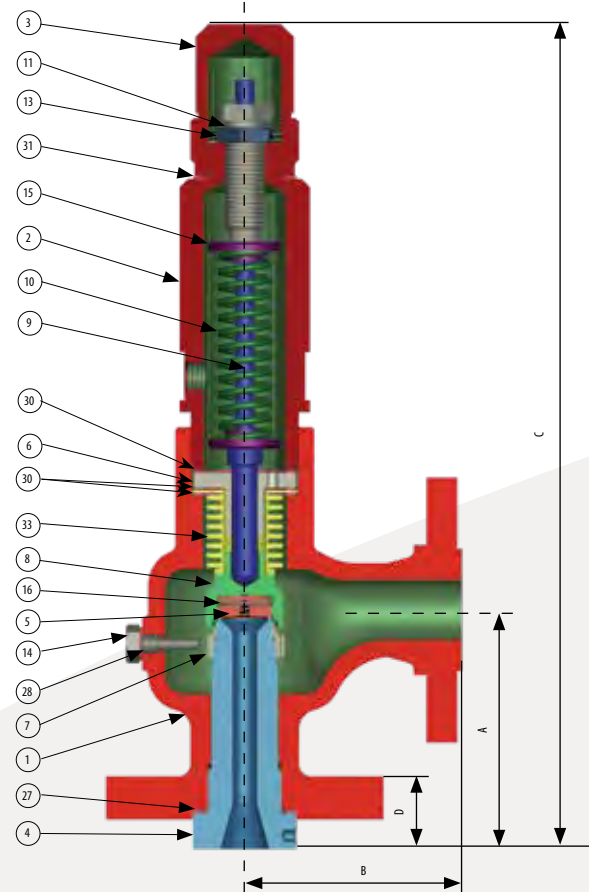
The data contained in this catalog is approximate. For exact operational data, always check the specification sheets.



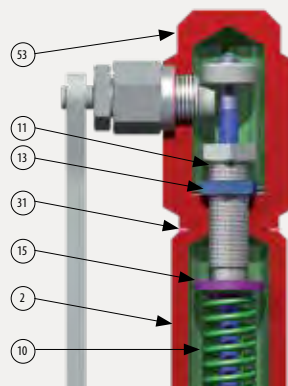
■ Part list



CONVENTIONAL



BELLOWS VALVE



LEVER

Operating technical characteristics table						
SAFETY VALVE MODEL 3-51			3-5111	3-5161	3-5111	3-5161
			Conventional	Bellows	Conventional	Bellows
SERVICE			GAS		LIQUID	
DISCHARGE COEFFICIENT (at 10% of overpressure)	(1)	(1) KD	0.94		0.80	
		Max	10% (2)		15% (3)	
BLOWDOWN	(4)	Min	-2%		-2.5%	
		±	3%			
MINIMUM SET PRESSURE	ASME VIII Div.1 (psig)		14.5			
	EN ISO 4126-1 (psig)		7.25			

