



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

TECHNICAL DATA

Sizing and selection information for Birkett spring loaded and pilot operated safety relief valves designed with a full lift and full nozzle to relieve excess pressure safely in a variety of process vessels



FEATURES

- Full nozzle, full lift designs provide high discharge coefficients and high capacities.
- Broad selection of valve types: thermal, conventional, bellows, pop and modulating for gas or liquid service enables optimum valve selection.
- Wide range of materials provides solutions for any application.
- Lightweight construction reduces handling and shipping costs and benefits offshore service.
- Seat leakage integrity minimizes fugitive emissions.
- In-situ testing capability reduces maintenance costs.
- Low number of parts minimizes inventory and reduces maintenance costs.
- Valves conform to API 526 pressure/temperature ranges, orifice areas and dimensions.
- Extensive accessory range enables valves to be adapted to meet specific code and application requirements.
- Worldwide certification.

GENERAL APPLICATION

Designed to relieve excess pressure or thermal expansion of process fluids safely in pumps, pipe work, tanks, calorifiers, gas and oil separators, other process vessels and long pipes. Models are available for gas, steam, vapor and liquid applications.

TECHNICAL DATA

Sizes:	1/2" x 1" to 8" x 10" (DN 15 x DN 25 to DN 200 x DN 250)
Connections:	Threaded or flanged
Pressure:	Up to 6170 psig (425.5 barg)
Temperature range:	-450°F to 1000°F (-268°C to 538°C)

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

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INTRODUCTION

The effects of exceeding safe pressure levels in an unprotected pressure vessel or system can have catastrophic effects on both plant and personnel.

Safety relief valves should be used to protect any pressurized system from the effects of exceeding its design pressure limit.

A safety relief valve is designed to discharge gas, steam, vapor or liquid automatically from any pressure containing system, preventing a predetermined safe pressure being exceeded and protecting plant and personnel.

The Birkett range of safety relief valves contains three distinct valve types, specific details of which can be found in the technical datasheets listed for each series:

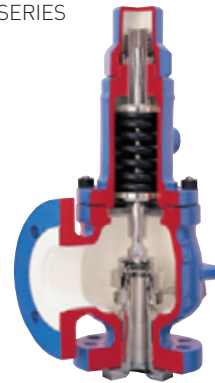
WB Series	Spring loaded safety relief valves (VCTDS-03791).
Safeflo	Safety and thermal relief valves (VCTDS-03792).
Safeset	Pilot operated safety relief valves (VCTDS-03793).

All types are certified in accordance with ASME Code Section VIII.

AGENCY APPROVALS

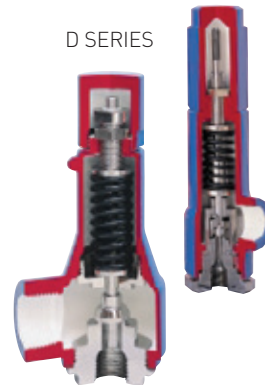
Quality standard:	ISO 9001:2008
Boiler and pressure vessels:	ASME VIII PED 97/23/EC
Mechanical engineering directive:	ATEX 94/9/EC
Sizing and selection:	API 520: Part 1 ISO 4126
Dimensions:	API 526
Leakage rates:	API 527
Flange ratings:	ANSI B16.5

WB SERIES

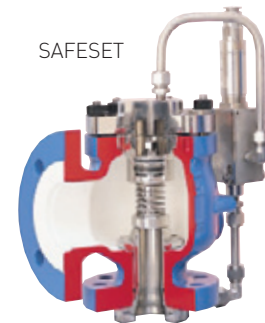


B/C SERIES

D SERIES



SAFESET



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

RECOMMENDED MATERIAL TEMPERATURE RANGES

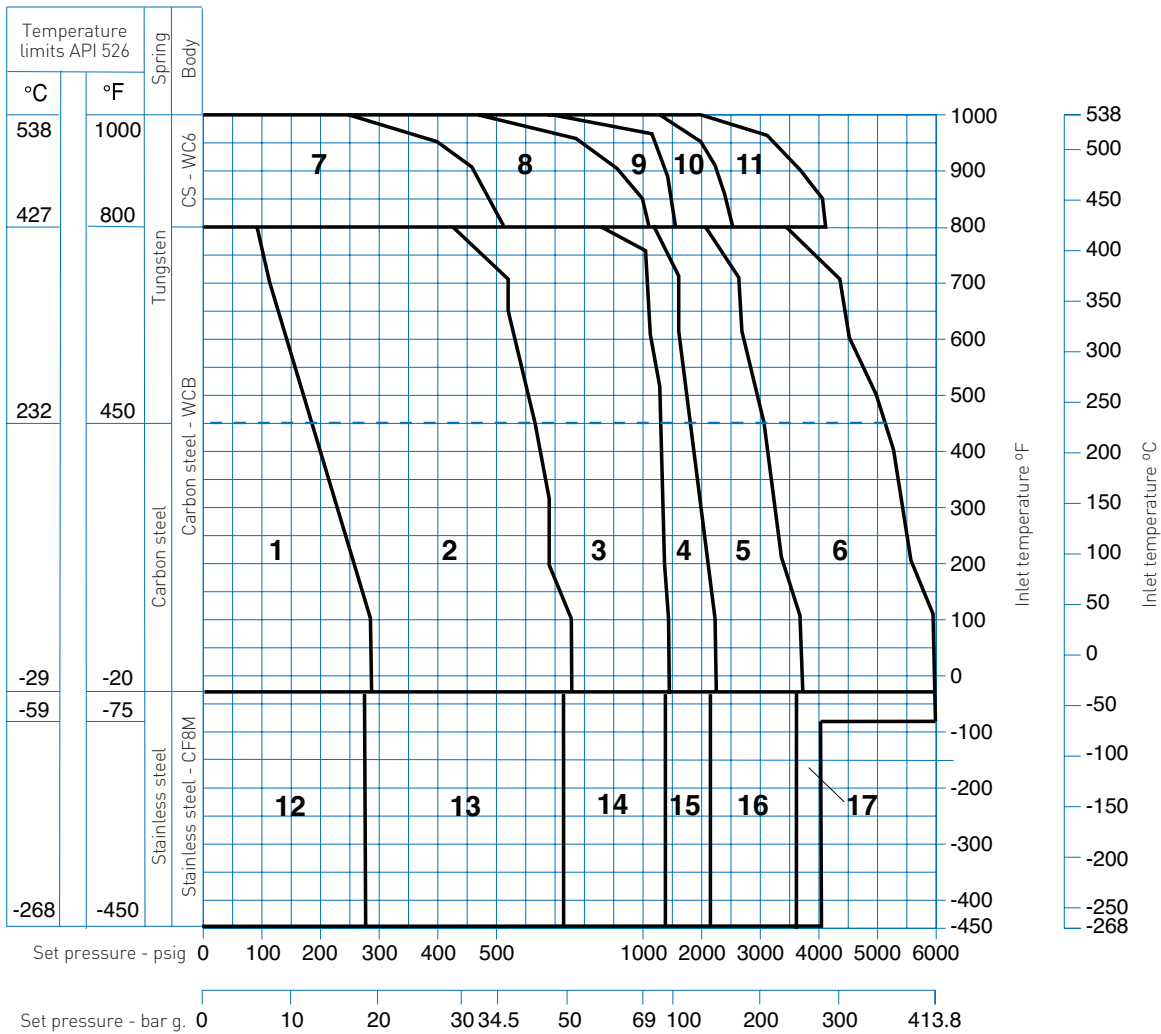
Description	Minimum		Maximum	
	°F	°C	°F	°C
Body				
1 Carbon steel SA 216-WCB	-20	-29	800	427
2 Carbon steel (NACE) SA 216-WCB	-20	-29	800	427
3 Stainless steel (NACE) SA 351-CF8M	-450	-267	1000	538
4 Stainless steel SA 351-CF8M	-450	-267	1000	538
5 Low temp. CS SA 352-LCB	-50	-46	800	427
6 Bronze (oxygen spec.) BS 1400 LG2	-450	-267	450	232
8 0.5% MOLY CS SA 217-WC6	-20	-29	1000	538
9 Hastelloy B SA 494-N12MV	-20	-29	1000	538
Spring				
1 Carbon steel	-75	-59	450	232
A Aluminium coated CS	-75	-59	450	232
2 Stainless steel (316)	-450	-267	500	260
6 Tungsten alloy (BH12)	-4	-20	1000	427
T Aluminium coated tungsten	-4	-20	1000	427
9 Hastelloy B	-20	-29	800	427
N Stainless steel (PH17/4)	-130	-90	752	400
Q Stainless steel (PH17/4 NACE)	-130	-90	752	400
Z Inconel X750	-450	-267	1000	538
Trim (nozzle and disc)				
1 Stainless steel (PH 17/4 NACE 29-33 HRC)	-130	-90	752	400
2 Stainless steel (316)	-450	-267	1000	538
3 Al. bronze/Monel	-76	-60	572	300
4 Hastelloy B	-20	-29	1000	538
5 Stainless steel (316 Stellite 39-43 HRC)	-321	-196	1000	538
6 Monel	-321	-196	800	427
7 Stainless steel 304	-238	-150	1000	538
Gaskets				
NAF (ST-706)	-40	-40	800	427
Graphite (supergraf)	-328	-200	932	500
Gylon 3504	-321	-196	500	260
Soft seat				
Nitrile	-40	-40	212	100
Viton	-22	-30	392	200
Silicon	-85	-65	446	230
Ethylene propylene	-58	-50	275	135
PTFE	-454	-270	428	220
Kalrez	-20	-29	500	260
Bolting				
B7 Alloy steel	-20	-29	800	427
B8T Stainless steel	-454	-270	1000	538
Monel K500	-274	-170	482	25

NOTES

1. All temperatures are at valve inlet.
2. Trim items 1 and 5 are recommended for maximum durability.
3. Alternative materials may be specified if agreed on enquiry.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE



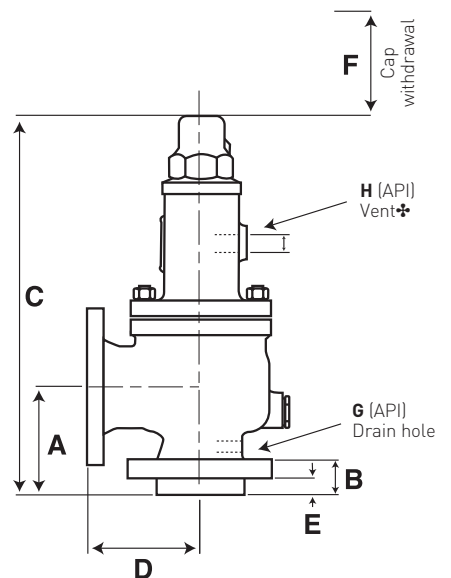
D - 0.110 in²
- 71 mm²

ORIFICE D (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
1 x 2	150 x 150	4.125	1.437	13.875	4.500	0.582	2	3/8	3/4	40	(18)
	300 x 150	4.125	1.437	13.875	4.500	0.582	2	3/8	3/4	40	(18)
	600 x 150	4.125	1.437	13.875	4.500	0.582	2	3/8	3/4	42	(19)
1 1/2 x 2	900 x 300	4.125	1.750	25.000	5.500	0.625	5	3/8	3/4	90	(41)
	1500 x 300	4.125	1.750	25.000	5.500	0.625	5	3/8	3/4	97	(44)
1 1/2 x 3	2500 x 300	5.500	2.375	26.875	6.500	0.625	5	3/8	3/4	115	(52)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a bellows is fitted in the 1 x 2 inch valve add 1.125 inch.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- * - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

D - 0.110 in²
- 71 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	1 x 2	150#RF	150#RF	WCB	-	-	285	185	80	-	285	230
2	1 x 2	300#RF	150#RF		-	-	740	615	410	-	285	230
3	1 x 2	600#RF	150#RF		-	-	1480	1235	825	-	285	230
4	1½ x 2	900#RF	300#RF		-	-	2220	1845	1235	-	600	500
5	1½ x 2	1500#RF	300#RF		-	-	3705	3080	2060	-	600	500
6	1½ x 3	2500#RF	300#RF		-	-	6000	5135	3430	-	740	500
7	1 x 2	300#RF	150#RF	WC6	-	-	-	-	510	225	285	230
8	1 x 2	600#RF	150#RF		-	-	-	-	1015	445	285	230
9	1½ x 2	900#RF	300#RF		-	-	-	-	1525	670	600	500
10	1½ x 2	1500#RF	300#RF		-	-	-	-	2540	1115	600	500
11	1½ x 3	2500#RF	300#RF	-	-	-	-	4230	1860	740	500	
12	1 x 2	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	230
13	1 x 2	300#RF	150#RF		720	720	-	-	-	-	275	230
14	1 x 2	600#RF	150#RF		1440	1440	-	-	-	-	275	230
15	1½ x 2	900#RF	300#RF		2160	2160	-	-	-	-	600	500
16	1½ x 2	1500#RF	300#RF		3600	3600	-	-	-	-	600	500
17	1½ x 3	2500#RF	300#RF		4000	6000	-	-	-	-	720	500

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	7 psig
Bellows - gas	22 psig
Bellows - liquid	59 psig*
Conventional (inverted)	2 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

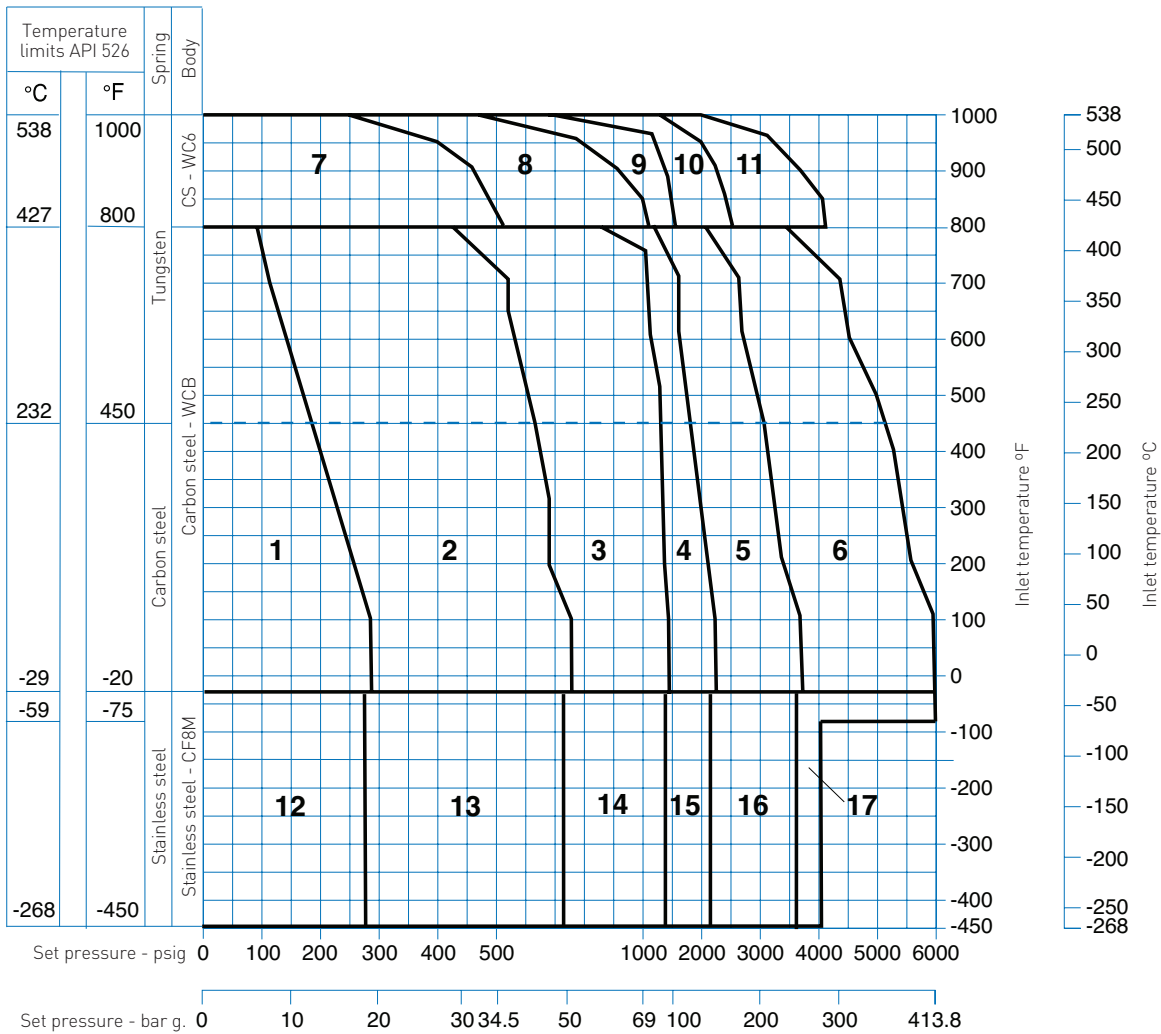
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

There is no requirement to have a high pressure version for this orifice.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE



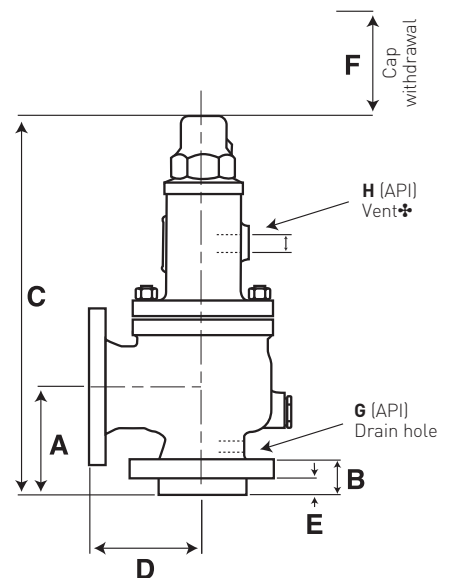
E - 0.196 in²
- 127 mm²

ORIFICE E (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
1 x 2	150 x 150	4.125	1.437	13.875	4.500	0.582	2	3/8	3/4	40	(18)
	300 x 150	4.125	1.437	13.875	4.500	0.582	2	3/8	3/4	40	(18)
	600 x 150	4.125	1.437	13.875	4.500	0.582	2	3/8	3/4	42	(19)
1 1/2 x 2	900 x 300	4.125	1.750	25.000	5.500	0.625	5	3/8	3/4	90	(41)
	1500 x 300	4.125	1.750	25.000	5.500	0.625	5	3/8	3/4	97	(44)
1 1/2 x 3	2500 x 300	5.500	2.375	26.875	6.500	0.625	5	3/8	3/4	115	(52)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a bellows is fitted in the 1 x 2 inch valve add 1.125 inch.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- * - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

E – 0.196 in²
– 127 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	1 x 2	150#RF	150#RF	WCB	-	-	285	185	80	-	285	230
2	1 x 2	300#RF	150#RF		-	-	740	615	410	-	285	230
3	1 x 2	600#RF	150#RF		-	-	1480	1235	825	-	285	230
4	1½ x 2	900#RF	300#RF		-	-	2220	1845	1235	-	600	500
5	1½ x 2	1500#RF	300#RF		-	-	3705	3080	2060	-	600	500
6	1½ x 3	2500#RF	300#RF		-	-	6000	5135	3430	-	740	500
7	1 x 2	300#RF	150#RF	WC6	-	-	-	-	510	225	285	230
8	1 x 2	600#RF	150#RF		-	-	-	-	1015	445	285	230
9	1½ x 2	900#RF	300#RF		-	-	-	-	1525	670	600	500
10	1½ x 2	1500#RF	300#RF		-	-	-	-	2540	1115	600	500
11	1½ x 3	2500#RF	300#RF		-	-	-	-	4230	1860	740	500
12	1 x 2	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	230
13	1 x 2	300#RF	150#RF		720	720	-	-	-	-	275	230
14	1 x 2	600#RF	150#RF		1440	1440	-	-	-	-	275	230
15	1½ x 2	900#RF	300#RF		2160	2160	-	-	-	-	600	500
16	1½ x 2	1500#RF	300#RF		3600	3600	-	-	-	-	600	500
17	1½ x 3	2500#RF	300#RF		4000	6000	-	-	-	-	720	500

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	7 psig
Bellows - gas	22 psig
Bellows - liquid	59 psig*
Conventional (inverted)	2 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

