



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

CONTENTS

Valve selection – WB and Safeflo Series

Recommended material temperature ranges3
 Valve selection charts, D to T 4-31

Valve adjustments and testing

Valve adjustment..... 32-33
 Seat tightness / seat leakage testing 34-35

Sizing

Valve sizing formulae..... 36-37
 Nomenclature38
 Backpressure and blowdown limits and orifice areas.....39
 Sizing factors..... 40-44

Pressure protection

Capacity charts 45-52
 Reaction forces53
 Definition of terms54
 Operational characteristics.....55
 Pressure term relationship.....56

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

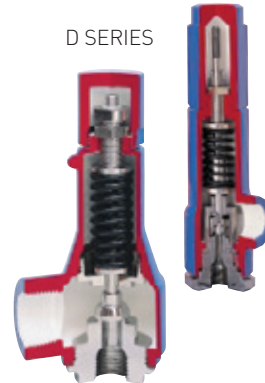
- Quality standard: ISO 9001:2008
- Boiler and pressure vessels: ASME VIII PED 97/23/EC
- Mechanical engineering directive: ATEX 94/9/EC
- Sizing and selection: API 520: Part 1 ISO 4126
- Dimensions: API 526
- Leakage rates: API 527
- Flange ratings: ANSI B16.5

WB SERIES



B/C SERIES

D SERIES



SAFESET



BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

RECOMMENDED MATERIAL TEMPERATURE RANGES

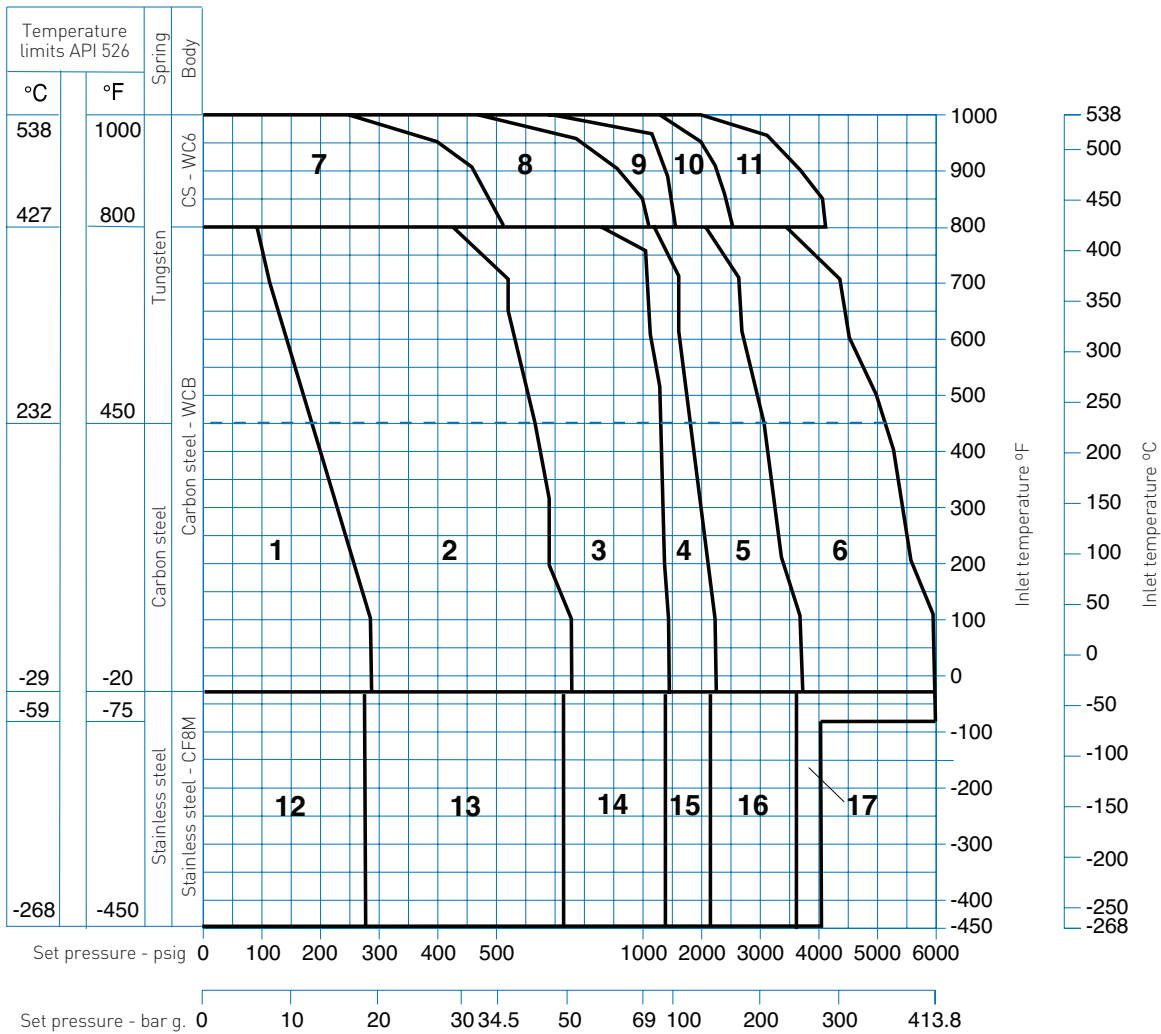
Description	Minimum		Maximum	
	°F	°C	°F	°C
Body				
1 Carbon steel SA 216-WCB	-20	-29	800	427
2 Carbon steel (NACE) SA 216-WCB	-20	-29	800	427
3 Stainless steel (NACE) SA 351-CF8M	-450	-267	1000	538
4 Stainless steel SA 351-CF8M	-450	-267	1000	538
5 Low temp. CS SA 352-LCB	-50	-46	800	427
6 Bronze (oxygen 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



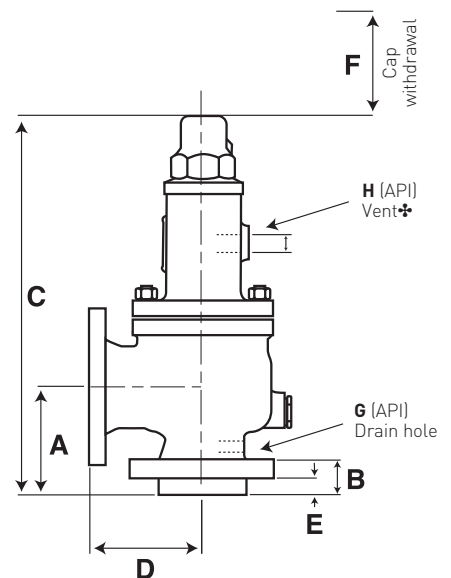
D - 0.110 in²
- 71 mm²

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

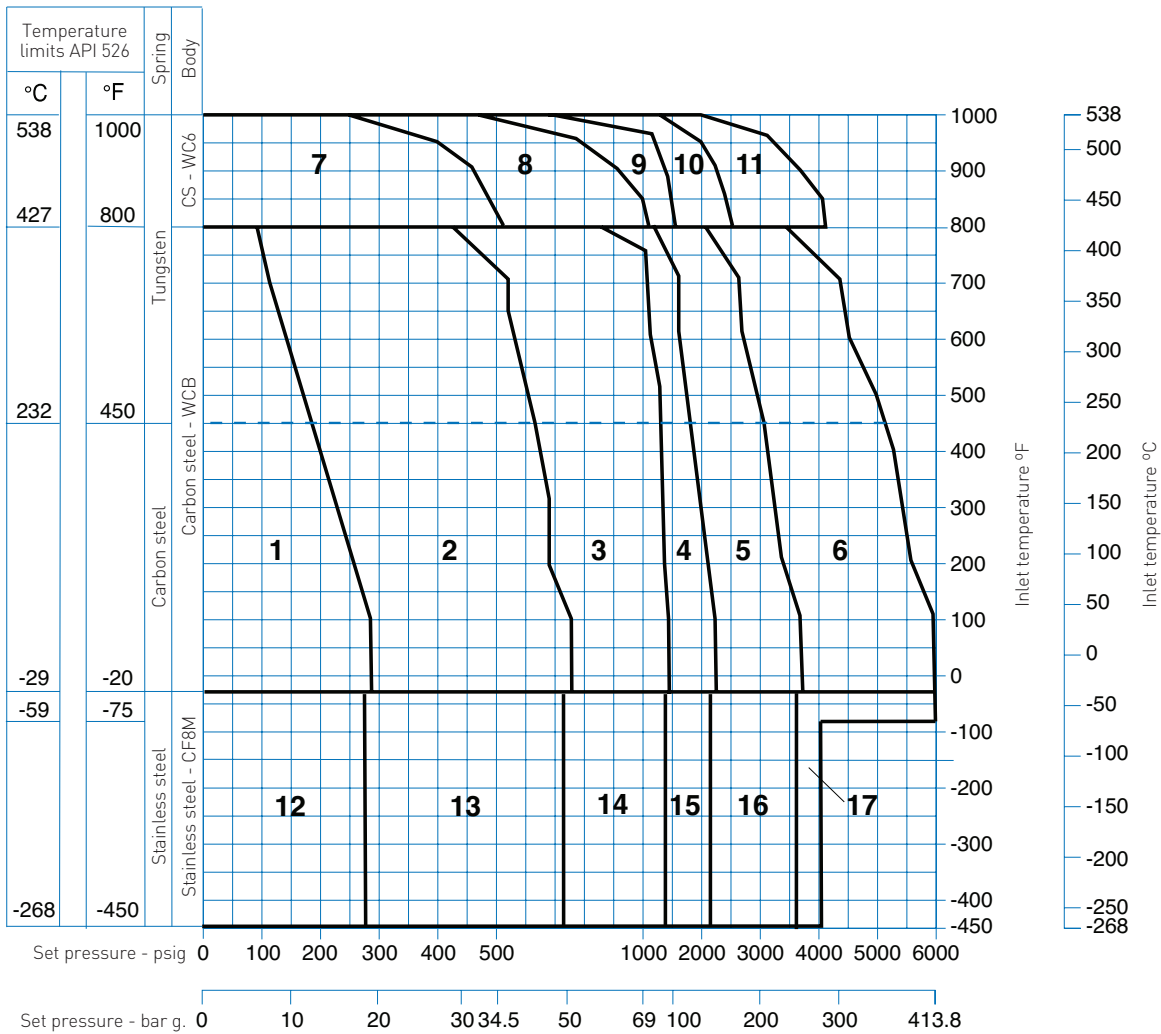
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