Bill of materials

CLASS		A	B	C	D	E	N1 (Duplex)	O (Super Dup.)	NACE - A
ITEM	DENOMINATION	-20 to 450 °F	451 to 797 °F	799 to 1000 °F	-51 to 653 °F	-450 to 1000 °F (*)	-20 to 500 °F	-20 to 601 °F	-20 to 797 °F
1	BODY	SA 216 WCB	SA 216 WCB	SA 217 WC6	SA 352 LCB	SA 351 CF8M	SA 995 CD4MCuN (3)	SA 995 CD3MWCuN (3)	SA 216 WCB
2	BONNET	SA 105	SA 105	SA 479 316	SA 479 316	SA 479 316	SA 479 S32550	SA 479 S32760	SA 105
3	CAP	SA 105	SA 105	SA 479 316	SA 479 316	SA 479 316	SA 479 316	SA 479 316	SA 105
4	NOZZLE	SEE SUBCLASS							
5	DISC								
6	GUIDE	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 S32550	A 479 S32760	A 479 316
7	ADJUSTING RING	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 S32550	A 479 S32760	A 479 316
8	DISC HOLDER	A 479 410	A 479 410	A 479 410	A 479 410	A 479 316	A 479 S32550	A 479 S32760	A 479 316
9	STEM	A 276 420 (8)	A 276 420 (8)	A 276 420 (8)	A 276 420 (8)	A 479 316	A 479 316	A 479 316	A 479 316
10	SPRING	A.C. 50CRV4	Inconel® X-750	Inconel® X-750	A 313 316 (4)	A 313 316 (4)	A 313 316 (4)	A 313 316 (4)	Inconel® X-750
11	ADJUSTING SCREW	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303
13	NUT	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303
14	LOCK SCREW	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303	A 582 303
15	SPRING BUTTON	F-212	F-212	F-212	A 582 303	A 582 303	A 582 303	A 582 303	F-212
16	ELASTIC RING	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302
17	ELASTIC PIN	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302
27	GASKET	Compressed Fibers	GRAPHITE/AISI 316			Compressed Fibers (1)(2)			Comp. Fibers (1)
28	GASKET	Compressed Fibers	GRAPHITE/AISI 316			Compressed Fibers (1)(2)			Comp. Fibers (1)
30	GASKET	Compressed Fibers	GRAPHITE/AISI 316			Compressed Fibers (1)(2)			Comp. Fibers (1)
31	GASKET	Compressed Fibers	GRAPHITE/AISI 316			Compressed Fibers (1)(2)			Comp. Fibers (1)
33	BELLOWS	AISI 316Ti (5)	AISI 316Ti (5)	AISI 316Ti (5)(6)	AISI 316Ti (5)	AISI 316Ti (5)(6)	AISI 316Ti (5)	AISI 316Ti (5)	Inconel® 625
34	GASKET	COMPRESSED FIBERS (1)							
43	BRACKET	A 105	A 105	A 105	A 105	A 479 316	A 479 316	A 479 316	A 105
44	SET BOLT	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304
45	PLAIN LEVER STEM	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316
46	SPLIT PIN	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304
47	PLAIN LEVER	A 351 CF8M	A 351 CF8M	A 351 CF8M	A 351 CF8M	A 351 CF8M	A 351 CF8M	A 351 CF8M	A 351 CF8M
53	LAVER CAP	SA 105	SA 105	SA 479 316	SA 479 316	SA 479 316	SA 479 316	SA 479 316	SA 479 316
54	LEVER STEM	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316
56	LEVER SHAFT	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A479 316	A479 316	A 479 316
57	PACKING	BRAID GRAPHITE							
58	PACING NUT	A 105	A 105	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316
59	PACKED LEVER	A.C.	A.C.	A.C.	A.C.	A.C.	A.C.	A.C.	A.C.
62	SHAFT BRACKET	A 105	A 105	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316	A 479 316
63	ELASTIC RING	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302	AISI 302
64	GASKET	COMPRESSED FIBERS							
65	SPIRAL PIN	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304
67	TEST GAG	A.C.	A.C.	A.C.	A.C.	AISI 304	AISI 304	AISI 304	A.C.

(*) At temperatures above 1000°F, use only when the carbon content of CF8M and 316 is 0.04% or higher

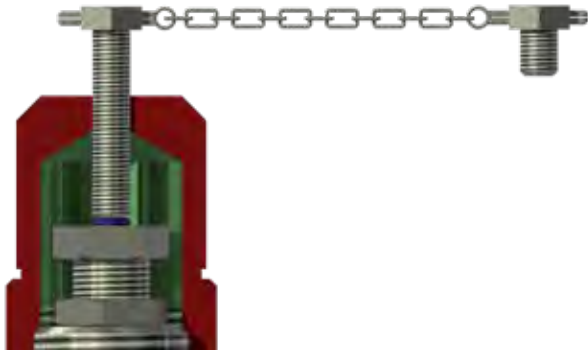
SUBCLASS	1	2	3	4	10 (Duplex)	11 (Super Dup.)	
4	NOZZLE	SA 479 316	SA 479 316 + ST	SA 479 316+ST.	SA 479 316	SA 479 S32550	SA 479 S32760
5	DISC	SA 479 316	SA 479 316 (7)	SA 479 316+ST.	SA 564 630 (7)	SA 479 S32550	SA 479 S32760

- (1) T>450 °F Graphite Material
 (2) T<-20 °F Graphite Material
 (3) Optional: Made of equivalent bar material
 (4) T>572 °F Inconel® X-750 material (tempered)
 (5) Ending made of SS 316L

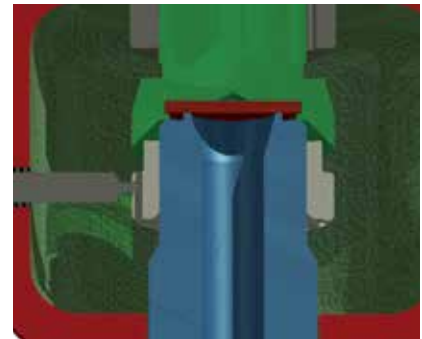
- (6) T>842 °F Inconel® 625 material
 (7) H900 Condition, hardness between 40 ÷ 47 HRC. For temperatures > -22 °F. H1150-M Condition, hardness between 27 ÷ 30 HRC. For temperatures < -22°F.
 (8) Tempered and annealed a 45 ÷ 50 HRC.