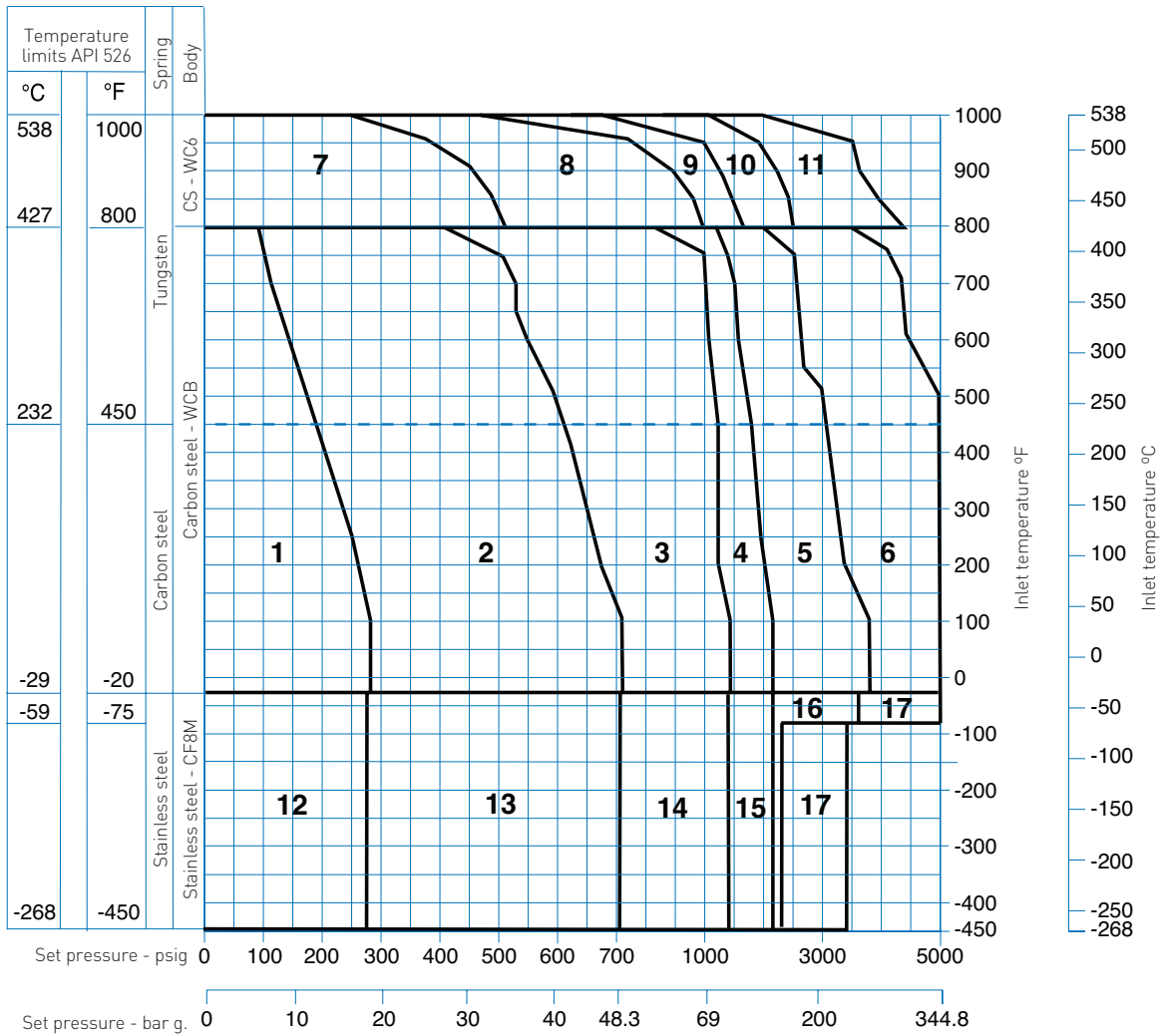
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

There is no requirement to have a high pressure version for this orifice.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE



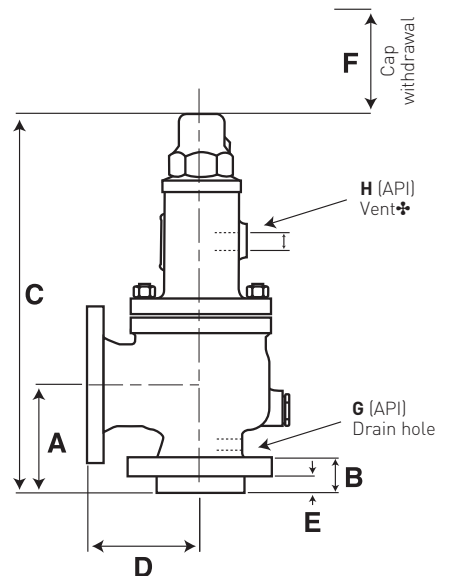
F - 0.307 in²
- 198 mm²

ORIFICE F (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
1½ x 2	150 x 150	4.875	1.625	14.625	4.750	0.750	2	¾	¾	46	(21)
	300 x 150	4.875	1.625	14.625	6.000	0.750	2	¾	¾	46	(21)
	600 x 150	4.875	1.625	14.625	6.000	0.750	2	¾	¾	46	(21)
1½ x 3	900 x 300	4.875	1.750	26.750	6.500	0.500	5	¾	¾	101	(46)
	1500 x 300	4.875	1.750	26.750	6.500	0.500	5	¾	¾	101	(46)
	2500 x 300	5.500	2.375	26.875	6.500	0.625	5	¾	¾	117	(53)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a bellows is fitted in the 1 x 2 inch valve add 1.125 inch.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- * - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

F – 0.307 in²
– 198 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	1½ x 2	150#RF	150#RF	WCB	-	-	285	185	80	-	285	230
2	1½ x 2	300#RF	150#RF		-	-	740	615	410	-	285	230
3	1½ x 2	600#RF	150#RF		-	-	1480	1235	825	-	285	230
4	1½ x 3	900#RF	300#RF		-	-	2220	1845	1235	-	600	500
5	1½ x 3	1500#RF	300#RF		-	-	3705	3080	2060	-	600	500
6	1½ x 3	2500#RF	300#RF		-	-	5000	5000	3430	-	740	500
7	1½ x 2	300#RF	150#RF	WC6	-	-	-	-	510	225	285	230
8	1½ x 2	600#RF	150#RF		-	-	-	-	1015	445	285	230
9	1½ x 3	900#RF	300#RF		-	-	-	-	1525	670	600	500
10	1½ x 3	1500#RF	300#RF		-	-	-	-	2540	1115	600	500
11	1½ x 3	2500#RF	300#RF		-	-	-	-	4230	1860	740	500
12	1½ x 2	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	230
13	1½ x 2	300#RF	150#RF		720	720	-	-	-	-	275	230
14	1½ x 2	600#RF	150#RF		1440	1440	-	-	-	-	275	230
15	1½ x 3	900#RF	300#RF		2160	2160	-	-	-	-	600	500
16	1½ x 3	1500#RF	300#RF		2200	3600	-	-	-	-	600	500
17	1½ x 3	2500#RF	300#RF		3400	5000	-	-	-	-	720	500

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	7 psig
Bellows - gas	22 psig
Bellows - liquid	59 psig*
Conventional (inverted)	2 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

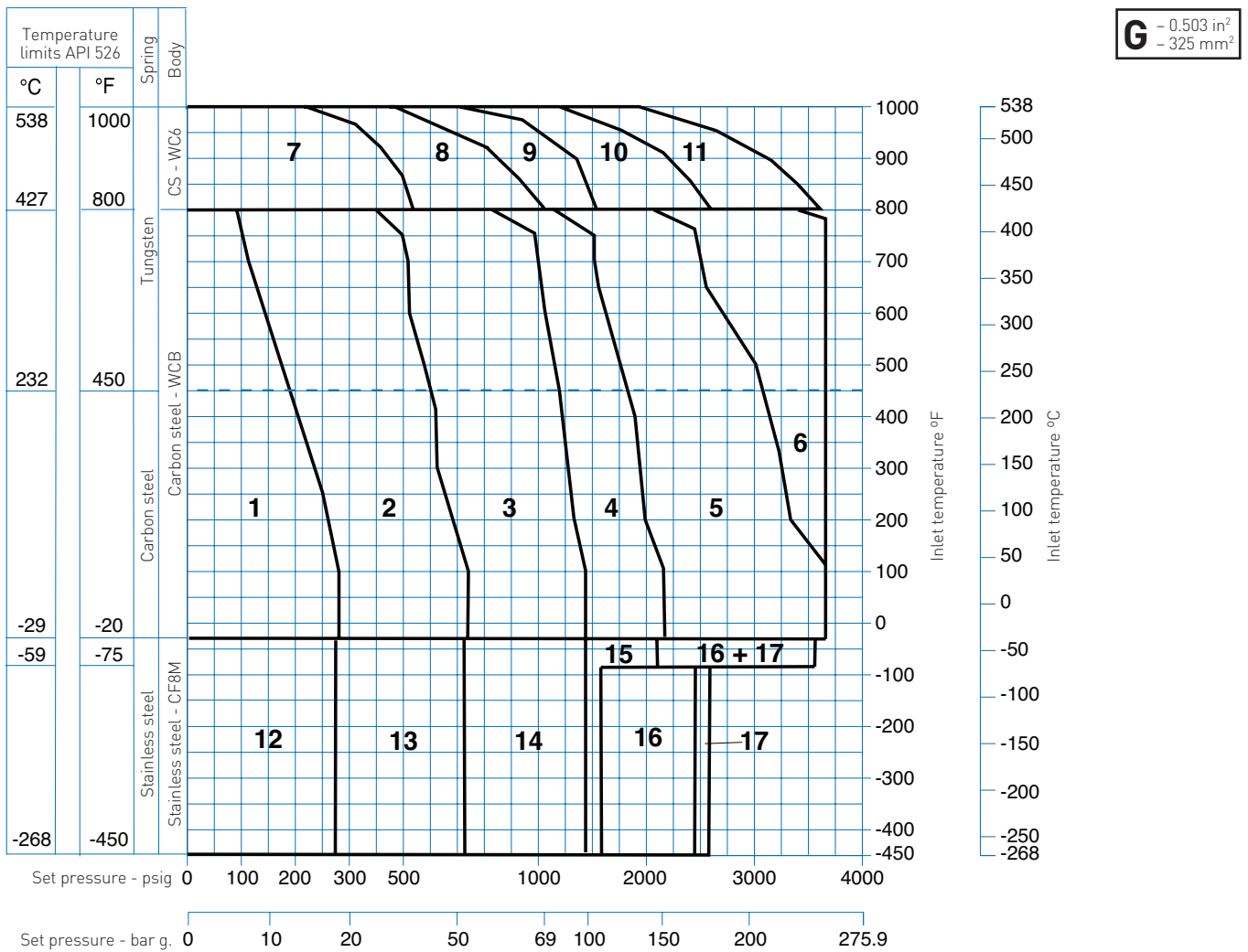
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

There is no requirement to have a high pressure version for this orifice.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

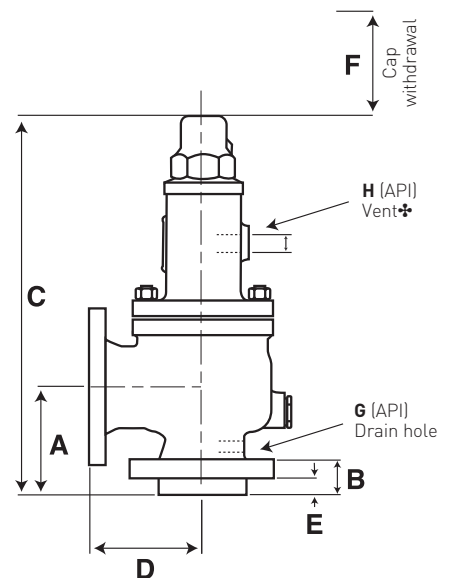


ORIFICE G (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H* Vent	Wt	
										lbs	(kg)
1½ x 3	150 x 150	4.875	1.312	18.750	4.750	0.500	2	¾	¾	60	(27)
	300 x 150	4.875	1.312	18.750	6.000	0.500	2	¾	¾	64	(29)
	600 x 150	4.875	1.437	18.750	6.000	0.500	2	¾	¾	66	(30)
	900 x 300	4.875	1.750	27.500	6.500	0.500	5	¾	¾	119	(54)
2 x 3	1500 x 300	6.125	2.125	32.000	6.750	0.500	5	½	¾	126	(57)
	2500 x 300	6.125	2.812	32.000	6.750	0.687	2	½	¾	139	(63)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- * Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

G – 0.503 in²
– 325 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	1½ x 2	150#RF	150#RF	WCB	-	-	285	185	80	-	285	230
2	1½ x 2	300#RF	150#RF		-	-	740	615	410	-	285	230
3	1½ x 2	600#RF	150#RF		-	-	1480	1235	825	-	285	230
4	1½ x 3	900#RF	300#RF		-	-	2220	1845	1235	-	740	470
5	2 x 3	1500#RF	300#RF		-	-	3705	3080	2060	-	740	470
6	2 x 3	2500#RF	300#RF		-	-	3705	3705	3430	-	740	470
7	1½ x 2	300#RF	150#RF	WC6	-	-	-	-	510	225	285	230
8	1½ x 2	600#RF	150#RF		-	-	-	-	1015	445	285	230
9	1½ x 3	900#RF	300#RF		-	-	-	-	1525	670	740	470
10	2 x 3	1500#RF	300#RF		-	-	-	-	2540	1115	740	470
11	2 x 3	2500#RF	300#RF		-	-	-	-	3705	1860	740	470
12	1½ x 2	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	230
13	1½ x 2	300#RF	150#RF		720	720	-	-	-	-	275	230
14	1½ x 2	600#RF	150#RF		1440	1440	-	-	-	-	275	230
15	1½ x 3	900#RF	300#RF		1600	2160	-	-	-	-	720	470
16	2 x 3	1500#RF	300#RF		2450	3600	-	-	-	-	720	470
17	2 x 3	2500#RF	300#RF		2600	3600	-	-	-	-	720	470

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	13 psig
Bellows - gas	13 psig
Bellows - liquid	40 psig*
Conventional (inverted)	2 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

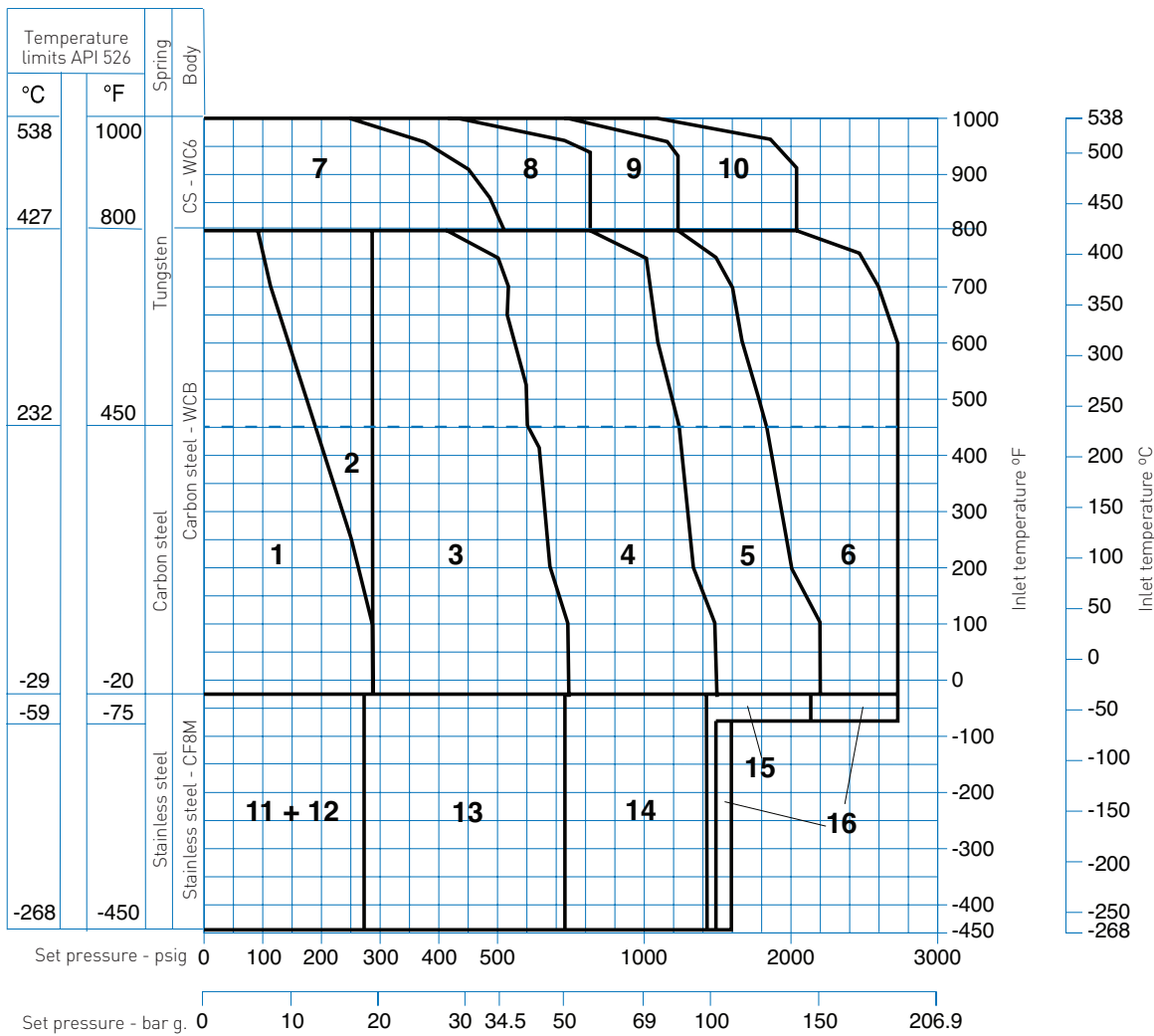
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

There is no requirement to have a high pressure version for this orifice.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE



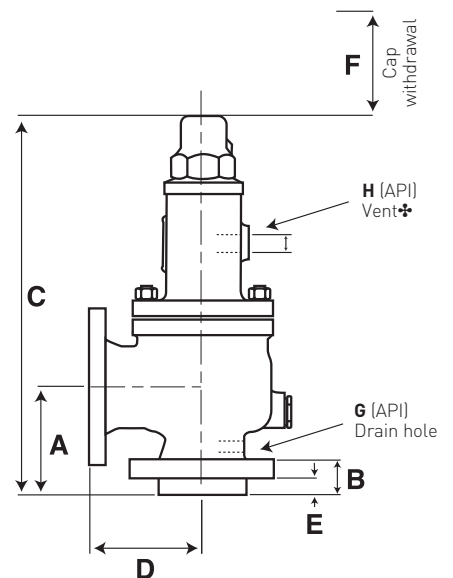
H - 0.758 in²
- 506 mm²

ORIFICE H (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
1½ x 3	150 x 150	5.125	1.375	18.750	4.875	0.500	2	¾	¾	60	(27)
	300 x 150	5.125	1.375	18.750	4.875	0.500	2	¾	¾	60	(27)
2 x 3	300 x 150	5.125	1.375	19.000	4.875	0.500	2	¾	¾	64	(29)
	600 x 150	6.062	1.687	20.000	6.375	0.687	2	¾	¾	86	(39)
	900 x 150	6.062	2.312	31.750	6.375	0.687	5	½	¾	176	(80)
	1500 x 300	6.062	2.375	32.000	6.375	0.750	5	½	¾	187	(85)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- ✦ - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

H - 0.758 in²
- 506 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	1½ x 2	150#RF	150#RF	WCB	-	-	285	185	80	-	285	230
2	1½ x 2	300#RF	150#RF		-	-	285	285	285	-	285	230
3	2 x 3	300#RF	150#RF		-	-	740	615	410	-	285	230
4	2 x 3	600#RF	150#RF		-	-	1480	1235	825	-	285	230
5	2 x 3	900#RF	150#RF		-	-	2220	1845	1235	-	285	230
6	2 x 3	1500#RF	300#RF		-	-	2750	2750	2060	-	740	415
7	2 x 3	300#RF	150#RF	WC6	-	-	-	-	510	225	285	230
8	2 x 3	600#RF	150#RF		-	-	-	-	815	445	285	230
9	2 x 3	900#RF	150#RF		-	-	-	-	1225	670	285	230
10	2 x 3	1500#RF	300#RF		-	-	-	-	2040	1115	740	415
11	1½ x 2	2500#RF	150#RF	CF8M	275	275	-	-	-	-	275	230
12	1½ x 2	150#RF	150#RF		275	275	-	-	-	-	275	230
13	2 x 3	300#RF	150#RF		720	720	-	-	-	-	275	230
14	2 x 3	600#RF	150#RF		1440	1440	-	-	-	-	275	230
15	2 x 3	900#RF	150#RF		1485	2160	-	-	-	-	275	230
16	2 x 3	1500#RF	300#RF		1600	2750	-	-	-	-	720	415

