



SARASIN-RSBD™

Portable Spring Loaded Safety Relief Valves

Series 9

QUALITY ASSURANCE

Trillium operates quality programmes to cover the full scope of their activities. Comprehensive quality systems have been developed to serve the power, oil and gas and industrial markets which they serve.

The company holds approvals to or complies with:

- ASME Section III 'N', 'NPT', 'NV'
- ASME Section I 'V'
- ASME Section VIII 'UV'
- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018
- API Q1 TO API LICENCES API 6D (6D-0182) AND API 6A (6A-0445)
- API STD 520
- API STD 526
- API STD 527
- API STD 2000
- ISO 4126

The Quality systems have been approved for the supply of products to meet the requirements of the Pressure Equipment Directive (PED) and compliance modules A, D1, H, B&D have been applied in categories I through IV respectively.

The company is committed to compliance with legislation and has an established environment and health and safety policy.

An ongoing commitment to customer care is met through the process of continuous improvement and the further development of our systems and processes towards meeting ISO 9001:2008.

SARASIN-RSBD™

The Sarasin-RSBD™ range of products is manufactured in accordance with ASME, API and ISO standards and therefore can meet most of worldwide customers requirements. The company holds approvals or complies with:

- ISO 9001:2015
- ISO 14001:2015
- ISO 45001:2018
- PED 97/23/EC Module B+D Category IV
- ATEX 94/9/EC
- ASME Section I 'V' - ASME Section VIII 'UV'
- API STD 520 - API STD 526 - API STD 527
- API STD 2000
- ISO 4126
- SELO

Specifically, Trillium can design and manufacture special valves to meet special customer requirements.

- ATWOOD & MORRILL™**
Engineered Isolation & check valves
- BATLEY VALVE®**
High Performance Buttery Valves
- BDK™**
Industrial Valves
- BLAKEBOROUGH®**
Control & Severe Service Valves
- HOPKINSONS®**
Parallel Slide Gate & Globe Valves
- MAC VALVE®**
Ball & Rotary Gate Valves
- SARASIN-RSBD™**
Pressure Safety Devices
- SEBIM™**
Nuclear Valves
- TRICENTRIC®**
Triple Offset Buttery Valves

Portfolio of engineered service solutions and aftermarket support





TRILLIUM FLOW TECHNOLOGIES™

Trillium provides critical service and safety valves, specialist pumps and service support to flow control and rotating equipment. Our world-wide reputation is based on engineering excellence applied to a comprehensive range of specialist products and effective customer support.

We have the capability to deliver complete valve solutions for major projects in the power generation, oil and gas exploration and general industrial sectors. Our global network of service operations specialise in the maintenance, upgrade and management of power and industrial assets at customer sites.

Trillium manufactures the Sarasin-RSBD range of pressure safety valves and safety devices for oil and gas, petrochemical and chemical industries, pipelines, thermal and nuclear power plants, sugar refineries and pulp mills.

VALVE TESTING

All pressure containing items are hydrostatically tested, seat leakage tested and functionally tested.

We can also perform gas, packing emission, cryogenic and advanced functional testing, as well as seismic testing for nuclear applications.

MATERIAL TESTING

- Non-destructive examination by radiography, ultrasonics, magnetic particle and liquid penetrant.
- Chemical analysis by computer controlled direct reading emission spectrometer.
- Mechanical testing for tensile properties at ambient and elevated temperatures, bend and hardness testing. Charpy testing at ambient, elevated and sub-zero temperatures.

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The 9 Series valves are designed and manufactured in compliance with American and European standards (ASME B&PVC Section VIII Division 1, EN ISO 4126 Part 1).

The 9 Series comply with most overpressure protection requirements in the following industries: oil & gas, petrochemical, chemical and many other general industries.

General

- Full lift
- Full Nozzle
- Adjustable blowdown
- Use on Gas, Liquids, Steam
- Size: 1/2" to 1" 1/2
- Set Pressure up to 430 barg (6250 psig)
- Temperature: up to 400°C (752°F)

Connections

- Screwed
 - Inlet: NPT male (female on request)
BSP male
 - Outlet: NPT female
BSP cylindrical female
- Flanged
 - Inlet: Loose captive flange or Integral Flange
 - Outlet: Screwed or flange
 - Type: ASME B16.5, EN 1759-1, EN 1092-1, Other standard on request

Concept

- Adjusting ring for perfect popping and blowdown adjustment
- Metal/metal seating