Inconel® is a trademark of Special Metals Corporation.

■ **Accessories**



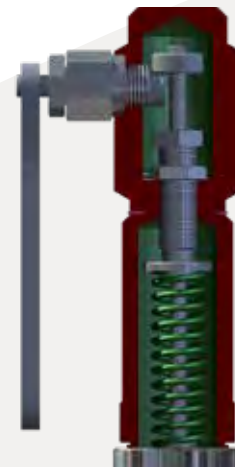
TEST-GAG



O-RING

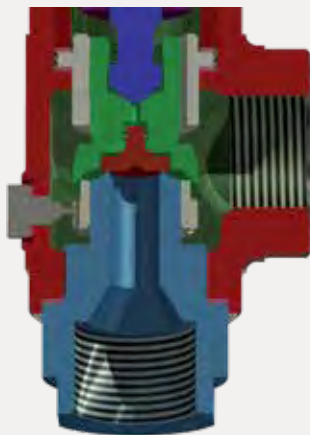


HEATING JACKET

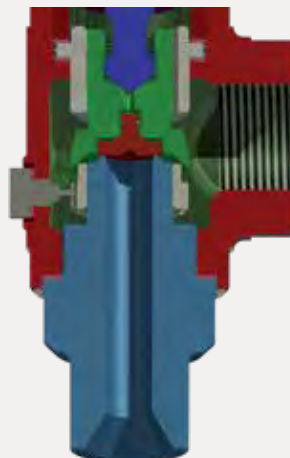


LEVER

■ **Connections**



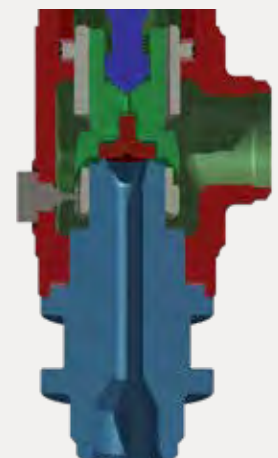
THREADED FEMALE



THREADED MALE



SOCKET WELDING



BUTT WELDING

■ General Dimensions

								MODEL 3-5111								
		SIZES				ORIFICES	General Dimensions (in)					Std.	Lever			
		INLET	OUTLET				A	B	C	D	E	Weight - (lbs)				
FLANGED CONNECTIONS	ASME	INLET 150-600# OUTLET 150#	1/2"	1"			C, D, E	3.89	3.54	12.24	1.19	13.34	13.22	15.43		
			3/4"				C, D, E, F									
			1"				C, D, E, F									
		INLET 900/1500# OUTLET 150/300#	1/2"	1"			C, D, E			4.13	12.48	1.41	13.58	15.43	17.63	
			3/4"				C, D, E, F									
			1"				C, D, E, F									
	INLET 2500# OUTLET 300#	1/2"	1"			C, D, E	4.37	12.71	1.73	13.81	17.63	19.84				
		3/4"				C, D, E, F										
		1"				C, D, E, F										
DIN	INLET PN-16-160 OUTLET PN-16-40	DN-15	DN-25			C, D, E	3.89	12.24	1.18	13.34	13.22	15.43				
		DN-20				C, D, E, F										
		DN-25				C, D, E, F										
THREADED CONNECTIONS	NPT/GAS	H/H	1/2"	3/4"	1"	1 1/4"	C, D	1.81	10.43	11.06	11.53	6.61	8.81			
			3/4"	C, D, E, F												
			1"	C, D, E, F												
	NPT/GAS	M/H	1/2"	3/4"	1"	1 1/4"	C, D				3.54			11.81	12.91	12.16
			3/4"	C, D, E, F												
			1"	C, D, E, F												

ORIFICES	Type	Ø in.	Area (in) ²	Set Pressure Range
	C	0.24	0.04	7.25 - 6090 (psig)
	D	0.39	0.12	7.25 - 2610 (psig)
	E	0.50	0.19	7.25 - 1450 (psig)
	F	0.62	0.30	7.25 - 797 (psig)