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



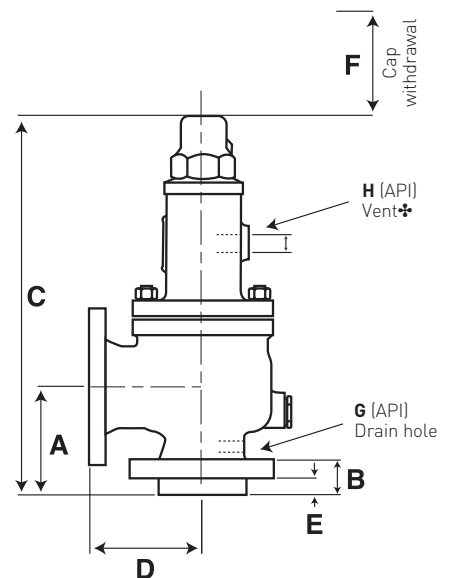
E - 0.196 in²
- 127 mm²

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

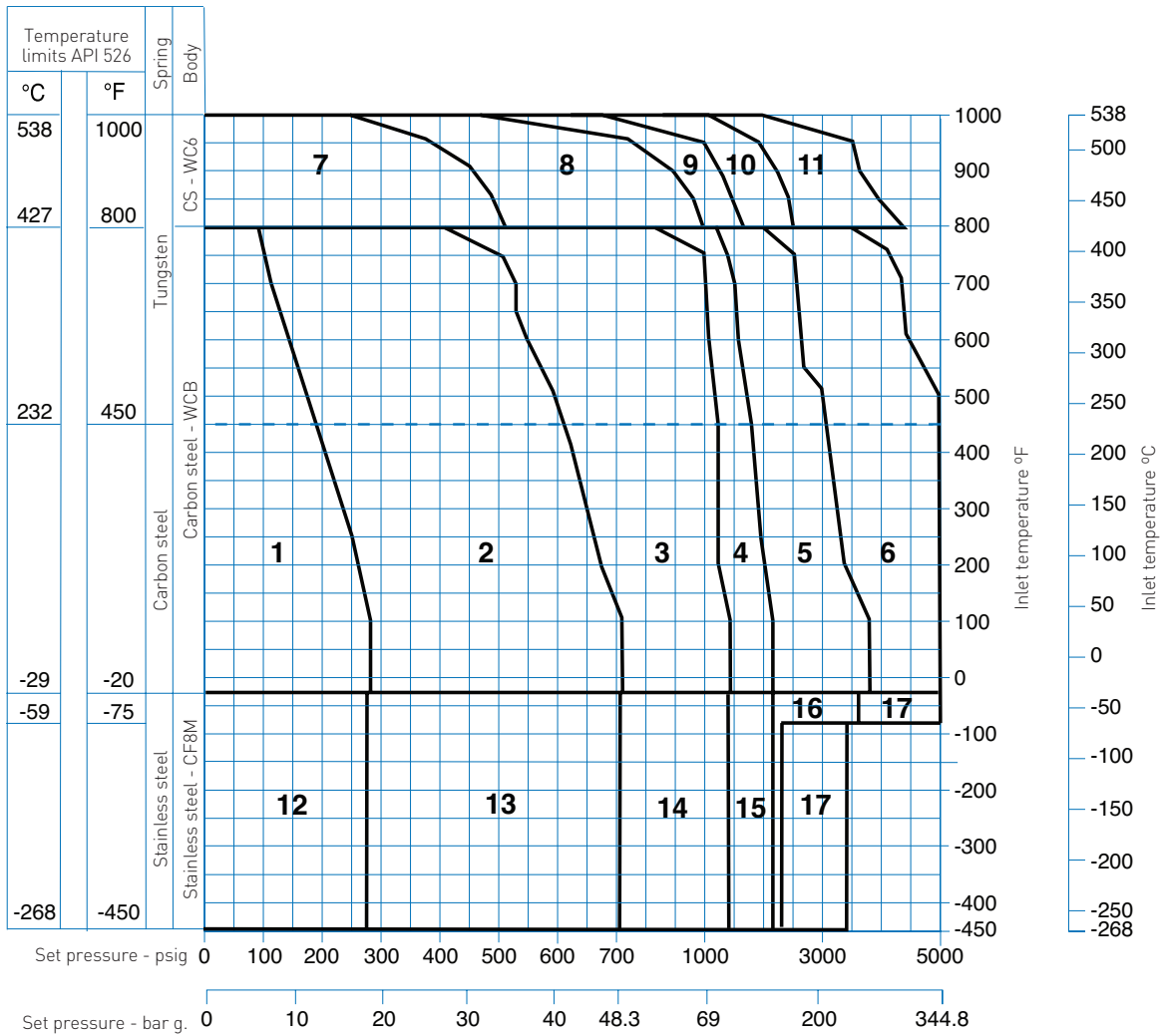
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

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



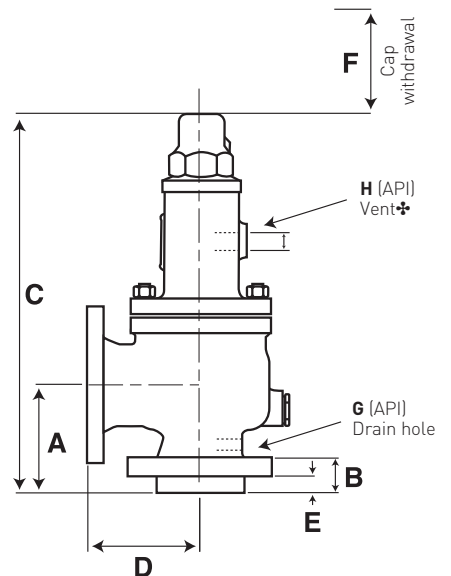
F - 0.307 in²
- 198 mm²

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

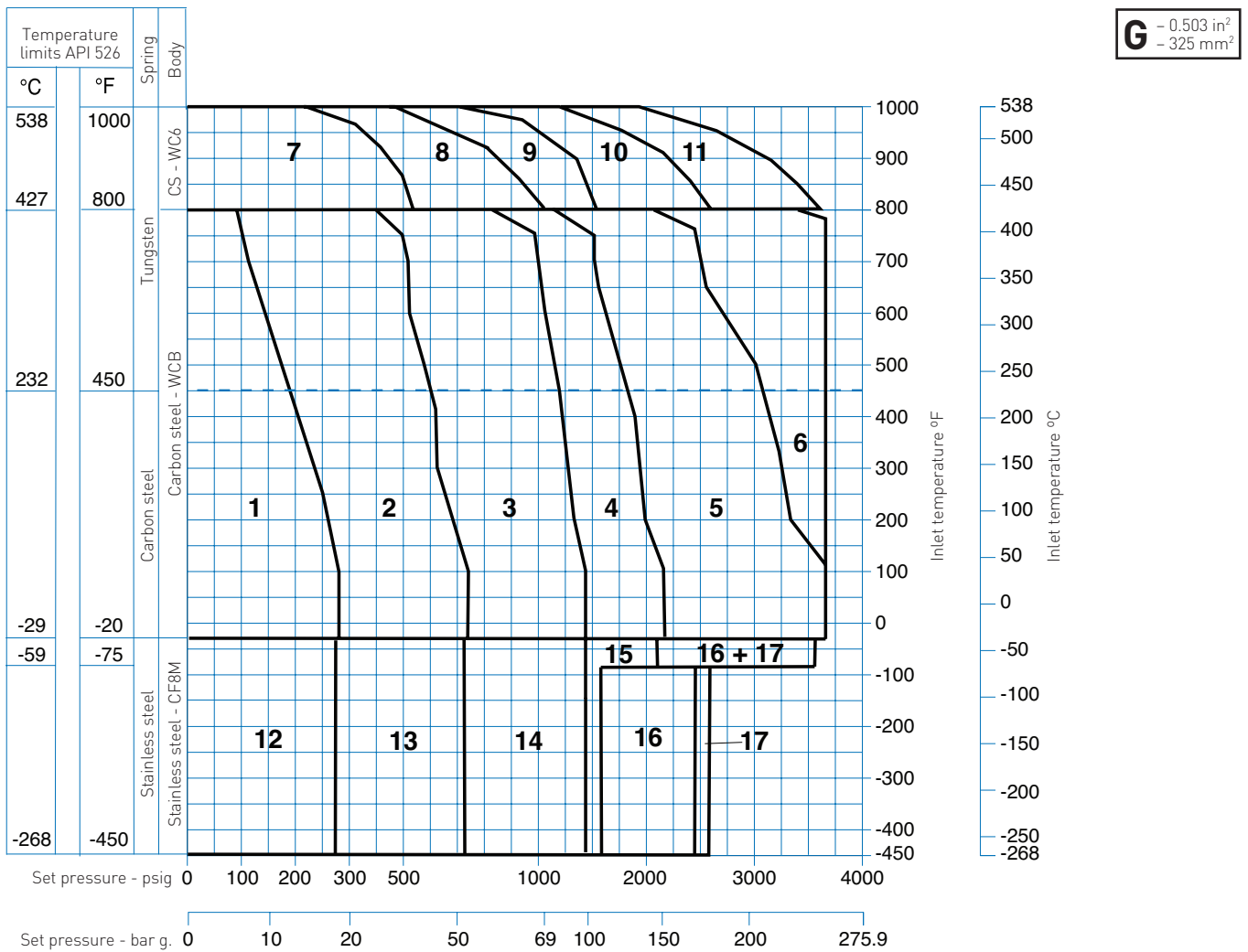
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

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

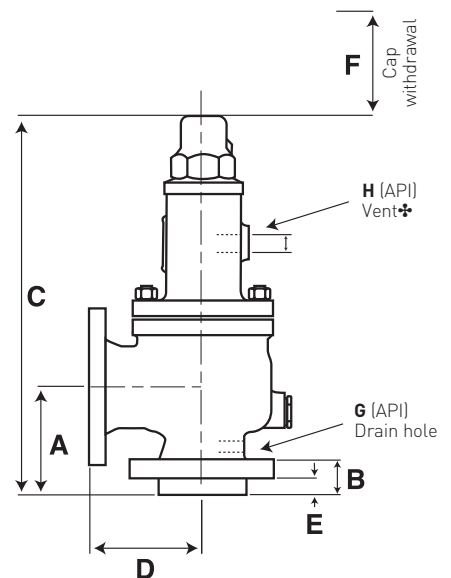


ORIFICE G (ALL DIMENSIONS in inches)

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

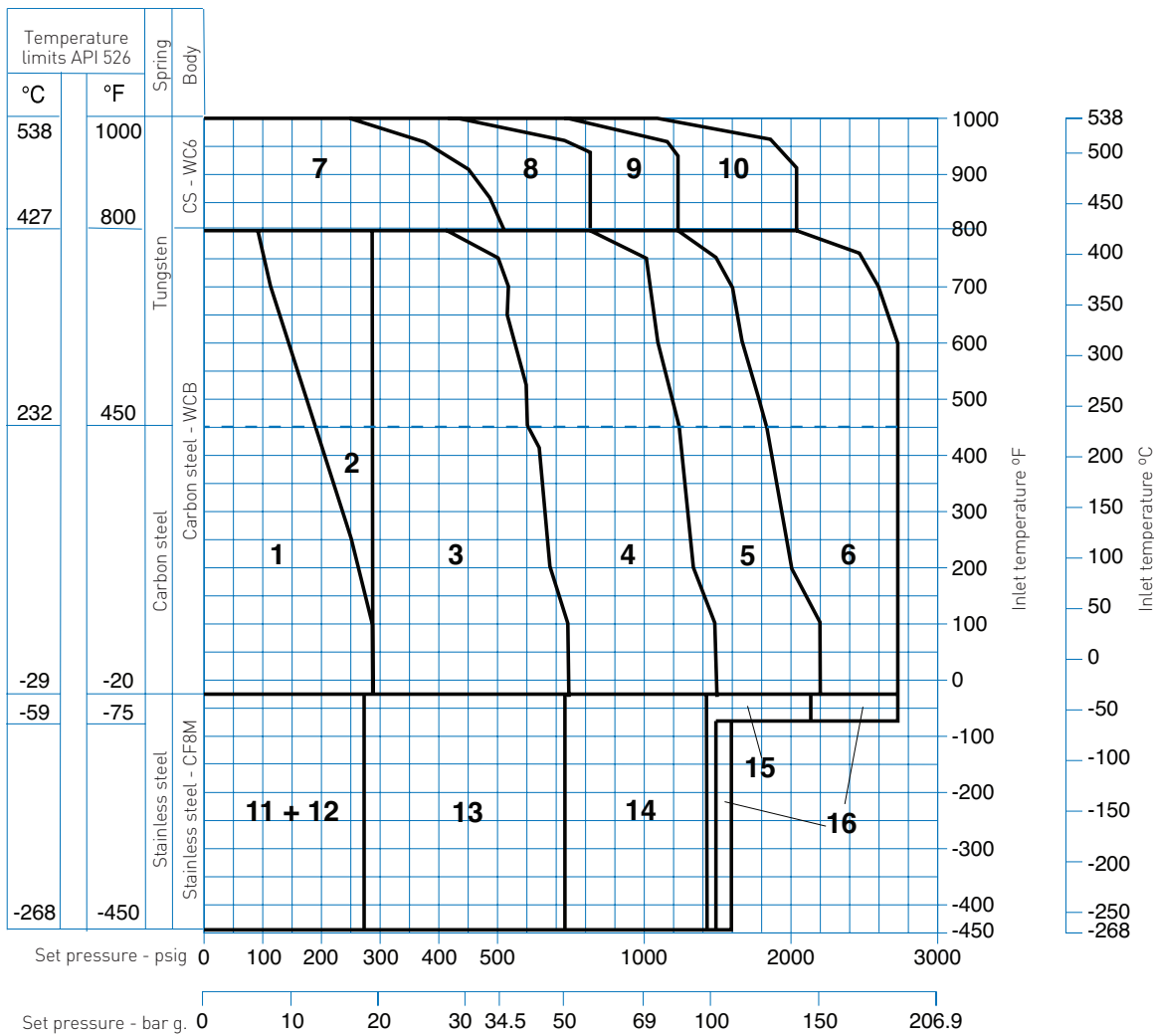
Soft seated valves require a minimum set pressure of 15 psig (1 barg).

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



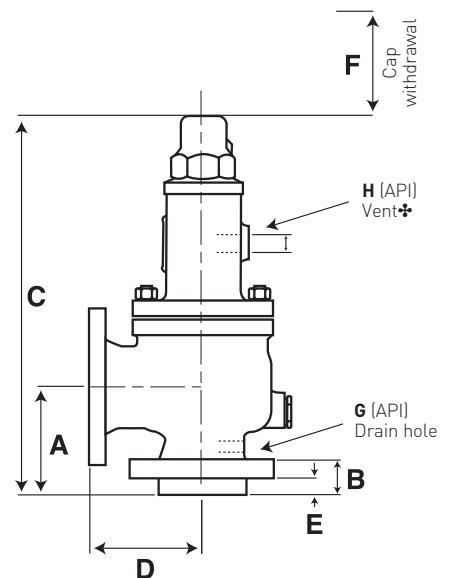
H - 0.758 in²
- 506 mm²

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).