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	7 psig
Bellows - gas	13 psig
Bellows - liquid	28 psig*
Conventional (inverted)	2 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

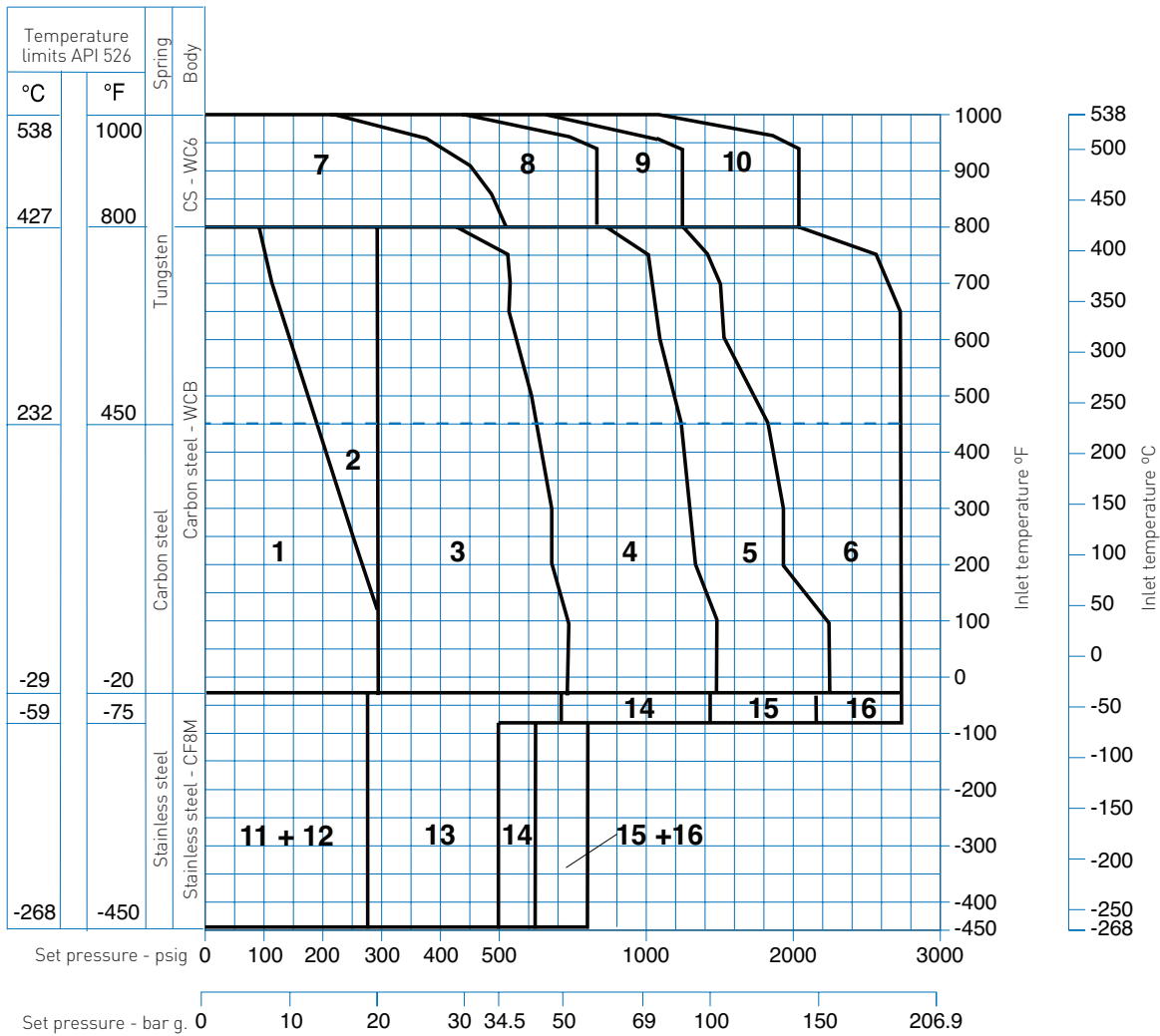
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
1.5H	150#	285	-	-	-	-	-	-
1.5H	300#	285	-	-	-	-	-	-
2H	300#	740	-	-	-	-	-	-
2H	600#	1480	-	1000	-	-	1000	-

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

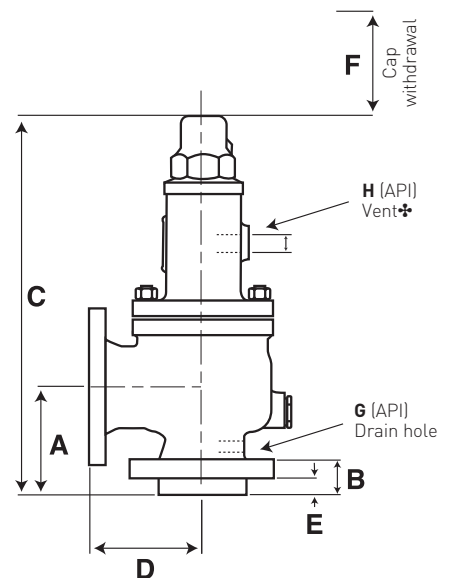


ORIFICE J (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
2 x 3	150 x 150	5.375	1.625	19.250	4.875	0.750	2	3/8	3/4	64	(29)
	300 x 150	5.375	1.625	19.250	4.875	0.750	2	3/8	3/4	64	(29)
3 x 4	300 x 150	7.250	2.125	21.750	7.125	0.750	2	3/8	3/4	82	(37)
	600 x 150	7.250	2.125	23.000	7.125	0.750	2	3/8	3/4	99	(45)
	900 x 150	7.250	2.375	33.875	7.125	0.750	5	1/2	3/4	231	(105)
	1500 x 300	7.250	2.750	33.875	7.125	0.750	5	1/2	3/4	253	(115)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- ✦ Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

J – 1.287 in²
– 830 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	2 x 3	150#RF	150#RF	WCB	-	-	285	185	80	-	285	230
2	2 x 3	300#RF	150#RF		-	-	285	285	285	-	285	230
3	3 x 4	300#RF	150#RF		-	-	740	615	410	-	285	230
4	3 x 4	600#RF	150#RF		-	-	1480	1235	825	-	285	230
5	3 x 4	900#RF	150#RF		-	-	2220	1845	1235	-	285	230
6	3 x 4	1500#RF	300#RF		-	-	2700	2700	2060	-	600	230
7	3 x 4	300#RF	150#RF	WC6	-	-	-	-	510	225	285	230
8	3 x 4	600#RF	150#RF		-	-	-	-	815	445	285	230
9	3 x 4	900#RF	150#RF		-	-	-	-	1225	670	285	230
10	3 x 4	1500#RF	300#RF		-	-	-	-	2040	1115	600	230
11	2 x 3	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	230
12	2 x 3	300#RF	150#RF		275	275	-	-	-	-	275	230
13	3 x 4	300#RF	150#RF		500	720	-	-	-	-	275	230
14	3 x 4	600#RF	150#RF		625	1440	-	-	-	-	275	230
15	3 x 4	900#RF	150#RF		800	2160	-	-	-	-	275	230
16	3 x 4	1500#RF	300#RF		800	2700	-	-	-	-	600	230

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	5 psig
Bellows - gas	13 psig
Bellows - liquid	34 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

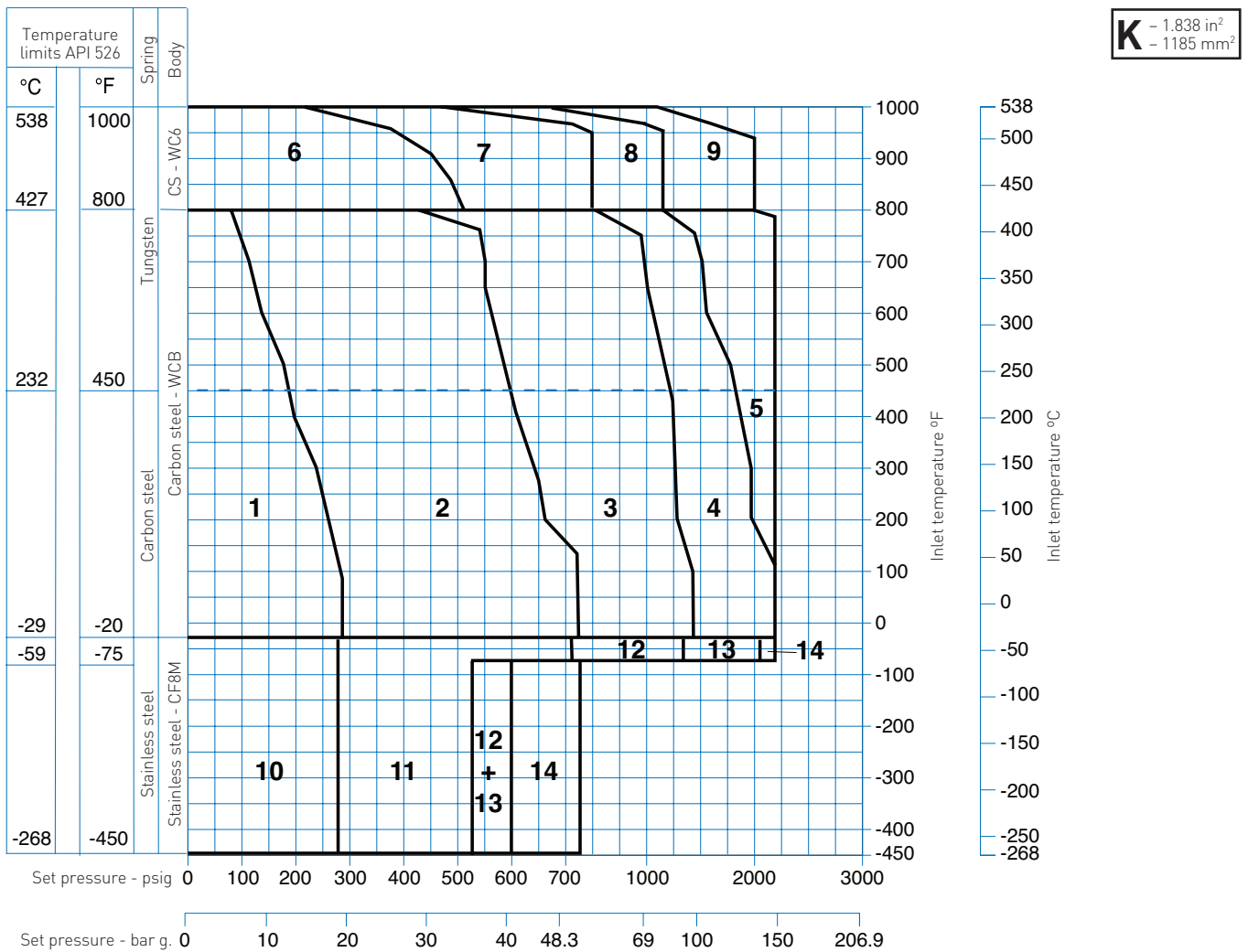
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
2J	150#	285	-	-	-	-	-	-
2J	300#	285	-	-	-	-	-	-
3J	300#	740	-	500	-	-	430	-
3J	600#	1480	-	900	-	900	870	900

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

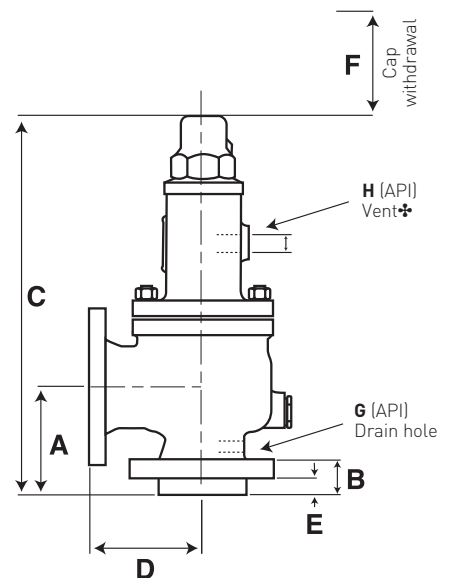


ORIFICE K (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
3 x 4	150 x 150	6.125	2.000	21.750	6.375	0.875	3	3/8	3/4	108	(49)
	300 x 150	6.125	2.000	21.750	6.375	0.875	3	3/8	3/4	108	(49)
	600 x 150	7.250	2.125	23.500	7.125	0.875	3	3/8	3/4	141	(64)
3 x 6	900 x 150	7.812	2.562	40.000	8.500	0.937	5	3/4	3/4	339	(154)
	1500 x 300	7.750	2.875	40.000	8.500	0.875	5	3/4	3/4	353	(160)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- ✦ - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

K – 1.838 in²
– 1185 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	3 x 4	150#RF	150#RF	WCB	-	-	285	185	80	-	285	150
2	3 x 4	300#RF	150#RF		-	-	740	615	410	-	285	150
3	3 x 4	600#RF	150#RF		-	-	1480	1235	825	-	285	200
4	3 x 4	900#RF	150#RF		-	-	2220	1845	1235	-	285	200
5	3 x 4	1500#RF	300#RF		-	-	2220	2220	2060	-	600	200
6	3 x 4	300#RF	150#RF	WC6	-	-	-	-	510	215	285	150
7	3 x 4	600#RF	150#RF		-	-	-	-	815	445	285	200
8	3 x 6	900#RF	150#RF		-	-	-	-	1225	670	285	200
9	3 x 6	1500#RF	300#RF		-	-	-	-	2040	1115	600	200
10	3 x 4	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	150
11	3 x 4	300#RF	150#RF		525	720	-	-	-	-	275	150
12	3 x 4	600#RF	150#RF		600	1440	-	-	-	-	275	200
13	3 x 6	900#RF	150#RF		600	2160	-	-	-	-	275	200
14	3 x 6	1500#RF	300#RF		750	2220	-	-	-	-	600	200

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	5 psig
Bellows - gas	13 psig
Bellows - liquid	26 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

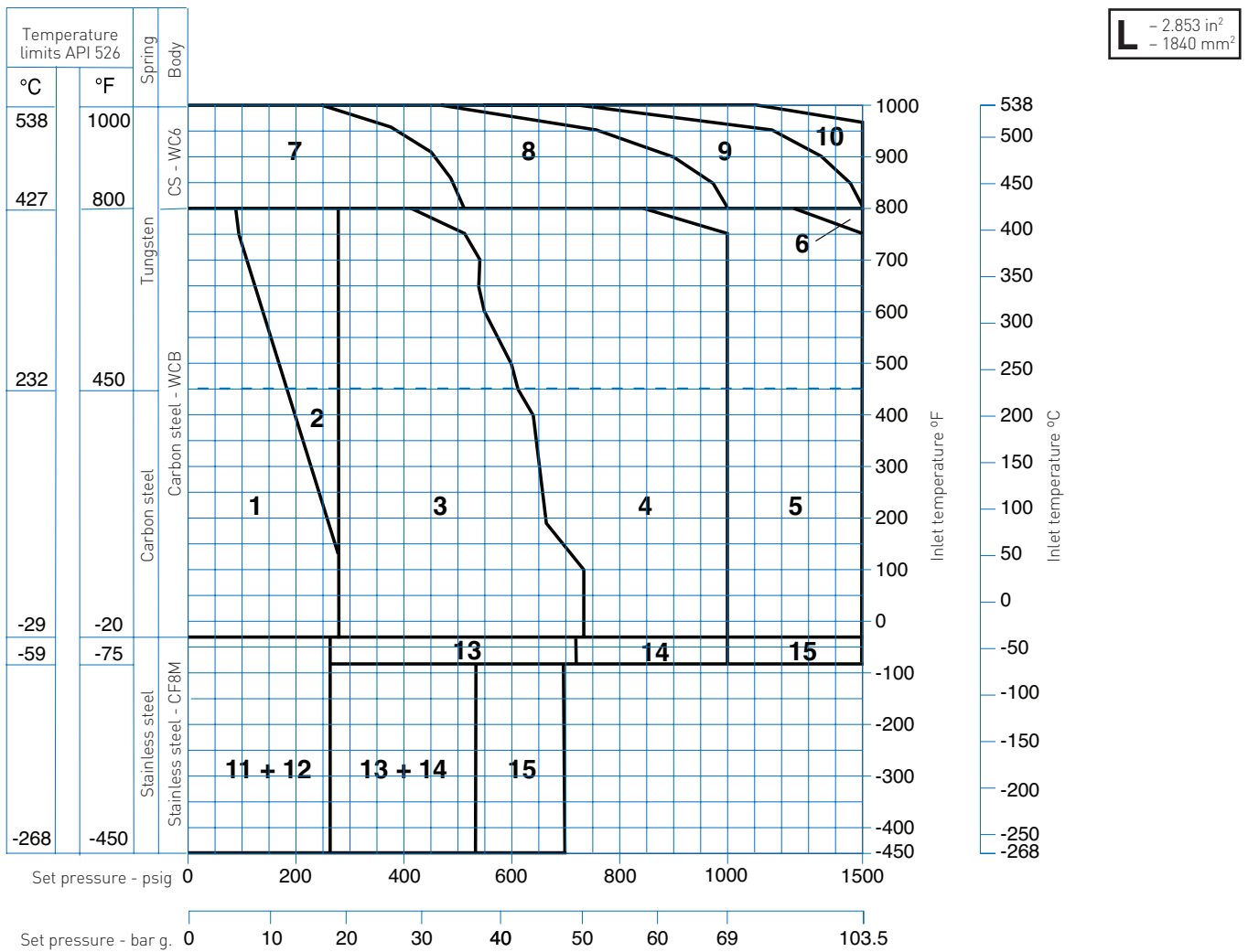
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
K	150#	285	-	-	-	-	-	-
K	300#	740	-	450	-	-	600	-
K	600#	1480	-	750	-	-	570	1070

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

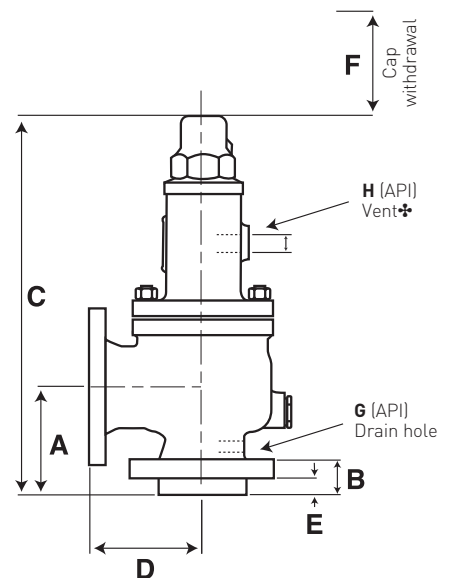


ORIFICE L (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
3 x 4	150 x 150	6.125	2.000	21.750	6.500	0.875	4	3/8	3/4	108	(49)
	300 x 150	6.125	2.000	21.750	6.500	0.875	4	3/8	3/4	108	(49)
4 x 6	300 x 150	7.062	2.062	27.000	7.125	0.812	5	1/2	1	234	(106)
	600 x 150	7.062	2.312	28.250	8.000	0.812	5	1/2	1	249	(113)
	900 x 150	7.750	2.687	41.875	8.750	0.750	5	1/2	1	353	(160)
	1500 x 150	7.750	2.937	44.000	8.750	0.812	5	1/2	1	361	(164)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- ✦ Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

L – 2.853 in²
– 1840 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	3 x 4	150#RF	150#RF	WCB	-	-	285	185	80	-	285	100
2	3 x 4	300#RF	150#RF		-	-	285	285	285	-	285	100
3	4 x 6	300#RF	150#RF		-	-	740	615	410	-	285	170
4	4 x 6	600#RF	150#RF		-	-	1480	1000	825	-	285	170
5	4 x 6	900#RF	150#RF		-	-	1000	1500	1235	-	285	170
6	4 x 6	1500#RF	300#RF		-	-	1500	1500	1500	-	285	170
7	4 x 6	300#RF	150#RF	WC6	-	-	-	-	510	225	285	170
8	4 x 6	600#RF	150#RF		-	-	-	-	1000	445	285	170
9	4 x 6	900#RF	150#RF		-	-	-	-	1500	670	285	170
10	4 x 6	1500#RF	300#RF		-	-	-	-	1500	1115	285	170
11	3 x 4	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	100
12	3 x 4	300#RF	150#RF		275	275	-	-	-	-	275	100
13	4 x 6	300#RF	150#RF		535	720	-	-	-	-	275	170
14	4 x 6	600#RF	150#RF		535	1000	-	-	-	-	275	170
15	4 x 6	900#RF	150#RF		700	1500	-	-	-	-	275	170