FLANGED



THREADED FEMALE



THREADED MALE



LEVER

■ General Dimensions

		SIZES				ORIFICES	MODEL 3-5161					Std.	Level					
		INLET	OUTLET		General Dimensions (in)					Weight - (lbs)								
CONNECTIONS	STANDARD				A		B	C	D		E							
		FLANGED CONNECTIONS	ASME	INLET 150-600# OUTLET 150#	1/2"	1"		C, D, E	3.89	3.54	13.42	1.18	14.52	15.43	17.63			
3/4"	C, D, E, F																	
1"	C, D, E, F																	
INLET 900/1500# OUTLET 150/300#	1/2"			C, D, E	4.13	13.42	1.41	14.76			17.63	19.84						
	3/4"			C, D, E, F														
	1"			C, D, E, F														
INLET 2500# OUTLET 300#	1/2"		C, D, E	4.37	13.66	1.73	15.00	19.84	22.04									
	DIN		DN-25								C, D, E	3.89	13.89	1.18	14.52	15.43	17.63	
	INLET PN-16-160 OUTLET PN-16-40										DN-20							C, D, E, F
		DN-25		C, D, E, F														
THREADED CONNECTIONS	NPT/GAS	H/H	1/2"	3/4"	1"	1 1/4"	C, D	1.81	11.61		12.71	8.81	11.02					
			3/4"	C, D, E, F			2.16											
			1"	C, D, E, F										2.79				
	NPT/GAS	M/H	1/2"	3/4"	1"	1 1/4"	C, D		3.54	12.24					13.34			
			3/4"	C, D, E, F			12.99											
			1"	C, D, E, F										14.09				

ORIFICES	Type	Ø in.	Area (in) ²	Set Pressure Range
	C	0.24	0.04	7.25 - 797 (psig)
	D	0.39	0.12	
	E	0.50	0.19	
	F	0.62	0.30	



FLANGED



THREADED FEMALE



THREADED MALE



LEVER

■ Correction Coefficient Factors

DENS.	Kg	°F	Kt	K	Kc	P1 (psig)	T (°F)	0.99	0.97	0.93	0.89	0.85	0.81	0.77
								SUPERHEATED STEAM (°F)						
0.2	2.240	-20	1.087	1.01	1	7.3	231.8	276.8	330.8	460.4	570.2	670.1	783.5	920.3
0.3	1.825	-9	1.075	1.02	1.01	14.5	247.1	267.8	338.0	462.2	568.4	667.4	781.7	919.4
0.4	1.580	-0	1.063	1.04	1.016	21.8	260.6	287.6	345.2	464.0	564.8	663.8	780.8	917.6
0.5	1.414	10	1.052	1.06	1.022	29.0	271.4	294.8	350.6	464.9	563.0	662.0	778.1	917.2
0.6	1.320	19	1.041	1.08	1.029	36.3	280.4	303.8	354.2	465.8	561.2	661.1	776.3	916.7
0.7	1.195	30	1.03	1.1	1.033	43.5	289.4	312.8	361.4	467.6	560.3	659.3	773.6	915.8
0.8	1.117	39	1.02	1.12	1.044	50.8	296.6	321.8	365.0	469.4	559.4	657.5	771.8	915.8
0.82	1.104	50	1.01	1.14	1.051	58.0	303.8	327.2	370.4	471.2	558.5	655.7	770.0	915.4
0.84	1.091	59	1	1.16	1.057	65.3	310.1	334.4	374.0	473.0	557.6	654.8	770.0	914.9
0.86	1.078	70	0.991	1.18	1.063	72.5	316.4	339.8	379.4	474.8	556.7	653.0	770.0	914.9
0.88	1.066	81	0.981	1.2	1.07	87.0	327.2	348.8	388.4	478.4	563.0	652.1	769.1	914.4
0.9	1.055	90	0.972	1.22	1.076	101.5	337.1	359.6	395.6	483.8	554.9	651.2	768.2	914.0
0.92	1.043	100	0.964	1.24	1.083	116.0	346.1	366.8	402.8	487.4	555.8	651.2	766.4	913.1
0.94	1.031	109	0.955	1.26	1.089	130.5	354.2	375.8	410.0	492.8	557.6	652.1	765.5	912.2
0.96	1.021	120	0.947	1.28	1.095	145.0	361.4		417.2	496.4	560.3	653.9	764.6	912.2
0.98	1.010	129	0.939	1.3	1.102	159.5	368.6		422.6	501.8	563.9	654.8	764.6	912.2
1	1.000	140	0.931	1.32	1.108	174.0	374.9		428.0	505.4	568.4	655.7	764.6	911.3
1.02	0.990	151	0.923	1.34	1.113	188.5	381.2		435.2	509.0	572.0	656.6	764.1	910.4
1.04	0.981	160	0.916	1.36	1.118	203.1	387.5		440.6	512.6	574.7	658.4	763.7	910.4
1.06	0.971	180	0.901	1.38	1.124	217.6	392.9		444.2	515.3	577.4	660.2	762.8	910.4
1.08	0.962	199	0.888	1.4	1.13	232.1	398.3		449.6	518.9	580.1	662.0	762.8	910.4
1.1	0.953	219	0.875	1.42	1.136	246.6	402.8		453.2	521.6	582.8	663.8	762.8	910.0
1.12	0.945	241	0.862	1.44	1.141	261.1	408.2		456.8	525.2	585.5	665.6	762.8	910.0
1.14	0.937	261	0.850	1.46	1.146	275.6	412.7		462.2	527.9	588.2	666.5	763.7	910.0
1.16	0.928	280	0.838	1.48	1.152	290.1	417.2		465.8	531.5	590.9	667.4	764.1	910.0
1.18	0.921	300	0.827	1.5	1.157	304.6	421.7		469.4	535.1	593.6	668.3	764.6	909.6
1.2	0.913	320	0.817	1.52	1.162	319.1	426.2		473.0	538.7	596.3	669.2	765.1	909.2
1.25	0.895	340	0.806	1.54	1.168	333.6	430.7		476.6	542.3	599.0	670.1	765.6	908.8
1.3	0.877	360	0.796	1.56	1.172	348.1	435.2		480.2	545.9	601.7	671.0	766.1	908.4
1.35	0.861	379	0.787	1.58	1.177	362.6	439.7		483.8	549.5	604.4	671.9	766.6	908.0
1.4	0.845	399	0.778	1.6	1.182	377.1	444.2		487.4	553.1	607.0	672.8	767.1	907.6
1.45	0.830	500	0.736	1.62	1.187	391.6	448.7		491.0	556.7	609.7	673.7	767.6	907.2
1.5	0.817	601	0.701	1.64	1.193	406.1	453.2		494.6	560.3	612.3	674.6	768.1	906.8
1.55	0.803	700	0.670	1.66	1.197	420.6	457.7		498.2	563.9	615.0	675.5	768.6	906.4
1.6	0.791	801	0.643	1.68	1.202	435.1	462.2		501.8	567.5	617.6	676.4	769.1	906.0
1.65	0.779	896	0.618	1.7	1.207	449.6	466.7		505.4	571.1	620.3	677.3	769.6	905.6
1.7	0.768	1000	0.597	2	1.27									
1.75	0.756			2.2	1.308									
1.8	0.745													
1.9	0.725													
2	0.707													
2.1	0.690													
2.2	0.674													
2.3	0.659													
2.4	0.645													
2.5	0.633													