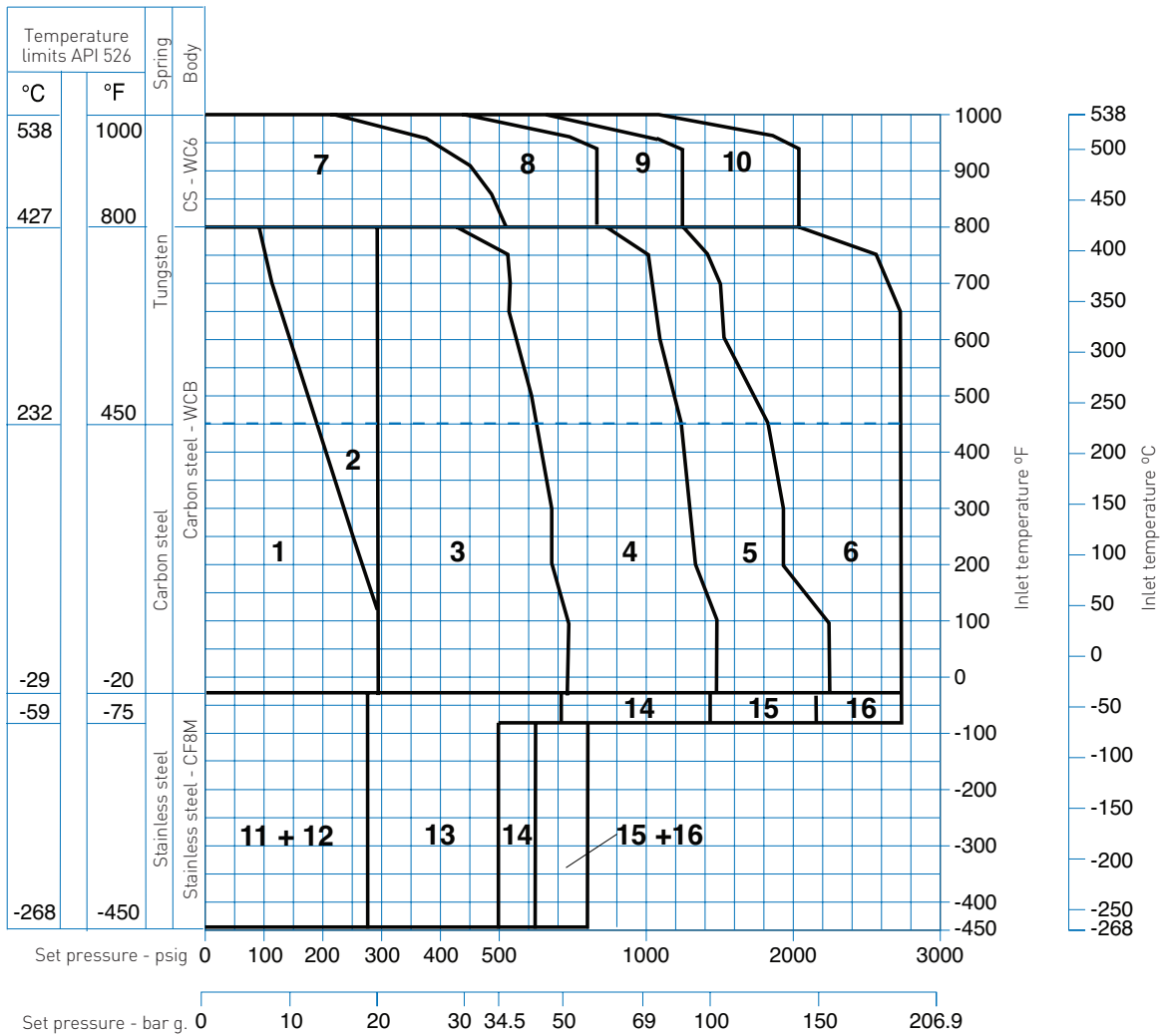
High pressure version

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

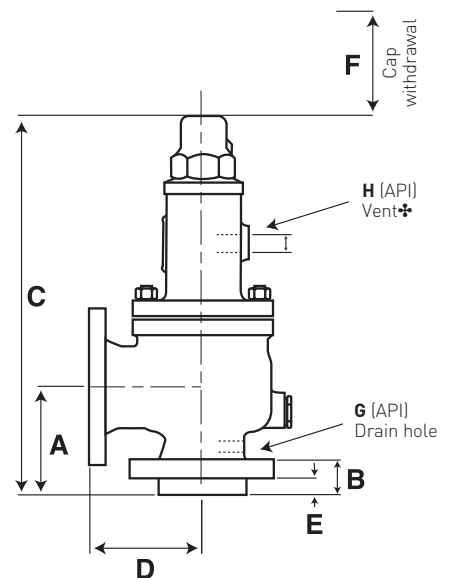


ORIFICE J (ALL DIMENSIONS in inches)

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).

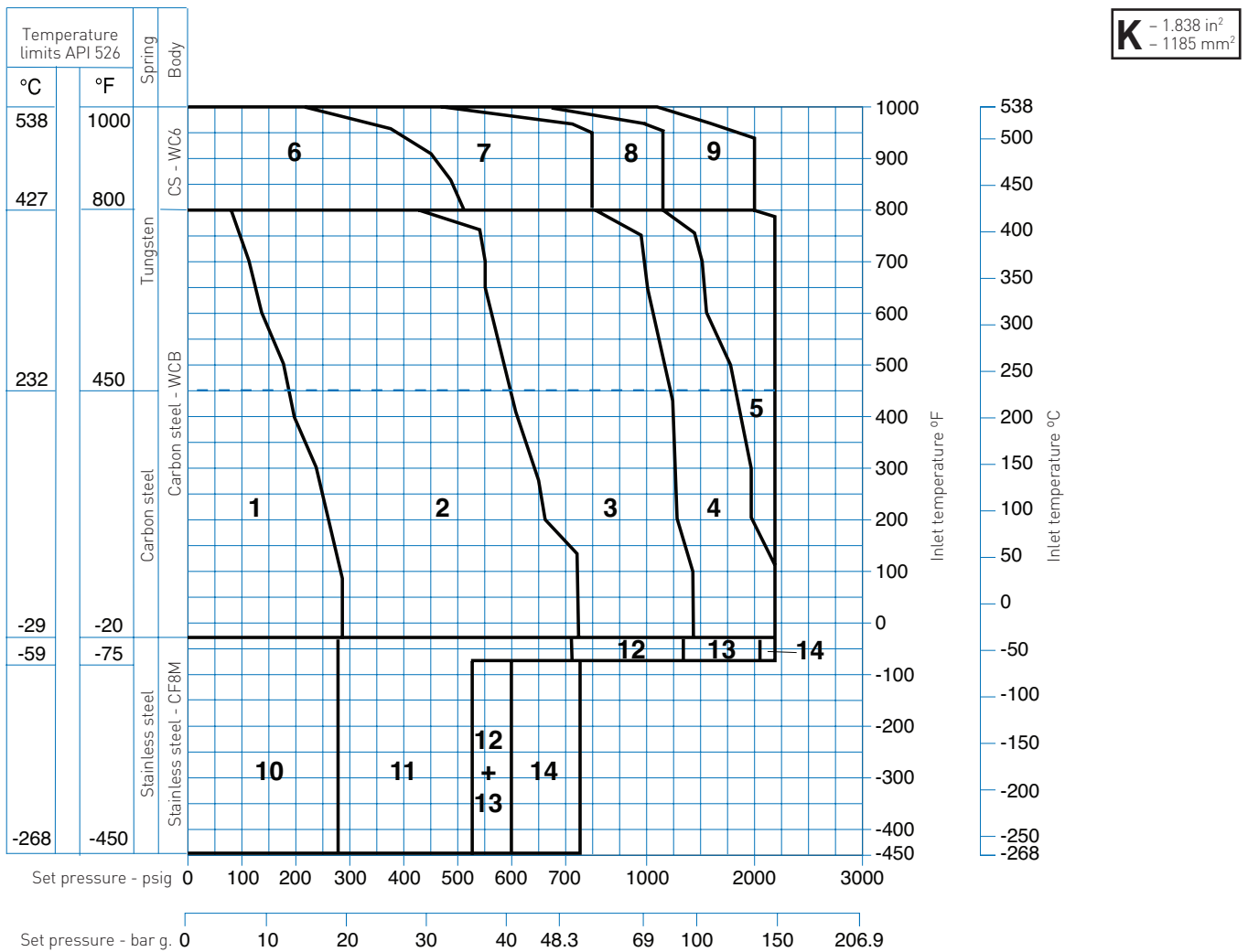
High pressure version

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

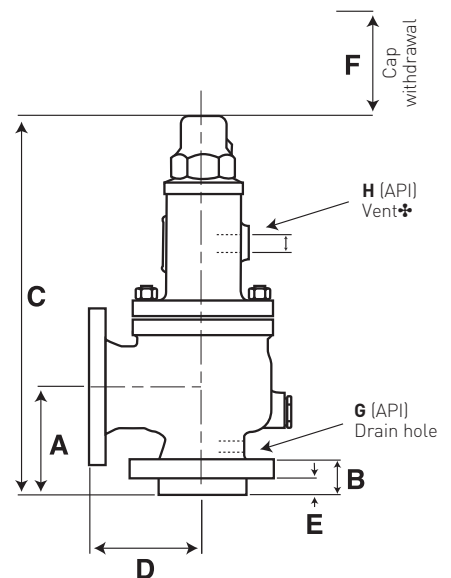


ORIFICE K (ALL DIMENSIONS in inches)

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).

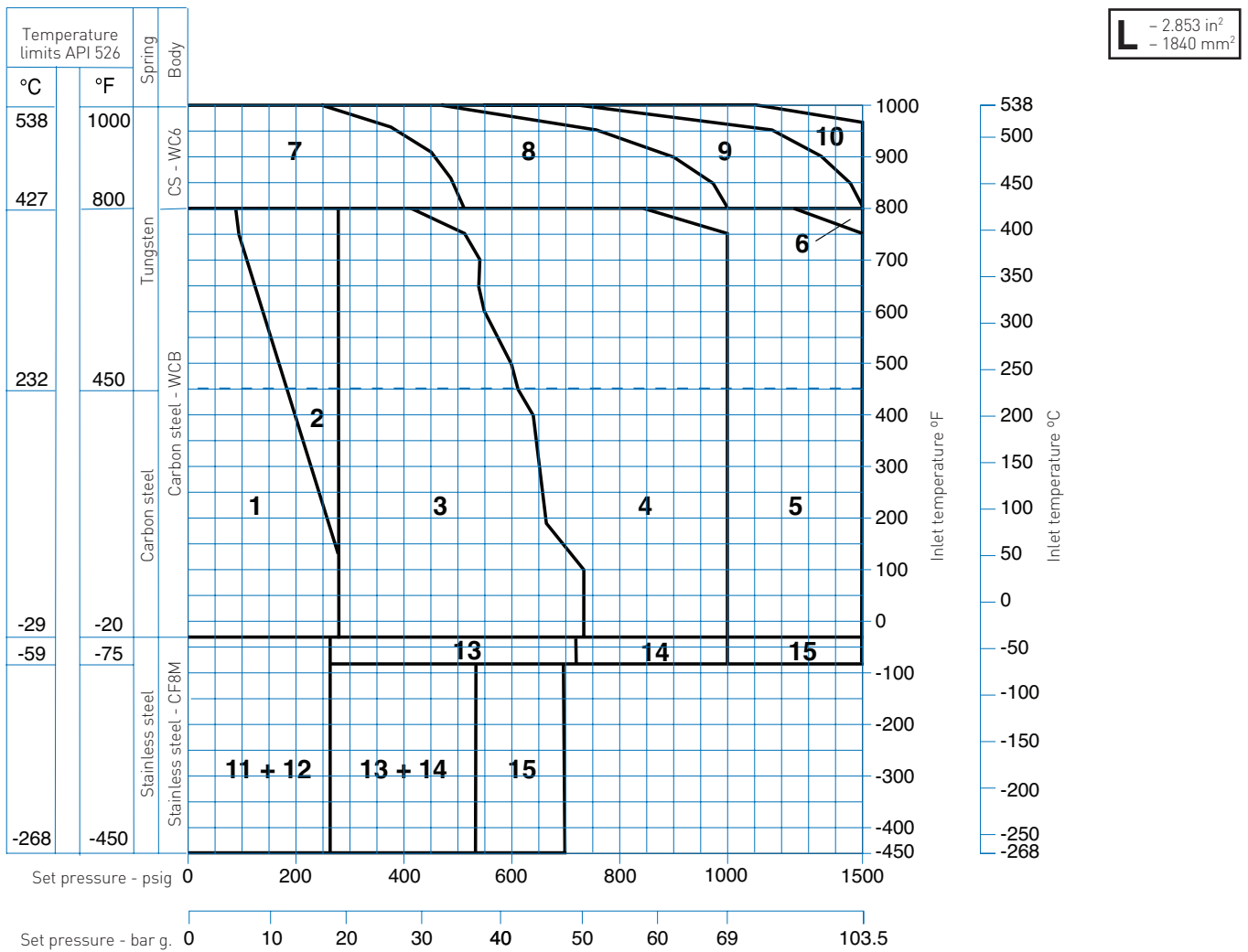
High pressure version

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

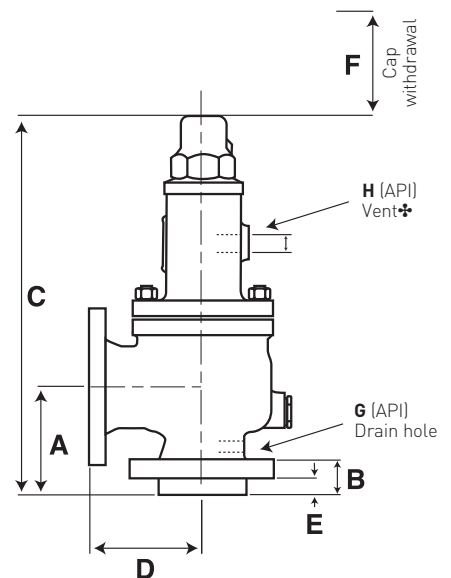


ORIFICE L (ALL DIMENSIONS in inches)