Construction

- Body: Carbon steel (SA 216 Gr WCC)
Stainless steel (SA 351 Gr CF3M)
Exotic material
- Trims: Stainless steel
Exotic material

Options

- Packed lifting lever
- Test gag
- Bellows (metal seat - D & F orifices)
- Soft seat
- Balanced Piston (soft seat)

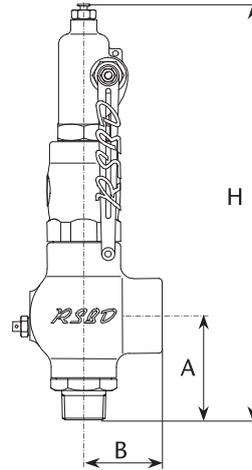


Orifices & Dimensions

NB Certified Flow Coefficient

Gas: 0.823

Liquid: 0.632

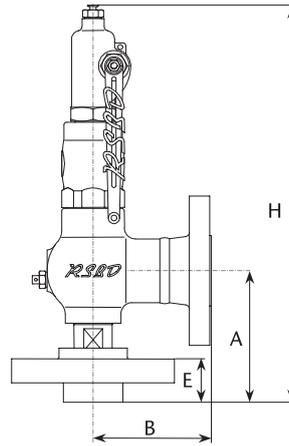


Screwed									
Orifice	Type	Inlet Max Set Pressure		Outlet Max Back Pressure		Dimensions			
		barg	psig	barg	psig	A	B	H	Weight
		mm	mm	mm	mm	mm	mm	mm	Kg
B actual area: 0.283 cm ² /0.044 in ²	1/2" x 1/2"	155.2	2250	51.7	750	43.5	40	242	1.8
	1/2" x 1"	155.2	2250	20.0	290	47.5	40	242	1.8
		431.0	6250	51.7	750	63.0	85	344	6.5
	3/4" x 1"	155.2	2250	20.0	290	50.5	40	245	1.8
		431.0	6250	51.7	750	63.0	85	344	6.5
	1" x 1"	155.2	2250	20.0	290	50.5	40	245	2
431.0		6250	51.7	750	69.0	85	350	6.7	
D actual area: 0.283 cm ² /0.044 in ²	3/4" x 1" 1/2" x 1"	103.4	1500	51.7	290	64.0	50	255	2
		258.6	3750	51.7	750	63.0	85	344	6.5
	1" x 1"	103.4	1500	51.7	290	70.0	50	262	2.2
		258.6	3750	51.7	750	69.0	85	350	6.7
E actual area: 1.431 cm ² /0.222 in ²	3/4" x 1"	51.7	750	20.0	290	64.0	50	255	2
		155.2	2250	51.7	750	63.0	85	344	6.5
	1" x 1"	51.7	750	20.0	290	70.0	50	262	2.2
		155.2	2250	51.7	750	69.0	85	350	6.7
F actual area: 2.270 cm ² /0.352 in ²	1" x 1 1/2"	51.7	750	20.0	290	91.0	60	325	4.3
	1 1/2" x 1 1/2"	51.7	750	20.0	290	91.0	60	325	4.3
G actual area: 3.664 cm ² /0.568 in ²	1" x 1 1/2"	20.0	290	20.0	290	91.0	60	325	4.5
	1 1/2" x 1 1/2"	20.0	290	20.0	290	91.0	60	325	4.5