If the flow charts on the following pages for the determination of the orifices are used, it will be necessary to apply the correction coefficients indicated here for fluids or working conditions different from those used in the following tables.

■ Air discharge flow

Medium: Air Capacity in SCFH Overpressure: 10%		Air relative density other than 1, multiply by Kg Temperature other than 59 °F, multiply po Kt K values other than 1.01, multiplied by Kc		
P1 (psig)	Orifices designation / Areas (in ²)			
	C	D	E	F
	0.05	0.12	0.20	0.31
7.25	1147.7	2888.7	4686.3	7334.9
14.50	1486.7	3743.4	6070.6	9503.2
21.76	1825.8	4598.0	7454.9	11668.0
29.01	2164.8	5449.1	8839.3	13832.8
36.26	2539.1	6388.4	10361.3	16216.5
43.51	2913.5	7327.8	11883.4	18600.2
50.76	3284.3	8267.2	13405.4	20980.4
58.02	3658.6	9203.0	14927.5	23364.2
65.27	4029.4	10142.4	16449.6	25747.9
72.52	4403.7	11081.7	17971.6	28128.1
87.02	5148.9	12957.0	21015.8	32895.6
101.53	5897.5	14835.7	24059.9	37659.6
116.03	6642.7	16710.9	27104.0	42423.5
130.53	7387.8	18589.6	30148.1	47191.0
145.04	8133.0	20468.4	33192.3	51954.9
159.54	8881.6	22343.6	36236.4	56718.9
174.05	9626.8	24222.3	39280.5	61482.8
188.55	10371.9	26097.5	42324.6	66250.3
203.05	11117.1	27976.3	45368.8	71014.3
217.56	11865.7	29851.5	48416.4	75778.2
232.06	12610.9	31730.2	51460.5	80545.7
246.56	13356.0	33605.4	54504.7	85309.6
261.07	14101.1	35484.2	57548.8	90073.6
275.57	14849.8	37359.4	60592.9	94841.1
290.08	15595.0	39238.1	63637.0	99605.0
362.59	19324.2	48624.8	78857.7	123431.8
435.11	23053.4	58011.4	94078.3	147255.1
507.63	26786.2	67394.5	109302.4	171081.9
580.15	30515.4	76781.2	124523.1	194905.2
652.67	34244.6	86167.8	139743.7	218732.0
725.19	37977.4	95550.9	154967.8	242555.3
797.71	41706.6	104937.5	170188.5	266382.1
870.23	45435.9	114324.2	185409.1	290205.4
942.75	49165.1	123710.8	200629.7	314032.2
1015.26	52897.8	133093.9	215853.9	337855.4
1087.78	56627.1	142480.6	231074.5	361682.3
1160.30	60356.3	151867.2	246295.1	385509.1
1232.82	64089.1	161253.8	261519.3	409332.3
1305.34	67818.3	170637.0	276739.9	433159.1
1377.86	71547.5	180023.6	291960.5	
1450.38	75276.8	189410.2	307184.7	
1595.41	82738.7	208180.0	337625.9	
1740.45	90197.2	226953.3	368070.7	
1885.49	97659.2	245723.0	398511.9	
2030.53	105121.2	264496.3	428956.7	
2175.57	112579.6	283266.0	459401.5	