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

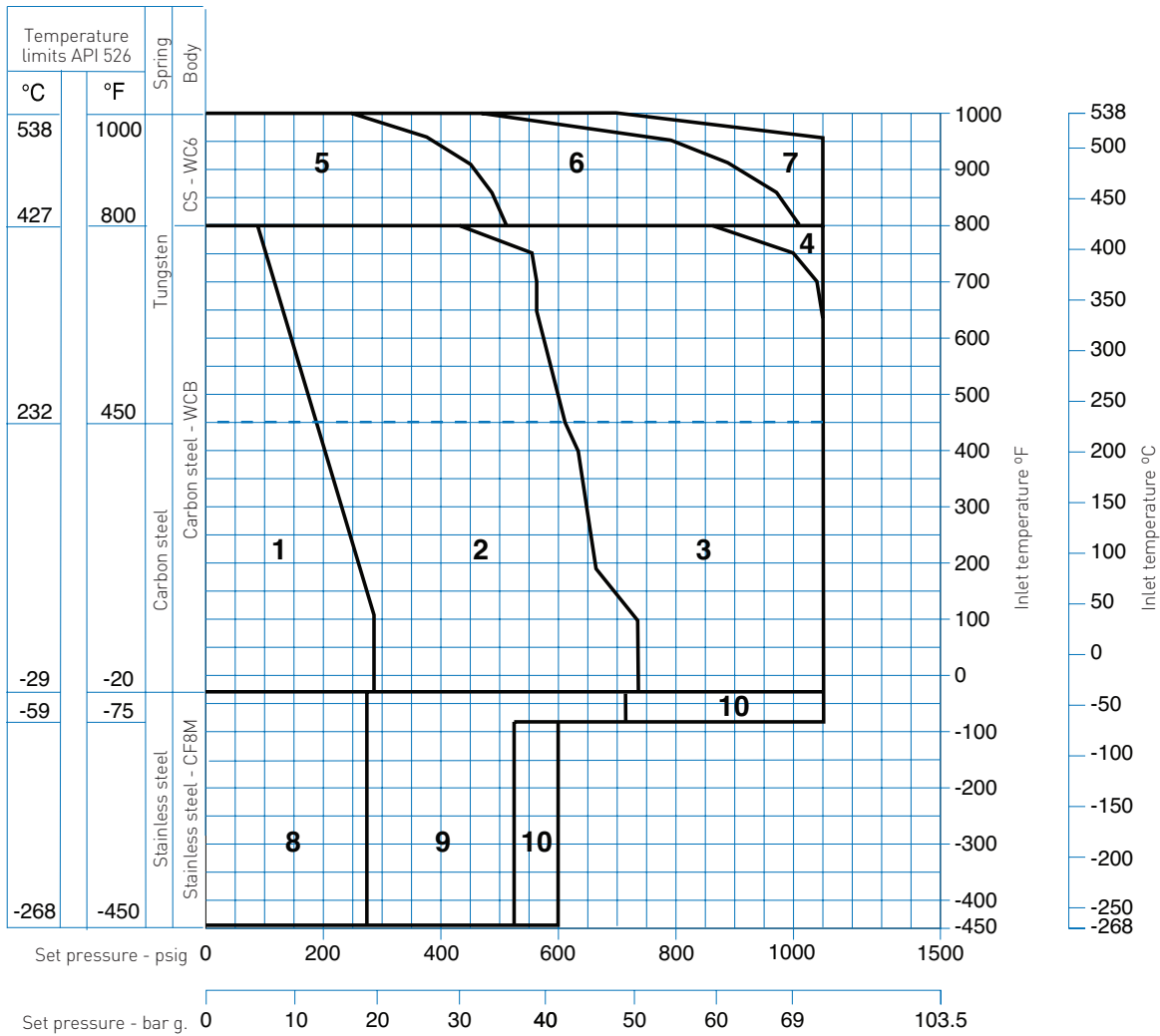
Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high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

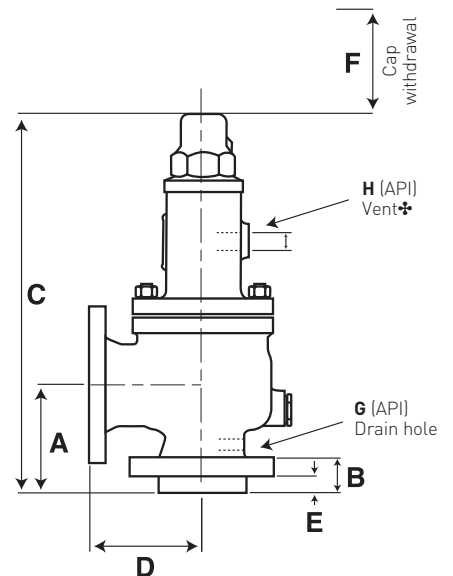


ORIFICE M (ALL DIMENSIONS in inches)

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

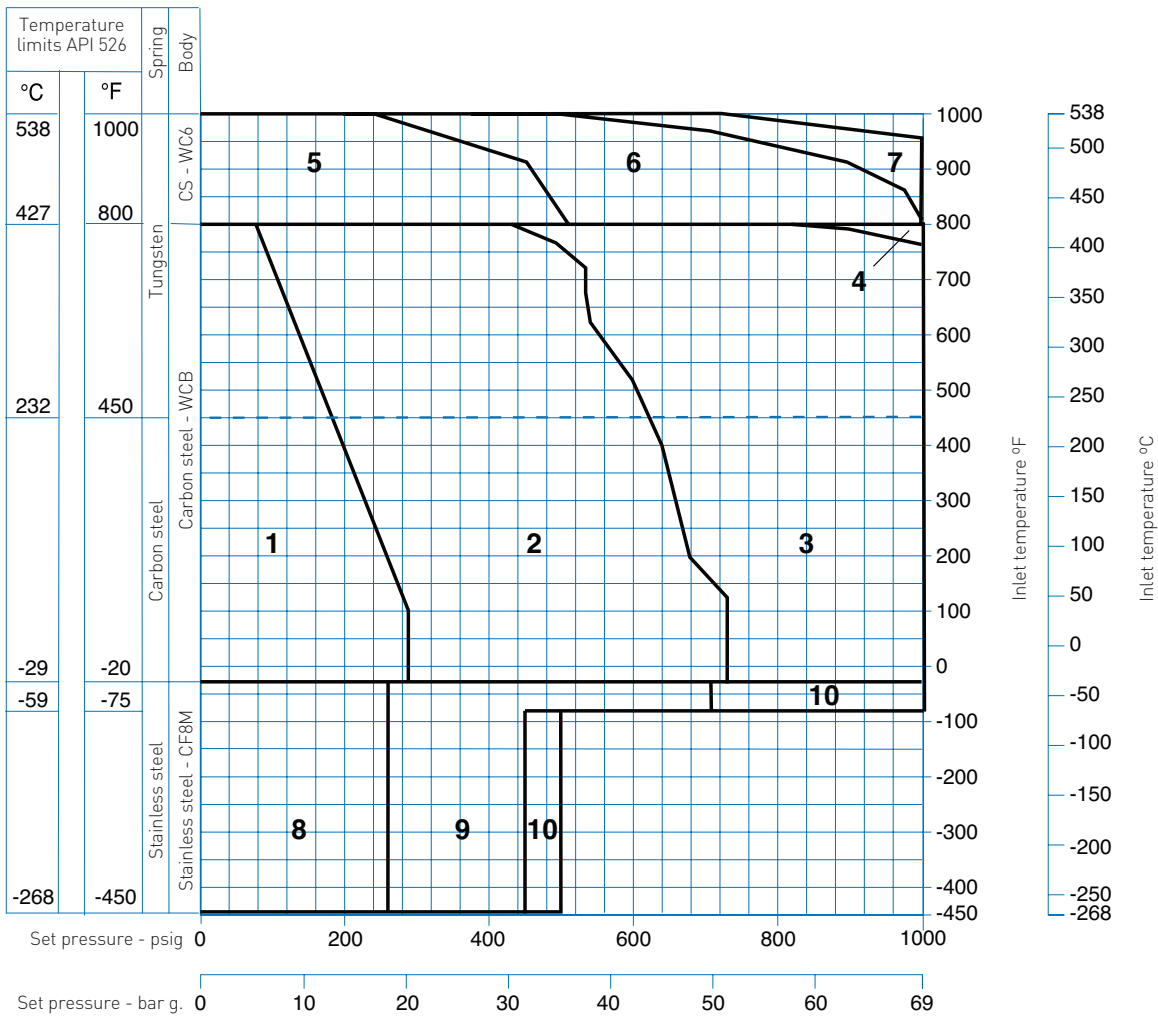
Certain spring materials cannot be used in the low pressure version of the valve, up to the maximum pressure. If the required set pressure with your choice of spring material is in excess of the figure shown in the table either choose another material or add 'H' to the valve accessories to select a high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

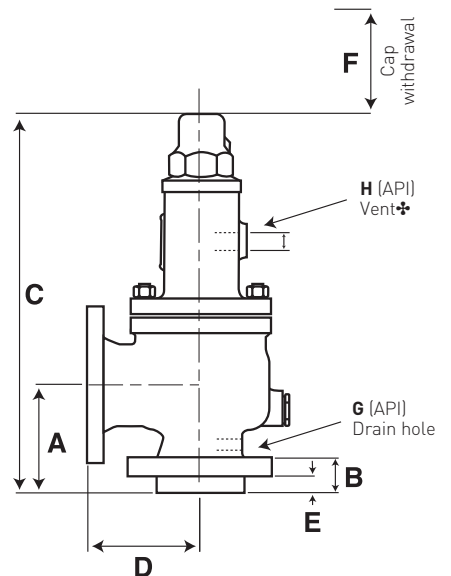


ORIFICE N (ALL DIMENSIONS in inches)

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).