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	5 psig
Bellows - gas	13 psig
Bellows - liquid	23 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

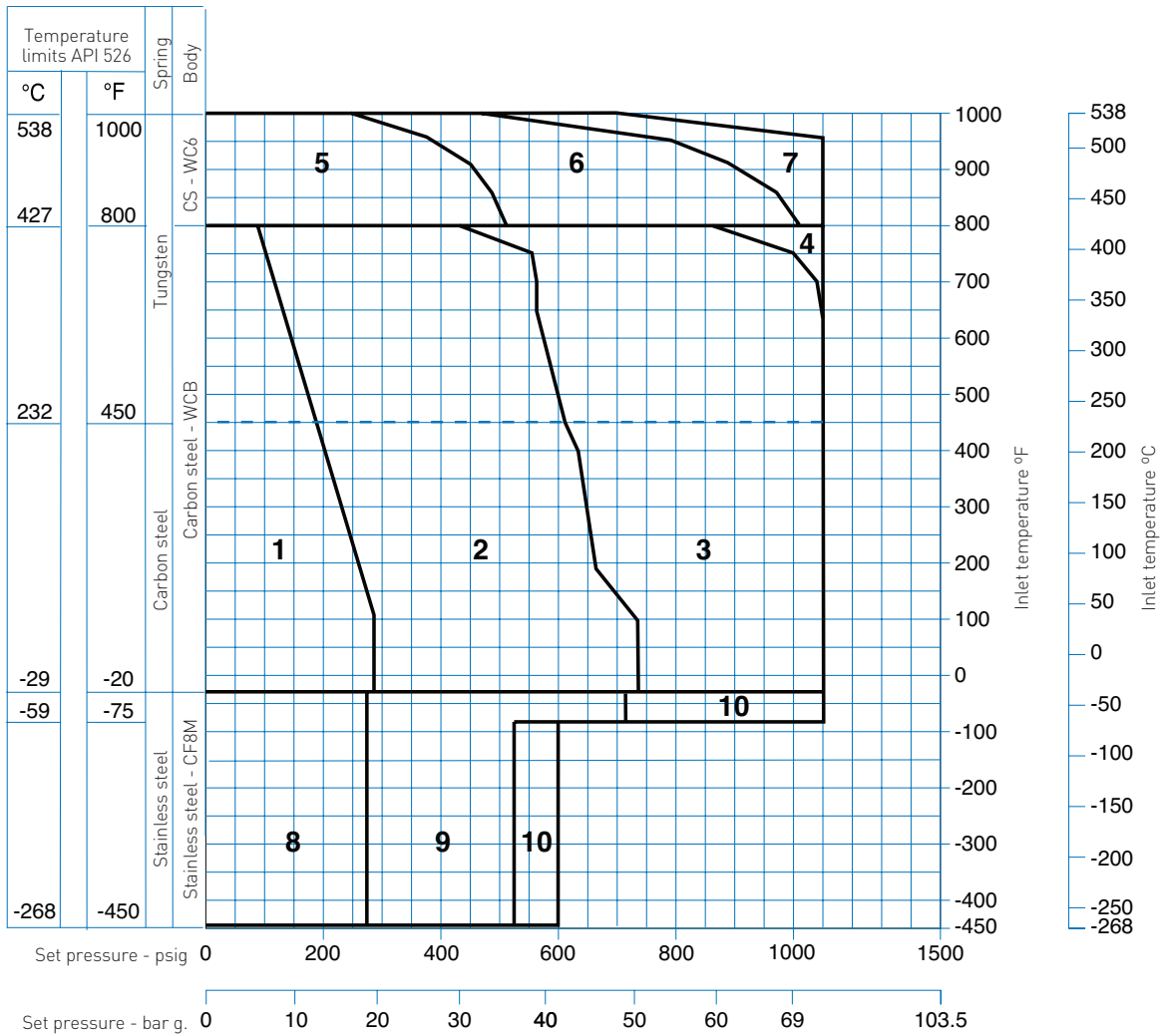
Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
3L	150#	285	-	-	-	-	255	-
3L	300#	285	-	-	-	-	255	-
4L	300#	740	-	-	-	-	-	-
4L	600#	1000	-	850	-	-	825	-

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

M - 3.60 in²
- 2320 mm²

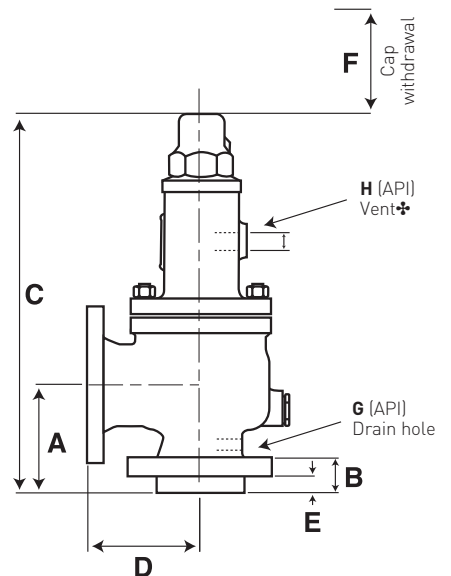


ORIFICE M (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
4 x 6	150 x 150	7.000	2.000	26.500	7.250	0.750	5	½	1	234	(106)
	300 x 150	7.000	2.000	26.500	7.250	0.750	5	½	1	234	(106)
	600 x 150	7.000	2.250	28.250	8.000	0.750	5	½	1	249	(113)
	900 x 300	7.750	2.500	41.875	8.750	0.750	5	½	1	377	(171)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- ✦ - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

M – 3.60 in²
– 2320 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	4 x 6	150#RF	150#RF	WCB	-	-	285	185	80	-	285	80
2	4 x 6	300#RF	150#RF		-	-	740	615	410	-	285	160
3	4 x 6	600#RF	150#RF		-	-	1100	1100	825	-	285	160
4	4 x 6	900#RF	150#RF		-	-	1100	1100	1100	-	285	160
5	4 x 6	300#RF	150#RF	WC6	-	-	-	-	510	225	285	160
6	4 x 6	600#RF	150#RF		-	-	-	-	1015	445	285	160
7	4 x 6	900#RF	150#RF		-	-	-	-	1100	670	285	160
8	4 x 6	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	80
9	4 x 6	300#RF	150#RF		525	720	-	-	-	-	275	160
10	4 x 6	600#RF	150#RF		600	1000	-	-	-	-	275	160

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	4 psig
Bellows - gas	13 psig
Bellows - liquid	27 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

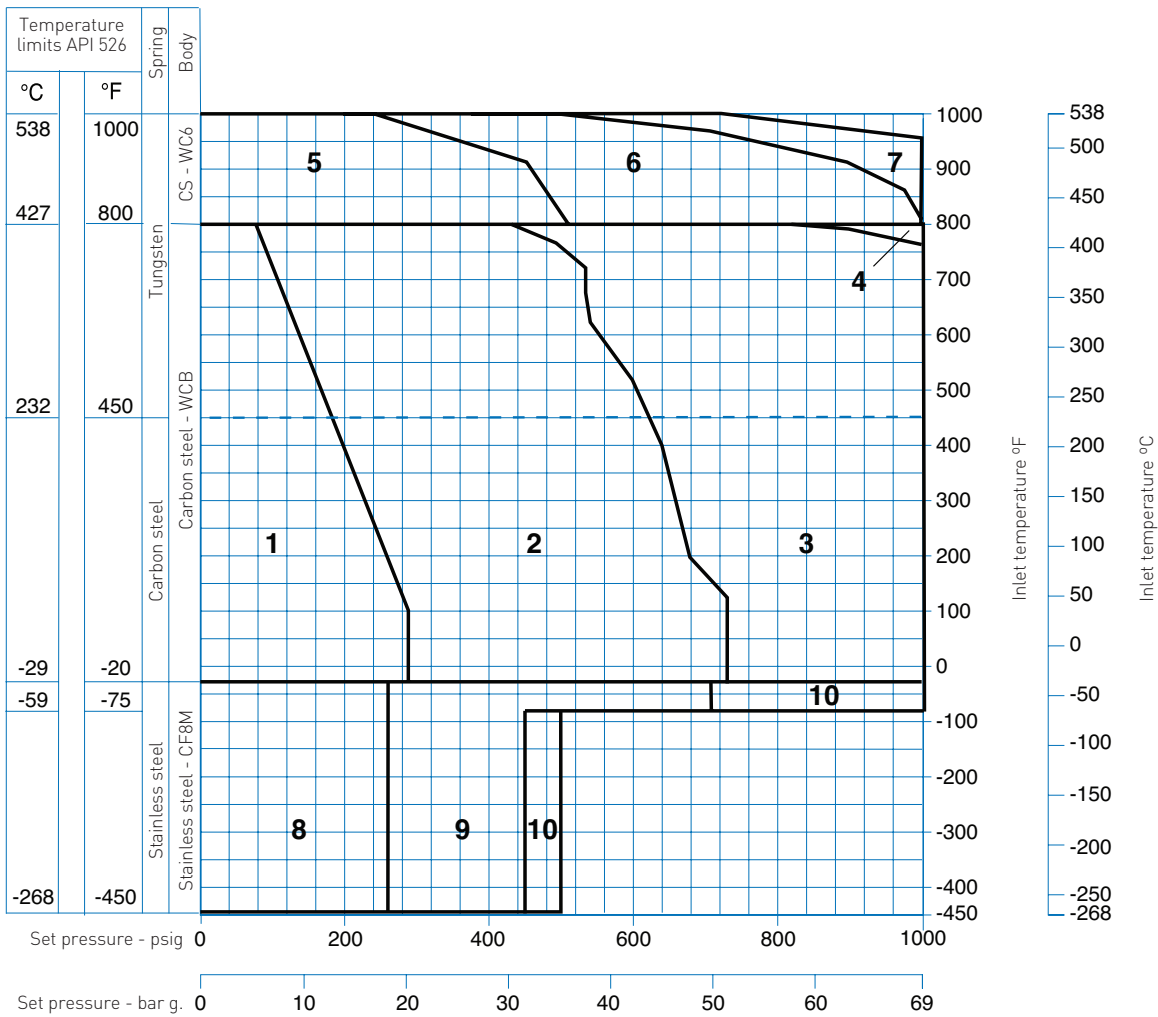
Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
M	150#	285	-	-	-	-	-	-
M	300#	740	-	500	-	-	590	-
M	600#	1100	-	825	-	1000	900	1000

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

N - 4.34 in²
- 2800 mm²

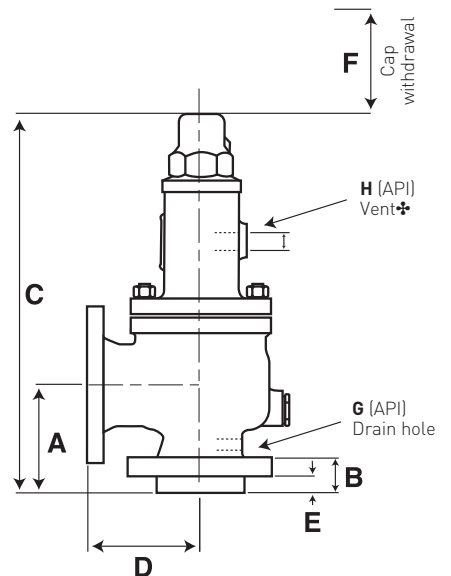


ORIFICE N (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
4 x 6	150 x 150	7.750	2.000	29.250	8.250	0.750	5	1/2	1	242	(110)
	300 x 150	7.750	2.000	29.250	8.250	0.750	5	1/2	1	242	(110)
	600 x 150	7.750	2.250	34.250	8.750	0.750	5	1/2	1	258	(117)
	900 x 300	7.750	2.500	41.500	8.750	0.750	5	1/2	1	395	(179)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- * - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

N – 4.34 in²
– 2800 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	4 x 6	150#RF	150#RF	WCB	-	-	285	185	80	-	285	80
2	4 x 6	300#RF	150#RF		-	-	740	615	410	-	285	160
3	4 x 6	600#RF	150#RF		-	-	1000	1000	825	-	285	160
4	4 x 6	900#RF	150#RF		-	-	1000	1000	1000	-	285	160
5	4 x 6	300#RF	150#RF	WC6	-	-	-	-	510	225	285	160
6	4 x 6	600#RF	150#RF		-	-	-	-	1000	445	285	160
7	4 x 6	900#RF	150#RF		-	-	-	-	1000	670	285	160
8	4 x 6	150#RF	150#RF	CF8M	275	275	-	-	-	-	275	80
9	4 x 6	300#RF	150#RF		450	720	-	-	-	-	275	160
10	4 x 6	600#RF	150#RF		500	1000	-	-	-	-	275	160

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	5 psig
Bellows - gas	13 psig
Bellows - liquid	29 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

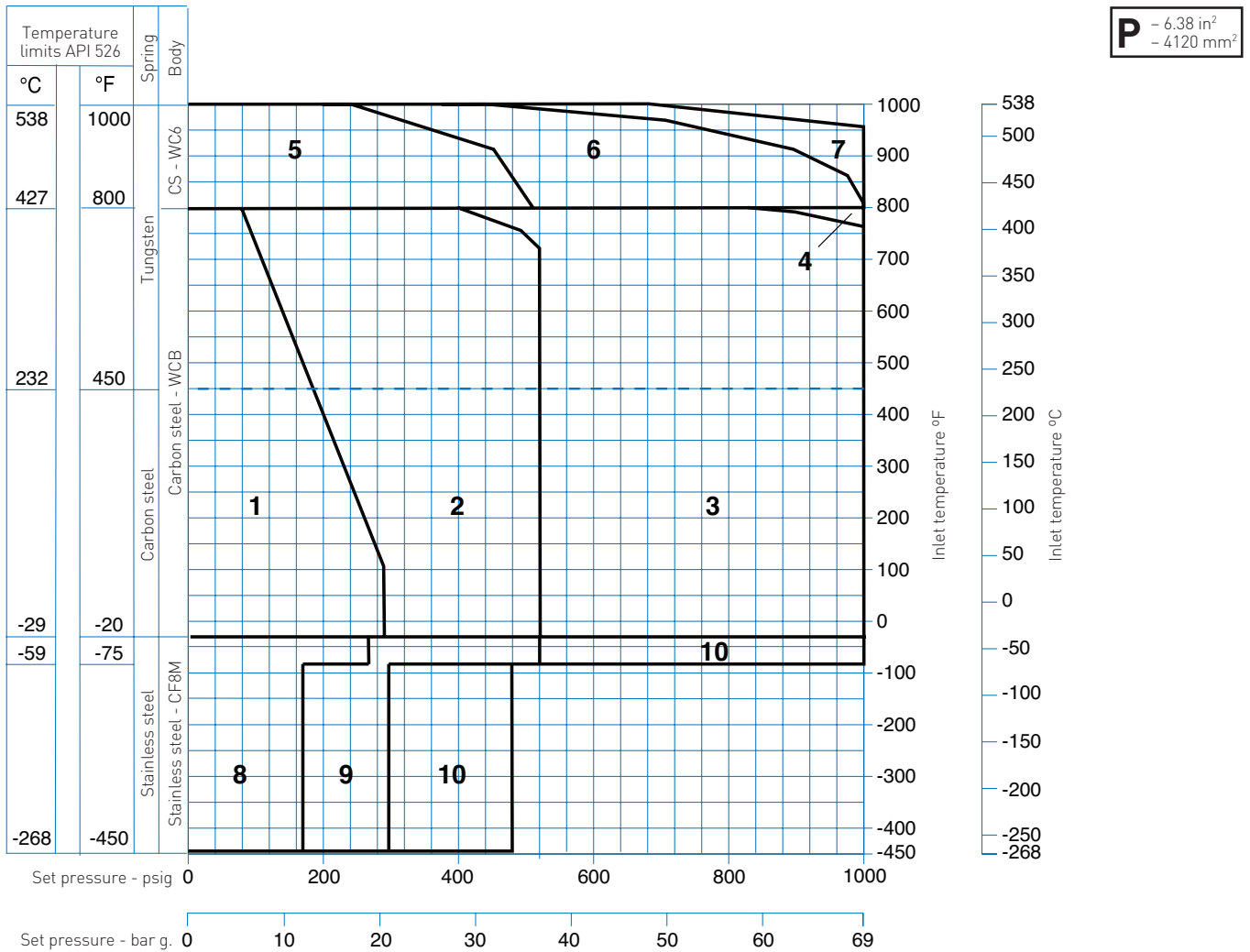
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
N	150#	285	-	-	-	-	-	-
N	300#	740	-	680	-	-	700	-
N	600#	1000	-	-	-	-	-	-

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

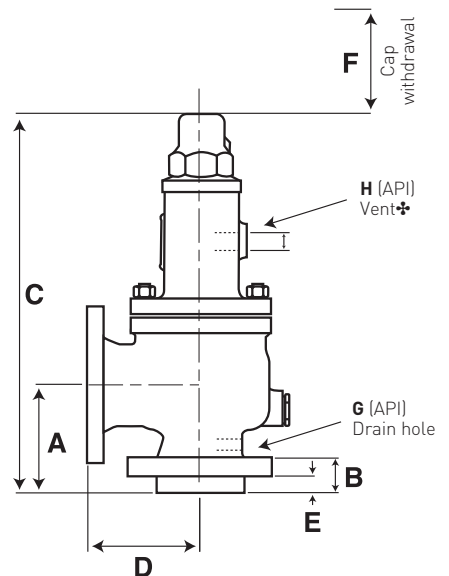


ORIFICE P (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
4 x 6	150 x 150	7.125	2.000	27.750	9.000	0.750	5	½	1	254	(115)
	300 x 150	8.875	2.000	29.250	10.000	0.750	5	½	1	254	(115)
	600 x 150	8.875	2.250	35.250	10.000	0.750	5	½	1	269	(122)
	900 x 300	8.875	2.500	45.000	10.000	0.750	5	½	1	412	(187)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- ✦ - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

P – 6.38 in²
– 4120 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	4 x 6	150#RF	150#RF	WCB	-	-	285	185	80	-	285	80
2	4 x 6	300#RF	150#RF		-	-	525	525	410	-	285	150
3	4 x 6	600#RF	150#RF		-	-	1000	1000	825	-	285	150
4	4 x 6	900#RF	150#RF		-	-	1000	1000	1000	-	285	150
5	4 x 6	300#RF	150#RF	WC6	-	-	-	-	510	225	285	150
6	4 x 6	600#RF	150#RF		-	-	-	-	1000	445	285	150
7	4 x 6	900#RF	150#RF		-	-	-	-	1000	670	285	150
8	4 x 6	150#RF	150#RF	CF8M	175	275	-	-	-	-	275	80
9	4 x 6	300#RF	150#RF		300	525	-	-	-	-	275	150
10	4 x 6	600#RF	150#RF		480	1000	-	-	-	-	275	150

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	4 psig
Bellows - gas	13 psig
Bellows - liquid	24 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