■ Air discharge flow *Continued*

Medium: Air Capacity in SCFH Overpressure: 10%		Air relative density other than 1, multiply by Kg Temperature other than 59 °F, multiply po Kt K values other than 1.01, multiplied by Kc			
P1 (psig)	Orifices designation / Areas (in ²)				
	C	D	E	F	
2320.60	120041.6	302039.3	489842.7		
2465.64	127500.1	320809.1	520287.5		
2610.68	134962.1	339578.8			
2755.72	142420.5	358352.1			
2900.75	149882.5				
3190.83	164803.0				
3480.90	179723.4				
3770.98	194643.9				
4061.06	209564.3				
4351.13	224484.8				
4641.21	239408.7				
4931.28	254329.2				
5221.36	269249.6				
5511.43	284170.1				
5801.51	299090.5				
6091.58	314011.0				

■ Steam discharge flow

Medium: STEAM Flow in Lb/ h Overpressure: 10%				Values for saturated steam For superheated steam, multiplied by Ks Discharge coefficient = 0.94			
Set press. (psig)	C	K	Vol.	Orifices designation / Areas (in ²)			
				C	D	E	F
				0.05	0.12	0.20	0.31
14.5	0.6698	1.31	0.8804	76.1	191.6	310.6	486.3
21.8	0.6696	1.31	0.7152	93.5	235.2	381.4	597.0
29.0	0.6693	1.31	0.6034	110.7	278.7	451.7	707.0
36.3	0.6691	1.31	0.5224	128.7	323.6	524.9	821.7
43.5	0.6689	1.31	0.4610	146.6	368.8	598.1	936.1
50.8	0.6687	1.31	0.4128	164.5	413.8	671.1	1050.3
58.0	0.6686	1.31	0.3739	182.3	458.6	743.6	1163.8
65.3	0.6684	1.31	0.3419	200.0	503.1	816.2	1277.4
72.5	0.6683	1.30	0.3150	217.6	547.8	888.2	1390.5
87.0	0.6680	1.30	0.2723	253.1	636.7	1032.4	1616.0
101.5	0.6678	1.30	0.2400	288.1	725.3	1176.2	1841.1
116.0	0.6675	1.30	0.2146	323.4	813.5	1319.5	2065.3
130.5	0.6673	1.30	0.1941	358.5	901.9	1462.5	2289.3
145.0	0.6671	1.30	0.1773	393.5	989.9	1605.4	2512.8
159.5	0.6669	1.30	0.1631	428.4	1077.8	1748.0	2736.2
174.0	0.6668	1.30	0.1511	463.4	1165.8	1890.7	2959.5
188.5	0.6666	1.30	0.1407	498.2	1253.8	2033.3	3182.6
203.0	0.6665	1.30	0.1316	533.1	1341.5	2175.7	3405.5
217.6	0.6663	1.29	0.1236	568.1	1429.5	2318.2	3628.4
232.1	0.6662	1.29	0.1166	603.0	1517.2	2460.6	3851.5
246.6	0.6661	1.29	0.1103	638.0	1605.2	2603.2	4074.4
261.1	0.6660	1.29	0.1046	672.9	1692.9	2745.6	4297.5