Orifices & Dimensions

NB Certified Flow Coefficient

Gas: 0.823
Liquid: 0.632

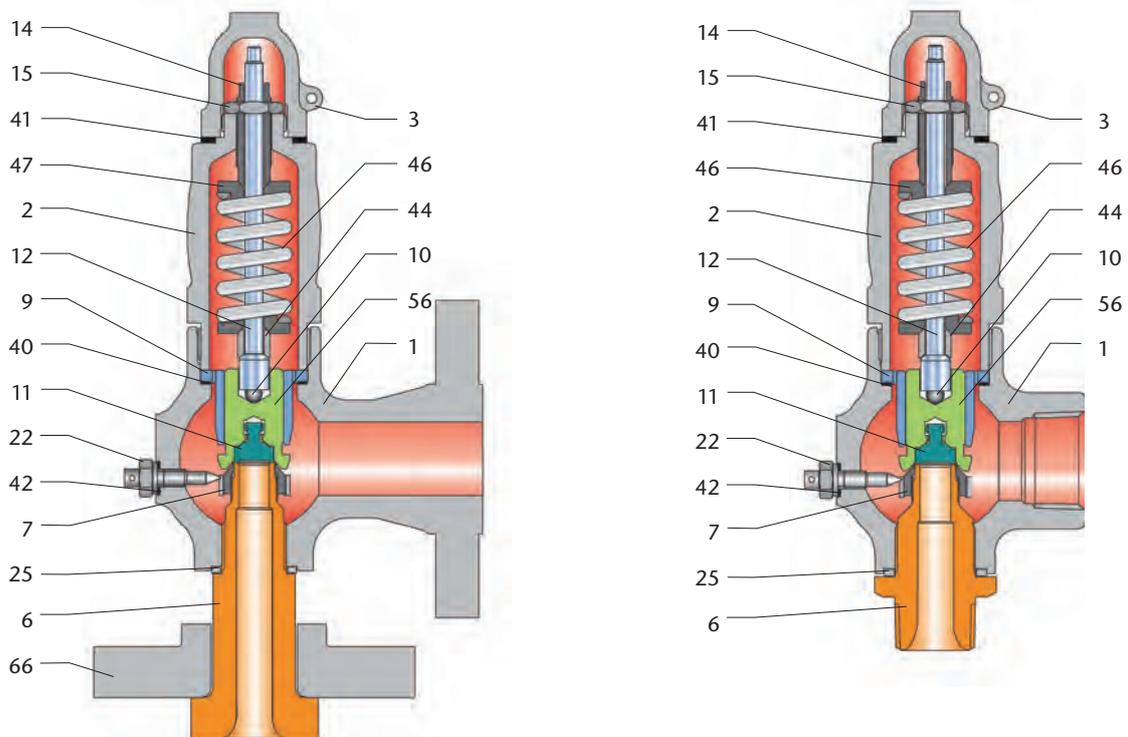


Flanged																		
Orifice	Type	Inlet			Outlet				Dimensions									
		Max Set Pressure		Class	Class	Max Back Pressure		A	B	E	H	Weight						
		barg	psig	ASME ⁽¹⁾	ASME ⁽¹⁾	barg	psig	mm	mm	mm	mm	Kg						
B actual area: 0.283 cm ² /0.044 in ²	1/2" x 1"	19.7	285	150	150	19.7	285	90	85	26.8	285	3.6						
		51.0	740	300						29.8		4						
		102.1	1480	600						29.8		4						
		153.1	2220	900						300		51.0	740	90	90	38.5	285	6
		255.5	3705	1500										115	120	38.5	400	10.2
		425.5	6170	2500										45.8	11.5			
	3/4" x 1"	19.7	285	150	150	19.7	285	90	85	28.3	285	4						
		51.0	740	300						31.3		4.5						
		102.1	1480	600						31.3		4.5						
		153.1	2220	900						300		51.0	740	105	90	41	300	6.6
		255.5	3705	1500										115	120	41	400	11
		425.5	6170	2500										47.4	12.1			
	1" x 1"	19.7	285	150	150	19.7	285	90	85	29.9	285	4.4						
		51.0	740	300						33.1		5						
		102.1	1480	600						33.1		5						
		153.1	2220	900						300		51.0	740	120	90	44	31.5	8
		255.5	3705	1500										115	120	44	400	12.3
		425.5	6170	2500										50.6	14			
D actual area: 0.801cm ² /0.124 in ²	1/2" x 1" 3/4" x 1"	19.7	285	150	150	19.7	285	95	85	28.3	290	4						
		51.0	740	300						31.3		4.5						
		102.1	1480	600						31.3		4.5						
		153.1	2220	900						300		51.0	740	115	120	41	400	10.9
	255.5	3705	1500	41	10.9													
	1" x 1"	19.7	285	150	150	19.7	285	95	85	29.9	290	4						
		51.0	740	300						33.1		4.6						
		102.1	1480	600						33.1		4.6						
		153.1	2220	900						300		51.0	740	115	120	50.6	400	10.9
	255.5	3705	1500	50.6	12.3													
	E actual area: 1.431 cm ² /0.222 in ²	3/4" x 1"	19.7	285	150	150	19.7	285	95	85	28.3	290	4.2					
			51.0	740	300						31.3		4.8					
102.1			1480	600	300						51.0		740	115	120	31.3	400	9
153.1			2220	900										41	11			
1" x 1"		19.7	285	150	150	19.7	285	95	85	29.9	290	4.2						
		51.0	740	300						31.1		5						
		102.1	1480	600						31.1		9.5						
		153.1	2220	900						300		51.0	740	115	120	44	400	12.3
		255.5	3705	1500														
		425.5	6170	2500														
F actual area: 2.270 cm ² /0.352 in ²	1" x 1 1/2" (2)	19.7	285	150	150	19.7	285	115	110	15.8	350	7.8						
		51.0	740	300						19.1		8.5						
	1 1/2" x 1 1/2"	19.7	285	150						33.1		8.5						
		51.0	740	300						36.2		20						
G actual area: 3.664 cm ² /0.568 in ²	1" x 1 1/2" (2)	19.7	285	150	150	19.7	285	115	110	15.8	350	7.8						
	1 1/2" x 1 1/2"	19.7	285	150						33.1		8.7						