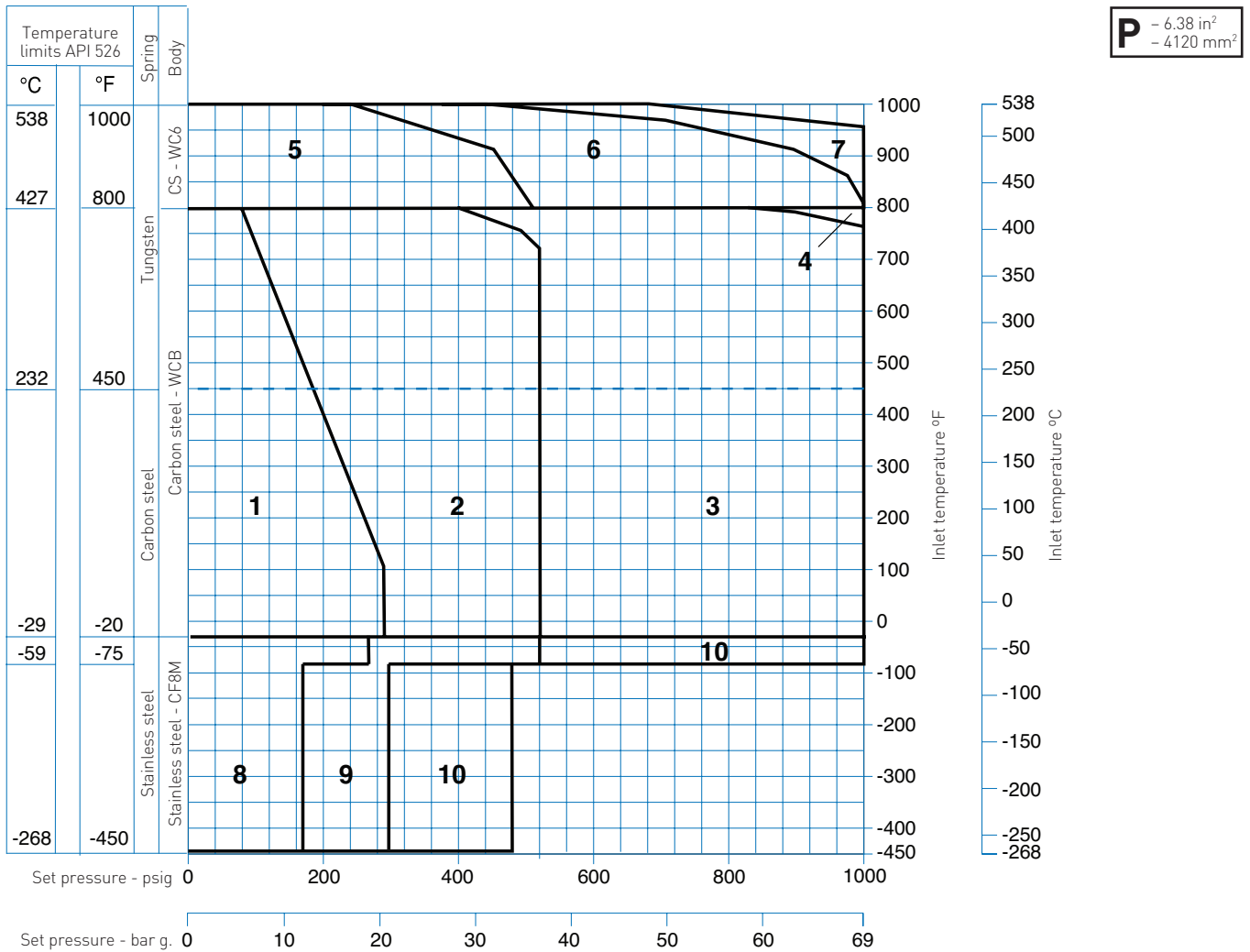
High pressure version

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

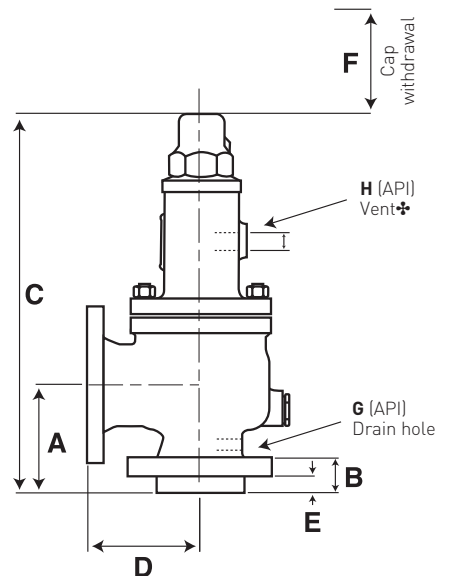


ORIFICE P (ALL DIMENSIONS in inches)

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).

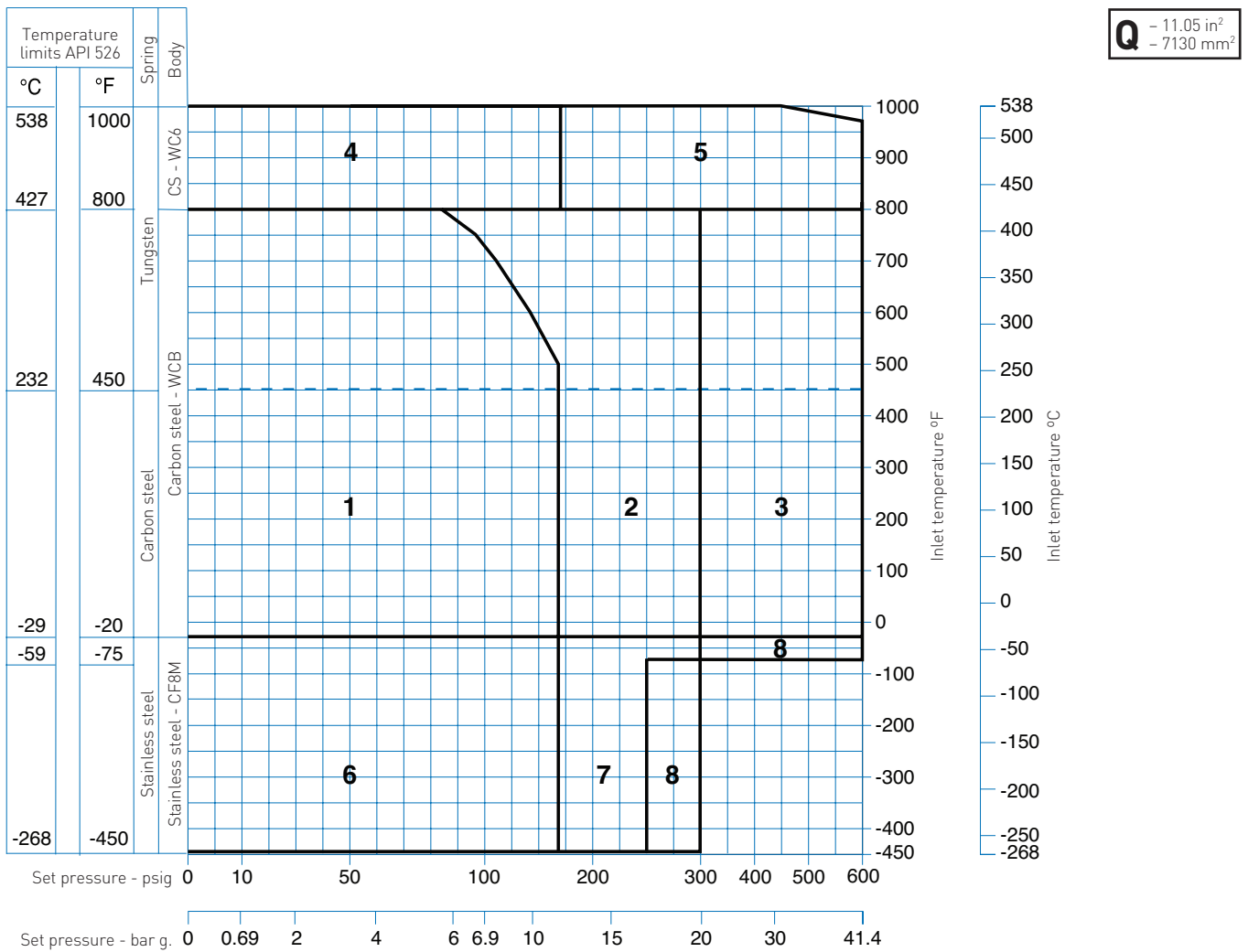
High pressure version

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

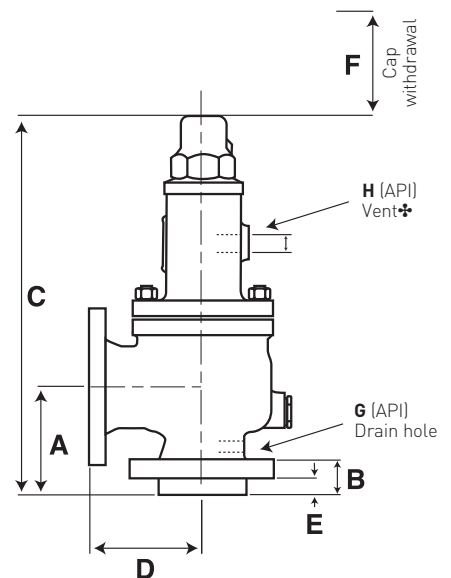


ORIFICE Q (ALL DIMENSIONS in inches)

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).

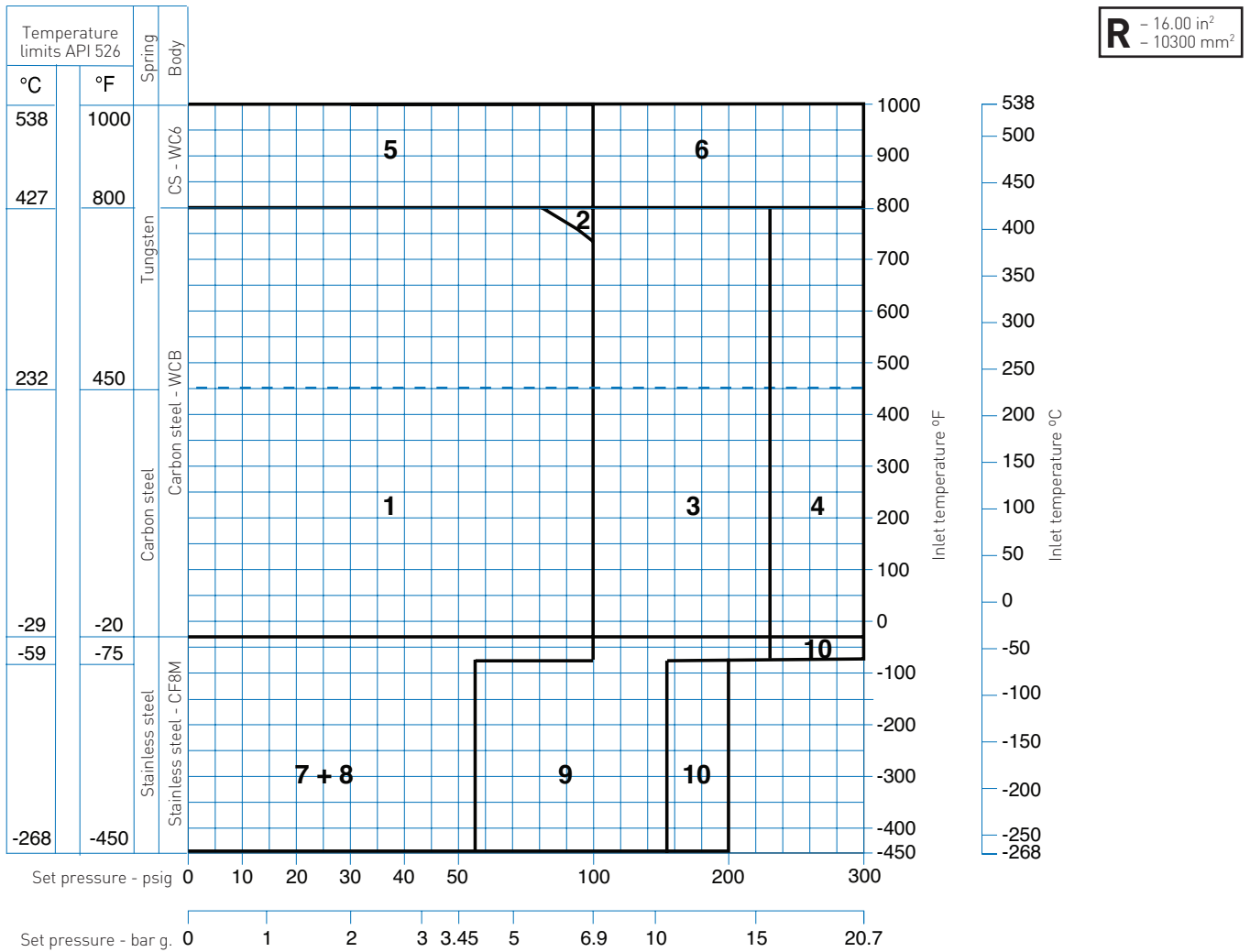
High pressure version

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

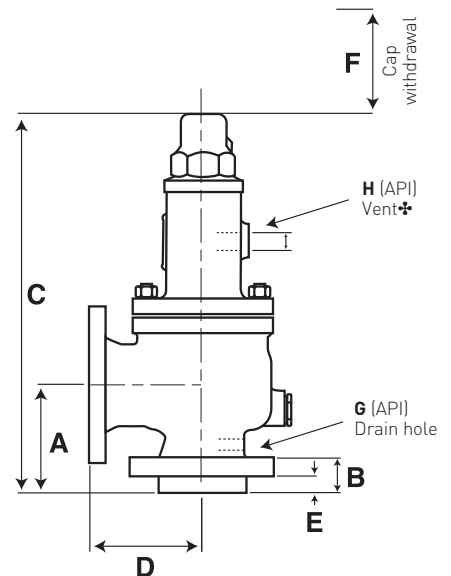


ORIFICE R (ALL DIMENSIONS in inches)

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).