■ Steam discharge flow *Continued*

Medium: STEAM Flow in Lb/ h Overpressure: 10%				Values for saturated steam For superheated steam, multiplied by Ks Discharge coefficient = 0.94			
Set press. (psig)	C	K	Vol.	Orifices designation / Areas (in ²)			
				C	D	E	F
275.57	0.6659	1.29	0.0995	707.9	1780.9	2888.3	4520.8
290.1	0.6658	1.29	0.0949	742.7	1868.9	3030.9	4744.1
362.6	0.6653	1.29	0.0769	918.0	2310.0	3746.1	5863.6
435.1	0.6651	1.29	0.0645	1094.4	2753.3	4465.5	6989.5
507.6	0.6650	1.29	0.0554	1271.8	3200.2	5190.3	8123.8
580.1	0.6650	1.29	0.0485	1451.1	3651.3	5921.6	9268.7
652.7	0.6651	1.29	0.0430	1632.3	4107.0	6660.8	10425.6
725.2	0.6654	1.29	0.0386	1815.5	4568.2	7408.8	11596.3
797.7	0.6659	1.29	0.0349	2001.4	5035.6	8166.8	12782.8
870.2	0.6665	1.29	0.0319	2189.8	5510.0	8936.2	13987.0
942.7	0.6673	1.30	0.0292	2381.4	5992.2	9718.0	15210.8
1015.3	0.6683	1.30	0.0269	2576.5	6482.7	10513.6	16456.2
1087.8	0.6695	1.31	0.0249	2775.2	6982.9	11324.7	17725.8
1160.3	0.6709	1.32	0.0232	2978.2	7493.5	12153.0	19022.1
1232.8	0.6725	1.33	0.0216	3185.7	8015.8	12999.8	20347.5
1305.3	0.6744	1.34	0.0202	3398.4	8550.6	13867.5	21705.6
1377.9	0.6765	1.35	0.0189	3616.7	9099.8	14757.9	23099.3
1450.4	0.6790	1.37	0.0178	3840.9	9664.4	15673.5	24532.6
1595.4	0.6848	1.40	0.0158	4310.9	10847.0	17591.5	27534.6
1740.4	0.6920	1.44	0.0141	4814.7	12114.2	19646.7	30751.4
1885.5	0.7010	1.50	0.0126	5359.9	13486.3	21872.0	34234.4
2030.5	0.7121	1.57	0.0114	5958.0	14991.0	24312.1	38053.7
2175.6	0.7258	1.67	0.0102	6623.6	16665.6	27028.4	42305.1
2320.6	0.7431	1.80	0.0092	7378.6	18565.8	30110.0	47128.6
2465.6	0.7651	1.97	0.0082	8274.4	20819.8	33765.3	52850.0
2610.7	0.7940	2.24	0.0074	9315.2	23438.2	38011.8	59496.7
2755.7	0.8339	2.65	0.0066	10655.8	26811.3	43482.4	68059.5
2900.7	0.8957	3.46	0.0058	12534.6	31538.4	51148.9	80059.2
3045.8	1.0154	5.77	0.0049	15786.0	39719.8	64417.2	100827.0

■ Liquids discharge flow

Medium: Water (59°F) Flow in GPM Overpressure: 10%		Relative density to water other than 1, multiply by Kg Discharge coefficient: 0.80			
Set press. psig	Orifices designation / Areas (in ²)				
	C	D	E	F	
	0.05	0.12	0.20	0.31	
14.5	48.73	122.90	199.17	312.89	
29.0	66.04	166.33	269.80	423.42	
43.5	80.87	203.77	330.55	518.77	
58.0	93.58	235.20	381.75	598.94	
72.5	104.53	263.09	426.60	669.57	
87.0	114.42	288.17	467.57	733.49	
101.5	123.60	311.48	505.00	792.46	
116.0	132.43	332.66	539.61	846.85	
130.5	140.20	353.15	572.45	898.41	
145.0	147.97	372.22	603.53	947.14	
159.5	155.03	390.23	632.84	993.05	