1. Comply with EN 1759-1 - EN 1092-1 (Former DIN) on request.
2. Integral flange for ASME B16.5 connections

9 SERIES – Standard configuration

Materials for standard applications, high temperature, low temperature and corrosive fluids.



Standard Material			
Tag	Designation	Carbon Steel Material Code A	Stainless Steel Material Code X
1	Body	SA 216 Gr WCC	SA 351 Gr CF3M
2	Bonnet	CS LF2 or SS 316L	SA 351 Gr CF3M or SS 316L
3	Cap	SA 216 Gr WCC or SS 316L	SA 351 Gr CF3M or SS 316L
6	Nozzle (Base)	SS 316L	SS 316L
7	Adjusting Ring	SA 351 Gr CF3M	SA 351 Gr CF3M
9	Guide	SS 17.4 PH	SS 17.4 PH
10	Ball	CS	SS
11	Disc	SS 316L	SS 316L
12	Spindle	13% Cr or SS 316L	SS 316L
14	Adjusting Screw	SS 316L	SS 316L
15	Lock Nut	SS 316L	SS 316L
22	Adjusting Ring Screw	SS 316L	SS 316L
25	Nozzle Gasket	SS 316L	SS 316L
40-41-42	Gasket	SS	
44	Spacer	SS 316L	SS 316L
46	Spring	Alloy X750	
47	Spring Washers (Upper & Lower)	CS	SS 316L
56	Disc Holder	SS 316L	SS 316L
66	Lapped Flange	SA 105 LF2	SS 316L

Note:

1. Stellite seat for 900# and over for B and D orifices.
2. Other materials (such as superalloy) on request.

9 SERIES – Special configuration

Materials for Cryogenic and Liquefied Natural Gas.

Liquefied Natural Gas and more generally cryogenic applications require special features for the internal materials.

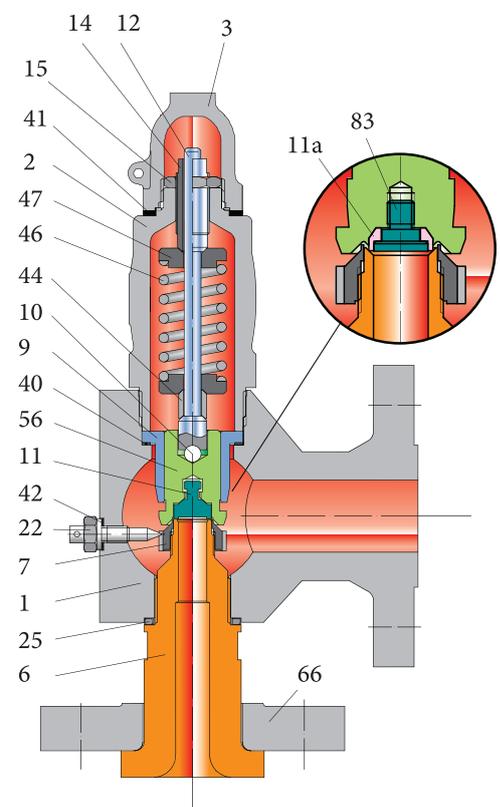
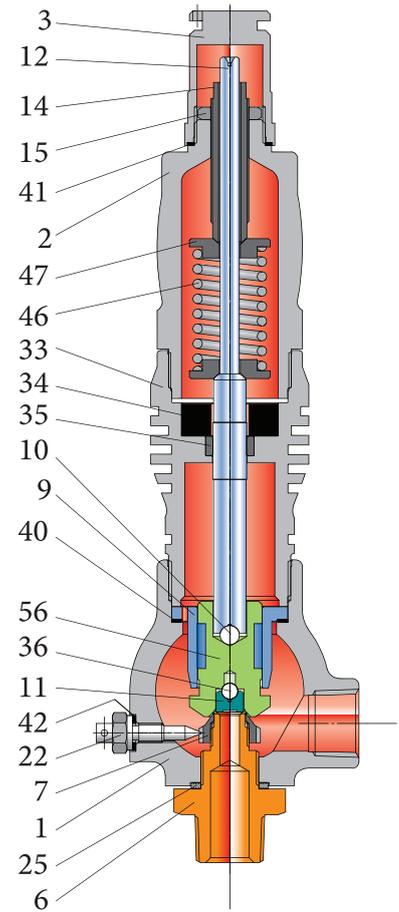
End-users and contractors must be aware that any leakage on cryogenic applications could create an ice ball around the seat and affect the pressure safety valve reliability.