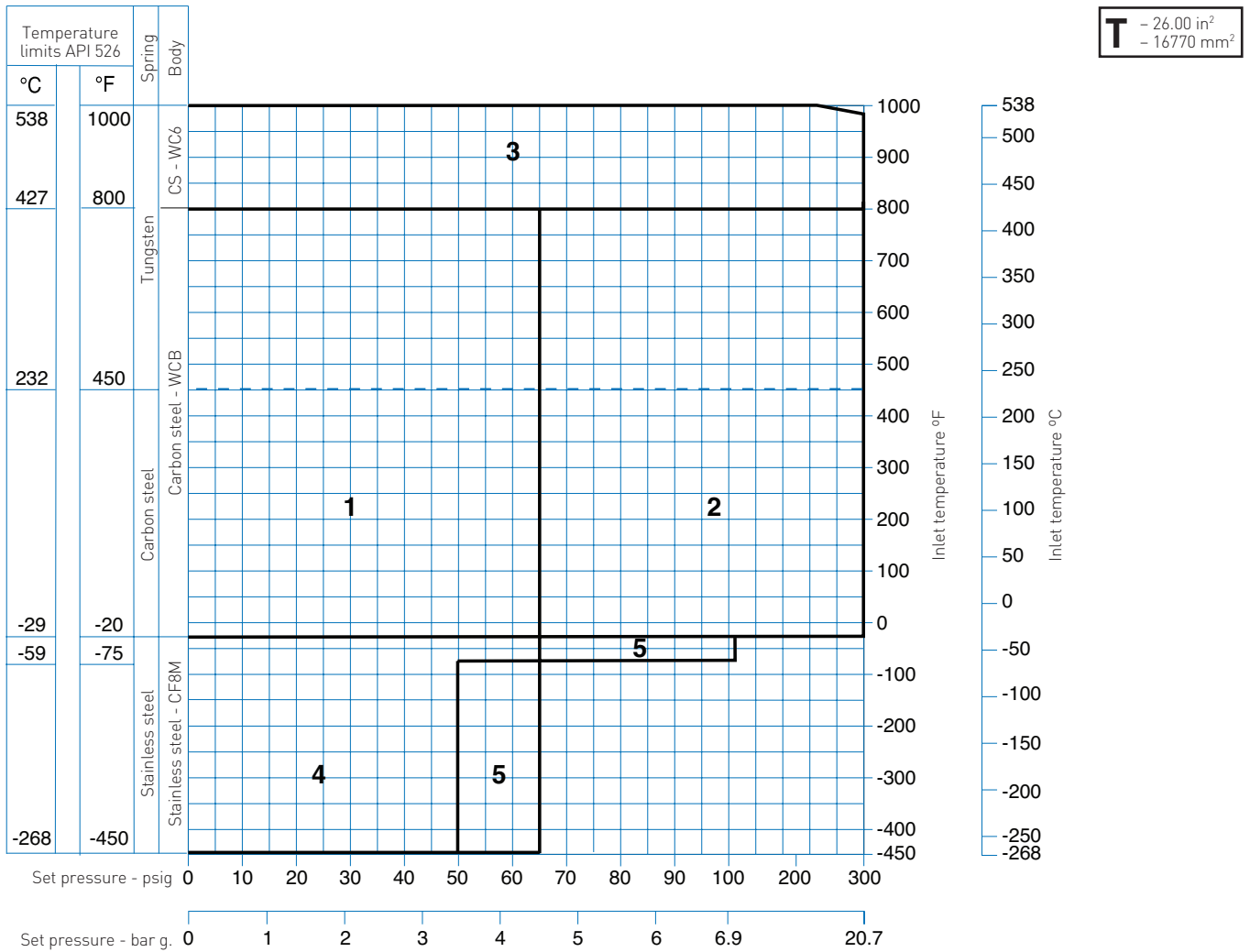
High pressure version

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

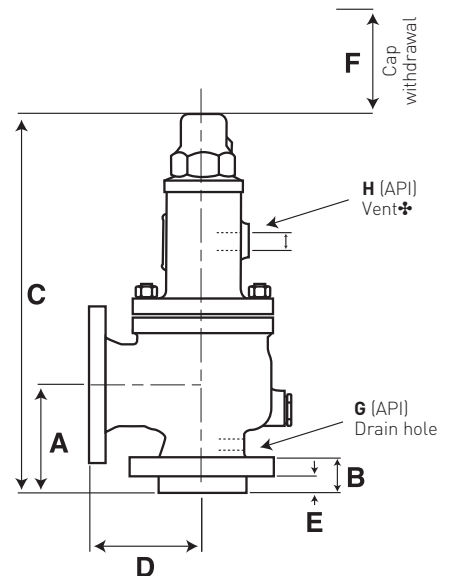


ORIFICE T (ALL DIMENSIONS in inches)

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

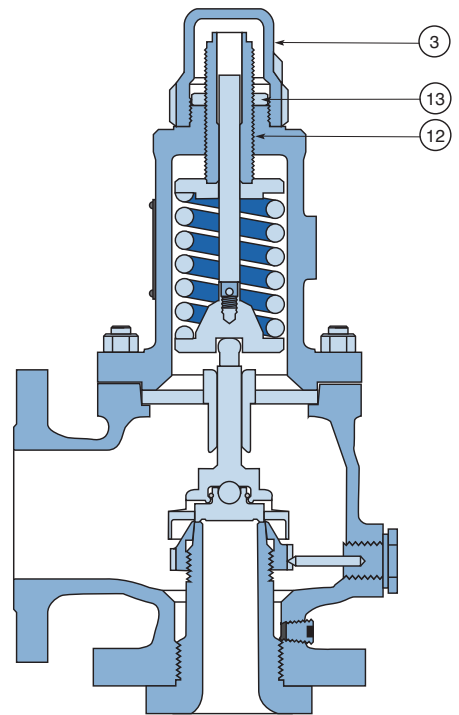
1. Remove the cap (3) to expose the compression screw (12).
2. Slacken the locknut (13).
3. Introduce pressure to the valve inlet. The spring pressure and consequently the valve set pressure may be increased or decreased by turning the compression screw:

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

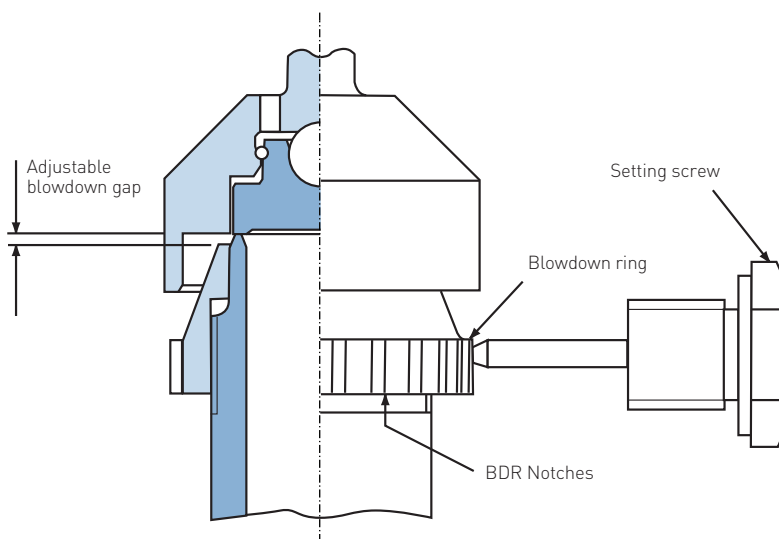
The blowdown adjustment is achieved by means of a single blowdown ring.
By reducing the blowdown gap, blowdown is increased.
By increasing the blowdown gap, blowdown is decreased.
Blowdown is defined as the difference between the set pressure of the valve and the reseating pressure.

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:

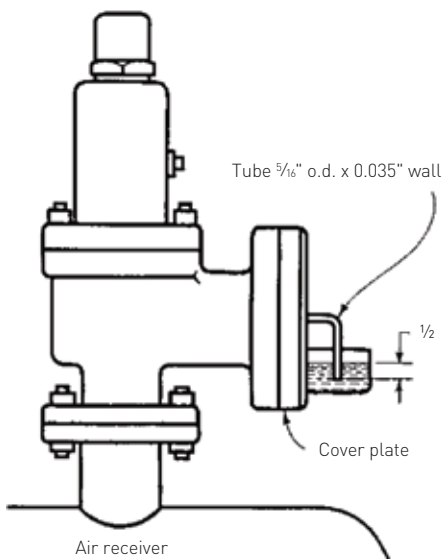
Valve size	Time
Up to 2 ins	1 min
3 ins to 4 ins	2 min
6 ins and above	5 min

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

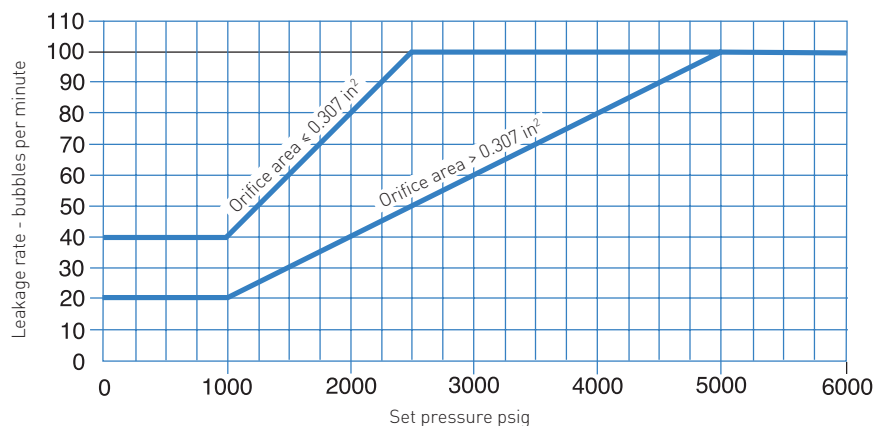
A6 Acceptance criteria

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.

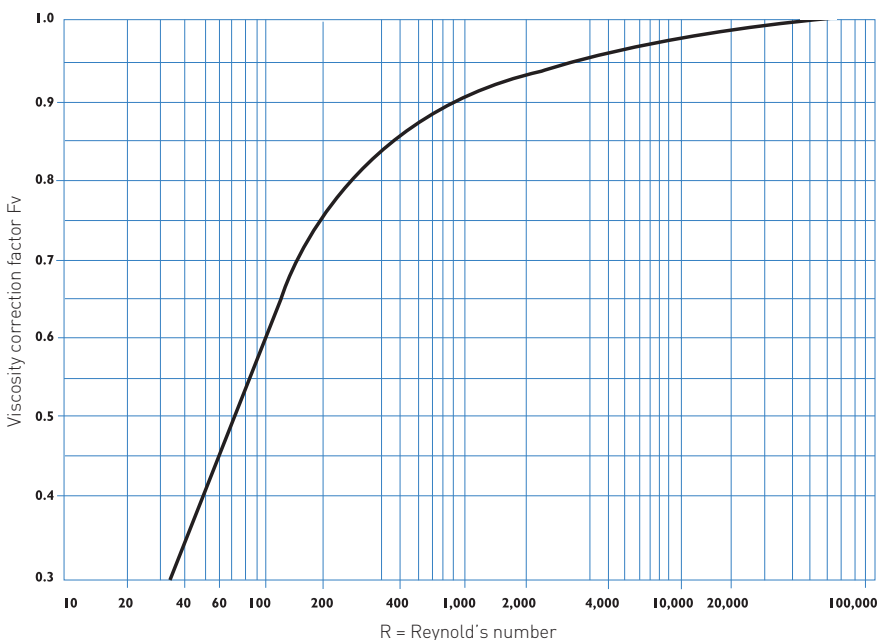
A = Effective discharge area, in square inches (from manufacturer's standard orifice areas).