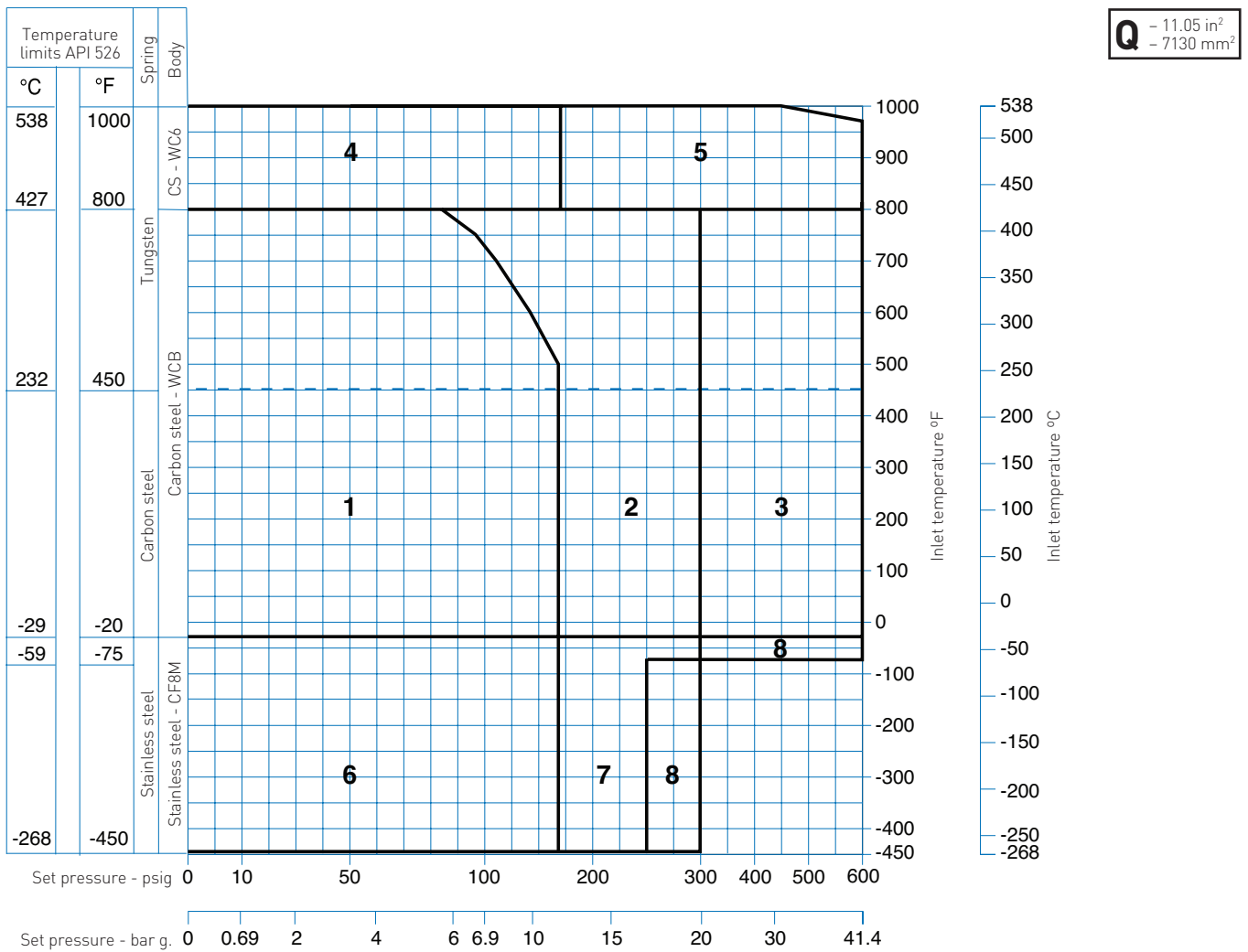
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
P	150#	285	-	-	-	-	-	-
P	300#	525	-	350	-	-	390	460
P	600#	1000	-	-	-	-	336	-

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

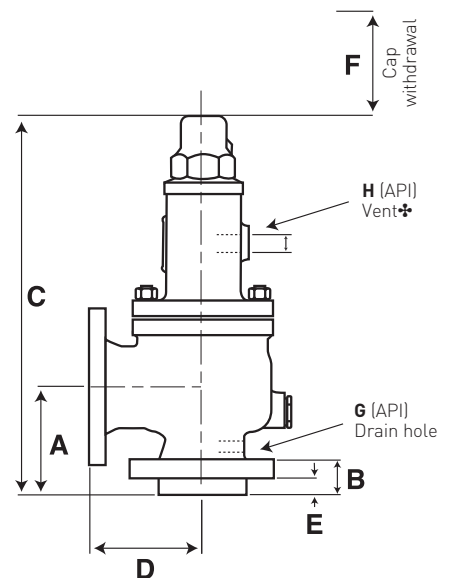


ORIFICE Q (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
6 x 8	150 x 150	9.437	2.312	31.750	9.500	0.812	3	½	1	364	(165)
	300 x 150	9.437	2.312	31.750	9.500	0.812	3	½	1	364	(165)
	600 x 150	9.437	2.750	36.750	9.500	0.812	6	½	1	399	(181)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height [c], consult factory.
- * - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

Q – 11.05 in²
– 7130 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	6 x 8	150#RF	150#RF		-	-	165	165	80	-	115	70
2	6 x 8	300#RF	150#RF	WCB	-	-	300	300	300	-	115	115
3	6 x 8	600#RF	150#RF		-	-	600	600	600	-	115	115
4	6 x 8	300#RF	150#RF	WC6	-	-	-	-	165	165	115	115
5	6 x 8	600#RF	150#RF		-	-	-	-	600	445	115	115
6	6 x 8	150#RF	150#RF	CF8M	165	165	-	-	-	-	115	70
7	6 x 8	300#RF	150#RF		250	300	-	-	-	-	115	115
8	6 x 8	600#RF	150#RF		300	600	-	-	-	-	115	115

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	4 psig
Bellows - gas	13 psig
Bellows - liquid	23 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

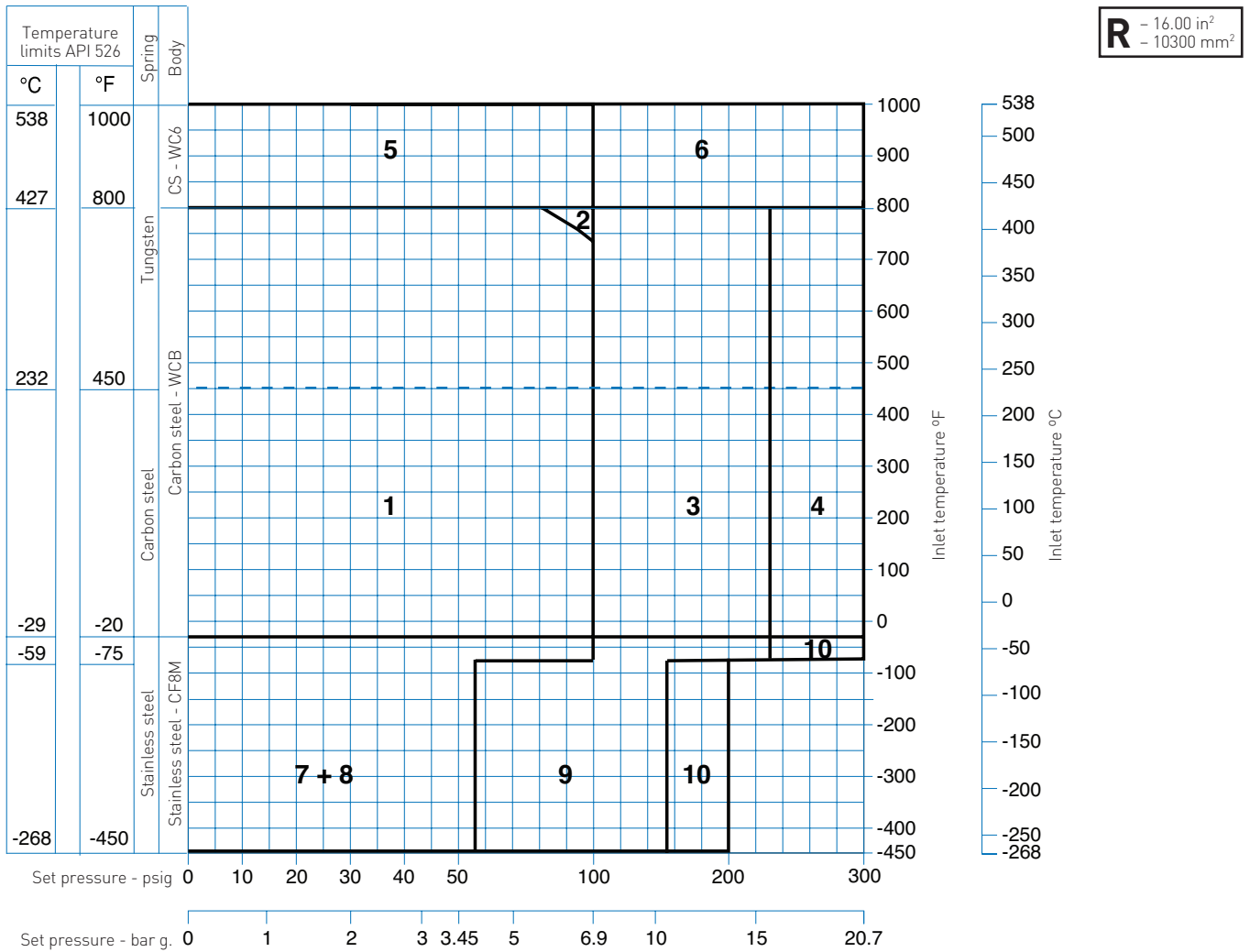
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
Q	150#	165	-	109	-	-	117	-
Q	300#	300	-	109	-	165	117	165
Q	600#	600	-	109	-	400	117	390

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

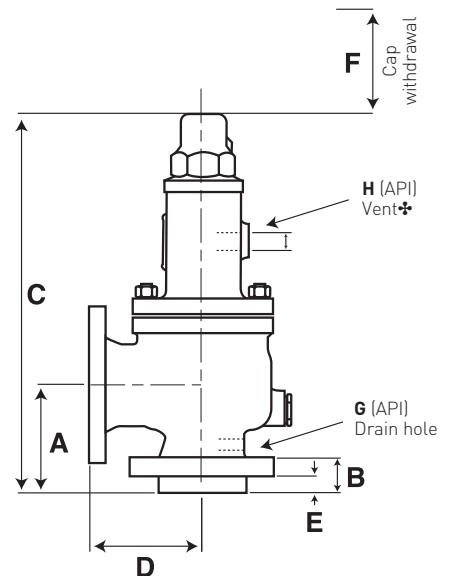


ORIFICE R (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
6 x 8	150 x 150	9.437	2.312	34.750	9.500	0.812	3	½	1	370	(168)
	300 x 150	9.437	2.312	34.750	9.500	0.812	3	½	1	370	(168)
6 x 10	300 x 150	9.437	2.312	34.750	10.500	0.812	3	½	1	465	(211)
	600 x 150	9.437	2.750	40.750	10.500	0.812	6	½	1	489	(222)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. (Only if flange rating is 600# or less.)
- For certified height (c), consult factory.
- * Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

R – 16.00 in²
– 10300 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	6 x 8	150#RF	150#RF	WCB	-	-	100	100	80	-	60	60
2	6 x 8	300#RF	150#RF		-	-	100	100	100	-	60	60
3	6 x 10	300#RF	150#RF		-	-	230	230	230	-	100	100
4	6 x 10	600#RF	150#RF		-	-	300	300	300	-	100	100
5	6 x 8	300#RF	150#RF	WC6	-	-	-	-	100	100	60	60
6	6 x 10	600#RF	150#RF		-	-	-	-	300	300	100	100
7	6 x 8	150#RF	150#RF	CF8M	55	100	-	-	-	-	60	60
8	6 x 8	300#RF	150#RF		55	100	-	-	-	-	60	60
9	6 x 10	300#RF	150#RF		150	230	-	-	-	-	100	100
10	6 x 10	600#RF	150#RF		200	300	-	-	-	-	100	100

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	4 psig
Bellows - gas	13 psig
Bellows - liquid	25 psig*
Conventional (inverted)	1.5 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

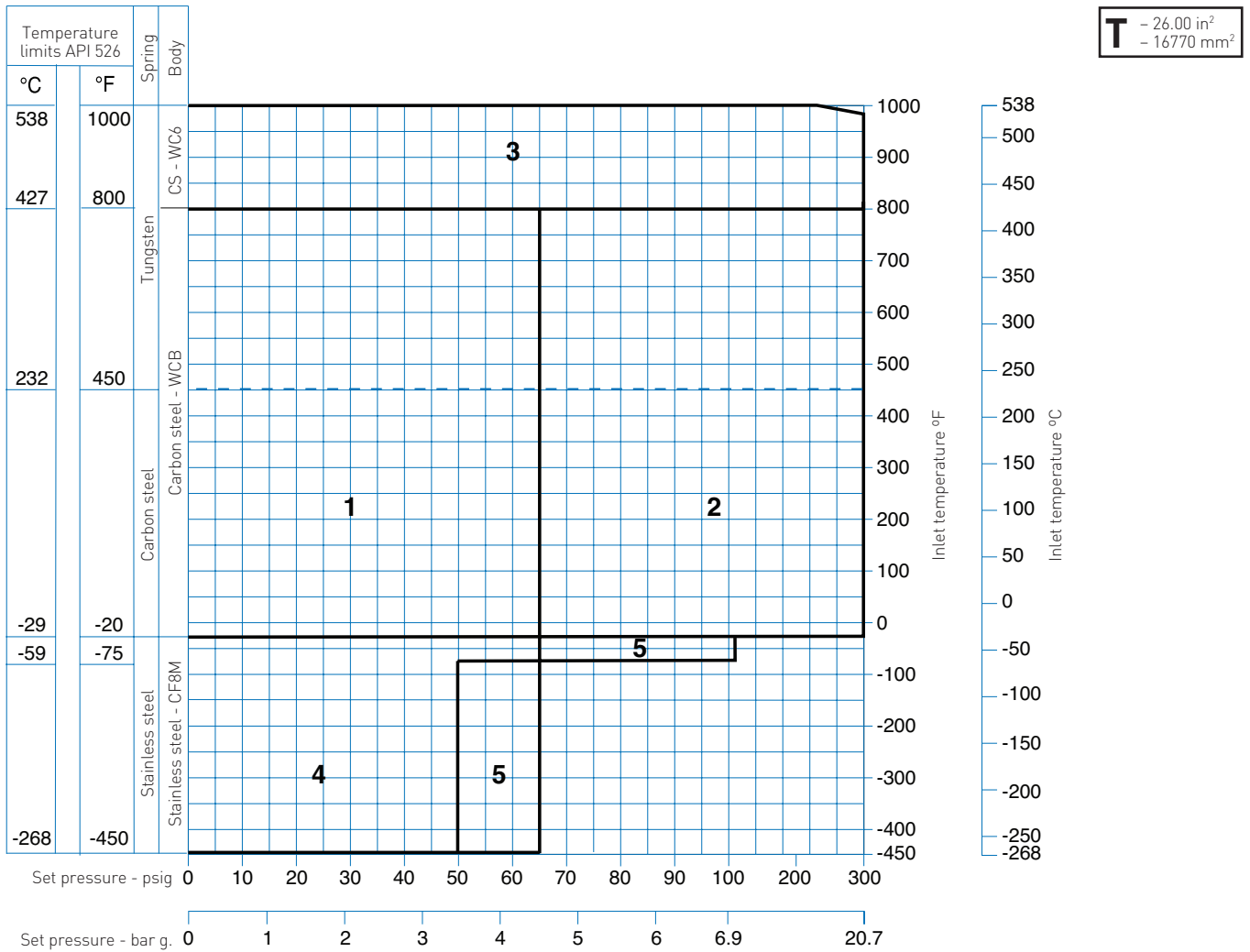
High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
6R8	150#	100	-	73	-	-	90	-
6R8	300#	100	-	73	-	-	90	-
6R8	300#	230	-	73	-	224	90	147
6R8	600#	300	-	190	-	-	180	-

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SELECTION GUIDE

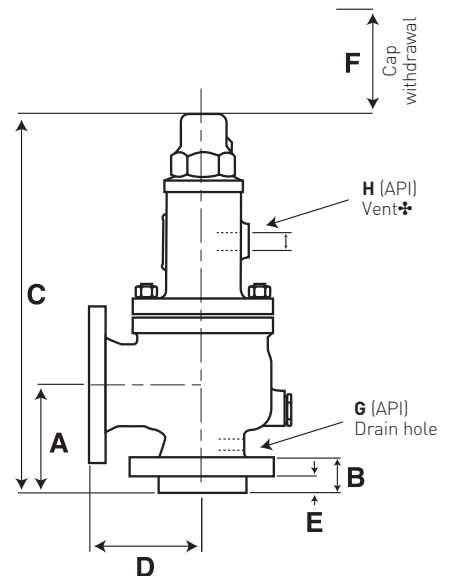


ORIFICE T (ALL DIMENSIONS in inches)

Size NPS	Rating	A	B	C*	D	E	F	G	H*	Wt	
										lbs	(kg)
8 x 10	150 x 150	10.875	2.625	42.250	11.000	1.000	6	½	1	661	(300)
	300 x 150	10.875	2.625	42.250	11.000	1.000	6	½	1	683	(310)

NOTES

- * - If a gag is fitted, add 0.5 ins.
- If a lever is fitted, add a maximum of 3.5 inch. [Only if flange rating is 600# or less.]
- For certified height (c), consult factory.
- ♣ - Vent hole 'H' on bellows valves only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

T – 26.00 in²
– 16770 mm²

VALVE SELECTION TABLE

Key No.	Valve size inlet x outlet (ins)	Flanges ANSI		Body material	Max. set pressure (psig) and temperature limits						Max. back pressure (psig)	
		Inlet	Outlet		-76°F to -450°F	-21°F to -75°F	100°F to -20°F	450°F	800°F	1000°F	Conventional valve	Balanced bellows valve
					-60°C to -268°C	-30°C to -59°C	38°C to -29°C	232°C	427°C	538°C		
1	8 x 10	150#RF	150#RF	WCB	-	-	65	65	65	-	30	30
2	8 x 10	300#RF	150#RF	WCB	-	-	300	300	300	-	100	100
3	8 x 10	300#RF	150#RF	WC6	-	-	-	-	300	225	100	100
4	8 x 10	150#RF	300#RF	CF8M	50	65	-	-	-	-	30	30
5	8 x 10	300#RF	300#RF		65	120	-	-	-	-	60	60

RF = Raised face

Minimum set pressure limits for metal seat trim

Conventional	13 psig
Bellows - gas	13 psig
Bellows - liquid	40 psig*
Conventional (inverted)	2 psig

* For liquid bellows valves below this pressure refer to factory.

NOTE

Soft seated valves require a minimum set pressure of 15 psig (1 barg).

High pressure version

Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high pressure valve.

Orifice	Inlet rating	Max. set pressure psig	Spring material (pressures in psig)					
			Carbon st.	316 SS	Tungsten	17/4PH	17/4PH NACE	Inconel X750
T	150#	65	-	-	-	-	-	-
T	300#	300	200	79	200	138	96	83

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

PRESSURE ADJUSTMENT

Each valve is factory set and normally will not need any pressure adjustment; however, if the occasion arises, the following procedures apply:

ASME

If the valve is ASME stamped (UV) (NB), repairs must be carried out by an ASME authorized repair company, i.e. one holding either the (UV) or (VR) stamp.

Test rig

It is normally desirable to remove the valve from the plant and use a suitable test rig designed specifically for safety relief valves.

Range

Each spring has a definite range, the limits of which should not be exceeded. These should be checked with the factory, as if a set pressure change is required, it may be necessary to obtain a new spring. Should the set pressure be changed it is important to ensure that the valve will still have sufficient capacity under the new service conditions.

Procedure

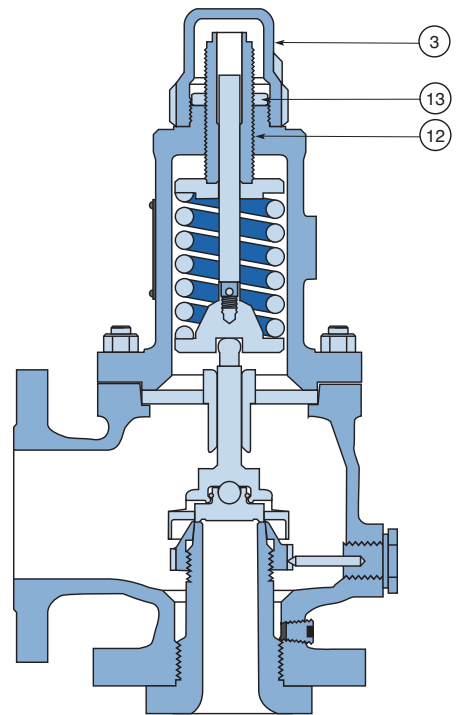
1. Remove the cap (3) to expose the compression screw (12).
2. Slacken the locknut (13).
3. Introduce pressure to the valve inlet. The spring pressure and consequently the valve set pressure may be increased or decreased by turning the compression screw:

Clockwise - increases set pressure

Anti-clockwise - decreases set pressure

Check against a calibrated pressure gauge.

4. Re-tighten the locknut and refit the cap. Replace cap gasket if damaged.
5. Check seat leakage (see page 34/35).



COLD DIFFERENTIAL TEST PRESSURE

When setting a valve intended for use at high temperature on a test rig using a test fluid at ambient temperatures, it is necessary to set the valve at a slightly higher pressure, so that it will open at the correct set pressure under relieving conditions. The necessary allowance is shown in the table.