In order to prevent any leakage due to seat damage, Trillium recommends the use of soft seat.

Tag	Designation	Material for Cryogenics and LNG below -46°C
1	Body	SA 351 Gr CF3M or SS 316L
2	Bonnet	SA 351 Gr CF3M or SS 316L
3	Cap	SA 351 Gr CF3M or SS 316L
6	Nozzle	SS 316L
7	Adjusting Ring	SA 351 Gr CF3M
9	Guide	SS 316L
10	Ball	SS
11	Disc	SS 316L
11a	Soft Seat	See Soft Disc Material Table
12	Spindle	SS 316L
14	Adjusting Screw	SS 316L
15	Adj. Screw Locknut	SS 316L
16	Washers	SS 316L
22	Adjusting Ring Screw	SS 316L
25	Nozzle Gasket	SS 316L
33	Thermal Spacer	SS 316L
34	Thermal Barrier	Bakelite®
35	Spacer Ring	Thermoglide
36	Ball	SS
40	Guide Gasket	SS
41	Cap Gasket	SS
42	Adj. R. Screw Gasket	SS
44	Spacer	SS 316L
46	Spring	Alloy X750
56	Disc Holder	SS 316L
66	Lapped Flange	SS 316L
83	Retaining Screw	SS 316L

Soft Seat

Set Pressure	Soft Material
1 to 26 barg	PTFE
26 to 66 barg	PCTFE
66 to 200 barg	PEEK



9 SERIES – Special configuration

Materials for Cryogenic and Liquefied Natural Gas.

Many process streams in the oil and gas industry contain enough H₂S to cause sulfide stress cracking (SSC) in susceptible materials. It exists in two different domains in which two different standards may be applicable:

- Oil and Gas production: NACE MR0175/ISO 15156
 - Part 1 - 2001: General principles for selection of cracking-resistant materials
 - Part 2 - 2003: Cracking-resistant carbon and low alloy steels, and the use of cast irons.
 - Part 3 - 2003: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys.
- Oil and gas refining: NACE MR0103

The last revisions of NACE MR0175/ISO 15156 shows results of the inadequacy of some standard materials commonly used in the oil and gas industry. We then highlight this point and ask the end-user to clearly specify the condition of use (fluid details, pressure and temperature) in order to be able to select acceptable materials.

Trillium manufactures a large variety of valves used in sour service. Based on our experience and the last edition of the standards, the definition of the actual critical components in a pressure safety valve should be mutually agreed between the purchaser and Trillium.

Please note, materials are applicable for NACE MR0175 / ISO 15156 according to the different paragraphs of the standard. As a first approach, we can note the following:

Materials	Paragraph
SA 352 Gr LCC	MR0175/ISO 15156-2 ¶ A2-1-2
SA 216 Gr WCC	MR0175/ISO 15156-2 ¶ A2-1-2
SA 217 Gr WC6	MR0175/ISO 15156-2 ¶ A2-1-2
SA 479 Gr 316L	MR0175/ISO 15156-3 ¶ A2-2 Table 2
UNS S31803	MR0175/ISO 15156-3 ¶ A7-2 Table 24
UNS N06625	MR0175/ISO 15156-3 ¶ A4-2 Table 13
UNS N07750	MR0175/ISO 15156-3 ¶ A2-9 Table 36

As an example of selection, Trillium can advise the following valve configuration. The conditions here are not so restrictive: temperature limited to 149°C (300°F).

SGA application : applicable on primary side only

Part N°	Part Name	Material	Applicable Paragraph
1	Body	SA 216 Gr WCC	MR0175/ISO 15156-2 ¶ A2-1-2
6 + 11	Nozzle & Disc	SS 316L	MR0175/ISO 15156-3 ¶ A7-2 Table A24
	Other parts	Standard	

Note : Above 233°C (500°F), parts 6-11 will be proposed in UNS N06625 (Alloy 625).