■ Liquids discharge flow *Continued*

Set Press. psig	Orifices designation / Areas (in ²)			
	C	D	E	F
174.1	162.09	407.53	661.09	1037.19
188.6	168.45	424.13	687.93	1079.57
203.1	175.16	440.37	714.06	1120.53
217.6	181.16	455.91	739.14	1159.73
232.0	187.17	470.74	763.50	1197.87
246.6	192.82	485.22	786.81	1234.60
261.1	198.47	499.35	809.77	1270.62
275.6	203.77	512.77	832.01	1305.23
290.1	209.06	526.19	853.56	1339.13
304.6	214.36	539.26	874.39	1372.33
319.1	219.30	551.97	895.23	1404.46
333.6	224.25	564.33	915.36	1436.25
348.1	229.19	576.34	934.78	1466.97
362.6	233.78	588.34	954.20	1497.34
377.1	238.37	600.00	973.27	1527.01
391.6	242.96	611.30	991.64	1555.96
406.1	247.56	622.60	1010.00	1584.57
420.6	251.79	633.55	1027.66	1612.82
435.1	256.03	644.49	1045.31	1640.37
449.6	260.27	655.09	1062.62	1667.21
464.1	264.51	665.68	1079.57	1694.04
478.6	268.74	675.92	1096.17	1720.18
493.1	272.63	686.16	1112.77	1746.31
507.6	276.51	696.05	1129.01	1771.74
522.1	280.75	705.94	1144.90	1796.81
536.6	284.64	715.83	1160.79	1821.53
551.1	288.17	725.36	1176.33	1845.90
565.7	292.05	734.90	1191.87	1870.26
580.2	295.94	744.08	1207.06	1893.93
652.7	313.59	789.28	1280.16	2008.70
725.2	330.55	832.01	1349.37	2117.47
797.7	346.79	872.63	1415.41	2220.94
870.2	362.33	911.47	1478.27	2319.47
942.8	377.16	948.55	1538.66	2414.46
1015.3	391.29	984.57	1596.58	2505.58
1087.8	405.06	1019.18	1652.73	2593.51
1160.3	418.13	1052.38	1706.76	2678.62
1232.8	431.19	1084.87	1759.38	2760.90
1305.3	443.55	1116.30	1810.58	2841.07
1377.9	455.91	1147.02	1860.02	
1450.4	467.57	1176.68	1908.40	
1595.4	490.52	1234.25	2001.64	
1740.5	512.42	1288.99	2090.63	
1885.5	533.25	1341.60	2176.09	
2030.5	553.38	1392.46	2258.02	
2175.6	572.80	1441.19	2337.48	
2320.6	591.52	1488.51	2414.11	
2465.6	609.88	1534.42	2488.27	
2610.7	627.54	1578.92		
2755.7	644.49	1622.00		

■ Definitions (EN ISO 4126-1)

Blowdown: The difference between the set and re-seating pressures, normally stated as a percentage on the set pressure of a safety valve except for pressures of less than 3 bar when it is expressed to operate.

Built-up back pressure: The pressure existing at the outlet of the safety valve caused by flow through the valve and the discharge system

Coefficient of discharge: The value of actual flowing capacity (from tests).

Cold differential test pressure: The inlet static pressure at which a safety valve is set to initiate to open on the test bench. This test pressure includes corrections for service conditions, as back pressure and/or temperature.

Flow area: The minimum cross-sectional flow area (but not the curtain area) between inlet and nozzle which is used to calculate the theoretical flow to discharge.

Flow diameter: The diameter corresponding to the flow area.

Lift: The actual travel of the valve disc starting from the closed position.

Maximum allowable pressure: The maximum pressure for which the equipment is designed as specified by the manufacturer.

Overpressure: A pressure increase over the set pressure, at which the safety valve achieves the lift specified by the manufacturer, usually expressed as a percentage of the set pressure.

Pressure: The pressure unit used in this standard is the bar (1 bar = 10^5 Pa). It is quoted as gauge (relative to atmospheric pressure) or absolute as appropriate.

Relieving pressure: The pressure used for the sizing of the safety valve which is greater than or equal to the set pressure plus the overpressure.

Re-seating pressure: The value of the inlet static pressure at which the disc re-establishes contact with the seat or at which the lift becomes zero.

Safety valve: Valve which automatically, without the assistance of any energy other than that of the fluid concerned, discharges a quantity of the fluid so as to prevent a predetermined safe pressure being exceeded and which is designed to re-close and prevent further flow or fluid after nominal pressure conditions of service have been restored.

Set pressure: The predetermined pressure at which a safety valve under operating conditions initiates to open.

Superimposed back pressure: The pressure existing at the outlet of the safety valve at the time when the device is required to operate.



Compositor Vivaldi, 2 – 8
Pol. Ind Can Jardí
08191 RUBI (Barcelona – Spain)
Tel.: +34 936 995 200
safety@valvulasnacional.com
www.valvulasnacional.com

7455 East 46th Street
Tulsa, Oklahoma 74145
Tel.: 918 622 5950
Fax: 918 665 3904
sales@bsbsystems.com
www.bsbsystems.com

Products, specifications and all data in this literature are subject to change without notice. Questions regarding product selection and specifications for specific applications should be directed to BS&B. All sales are subject to the BS&B companies' standard terms and conditions of sale. Nothing herein should be construed as a warranty of merchantability or fitness for a particular purpose.

BSBSystems.com | BSB.ie

© 2018, BS&B Innovations, Limited. Revised June 2018.