Relieving temperature - Centigrade	Relieving temperature - Fahrenheit	% Increase in set pressure at ambient temperature
WB, B + C Series		
Up to 121°C	Up to 250°F	None
>121°C to 316°C	>250°F to 600°F	1
>316°C to 427°C	>600°F to 800°F	2
>427°C to 538°C	>800°F to 1000°F	3
D Series		
Up to 100°C	Up to 212°F	None
>100°C to 150°C	>212°F to 302°F	2
>150°C to 260°C	>302°F to 500°F	3

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

BLOWDOWN RING SETTING

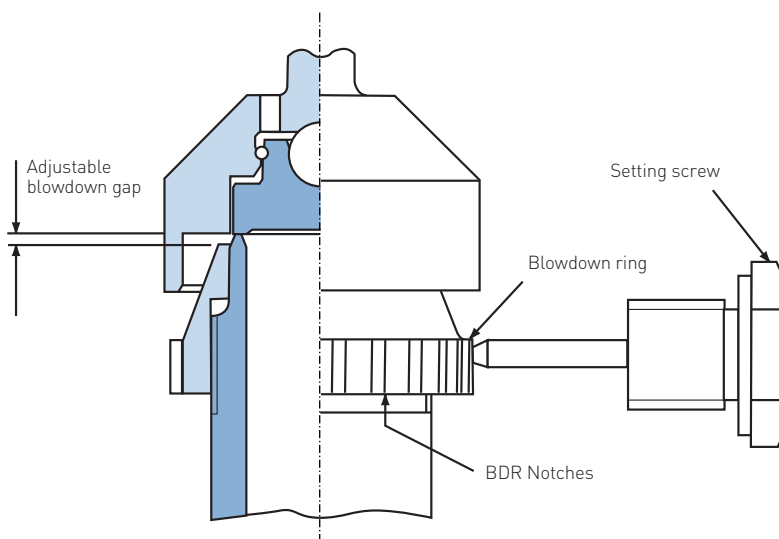
The blowdown adjustment is achieved by means of a single blowdown ring.
By reducing the blowdown gap, blowdown is increased.
By increasing the blowdown gap, blowdown is decreased.
Blowdown is defined as the difference between the set pressure of the valve and the reseating pressure.

IMPORTANT

It is important to reset the blowdown ring to the correct position after maintenance has been carried out on the valve.

Method

1. Removing the setting screw in the body permits access to the blowdown ring.
2. Close the blowdown gap until the ring is touching the face of the disc (turn the ring from left to right).
3. Consult the chart in the maintenance manual to determine the correct blowdown ring setting, or consult the factory.
4. Wind back the blowdown ring the right number of notches to establish the correct position (count the number of notches or serrations on the outside of the blowdown ring).
5. Relocate the locking pin into the notches provided on the outside diameter of the blowdown ring.
6. Tighten up the setting screw, ensuring that an undamaged gasket is in place.



NOTE

It is dangerous to adjust the blowdown ring when the valve is under pressure, unless a suitable 'test gag' is fitted to prevent inadvertent valve opening.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

SEAT TIGHTNESS / SEAT LEAKAGE TESTING

(in accordance with API 527)

Described here are methods of determining the seat tightness of metal and soft-seated pressure relief valves, including those of conventional, bellows and pilot-operated designs.

The maximum acceptable leakage rates are defined for pressure relief valves with set pressures from 15 psig to 6,000 psig. If greater seat tightness is required, the purchaser shall specify it in the purchase order.

The test medium for determining the seat tightness - air, steam or water - shall be the same as that used for determining the set pressure of the valve.

For dual-service valves, the test medium - air, steam or water - shall be the same as the primary relieving medium.

To ensure safety, the procedures outlined shall be performed by persons experienced in the use and functions of pressure relief valves.

TESTING WITH AIR

A1 Test apparatus

A test arrangement for determining seat tightness with air is shown opposite. Leakage shall be measured using a tube with an outside diameter of $\frac{5}{16}$ inch and a wall thickness of 0.035 inch. The tube end shall be cut square and smooth. The tube opening shall be $\frac{1}{2}$ inch below the surface of the water. The tube shall be perpendicular to the surface of the water.

A2 Test medium

The test medium shall be air (or nitrogen) near ambient temperature.

A3 Test configuration

The valve shall be vertically mounted on the test stand and the test apparatus shall be attached to the valve outlet, as shown opposite. All openings - including but not limited to caps, drain holes, vents, and outlets - shall be closed.

A4 Test pressure

For a valve whose set pressure is greater than 50 psig, the leakage rate (in bubbles per minute) shall be determined with the test pressure at the valve inlet held at 90% of the set pressure. For a valve set at 50 psig or less, the test pressure shall be held at 5 psig less than the set pressure.

A5 Leakage test

Before the leakage test, the set pressure shall be demonstrated and all valve body joints and fittings should be checked with a suitable solution to ensure that all joints are tight. Before the bubble count, the test pressure shall be applied for the following times:

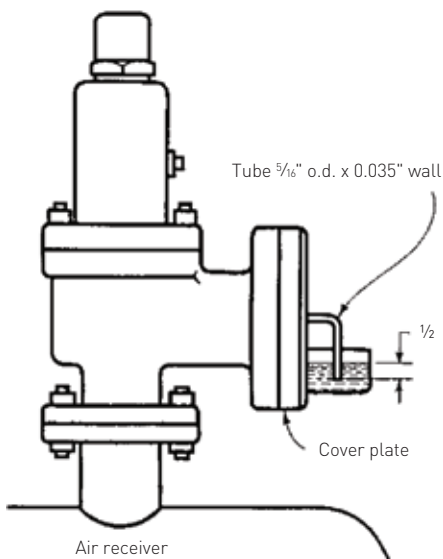
Valve size	Time
Up to 2 ins	1 min
3 ins to 4 ins	2 min
6 ins and above	5 min

The valve shall then be observed for leakage for at least 1 minute.

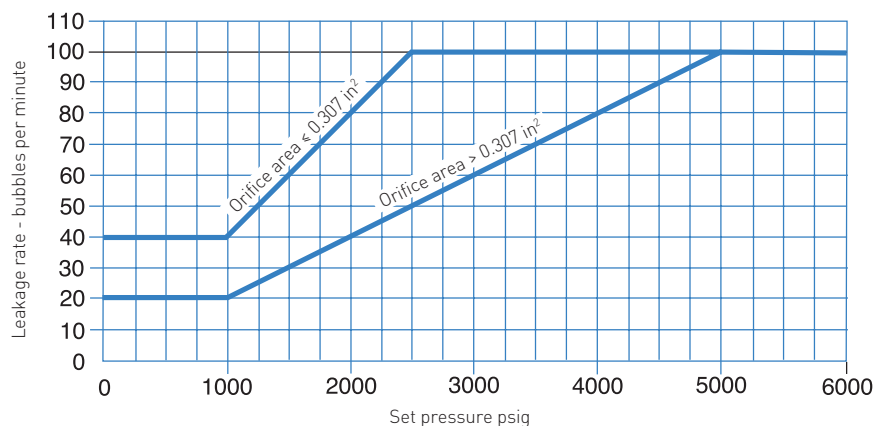
A6 Acceptance criteria

For a valve with a metal seat, the leakage rate in bubbles per minute shall not exceed the appropriate value in chart opposite. For a softseated valve, there shall be no leakage for 1 minute (0 bubbles per minute).

TEST APPARATUS FOR AIR SEAT TIGHTNESS



API 527 AIR LEAKAGE RATES



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

(in accordance with API 527)

TESTING WITH STEAM

S1 Test medium

The test medium shall be saturated steam.

S2 Test configuration

The valve shall be vertically mounted on the steam test stand.

S3 Test pressure

For a valve whose set pressure is greater than 50 psig, the seat tightness shall be determined with the test pressure at the valve inlet held at 90% of the set pressure. For a valve set at 50 psig or less, the test pressure shall be held at 5 psig less than the set pressure.

S4 Leakage test

Before starting the seat tightness test, the set pressure shall be demonstrated and the test pressure shall be held for at least 3 minutes. Any condensate in the body bowl shall be removed before the seat tightness test. Air (or nitrogen) may be used to dissipate condensate.

After any condensate has been removed, the inlet pressure shall be increased to the test pressure. Tightness shall then be checked visually using a black background.

The valve shall then be observed for leakage for at least 1 minute.

S5 Acceptance criteria

For both metal and soft-seated valves, there shall be no audible or visible leakage for 1 minute.

TESTING WITH WATER

IMPORTANT

All liquid trim valves must be tested on water. Otherwise set pressures and leakage rate results will be false.

W1 Test medium

The test medium shall be water near ambient temperature.

W2 Test configuration

The valve shall be vertically mounted on the water test stand.

W3 Test pressure

For a valve whose set pressure is greater than 50 psig, the seat tightness shall be determined with the test pressure at the valve inlet held at 90% of the set pressure. For a valve set at 50 psig or less, the test pressure shall be held at 5 psig less than the set pressure.

W4 Leakage test

Before starting the seat tightness, the set pressure shall be demonstrated and the outlet body bowl shall be filled with water. The pressure gauge shall be allowed to stabilise with no visible flow from the valve outlet. The inlet pressure shall then be increased to the test pressure. The valve shall then be observed for 1 minute at the test pressure.

W5 Acceptance criteria

For a metal-seated valve whose inlet has a nominal pipe-size of 1 inch or larger, the leakage rate shall not exceed 10 cubic centimetres per hour per inch of nominal inlet size. For a metal-seated valve whose inlet has a nominal pipe size of less than 1 inch, the leakage rate shall not exceed 10 cubic centimetres per hour. For soft-seated valves, there shall be no leakage for 1 minute.

IMPORTANT

Test rig cleanlines is vital to avoid contamination and damage to the safety relief valve seat surfaces.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

VALVE SIZING

Overview

A safety valve is fitted to restrict system overpressure to a predetermined level; this is normally 110% of the safety valve set pressure. In order to ensure that the overpressure is not exceeded, the flow rate through the safety valve has to be calculated. This calculation uses formulae which are derived from ASME VIII and API 520 Codes which are recognized throughout the world.

Sizing

The sizing of the safety valve uses data from the physical properties of the fluid, the valve set pressure, overpressure limits and effective discharge area.

Formulae are presented for sizing valves on steam, gas and liquid. The constants used in the sizing formulae may have a different value dependent upon the valve type; where this is the case, it is clearly illustrated on the graph or table. All discharge coefficients are relative to the valve type and have been approved to the ASME VIII Code.

Capacity tables are also shown for sizing on dry saturated steam, air and water. When calculating the flow rate through the safety valve, it is important that the flow rate through the valve is greater than the required flow rate generated by the system.

Selection

The safety valve selected must be suitable for the pressure and temperature required in the system; the appropriate section of the safety valve catalog should be referred to. The selected total discharge area of the safety valve must always be greater than the calculated discharge area required to relieve the system flow rate under all working conditions.

VALVE SIZING FORMULAE

Gas and vapour flow

1. Mass flow (imperial units)

$$A = \frac{W \sqrt{TZ}}{C P K_d F_b F_f F_p \sqrt{M} K_c}$$

2. Volumetric flow (imperial units)

$$A = \frac{Q \sqrt{GTZ}}{1.175 C P K_d F_b F_f F_p K_c}$$

3. Constant [C] (imperial units)

$$C = 520 \sqrt{k \left(\frac{2}{k+1} \right)^{\frac{k+1}{k-1}}}$$

4. Constant, Fb

$$F_b = \sqrt{\frac{\frac{2k}{k-1} \left[\left(\frac{P_b}{P} \right)^{2/k} - \left(\frac{P_b}{P} \right)^{(k+1)/k} \right]}{k \left[\left(\frac{2}{k+1} \right)^{(k+1)/(k-1)} \right]}}$$

TABLE 1 - NOZZLE GAS CONSTANT

K	C		K	C	
	Imperial	Metric		Imperial	Metric
1.00	315	2.40	1.38	354	2.69
1.02	318	2.41	1.40	356	2.70
1.04	320	2.43	1.42	358	2.72
1.06	322	2.45	1.44	359	2.73
1.08	324	2.46	1.46	361	2.74
1.10	326	2.48	1.48	363	2.76
1.12	329	2.50	1.50	364	2.77
1.14	331	2.51	1.52	366	2.78
1.16	333	2.53	1.54	368	2.79
1.18	335	2.55	1.56	369	2.80
1.20	337	2.56	1.58	371	2.82
1.22	339	2.58	1.60	372	2.83
1.24	341	2.59	1.62	374	2.84
1.26	343	2.61	1.64	376	2.85
1.28	345	2.62	1.66	377	2.86
1.30	347	2.63	1.68	378	2.87
1.32	349	2.65	1.70	380	2.89
1.34	350	2.66	2.00	400	3.04
1.36	353	2.68	2.20	412	3.13

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

Steam flow (sonic and subsonic flow)

5. Mass flow (imperial units)

$$A = \frac{W}{51.5 P K_d F_{sh} F_b F_f F_n F_p K_c}$$

High pressure steam correction factor F_n :

$F_n = 1.0$ when $P \leq 1515$ psia

Use the following formulae when $P > 1515$ psia (104.5 bara) and $P < 3215$ psia (221.7 bara)

6. F_n (imperial units)

$$F_n = \frac{0.1906 P - 1000}{0.2292 P - 1061}$$

Liquid flow

7. Liquid flow (imperial units)

$$A = \frac{VL\sqrt{G}}{38 K_d F_1 F_v K_c \sqrt{(P_g - P_{bg})}}$$

Liquid viscosity correction (F_v): when a relief valve is sized for viscous liquid service, it should first be sized as it was for nonviscous type application so that a preliminary required discharge area, A , can be obtained.

The next larger orifice size should be used in determining the Reynold's number, R , from either of the following relationships:

$$R = \frac{VL(2800G)}{e\sqrt{A}} \quad (8)$$

or

$$R = \frac{12,700VL}{u\sqrt{A}} \quad (9)$$

where:

VL = Flow rate at the flowing temperature, in U.S. gallons per minute.

G = Specific gravity of the liquid at the flowing temperature referred to water (1.00 at 70°F).

e = Absolute viscosity at the flowing temperature, in centipoise.

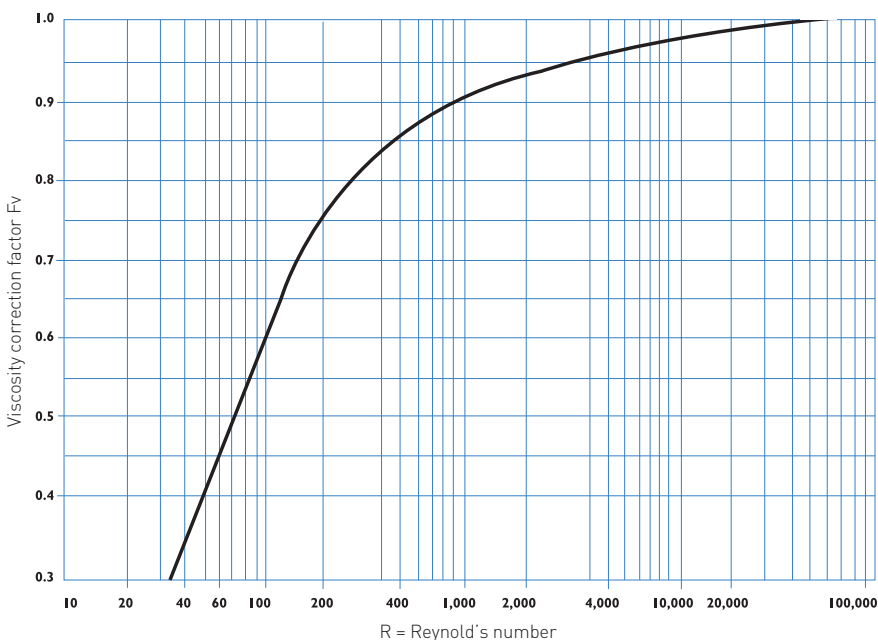
A = Effective discharge area, in square inches (from manufacturer's standard orifice areas).

U = Viscosity at the flowing temperature, in Saybolt Universal seconds.

Note: equation 9 is not recommended for viscosities less than 100 Saybolt Universal seconds. Hence use $F_v = 1$

After the value of R is determined, the factor F_v is obtained from graph 1.0. F_v is applied to correct the preliminary required discharge area. If the corrected area exceeds the chosen standard orifice area, the above calculations should be repeated using the next larger standard orifice size.

GRAPH 1.0
Factor F_v - capacity correction due to viscosity



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

NOMENCLATURE

Symbol	Description	Imperial units
A	Orifice discharge area	sq. ins
C	Gas constant, from the specific heat ratio (k); if unknown use 315 [see page 36 equation (3) or Table 1]	Dimensionless
e	Liquid absolute viscosity	Centipoise
Ff	Back pressure correction factor for gas - takes account of subsonic flow Balanced Bellows Valves (page 42, Graph 2.0)	
Fb	Back pressure correction factor for gas - takes account of subsonic flow Conventional Spring Loaded; WB 400; B Series; Pilot Operated Valves; Type 2, 4 and 8 Pilots: (use Graph 3.0, page 42 or equation (4) page 37)	Dimensionless
Fl	Back pressure correction factor for balanced bellows spring loaded valves (WB 100) liquid duty only, (use Graph 4.0, page 42)	Dimensionless
Fn	High temperature steam correction factor	
Fp	Subsonic flow factor for low set pressure on gas duty only, (use Graph 5.0, page 43)	Dimensionless
Fsh	Correction factor for superheated steam (Table 4, page 44)	Dimensionless
Fv	Liquid viscosity correction factor (page 37, Graph 1.0)	Dimensionless
G	Specific gravity	Dimensionless
Kc	Derating factor = 0.9 for use with bursting discs; if no bursting disc use 1.0	Dimensionless
Kd	Certified ASME Code Section VIII discharge coefficient:	(Actuals are used on WB valves, as the derating factor has been applied to the orifice area)
	WB100 / 200 = 0.653 (actual)	
	WB 300 / 400 = 0.975 (actual)	
	WB 300B = 0.925 (actual)	
	B Series = 0.857 (derated)	
	C Series = 0.509 (derated)	
	6D Series (gas/steam) = 0.811 (derated)	
	6D Series (liquid) = 0.670 (derated)	
	7D Series (gas/steam) = 0.824 (derated)	
	7D Series (liquid) = 0.506 (derated)	
	Pilots: Types 2, 4, 8 = 0.849 gases (derated)	
	Pilots: Types 4, 8 = 0.696 liquids (derated)	
	For full bore 8" x 10" x 10" pilot valves refer to page 96	Dimensionless
k	Isentropic exponent (ratio of specific heats)	Dimensionless
M	Molecular weight	kg/kmole
P	Set pressure + overpressure + atmospheric pressure where: - Overpressure = 10% or 3 Psi whichever is the greater - Atmospheric pressure = 14.7 psia	psia
Pg	Set pressure + Overpressure	psig
Pb	Back pressure at safety valve outlet	psia
Pbg	Back pressure at safety valve outlet	psig
Q	Volumetric flow rate at 14.7 psia and 60 °F	SCFM
R	Reynolds number	Dimensionless
T	Temperature at valve inlet deg.R = 460 + °F	deg. Rankine
VL	Liquid flow rate	us gpm
W	Mass flow rate	lb/h
w	Liquid density	lb/cu ft
Z	Compressibility factor (if unknown use 1.0)	Dimensionless

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

BACKPRESSURE AND BLOWDOWN LIMITS

Figures shown are expressed as a percentage of set pressure.

Valve type	Built up back	Superimposed	Constant superimposed	Blowdown %
	pressure %	variable back	variable back	
	pressure %	pressure %	pressure %	
Conventional spring loaded safety valves				
WB 200	10	3	80	10 – 15
WB 400	10	3	80	7
B	10	3	80	10
C	10	3	80	10 – 15
D	10	3	80	15 – 20
Balanced bellows spring loaded safety valves				
WB 100	50	50	50	10 – 15
WB 300	20	20	20	7
WB 300B	70	70	70	7
7D (piston) Gas	70	70	70	15 – 20
7D (piston) Liq.	50	50	50	15 – 20

Safeset pilot operated safety valves

Refer to data sheet VCTDS-03793

ORIFICE AREAS

Orifice letter	WB Series		Safeset pilot	
	in ²	mm ²	in ²	mm ²
D	0.110	71	0.164	106
E	0.196	127	0.256	165
F	0.307	198	0.338	218
G	0.503	325	0.616	397
H	0.785	506	0.871	562
J	1.287	830	1.427	921
K	1.838	1185	2.139	1380
L	2.853	1840	3.167	2043
M	3.600	2320	4.307	2779
N	4.340	2800	5.162	3330
P	6.380	4120	7.068	4560
Q	11.050	7130	12.864	8299
R	16.000	10300	17.758	11456
S	-	-	22.118	14270
T	26.000	16770	28.860	18619
X	-	-	44.178	28302

Orifice no.	Safeflo	
	in ²	mm ²
1	0.062	40
2	0.110	71
3	0.196	127
4	0.442	285
6	0.070	45
7	0.169	109

WB Series – Spring loaded SRV

WB100 / 200 / 300 / 300B and 400

The actual orifice area is 11% larger than those shown in this table. This ensures that after derating the discharge coefficient in accordance with industry standards, the full benefits of the API 526 orifice area can still be obtained. It is important to use the actual coefficient of discharge as the areas are already derated.