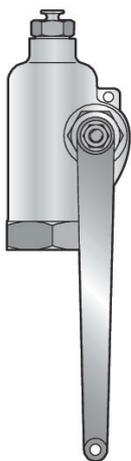
SGB application : applicable on primary and secondary sides

Part N°	Part Name	Material	Applicable Paragraph
1	Body	SA 216 Gr WCC	MR0175/ISO 15156-2 ¶ A2-1-2
2	Bonnet	SA 216 Gr WCC	MR0175/ISO 15156-2 ¶ A2-1-2
4	Cap	SA 216 Gr WCC	MR0175/ISO 15156-2 ¶ A2-1-2
6 + 11	Nozzle & Disc	SS 316L	MR0175/ISO 15156-3 ¶ A7-2 Table A24
9	Guide	SS 316L	
19	Balanced Bellows	UNS N06625 (Alloy 625)	MR0175/ISO 15156-3 ¶ A4-2 Table A13
46	Spring	Alloy X750	
	Other parts	Standard	

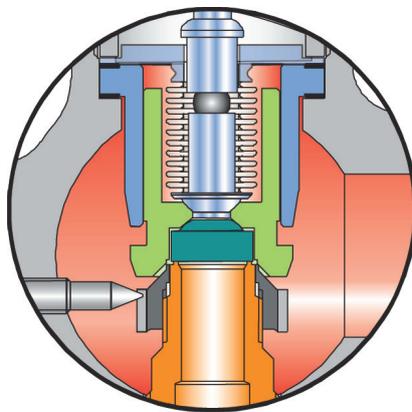
Note:

1. Above 233°C (500°F), parts 6-11-19 will be proposed in UNS N06625 (Alloy 625).

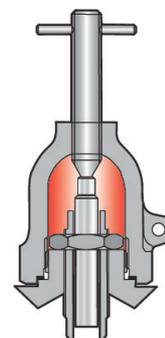
Accessories



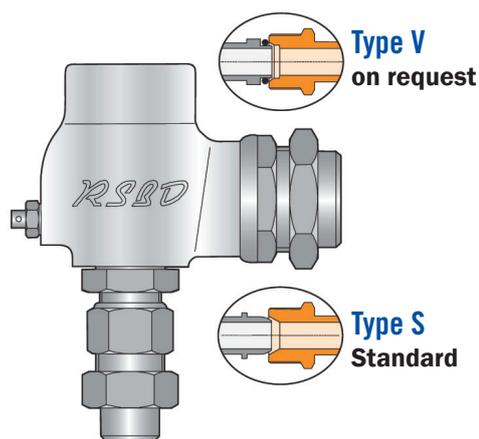
1) Packed lifting lever



2) Balanced Bellows
(D & F Orifices)



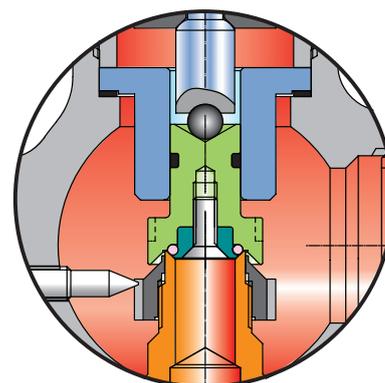
3) Test gag



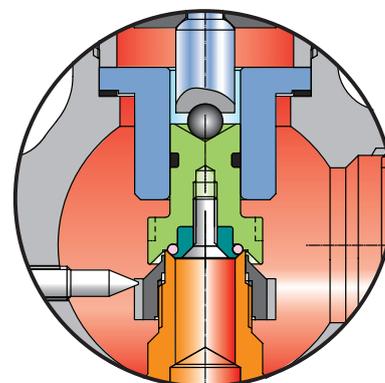
4) Butt-Welding fittings inlet & outlet
(3 pieces union couplings)