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

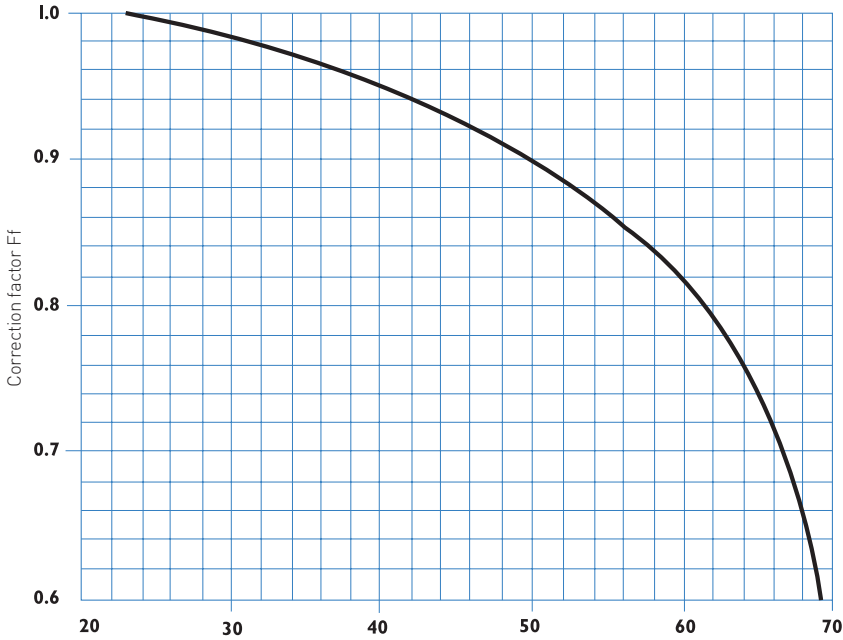
Liquid	G**	vG	Liquid	G**	vG
Acetic acid	1.05	1.025	n-Heptane	0.688	0.830
Acetone	0.792	0.890	n-Hexane	0.664	0.815
Ammonia	0.617	0.786	Hydrochloric acid (40%)	1.20	1.095
Benzene	0.885	0.941	Kerosene	0.82	0.906
1, 2 Butadiene	0.658	0.811	Methane	0.248	0.498
1, 3 Butadiene	0.627	0.792	Methyl alcohol (100%)	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

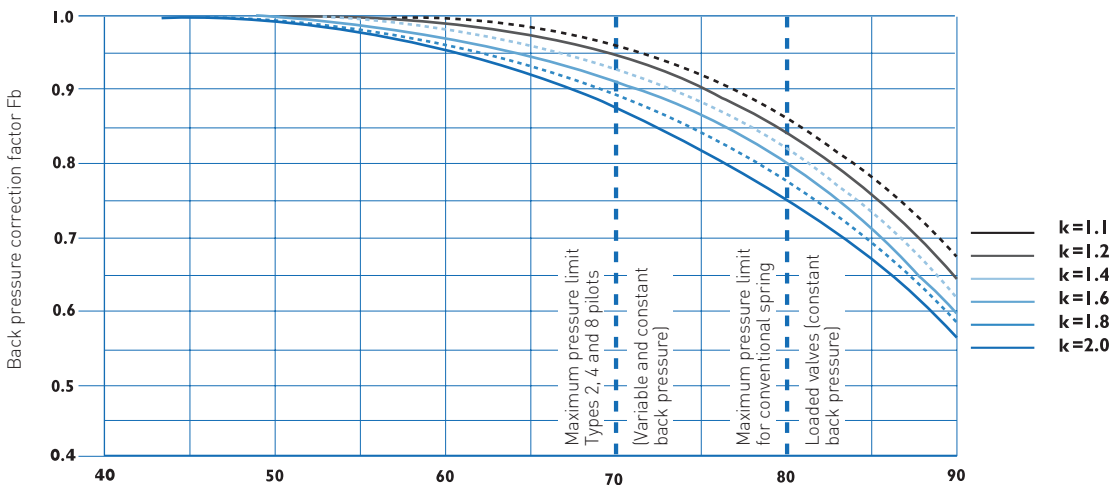
Factor Ff – For application sizing and capacity determination of balanced bellows safety relief valves against variable and constant back pressure – vapours and gases only.



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

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.

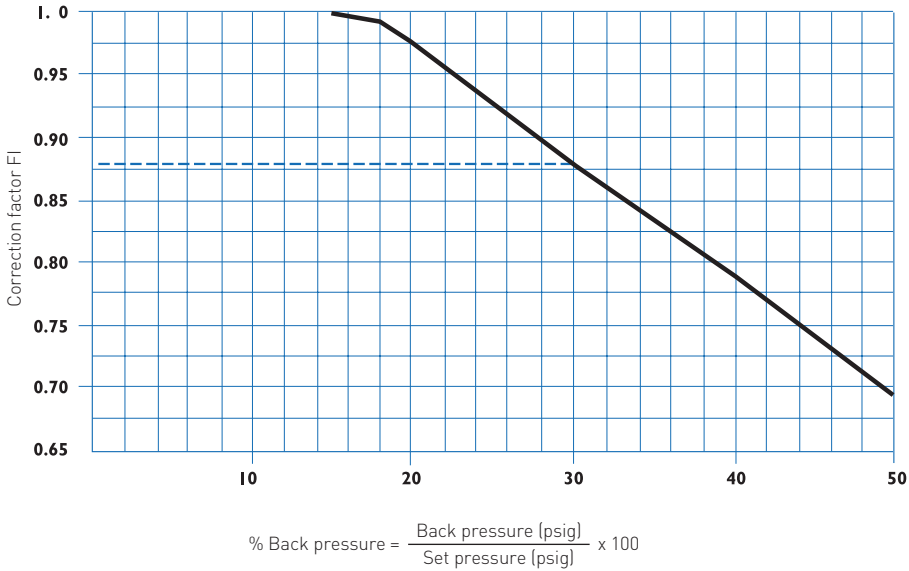


$$\% \text{ Back pressure} = \frac{\text{Back pressure (psia)}}{\text{Set pressure} + \text{Overpressure (psia)}} \times 100$$

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

GRAPH 4.0

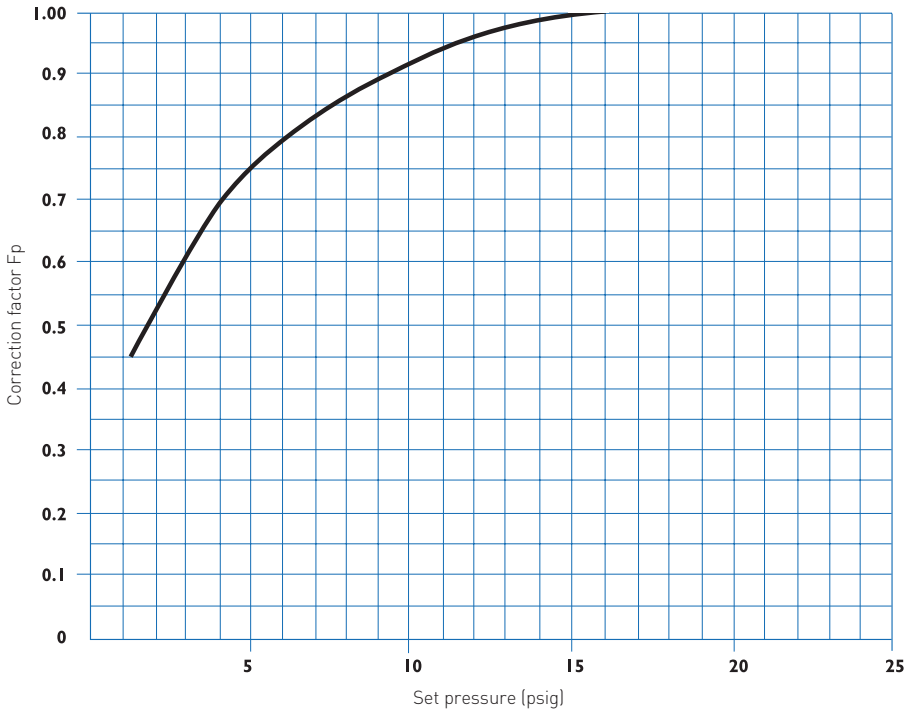
Factor FI – For application sizing and capacity determination of balanced bellows safety relief valves against variable or constant back pressure – liquids only (10% overpressure).



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

SATURATED STEAM CAPACITY CHART

WB 400 - Saturated steam capacities lb/hr 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	142	252	395	648	1011	1658	2367	3675	4637	5590	8217	14232	20607	33487
20	208	371	581	952	1486	2436	3479	5401	6815	8216	12077	20918	30288	49218
30	263	469	735	1205	1880	3083	4402	6833	8622	10395	15281	26466	38322	62274
40	324	578	905	1483	2314	3793	5417	8409	10611	12792	18805	32570	47160	76634
50	385	686	1074	1760	2747	4504	6433	9985	12599	15189	22329	38673	55997	90995
60	446	794	1244	2038	3181	5215	7448	11561	14588	17586	25853	44776	64834	105356
70	506	902	1414	2316	3615	5926	8463	13137	16576	19983	29377	50880	73672	119717
80	567	1011	1583	2594	4048	6637	9478	14712	18565	22381	32901	56983	82509	134077
90	628	1119	1753	2872	4482	7348	10493	16288	20553	24778	36242	63086	91347	148438
100	689	1227	1922	3150	4915	8059	11509	17864	22541	27175	39948	69190	100184	162799
120	810	1444	2261	3705	5782	9480	13539	21016	26518	31969	46996	81396	117859	191521
140	932	1660	2601	4261	6650	10902	15569	24167	30495	36763	54044	93603	135534	220242
160	1053	1877	2940	4816	7517	12324	17600	27319	34472	41558	61092	105810	153208	248964
180	1175	2093	3279	5372	8384	13745	19630	30471	38449	46352	68140	118016	170883	277685
200	1296	2310	3618	5928	9251	15167	21661	33622	42426	51146	75185	130223	188558	306407
220	1418	2526	3957	6483	10118	16589	23691	36774	46402	55941	82235	142430	206233	335128
240	1539	2743	4296	7039	10985	18011	25721	39926	50379	60735	89283	154636	223908	363850
260	1661	2959	4635	7595	11853	19432	27752	43077	54356	65529	96331	166843	241582	392571
280	1782	3176	4974	8150	12720	20854	29782	46229	58333	70324	103379	179049	259257	421193
300	1940	3392	5314	8706	13587	22276	31813	49380	62310	75118	110427	191256	276932	450014
320	2025	3609	5653	9262	14454	23697	33843	52532	66287	79912	117474	203463		
340	2147	3825	5992	9817	15321	25119	35873	55684	70263	84706	124522	215669		
360	2268	4042	6331	10373	16188	26541	37904	58835	74240	89501	131570	227876		
380	2390	4258	6670	10929	17056	27963	39934	61987	78217	94295	138618	240083		
400	2511	4475	7009	11484	17923	29384	41965	65139	82194	99089	145666	252289		
420	2633	4692	7348	12040	18790	30806	43995	68290	86171	103884	152714	264496		
440	2755	4908	7688	12596	19657	32228	46025	71442	90148	108678	159761	276703		
460	2876	5125	8027	13151	20524	33649	48056	74594	94124	113472	166809	288909		
480	2998	5341	8366	13707	21392	35071	50086	77745	98101	118266	173857	301116		
500	3119	5558	8705	14263	22259	36493	52116	80897	102078	123061	180905	313323		
520	3241	5774	9044	14818	23126	37915	54147	84048	106055	127855	187953	325529		
540	3362	5991	9383	15374	23993	39336	56177	87200	110032	132649	195001	337736		
560	3484	6207	9722	15930	24860	40758	58208	90352	114008	137444	202048	349943		
580	3605	6424	10062	16485	25727	42180	60238	93503	117985	142238	209096	362149		
600	3727	6640	10401	17041	26595	43601	62268	96655	121962	147032	216144	374356		
620	3848	6857	10740	17596	27462	45023	64299	99807	125939	151826	223192			
640	3970	7073	11079	18152	28329	46445	66329	102958	129916	156621	230240			
660	4091	7290	11418	18708	29196	47867	68360	106110	133893	161415	237288			
680	4213	7506	11757	19263	30063	49288	70390	109262	137869	166209	244335			
700	4334	7723	12096	19819	30930	50710	72420	112413	141846	171004	251383			
720	4456	7939	12435	20375	31798	52132	74451	115565	145823	175798	258431			
740	4577	8156	12775	20930	32665	53553	76481	118716	149800	180592	265479			
760	4699	8372	13114	21486	33532	54975	78512	121868	153777	185386	272527			
780	4820	8589	13453	22042	34399	56397	80542	125020	157754	190181	279574			
800	4942	8805	13792	22597	35266	57819	82572	128171	161730	194975	286622			
850	5246	9347	14640	23986	37434	61373	87648	136050	171673	206961	304242			
900	5549	9888	15488	25376	39602	64927	92724	143930	181615	218946	321861			
950	5853	10429	16336	26765	41770	68482	97800	151809	191557	230932	339481			
1000	6157	10970	17183	28154	43938	72036	102876	159688	201499	242918	357101			
1100	6764	12053	18879	30932	48274	79144	113028	175446	221383					
1300	7980	14218	22270	36489	56945	93362	133332	206962						
1500	9155	16313	25551	41863	65334	107114	152972	237448						
1750	10820	19279	30198	49477	77216	126594	180793							
2000	12561	22382	35058	57440	89643	146969	209891							
2250	14403	25664	40199	65863	102788	168520	240668							
2500	16381	29189	45719	74907	116903	191662								
2750	18549	33052	51770	84821	132375	217028								
2900	19976	35593	55751	91344										

This chart should be used as a guideline only.