Safeset – Pilot operated SRV

The areas shown in the table are actual orifice areas of the main valves and are larger than the standard API 526 dimensions. This ensures that after derating the discharge coefficient in accordance with industry standards, the full benefits of the API 526 orifice area can still be obtained. It is important to use the derated coefficient of discharge as the areas are actuals.

Safeflo – Spring loaded types

The orifice areas shown in the table are in accordance with industry standards. API 526 does not specify requirements for thermal relief valves. It is important to use the derated coefficient of discharge as the areas are actuals.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

TABLE 2 - REPRESENTATIVE DATA ON SOME VAPOURS AND GASES USEFUL IN SIZING SAFETY RELIEF VALVES

Gas or vapour	k	C (imperial)	C (metric)	M	√M	G*	√G
Acetaldehyde	1.14	331	2.51	44.00	6.633	1.519	1.232
Acetic Acid	1.15	332	2.52	60.00	7.746	2.071	1.439
Acetylene	1.26	343	2.61	26.04	5.103	0.899	0.948
Air	1.40	356	2.70	28.97	5.382	1.000	1.000
Ammonia	1.31	348	2.64	17.03	4.127	0.587	0.766
Argon	1.67	377.5	2.87	40.00	6.325	1.381	1.175
Benzene	1.12	329	2.50	78.11	8.838	2.700	1.643
Butadiene 1.3	1.12	329	2.50	54.09	7.355	1.922	1.386
n-Butane	1.09	325	2.47	58.12	7.630	2.070	1.439
Iso-Butane	1.10	327	2.49	58.12	7.630	2.070	1.439
i-Butane	1.11	327	2.49	56.10	7.490	1.937	1.392
Iso-Butylene	1.12	329	2.49	56.10	7.490	1.998	1.413
Carbon dioxide	1.29	346	2.68	44.01	6.634	1.530	1.237
Carbon disulphate	1.21	338	2.57	76.13	8.726	2.628	1.621
Carbon monoxide	1.40	356	2.70	28.00	5.292	0.967	0.983
Chloride	1.36	353	2.68	70.91	8.421	2.450	1.565
Cyclohexane	1.09	325	2.47	84.16	9.174	2.905	1.705
Decane	1.03	319	2.42	142.00	11.920	4.910	2.216
Dowtherm A	1.043	320	2.43	165.00	12.850	5.696	2.386
Dowtherm E	—	—	—	147.00	12.120	5.074	2.253
Ethane	1.19	336	2.55	30.07	5.483	1.050	1.025
Ethene (ethylene)	1.24	341	2.59	28.05	5.297	0.977	0.988
Ethyl alcohol	1.13	330	2.50	46.07	6.787	1.590	1.261
Ethyl benzine	1.07	323	2.46	106.16	10.310	3.670	1.916
Ethyl chloride	1.19	336	2.55	64.50	8.031	2.226	1.492
Freon 11	1.14	331	2.51	137.37	11.720	4.742	2.177
Freon 12	1.14	331	2.51	120.92	10.995	4.174	2.043
Freon 22	1.18	335	2.55	86.48	9.299	2.985	1.727
Freon 114	1.09	325	2.47	170.93	13.073	5.900	2.429
Helium	1.66	377	2.86	4.00	2.000	0.138	0.3716
n-Heptane	1.05	321	2.44	100.00	10.000	3.490	1.868
n-Hexane	1.06	322	2.45	86.17	9.283	2.970	1.723
Hydrogen chloride	1.41	357	2.71	36.47	6.039	1.270	1.127
Hydrogen	1.41	357	2.71	2.02	1.421	0.070	0.265
Hydrogen sulphide	1.32	349	2.65	34.08	5.838	1.190	1.091
Methane	1.31	348	2.64	16.04	4.005	0.555	0.745
Menthyl alcohol	1.20	337	2.56	32.00	5.657	1.110	1.054
Menthyl butane	1.08	324	2.46	72.15	8.494	2.490	1.578
Methyl chloride	1.20	337	2.56	50.48	7.105	1.742	1.320
Natural gas	1.27	344	2.61	19.00	4.359	0.656	0.8099
Nitric oxide	1.40	356	2.70	30.00	5.477	1.036	1.018
Nitrogen	1.40	356	2.70	28.02	5.294	0.967	0.9834
Nitrous oxide	1.30	347	2.63	44.00	6.633	1.519	1.233
Nonane	1.04	320	2.43	128.00	11.310	4.430	2.105
n-Octane	1.05	321	2.44	114.22	10.687	3.940	1.985
Oxygen	1.40	356	2.70	32.00	5.657	1.100	1.0490
n-Pentane	1.07	323	2.46	72.15	8.494	2.490	1.578
Phenol	1.30	347	2.63	94.00	9.695	3.270	1.808
Propane	1.13	330	2.50	44.09	6.640	1.550	1.245
Propylene	1.15	332	2.52	42.08	6.487	1.476	1.214
Sulphur dioxide	1.29	346	2.63	64.06	8.004	2.260	1.503
Steam	1.33	349	2.66	18.00	4.243	0.622	0.7887
Styrene	1.07	323	2.46	104.14	10.210	3.600	1.897
Toluene	1.09	325	2.47	92.00	9.592	3.180	1.783

* Air = 1.0 at 14.7 psia and 60°F

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

TABLE 3 - REPRESENTATIVE DATA ON LIQUIDS USEFUL IN SIZING SAFETY VALVES

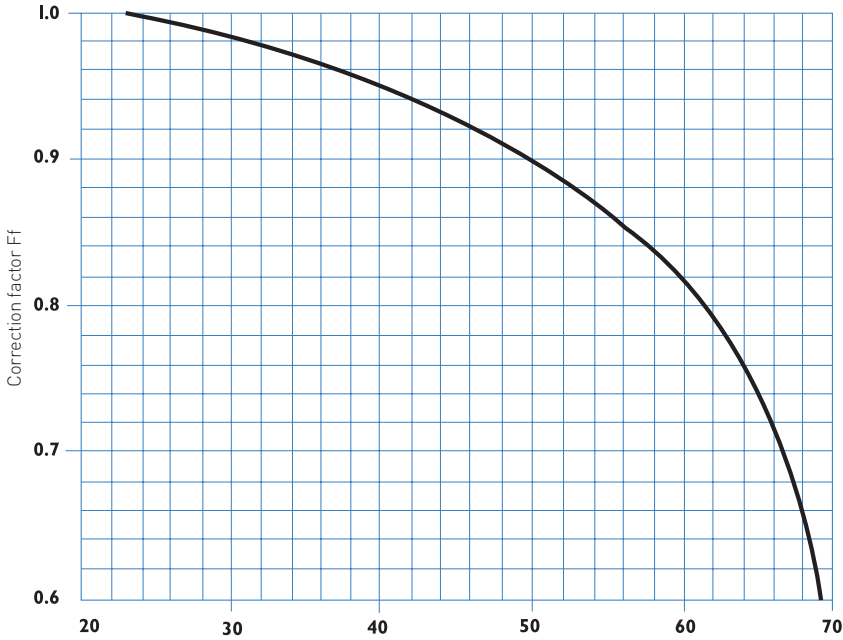
Liquid	G**	vG	Liquid	G**	vG
Acetic acid	1.05	1.025	n-Heptane	0.688	0.830
Acetone	0.792	0.890	n-Hexane	0.664	0.815
Ammonia	0.617	0.786	Hydrochloric acid (40%)	1.20	1.095
Benzene	0.885	0.941	Kerosene	0.82	0.906
1, 2 Butadiene	0.658	0.811	Methane	0.248	0.498
1, 3 Butadiene	0.627	0.792	Methyl alcohol (100%)	0.796	0.892
Iso-Butane	0.563	0.750	Methyl butane	0.625	0.791
n-Butane	0.584	0.764	Naphtha	0.88	0.938
j-Butane	0.601	0.775	Nitric acid (91%)	1.50	1.225
Carbon dioxide	0.816	0.903	Nitrogen	0.804	0.897
Carbon disulphide	1.26	1.122	Iso-Octane	0.696	0.834
Chlorine	1.423	1.93	n-Octane	0.707	0.841
Dowtherm A at 212°F	0.997	0.999	Oils, minerals and lubricants	0.910	0.954
Dowtherm E at 212°F	1.181	1.086	Iso-Pentane	0.625	0.791
Ethane	0.377	0.614	n-Pentane	0.631	0.794
Ethyl alcohol	0.794	0.891	Phosphoric acid	1.88	1.371
Ethyl benene	0.872	0.934	Propane	0.508	0.713
Fuel oil, bunker C	1.014 (max.)	1.007	Polythene	0.522	0.723
Fuel oil, No. 3 (60°F)	0.898 (max.)	0.948	Styrene	0.911	0.955
Fuel oil, No. 5 (60°F)	0.993 (max.)	0.997	Sulphuric acid (87%)	1.80	1.342
Fuel oil, No. 6 (60°F)	0.993 (min.)	0.997	Water	1.00	1.00
Petrol (gasoline)	0.75	0.886			

** Water = 1.0 at 70°F

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

GRAPH 2.0

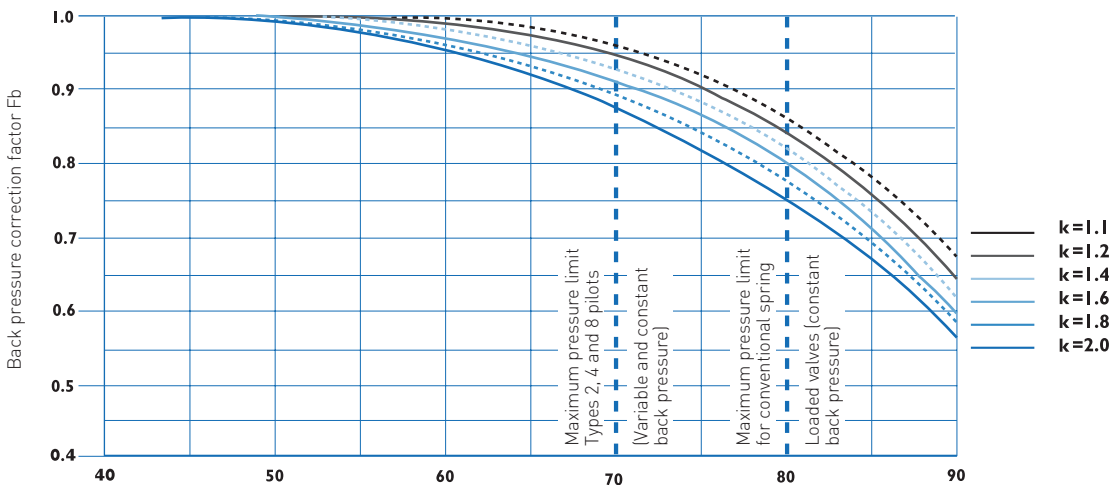
Factor Ff – For application sizing and capacity determination of balanced bellows safety relief valves against variable and constant back pressure – vapours and gases only.



$$\% \text{ Back pressure} = \frac{\text{Back pressure (psig)}}{\text{Set pressure (psig)}} \times 100$$

GRAPH 3.0

Use the curve to evaluate back pressure correction factor Fb, for pilot valves and for conventional valves with constant back pressure use.

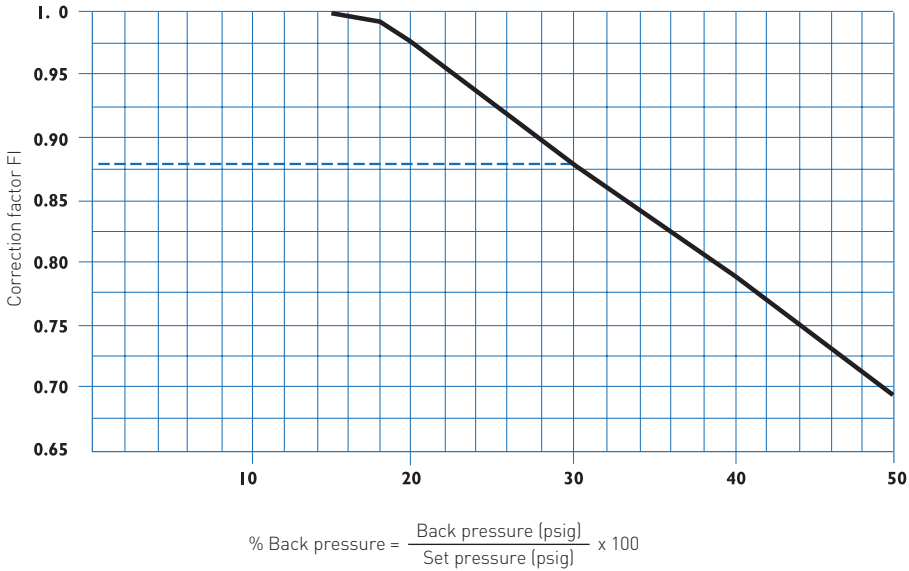


$$\% \text{ Back pressure} = \frac{\text{Back pressure (psia)}}{\text{Set pressure} + \text{Overpressure (psia)}} \times 100$$

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

GRAPH 4.0

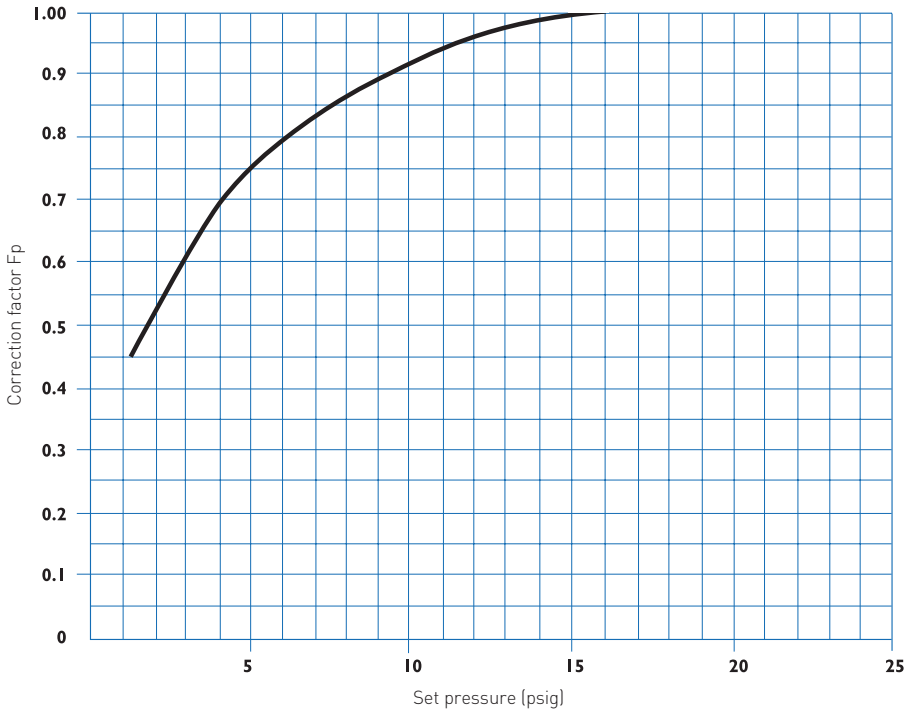
Factor FI – For application sizing and capacity determination of balanced bellows safety relief valves against variable or constant back pressure – liquids only (10% overpressure).



Example:
 Set pressure = 150 psig
 Back pressure = 45 psig
 The back pressure ratio = $\frac{45}{150} \times 100 = 30\%$
 and FI = 0.88

GRAPH 5.0

Factor Fp – For low set pressure – vapours and gases only.



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

TABLE 4 - SUPERHEATED STEAM CORRECTION FACTORS - FSH

For capacity on superheated steam, multiply saturated steam capacity by correction factor below

Set pressure p.s.i.-gauge	Saturated steam temp.°F	Total steam temperature in degrees Fahrenheit									
		300	400	500	600	700	800	900	1000	1100	1200
15	250	1.00	0.98	0.93	0.88	0.84	0.80	0.77	0.74	0.72	0.70
20	259	1.00	0.98	0.93	0.88	0.84	0.80	0.77	0.74	0.72	0.70
40	287	1.00	0.99	0.93	0.88	0.84	0.81	0.77	0.74	0.72	0.70
60	308	1.00	0.99	0.93	0.88	0.84	0.81	0.77	0.75	0.72	0.70
80	324	1.00	0.99	0.93	0.88	0.84	0.81	0.77	0.75	0.72	0.70
100	338	1.00	0.99	0.94	0.89	0.84	0.81	0.77	0.75	0.72	0.70
120	350	1.00	0.99	0.94	0.89	0.84	0.81	0.78	0.75	0.72	0.70
140	361	1.00	0.99	0.94	0.89	0.85	0.81	0.78	0.75	0.72	0.70
160	371	1.00	0.99	0.94	0.89	0.85	0.81	0.78	0.75	0.72	0.70
180	380	1.00	0.99	0.94	0.89	0.85	0.81	0.78	0.75	0.72	0.70
200	388	1.00	0.99	0.95	0.89	0.85	0.81	0.78	0.75	0.72	0.70
220	395	1.00	0.99	0.95	0.89	0.85	0.81	0.78	0.75	0.72	0.70
240	403	-	1.00	0.95	0.90	0.85	0.81	0.78	0.75	0.72	0.70
260	409	-	1.00	0.95	0.90	0.85	0.81	0.78	0.75	0.72	0.70
280	416	-	1.00	0.96	0.90	0.85	0.81	0.78	0.75	0.72	0.70
300	422	-	1.00	0.96	0.90	0.85	0.81	0.78	0.75	0.72	0.70
350	436	-	1.00	0.96	0.90	0.86	0.82	0.78	0.75	0.72	0.70
400	448	-	1.00	0.96	0.91	0.86	0.82	0.78	0.75	0.72	0.70
500	470	-	1.00	0.96	0.92	0.86	0.82	0.78	0.75	0.73	0.70
600	489	-	1.00	0.97	0.92	0.87	0.82	0.79	0.75	0.73	0.70
800	520	-	-	1.00	0.95	0.88	0.83	0.79	0.76	0.73	0.70
1000	546	-	-	1.00	0.96	0.89	0.84	0.78	0.76	0.73	0.71
1250	574	-	-	1.00	0.97	0.91	0.85	0.80	0.77	0.74	0.71
1500	597	-	-	-	1.00	0.93	0.86	0.81	0.77	0.74	0.71
1750	618	-	-	-	1.00	0.94	0.86	0.81	0.77	0.73	0.70
2000	636	-	-	-	1.00	0.95	0.86	0.80	0.76	0.72	0.69
2500	670	-	-	-	1.00	0.95	0.85	0.78	0.73	0.69	0.66
3000	690	-	-	-	-	1.00	0.82	0.74	0.69	0.65	0.62