5) Inlet "Clamp" connection



6a) Conventional Soft seat



6b) Balanced Soft seat

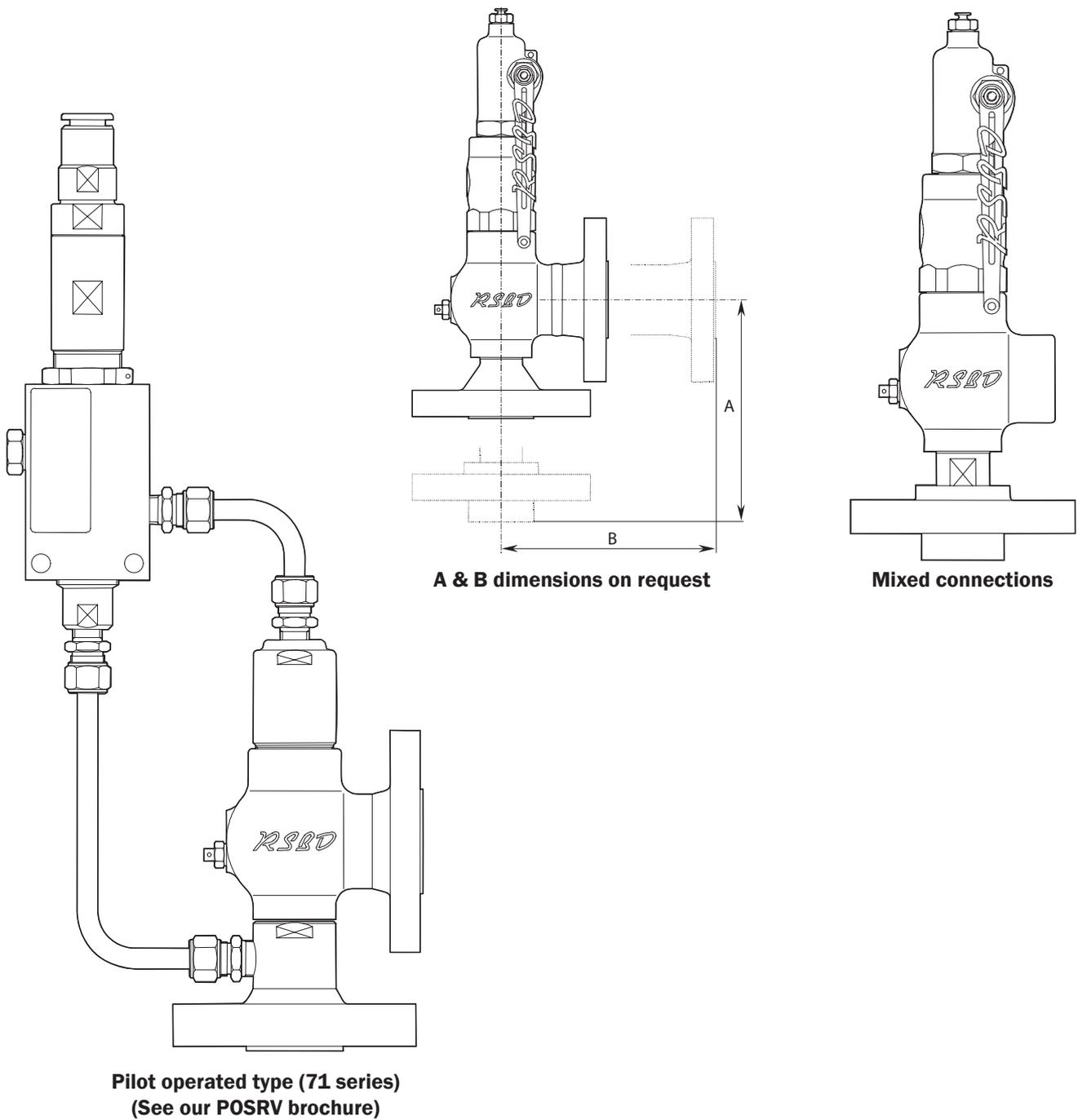
Soft Seat

Set Pressure	Soft Material
1 to 26 barg	PTFE
26 to 66 barg	PCTFE
66 to 200 barg	PEEK

Note:

- these values are applicable upto 25°C - for higher temperature, please consult the factory.

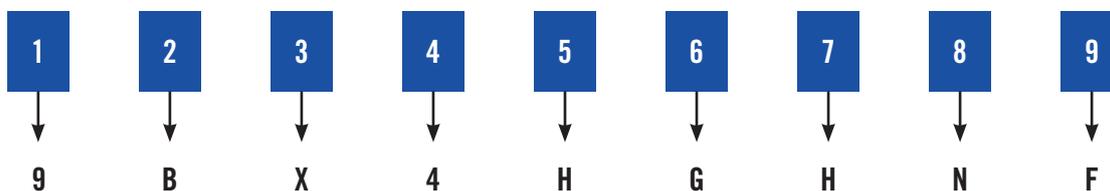
Special



Note:

1. Trillium can produce any forged body arrangement in order to meet high pressure or temperature and special dimensions.
2. On application, Trillium can supply the 18 Series (special) up to 990 barg (14,358 psig) with an orifice C of 0.385 cm² (0.0596 in²). This valve is CE marked (PED 97/23/CE)