BIRKETT WB/SAFEFLO/SAFESET SERIES SAFETY RELIEF VALVES

AIR CAPACITY CHART

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
10	50	89	140	229	357	586	836	1298	1638	1975	2903	5028	7280	11830
20	74	131	205	336	525	861	1229	1908	2408	2902	4267	7390	10700	17388
30	94	167	262	429	670	1098	1568	2434	3071	3703	5443	9427	13650	22181
40	115	206	322	528	824	1351	1930	2995	3779	4556	6698	11601	16798	27296
50	137	244	383	627	979	1604	2291	3557	4488	5410	7953	13775	19945	32411
60	159	283	443	726	1133	1858	2653	4118	5196	6264	9208	15949	23093	37526
70	180	321	503	825	1287	2111	3014	4679	5904	7118	10464	18123	26241	42642
80	202	360	564	924	1442	2364	3376	5240	6612	7972	11719	20297	29389	47757
90	224	399	624	1023	1596	2617	3738	5802	7321	8826	12974	22471	32537	52872
100	245	437	685	1122	1751	2870	4099	6363	8029	9679	14229	24644	35684	57987
120	289	514	805	1320	2060	3377	4822	7486	9445	11387	16739	28992	41980	68217
140	332	591	926	1518	2369	3883	5546	8608	10862	13095	19250	33340	48275	78448
160	375	668	1047	1716	2677	4390	6269	9731	12278	14802	21760	37688	54571	88678
180	418	746	1168	1913	2986	4896	6992	10853	13695	16510	24271	42036	60866	98908
200	462	823	1289	2111	3295	5402	7715	11976	15111	18218	26781	46384	67162	109138
220	505	900	1409	2309	3604	5909	8438	13098	16528	19925	29291	50732	73458	119369
240	548	977	1530	2507	3913	6415	9162	14221	17944	21633	31802	55080	79753	129599
260	592	1054	1651	2705	4222	6922	9885	15344	19361	23341	34312	59427	86049	139829
280	635	1131	1772	2903	4531	7428	10608	16466	20777	25048	36822	63775	92344	150059
300	678	1208	1893	3101	4840	7934	11331	17589	22194	26756	39333	68123	98640	160290
320	721	1285	2013	3299	5148	8441	12054	18711	23610	28464	41843	72471		
340	765	1363	2134	3497	5457	8947	12778	19834	25027	30171	44353	76819		
360	808	1440	2255	3695	5766	9454	13501	20956	26443	31879	46664	81167		
380	851	1517	2376	3893	6075	9960	14224	22079	27860	33587	49374	85515		
400	895	1594	2497	4091	6384	10466	14947	23202	29276	35294	51884	89862		
420	938	1671	2617	4288	6693	10973	15670	24324	30693	37002	54395	94210		
440	981	1748	2738	4486	7002	11479	16394	25447	32109	38710	56905	98558		
460	1024	1825	2859	4684	7311	11986	17117	26569	33526	40417	59415	102906		
480	1068	1902	2980	4882	7619	12492	17840	27692	34942	42125	61926	107254		
500	1111	1980	3101	5080	7928	12998	18563	28814	36359	43833	64436	111602		
520	1154	2057	3221	5278	8237	13505	19286	29937	37775	45540	66946	115950		
540	1198	2134	3342	5476	8546	14011	20010	31060	39192	47248	69457	120297		
560	1241	2211	3463	5674	8855	14518	20733	32182	40608	48956	71967	124645		
580	1284	2288	3584	5872	9164	15024	21456	33305	42025	50663	74478	128993		
600	1327	2365	3705	6070	9473	15530	22179	34427	43441	52371	76988	133341		
620	1371	2442	3825	6268	9782	16037	22902	35550	44858	54079	79498			
640	1414	2519	3946	6466	10090	16543	23626	36672	46274	55786	82009			
660	1457	2597	4067	6663	10399	17050	24349	37795	47691	57494	84519			
680	1501	2674	4188	6861	10708	17556	25072	38918	49107	59202	97029			
700	1544	2751	4309	7059	11017	18062	25795	40040	50524	60909	89540			
720	1587	2828	4429	7257	11326	18569	26518	41163	51940	62617	92050			
740	1630	2905	4550	7455	11635	19075	27242	42285	53357	64325	94560			
760	1674	2982	4671	7653	11944	19581	27965	43408	54773	66032	97071			
780	1717	3059	4792	7851	12253	20088	28688	44530	56190	67740	99581			
800	1760	3136	4913	8049	12561	20594	29411	45653	57606	69448	102091			
850	1868	3329	5215	8544	13334	21860	31219	48460	61148	73717	108367			
900	1977	3522	5517	9038	14106	23126	33027	51266	64689	77986	114643			
950	2085	3715	5819	9533	14878	24392	34835	54072	68230	82255	120919			
1000	2193	3908	6121	10028	15650	25658	36643	56879	71771	86524	127195			

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

AIR CAPACITY CHART

PILOT - TYPES 2, 4 AND 8 - Main valve discharge capacities s.c.f.m.

10% over pressure or 3 psig whichever is the greater. Kd = 0.849

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	119	186	246	448	634	1039	1556	2303	3133	3755	5141	9357	12917	16088	20994
40	150	234	309	563	796	1307	1956	2895	3938	4720	6462	11762	16236	20223	26387
60	206	322	425	774	1095	1796	2689	3980	5414	6488	8884	16170	22321	27802	36276
80	262	410	541	985	1393	2286	3422	5064	6890	8257	11306	20578	28406	35381	46166
100	319	497	657	1196	1692	2776	4155	6149	8366	10026	13728	24986	34492	42960	56055
150	459	717	946	1724	2438	4000	5987	8862	12055	14448	19783	36006	49704	61908	80779
200	600	936	1236	2252	3184	5224	7819	11574	15745	18871	25838	47026	64917	80856	105502
250	740	1155	1525	2780	3930	6448	9652	14286	19435	23293	31893	58047	80130	99804	130226
300	881	1374	1815	3307	4676	7672	11484	16998	23124	27715	37948	69067	95343	118752	154949
350	1021	1594	2104	3835	5423	8896	13317	19710	26814	32137	44003	80087	110556	137700	179673
400	1162	1813	2394	4363	6169	10121	15149	22423	30504	36559	50058	91107	125768	156647	204397
450	1302	2032	2683	4890	6915	11345	16982	25135	34193	40981	56113	102128	140981	175595	229120
500	1442	2252	2973	5418	7661	12569	18814	27847	37883	45403	62168	113148	156194	194543	253844
550	1583	2471	3263	5946	8407	13793	20646	30559	41573	49826	68223	124168	171407	213491	278567
600	1723	2690	3552	6474	9153	15017	22479	33272	45262	54248	74278	135188	186620	232439	303291
650	1864	2910	3842	7001	9900	16242	24311	35984	48952	58670	80333	146209	201832	251387	328015
700	2004	3129	4131	7529	10646	17466	26144	38696	52642	63092	86388	157229	217045	270335	352738
750	2145	3348	4421	8057	11392	18690	27976	41408	56332	67514	92443	168249	232258	289283	377462
800	2285	3568	4710	8584	12138	19914	29809	44121	60021	71936	98498	179269	247471	308231	402185
850	2426	3787	5000	9112	12884	21138	31641	46833	63711	76358	104553	190290	262684	327179	426909
900	2566	4006	5289	9640	13630	22363	33473	49545	67401	80781	110608	201310	277896	346126	451633
950	2707	4225	5579	10168	14377	23587	35306	52257	71090	85203	116663	212330	293109	365074	476356
1000	2847	4445	5869	10695	15123	24811	37138	54969	74780	89625	122718	223350	308322	384022	501080
1200	3409	5322	7027	12806	18107	29708	44468	65818	89539	107313	146938	267431	369173	459814	599974
1400	3971	6199	8185	14917	21092	34604	51798	76667	104298	125002	171157	311512	430024	535605	698868
1480	4196	6550	8648	15761	22286	36563	54730	81007	110201	132077	180845	329145	454365	565922	738426
1600	4533	7076	9343	17028	24077	39501	59127	87516	119056	142691	195377	355593	490876		
1800	5095	7954	10501	19139	27061	44398	66457	98365	133815	160379	219597	399674	551727		
2000	5657	8831	11660	21249	30046	49295	73787	109214	148574	178068	243817	443755	612578		
2200	6219	9708	12818	23360	33031	54191	81116	120063	163333	195756	268037	487836	673429		
2400	6781	10585	13976	25471	36015	59088	88446	130912	178091	213445	292257	531917	734281		
2600	7343	11463	15134	27582	39000	63985	95776	141761	192850	231134	316477	575998	795132		
2800	7905	12340	16293	29693	41985	68882	103106	152610	207609	248822	340696	620079	855983		
3000	8467	13217	17451	31804	44969	73778	110435	163459	222368	266511	364916	664160	916834		
3500	9872	15410	20346	37081	52431	86020	128759	190581	259265	310732	425466	774363	1068962		
3705	10448	16309	21533	39244	55490	91039	136272	201701	274392	328863	450291	819546	1131335		
4000	11277	17603	23242	42358	59892	98262									
4350	12261	19138	25269	46052	65116	106831									
4500	12682	19796	26137	47635	67354	110504									
5000	14087	21989	29033	52912	74816	122746									
5500	15492	24183	31929	58189	82277	134988									
6000	16897	26376	34824	63466	89739	147230									
6170	17375	27121	35809	65261	92276	151392									

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

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).

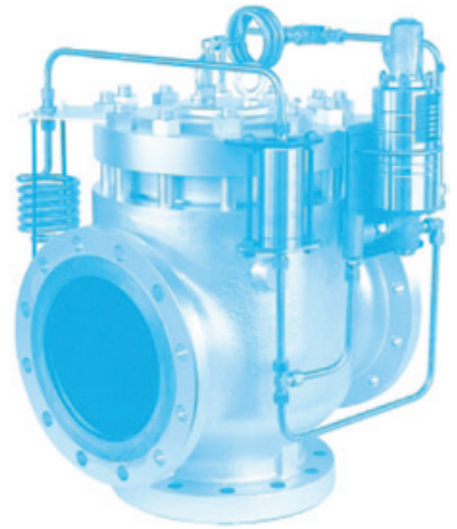
For 8" x 10" x 10" (200 x 250 x 250 mm) full bore capacity chart see page 52.

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.)

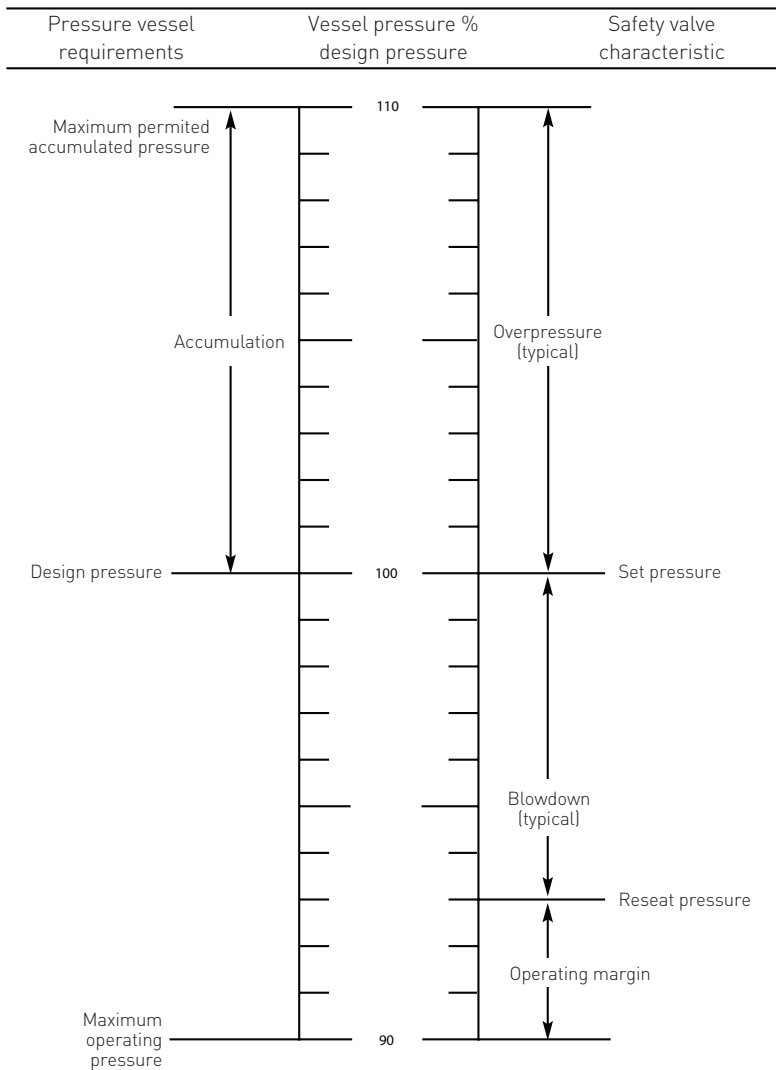
Popping pressure is the pressure at which the valve disc rapidly moves from a slightly open (simmer) position to a practically full open position.

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.

Neither Emerson, Emerson Automation Solutions, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

Emerson Automation Solutions, Emerson and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson.com/FinalControl