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

WATER CAPACITY CHART

WB 100/200 - Water capacity U.S.G.P.M. 10% over pressure or 3 psig minimum

Set psig gauge	Orifice size letter designation													
	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
10	10	18	28	45	70	115	164	255	322	388	571	989	1431	2326
20	13	23	37	60	93	153	219	340	428	516	759	1315	1904	3094
30	16	28	44	72	112	183	262	407	513	619	909	1575	2281	3706
40	18	32	51	83	129	212	303	470	593	714	1050	1819	2634	4280
50	20	36	56	93	144	237	338	525	662	799	1174	2033	2944	4785
60	22	40	62	101	158	259	371	575	726	875	1286	2228	3225	5241
70	24	43	67	110	171	280	400	621	784	945	1389	2406	3484	5661
80	26	46	71	117	183	300	428	664	838	1010	1485	2572	3724	6052
90	27	48	76	124	194	318	454	704	889	1072	1575	2728	3850	6419
100	29	51	80	131	204	335	478	742	937	1129	1660	2876	4164	6767
120	31	56	88	143	224	367	524	813	1026	1237	1819	3150	4561	7412
140	34	60	95	155	242	396	566	879	1109	1336	1965	3403	4927	8006
160	36	65	101	166	258	424	605	939	1185	1429	2100	3638	5267	8559
180	38	68	107	176	274	449	642	996	1257	1515	2228	3858	5587	9078
200	40	72	113	185	289	474	676	1050	1325	1597	2348	4067	5889	9569
220	42	76	119	194	303	497	709	1101	1390	1675	2463	4265	6176	10036
240	44	79	124	203	316	519	741	1150	1451	1750	2572	4455	6451	10483
260	46	82	129	211	329	540	771	1197	1511	1821	2677	4637	6714	10911
280	48	85	134	219	342	560	800	1242	1568	1890	2778	4812	6968	11323
300	50	88	138	227	354	580	829	1286	1623	1956	2876	4981	7212	11720
320	51	91	143	234	365	599	856	1328	1676	2020	2970	5144		
340	53	94	147	241	377	618	882	1369	1728	2083	3062	5303		
360	54	97	152	248	388	636	908	1409	1778	2143	3150	5456		
380	56	99	156	255	398	653	932	1447	1826	2202	3237	5606		
400	57	102	160	262	409	670	957	1485	1874	2259	3321	5752		
420	59	105	164	268	419	686	980	1522	1920	2315	3403	5894		
440	60	107	168	275	429	703	1003	1557	1965	2369	3483	6032		
460	61	109	171	281	438	718	1026	1592	2009	2422	3561	6168		
480	63	112	175	287	448	734	1048	1627	2053	2475	3638	6301		
500	64	114	179	293	457	749	1070	1660	2095	2526	3713	6430		
520	65	116	182	299	466	764	1091	1693	2136	2576	3786	6558		
540	67	119	186	304	475	778	1112	1725	2177	2625	3858	6683		
560	68	121	189	310	483	793	1132	1757	2217	2673	3929	6805		
580	69	123	192	315	492	807	1152	1788	2256	2720	3999	6926		
600	70	125	196	321	500	820	1172	1819	2295	2767	4067	7044		
620	71	127	199	326	509	834	1191	1849	2333	2812	4134			
640	72	129	202	331	517	847	1210	1878	2370	2857	4201			
660	74	131	205	336	525	860	1229	1908	2407	2902	4266			
680	75	133	208	341	533	873	1247	1936	2443	2945	4330			
700	76	135	211	346	541	886	1266	1964	2479	2988	4393			
720	77	137	214	351	548	899	1284	1992	2514	3031	4455			
740	78	139	217	356	556	911	1301	2020	2549	3073	4517			
760	79	141	220	361	563	923	1319	2047	2583	3114	4577			
780	80	142	223	366	571	935	1336	2074	2617	3154	4637			
800	81	144	226	370	578	947	1353	2100	2650	3195	4696			
850	83	149	233	382	596	977	1395	2165	2732	3293	4841			
900	86	153	240	393	613	1005	1435	2227	2811	3388	4981			
950	88	157	246	403	630	1032	1474	2289	2888	3481	5118			
1000	91	161	253	414	646	1059	1513	2348	2963	3572	5251			

This chart should be used as a guideline only.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

WATER CAPACITY CHART (CONTINUED)

WB 100/200 - Water capacity U.S.G.P.M. 10% over pressure or 3 psig minimum

Set psig gauge	Orifice size letter designation													
	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
1100	95	169	265	434	678	1111	1586	2463	3107					
1300	103	184	288	472	737	1208	1725	2677						
1500	111	198	309	507	791	1297	1853	2876						
1750	120	213	334	548	855	1401	2001							
2000	128	228	357	585	914	1498	2139							
2250	136	242	379	621	969	1589								
2500	143	255	399	655	1021	1675								
2750	150	267	419	686	1071									
3000	157	279	438	717										
3250	163	291	455	746										
3500	169	302	473	774										
3750	175	312	489											
4000	181	323	505											
4250	187	333	521											
4500	192	342	536											
4750	197	352	551											
5000	202	361	565											
5250	207	370												
5500	212	378												
5750	217	387												
6000	222	395												

This chart should be used as a guideline only.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

AIR CAPACITY CHART (CONTINUED)

WB 400 - Air capacity s.c.f.m. 10% over pressure or 3 psig minimum

Set psig gauge	Orifice size letter designation													
	D	E	F	G	H	J	K	L	M	N	P	Q	R	T
1100	2409	4293	6724	11018	17195	28190	40259	62492	78854					
1300	2842	5064	7932	12997	20283	33254	47491	73717						
1500	3275	5836	9140	14976	23372	38318	54723	84943						
1750	3816	6800	10650	17450	27233	44648	63763							
2000	4357	7764	12160	19924	31094	50978	72803							
2250	4898	8728	13670	22398	34955	57308	81843							
2500	5439	9692	15180	24872	38816	63638								
2750	5980	10656	16690	27346	42677	69968								
3000	6521	11620	18200	29820										
3250	7062	12584	19710	32294										
3500	7603	13548	21220	34768										
3750	8144	14512	22730											
4000	8685	15476	24240											
4250	9226	16440	25750											
4500	9767	17404	27260											
4750	10308	18368	28770											
5000	10849	19332	30280											
5250	11390	20296												
5500	11931	21260												
5750	12472	22224												
6000	13013	23188												

This chart should be used as a guideline only.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

WATER CAPACITY CHART - U.S.G.P.M.

PILOT - TYPES 4 AND 8 - Main valve discharge capacities water u.s.g.p.m.

10% over pressure or 3 psig whichever is the greater. Kd = 0.696

Set psig gauge	Orifice size letter designation [discharge area sq in]														
	D (0.164)	E (0.256)	F (0.338)	G (0.616)	H (0.871)	J (1.429)	K (2.139)	L (3.166)	M (4.307)	N (5.162)	P (7.068)	Q (12.864)	R (17.758)	S (22.118)	T (28.862)
29	25	38	51	92	130	214	320	473	644	771	1056	1922	2654	3305	4313
40	29	45	59	108	153	251	375	555	756	906	1240	2257	3115	3880	5063
60	35	55	73	132	187	307	460	680	925	1109	1519	2764	3816	4752	6201
80	41	64	84	153	216	355	531	785	1069	1281	1754	3192	4406	5488	7161
100	45	71	94	171	242	396	593	878	1195	1432	1961	3568	4926	6135	8006
150	56	87	115	209	296	485	727	1076	1463	1754	2401	4370	6033	7514	9805
200	64	100	133	242	342	561	839	1242	1690	2025	2773	5046	6966	8677	11322
250	72	112	148	270	382	627	938	1389	1889	2264	3100	5642	7788	9701	12659
300	79	123	162	296	418	687	1028	1521	2069	2480	3396	6181	8532	10627	13867
350	85	133	175	320	452	742	1110	1643	2235	2679	3668	6676	9215	11478	14978
400	91	142	188	342	483	793	1187	1756	2389	2864	3921	7137	9852	12271	16012
450	97	151	199	362	513	841	1259	1863	2534	3037	4159	7570	10449	13015	16983
500	102	159	210	382	540	886	1327	1964	2671	3202	4384	7979	11015	13719	17902
550	107	167	220	401	567	930	1391	2060	2802	3358	4598	8368	11552	14389	18776
600	111	174	230	419	592	971	1453	2151	2926	3507	4802	8741	12066	15028	19611
650	116	181	239	436	616	1011	1513	2239	3046	3651	4999	9097	12559	15642	20411
700	120	188	248	452	639	1049	1570	2324	3161	3788	5187	9441	13033	16232	21182
750	125	194	257	468	662	1086	1625	2405	3272	3921	5369	9772	13490	16802	21925
800	129	201	265	483	683	1121	1678	2484	3379	4050	5545	10093	13932	17353	22644
850	133	207	273	498	704	1156	1730	2560	3483	4175	5716	10403	14361	17887	23341
900	136	213	281	513	725	1189	1780	2635	3584	4296	5882	10705	14778	18406	24018
950	140	219	289	527	745	1222	1829	2707	3682	4413	6043	10998	15183	18910	24676
1000	144	225	297	540	764	1253	1876	2777	3778	4528	6200	11284	15577	19401	25317
1200	158	246	325	592	837	1373	2055	3042	4139	4960	6792	12361	17064	21253	27734
1400	170	266	351	639	904	1483	2220	3286	4470	5358	7336	13351	18431	22956	29956
1480	175	273	361	657	929	1525	2283	3379	4596	5509	7543	13728	18950	23603	30800
1600	182	284	375	683	966	1586	2373	3513	4779	5728	7842	14273	19703		
1800	193	301	398	725	1025	1682	2517	3726	5069	6075	8318	15139	20899		
2000	203	318	419	764	1080	1773	2653	3927	5343	6404	8768	15958	22029		
2200	213	333	440	801	1133	1859	2783	4119	5604	6716	9196	16737	23104		
2400	223	348	459	837	1184	1942	2907	4302	5853	7015	9605	17481	24132		
2600	232	362	478	871	1232	2021	3025	4478	6092	7301	9997	18195	25117		
2800	241	376	496	904	1278	2097	3140	4647	6322	7577	10374	18882	26065		
3000	249	389	514	936	1323	2171	3250	4810	6544	7843	10739	19545	26980		
3500	269	420	555	1011	1429	2345	3510	5196	7068	8471	11599	21111	29142		
3705	277	432	571	1040	1471	2413	3612	5346	7272	8716	11934	21720	29983		
4000	288	449	593	1081	1528	2507									
4350	300	468	618	1127	1593	2614									
6170	357	558	736	1342	1898	3114									

NOTES

Type 4 pilot is available to 1480 psig (102 barg).

Type 8 pilot is available from 1480 psig (102 barg).

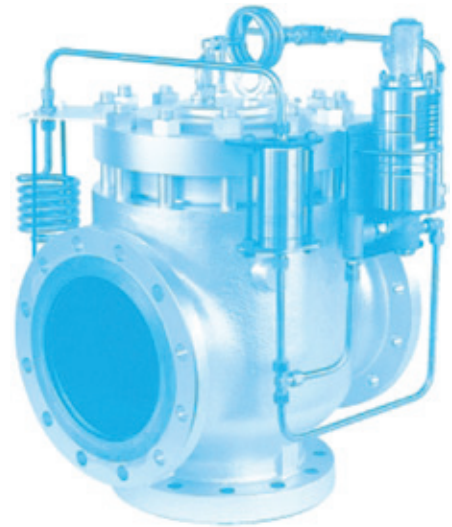
For 8" x 10" x 10" (200 x 250 x 250 mm) full bore capacity chart see page 52.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

DUAL OUTLET/FULL BORE PILOT VALVE

This valve is suitable for extremely high capacity duties. It achieves maximum discharge capacities by having a full bore 8" (200 mm) inlet with an available discharge area of 44.178 in² (28502 mm²) and two opposing 10" (250 mm) outlets, which can assist with reaction force problems.

Available with pilot types 2 and 4.



CAPACITY CHART (FULL BORE 8" X 10" X 10" PILOT VALVE)

Actual orifice area 44.178 sq.in.	Air S.C.F.M. at 60°F and 10% over pressure Pilot types 2 and 4 Derated kd 0.802	Water U.S.G.P.M. at 10% over pressure Pilot type 4 Derated kd 0.658
Set pressure psig		
29	30270	6239
50	45275	8192
100	81002	11585
150	116729	14189
200	152455	16384
250	188182	18318
300	223909	20067
350	259635	21674
400	295362	23171
450	331089	24576
500	366815	25906
550	402542	27170
600	438269	28378
650	473995	29537
700	509722	30652
740	538303	31516

NOTE

Pilot type 2 is available from 29 psig (2 barg). Overpressure at 29 psig (2 barg) is 3 psig (0.2 barg) minimum.

REACTION FORCE - VAPOUR AND GASES

The discharge from a safety relief valve exerts a reaction force on the valve or outlet piping. If the discharge piping is unsupported, this force is transmitted to the valve inlet and associated piping. The following formula can be used to determine the reaction force, assuming that critical flow of the gas or vapour occurs at the valve outlet.

$$F = W \sqrt{\frac{kT}{(k+1) M}} + (P_o \times A_o)$$

where:

F = Reaction force (lbs).

W = Flow rate of gas or vapour (lb/hr).

K = Ratio of specific heat (imperial).

M = Molecular weight of gas or vapour.

T = Temperature at valve inlet, degrees Rankine (equal to degrees F plus 460).

P_o = Outlet pressure (psig).

A_o = Discharge connection area (in²).

Discharge piping should be adequately supported. If pipework is not supported, it must be remembered that the reaction force will act on the end of the discharge pipe, and that the discharge pipe will act as a lever.

The force applied to the valve will therefore be determined by the reaction force and the geometry of the discharge pipework.

DEFINITION OF TERMS

Pressure relief devices

A pressure relief device is actuated by inlet static pressure and designed to open during an emergency or abnormal conditions to prevent a rise of internal fluid pressure in excess of a specified value. The device also may be designed to prevent excessive internal vacuum. The device may be a pressure relief valve, a nonreclosing pressure relief device, or a vacuum relief valve.

A spring-loaded pressure relief valve is a pressure relief device designed to automatically reclose and prevent the further flow of fluid.

A relief valve is a spring-loaded pressure relief valve, actuated by the static pressure upstream of the valve. The valve opens normally in proportion to the pressure increase over the opening pressure. A relief valve is used primarily with incompressible fluids.

A safety valve is a spring-loaded pressure relief valve, actuated by the static pressure upstream of the valve and characterized by rapid opening or pop action. A safety valve is normally used with compressible fluids.

A safety relief valve is a spring-loaded pressure relief valve that may be used as either a safety or relief valve, depending on the application.

A conventional pressure relief valve is a spring-loaded pressure relief valve whose performance characteristics are directly affected by changes in the back pressure on the valve.

A balanced pressure relief valve is a spring-loaded pressure relief valve that incorporates a means for minimizing the effect of back pressure on the performance characteristics.

A pilot-operated pressure relief valve is a pressure relief valve in which the main valve is combined with and controlled by an auxiliary pressure relief valve.

A rupture disc device is a nonreclosing differential pressure relief device, actuated by inlet static pressure and designed to function by bursting the pressure-containing rupture disc. A rupture disc device includes a rupture disc and a rupture disc holder.

Dimensional characteristics of pressure relief devices

The actual discharge area is the measured minimum net area that determines the flow through a valve.

The curtain area is the area of the cylindrical or conical discharge opening between the seating surfaces above the nozzle seat created by the lift of the disc.

The required discharge area is a nominal or computed area of a pressure relief valve used in recognized flow formulae to determine the size of the valve. It will be less than the actual discharge area.

The nozzle area is the cross-sectional flow area of a nozzle at the minimum nozzle diameter.

A huddling chamber is an annular pressure chamber in a pressure relief valve located beyond the seat for the purpose of generating a rapid opening.

The inlet size is the nominal pipe size (NPS) of the valve at the inlet connection, unless otherwise designated.

The outlet size is the nominal pipe size (NPS) of the valve at the discharge connection, unless otherwise designated.

Lift is the actual travel of the disc away from the closed position when a valve is relieving.

OPERATIONAL CHARACTERISTICS

The maximum operating pressure is the maximum pressure expected during system operation.

The maximum allowable working pressure (MAWP) is the maximum gauge pressure permissible in a vessel at its designated temperature. The maximum allowable working pressure is the basis for the pressure setting of the pressure relief devices that protect the vessel.

The design gauge pressure refers to at least the most severe conditions of coincident temperature and pressure expected during operation. This pressure may be used in place of the maximum allowable working pressure in all cases where the MAWP has not been established. The design pressure is equal to or less than the MAWP.

Accumulation is the pressure increase over the maximum allowable working pressure of the vessel during discharge through the pressure relief device, expressed in pressure units or as a percentage. Maximum allowable accumulations are established by applicable codes for operating and fire contingencies.

Overpressure is the pressure increase over the set pressure of the relieving device, expressed in pressure units or as a percentage. It is the same as accumulation when the relieving device is set at the maximum allowable working pressure of the vessel.

Rated relieving capacity is that portion of the measured relieving capacity permitted by the applicable code or regulation to be used as a basis for the application of a pressure relief device.

Stamped capacity is the rated relieving capacity that appears on the device nameplate. The stamped capacity is based on the set pressure or burst pressure, plus the allowable overpressure for compressible fluids and the differential pressure for incompressible fluids. The set pressure is the inlet gauge pressure at which the pressure relief valve is set to open under service conditions.

The cold differential test pressure is the pressure at which the pressure relief valve is adjusted to open on the test stand. The cold differential test pressure includes corrections for the service conditions of back pressure or temperature or both.

Back pressure is the pressure that exists at the outlet of a pressure relief device as a result of the pressure in the discharge system. It is the sum of the superimposed and built-up back pressure.

Built up back pressure is the increase in pressure in the discharge header that develops as a result of flow after the pressure relief device opens.

Superimposed back pressure is the static pressure that exists at the outlet of a pressure relief device at the time the device is required to operate. It is the result of pressure in the discharge system coming from other sources and may be constant or variable.

Blowdown is the difference between the set pressure and the closing pressure of a pressure relief valve, expressed as a percent of the set pressure or in pressure units.

Opening pressure is the value of increasing inlet static pressure at which there is a measurable lift of the disc or at which discharge of the fluid becomes continuous.

Closing pressure is the value of decreasing inlet static pressure at which the valve disc re-establishes contact with the seat or at which lift becomes zero.

Simmer is the audible or visible escape of compressible fluid between the seat and disc at an inlet static pressure above the set pressure and at no measurable capacity.

Leak-test pressure is the specified inlet static pressure at which a seat leak test is performed (normally 90% of set pressure according to AP1 527).

The term relieving conditions is used to indicate the inlet pressure and temperature on a pressure relief device at a specific overpressure. The relieving pressure is equal to the valve set pressure (or rupture disc burst pressure) plus the overpressure. (The temperature of the flowing fluid at relieving conditions may be higher or lower than the operating temperature.)

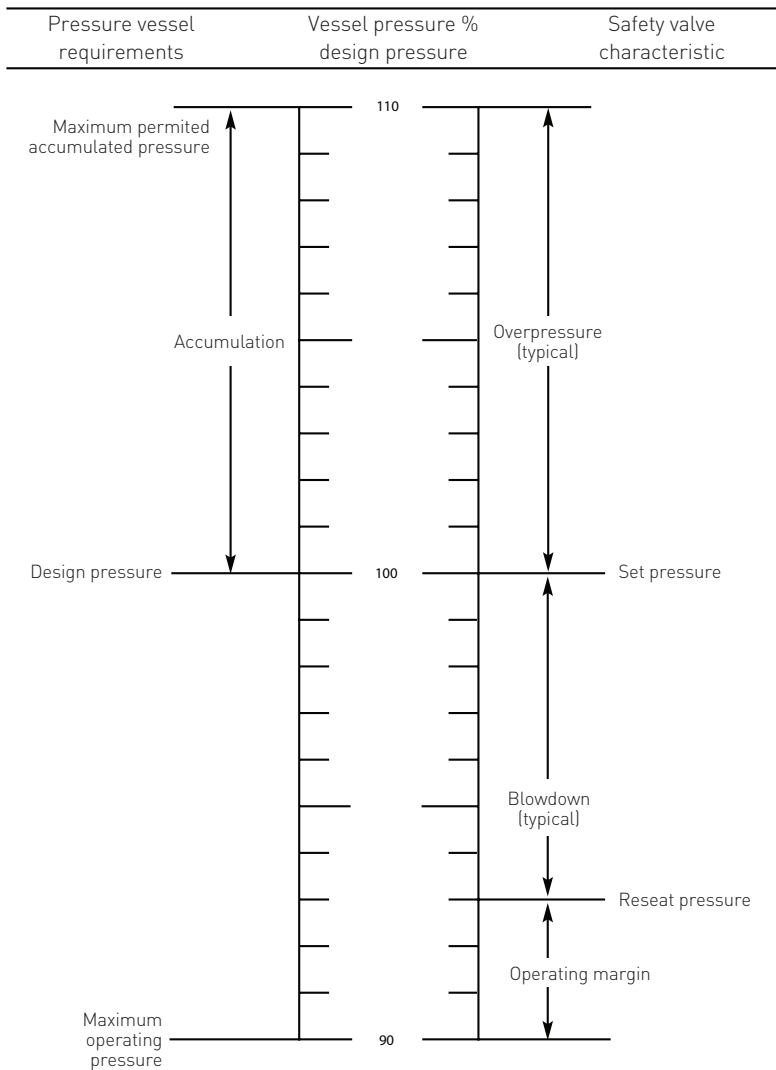
Popping pressure is the pressure at which the valve disc rapidly moves from a slightly open (simmer) position to a practically full open position.

Discharge capacity is the actual mass flow rate of discharge which can also be expressed in volumetric terms.

Equivalent capacity is the mass volumetric flow rate of a fluid calculated from the capacity of the valve for a test fluid. The fluids commonly used for the test purposes are steam, air and water.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

PRESSURE TERM RELATIONSHIP



NOTES

The system operating pressure must not exceed the reseat pressure of the safety valve. Blowdown control is designed to conform to ASME Code Section V111, however liquid applications may demand up to 15% blowdown. Overpressure and blowdowns shown are typical for spring loaded SRVs and can be reduced when using Safeset Pilot Operated SRVs. Refer to the appropriate catalog section for details.

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