Model code system



1 → **Type :** 9

2 → **Orifice :**

- (B-D-E-F-G)

3 → **Material of Construction :**

- 10 : A 351 Gr CF3M (Cryogenic)
- A : A 216 Gr WCC
- X : A 351 Gr CF3M (Std Application)
- A201 to A206 : Alloy 20
- AL1 & AL6 : Alloy 625
- AY1 & AY6 : Alloy 825
- AV1 & AV6 : Alloy 254 SMO
- CN1 & CN7 : A 351 Gr CN3MN
- D1 & D6 : Duplex
- H1 & H6 : Alloy C
- M1 & M6 : Alloy 400
- SD1 & SD6 : Superduplex
- MRA & MRB : NACE MR0103
- SGA & SGB : NACE MR0175 / ISO 15156

4 → **Inlet Pressure Class (ASME):**

- 1: 150#
- 2: 300#
- 3: 600#
- 4: 900#
- 5: 1500#
- 6: 2500#

5 → **Spring Material :**

- H: Alloy X750

6 → **Inlet Size :**

- F: 1/2"
- G: 3/4"
- H: 1"
- K: 1 1/2"

7 → **Outlet Size :**
(B Orifice only)

- – F: 1/2"
- – H: 1"

8 → **Connections :**

- A: ASME B16.5 (Equivalent to EN 1759-1)
- P: EN 1092-1
- K: Inlet Male con. BSP / Outlet Female cyl. BSP
- N: Inlet Male NPT / Outlet Female NPT
- N2: Inlet Female NPT / Outlet Female NPT
- Uœ: 3 piece union
- Z: Other

9 → **Options :**

- A: Without option
- F: Packed lifting lever
- L: Lapped flange at the inlet
- P: Bellows
- V: Test gag
- Z: Others

Spring Loaded Safety Relief Valves

Body in carbon steel, stainless steel, alloy and exotic materials; with bellows, lever and other accessories, to ensure suitability for all service conditions.



Starflow S5
(steam only)

ASME Section VIII Div. 1
(UV Stamp)
API Std 526
Full Nozzle - Enlarged
guide Inlet size : 1" to 12"
Rating : 150# to 2500#
Temp : up to 540°C



Starflow P3/P4/P5

ASME Section VIII Div. 1
(UV Stamp)
API Std 526
Full Nozzle
Inlet size: 1" to 12"
Rating: 150# to 2500#
Temp: -196°C up to
+540°C

Pilot Operated Pressure Relief Valves

The Sarasin-RSBD pilot-operated pressure relief valve is an autonomous valve. It does not need any auxiliary source of power to operate. The advanced technology of Sarasin-RSBD valves has been adopted by the nuclear industry, French and U.S. Navies and by the Oil and Gas industries. It is complementary to the range of spring-loaded safety relief valves and covers a wide field of applications including severe conditions.



76 Series
Full nozzle
API spring loaded
SRV dimensions



78 Series
Semi nozzle
API POSRV dimensions



86 Series
Hot service - Full nozzle
API spring loaded SRV dimensions
Set pressure : up to 180 barg
Temp : up to 550°C



63 Series

ISO 4126
Semi-nozzle
Inlet size: 3/4" to 10"
Rating: 150# to 300#
Temp:-196°C up to +330°C



9 Series

ASME Section VIII Div. 1
Portable SRV - Full nozzle
Screwed / Flanged / Welded
Size: 1/2" to 1 1/2"
Rating: 150# to 2500#
Temp:-196°C up to +400°C

Advantages of the Sarasin-RSBD Pilot-operated pressure relief valve

- leak-free pilot
- on-off opening, fully open or closed (limited maintenance)
- perfect tightness (no production loss)
- perfect operation, even with capacities smaller than those rated for all types of fluids
- excellent repeatability and reliability
- adjustable blowdown (pop action)
- no pressure/flow limit
- with additional equipment (solenoid valve), the safety relief valve can be used as a discharge valve.

To meet the most varied requirements, Sarasin- RSBD selects the appropriate pilot detector for the safety relief valve required (semi or full nozzle, with bellows, piston etc.)



Starvalve Changeover Valves

Low pressure drop COV Standard COV
Combined valve with linkage system
Sizes: 1/2" - 10"
Pressure: up to 100 barg
Temp: -196°C up to +427°C
Mat: CS - SS



Gas - Liquid
Modulating action



Gas
Pop action



**High temperature
steam - Gas**
Pop action



Trillium Flow Technologies France SAS

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