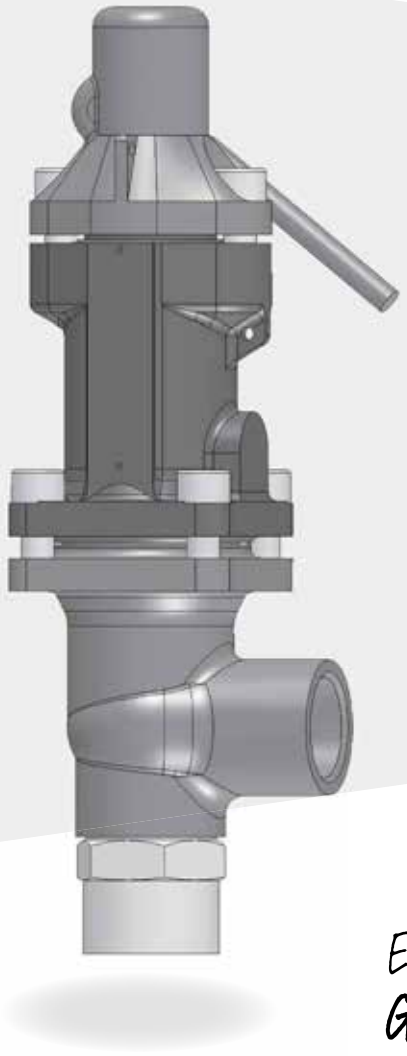
IMI BOPP & REUTHER

Si C132



Engineering GREAT Solutions

Safety valves for pressure relief in accordance to PED, DIN/EN and ASME

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Si C132

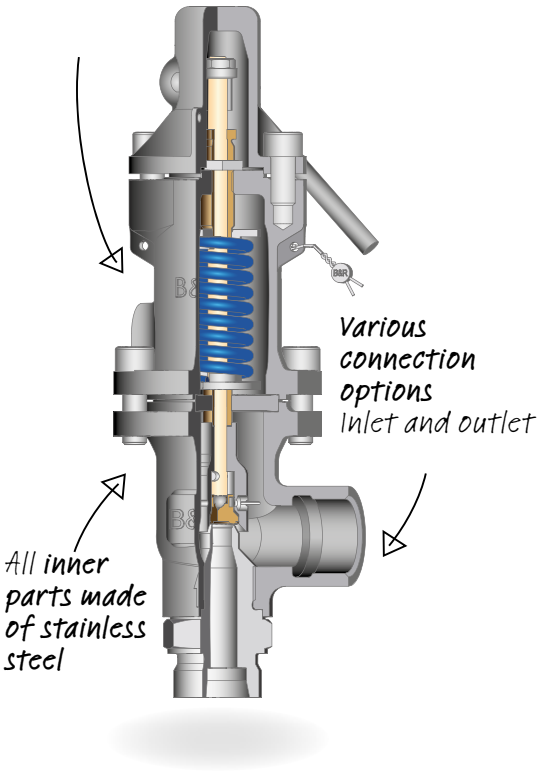
ASME VIII certified

Features

The universal compact safety valve

- 3 body seat sizes for appropriate size selection
- Bellows design available for body seat sizes 12.2 mm and 17 mm
- Connection available with EN and ASME flanges as well as threaded connections
- Increased sealing performance thanks to ball-bearing disc
- Block body design in special material available

Optimized construction – easy maintenance



Inlet sizes
DN 15 to DN 25
NPS ½ to NPS 1

Inlet pressure rating
PN 10/Class 150 to PN 320/Class 1500

Set pressures
0.55 bar/8 psi to 200 bar/2900 psi

Temperature range
-200°C to +427°C

Overpressure

Vapours/gases	10%
Liquids	10%

Blowdown

Vapours/gases	10%
Liquids	20%

Allowable built-up back pressure without bellows
10% of set pressure

Applications

- Vapours, gases and liquids
- Thermal expansion
- Protection of pipelines
- Chemical industry, petrochemicals
- Technical gases
- Cooling and oxygen applications
- OEM applications (e.g. pumps and compressors)
- Various connection options

Approvals and standards

Type examination (CE)

- Pressure Equipment Directive 97/23/EC
- DIN EN ISO 4126-1
- AD2000-Merkblatt A2
- VdTÜV Merkblatt "Sicherheitsventil 100"

ASME approval

- ASME Boiler & Pressure Vessel Code Section VIII

VdTÜV type approval acc. to

TÜV.SV.11-1068.d_0.D/G/F.α_w.p

IMI Bopp & Reuther will not renew the existing VdTÜV type approval. The requirements by VdTÜV and applicable standards are completely considered by the EC type examination.

The design, manufacture, testing and labelling meet the requirements of DIN EN ISO 4126-7, DIN EN 12266-1/-2 (insofar as applicable for safety valves), EN 1092-1, EN 1759-1, AD 2000-Merkblätter A2 and HP0, ASME B16.5, ASME VIII

Si C132

Type code

Type code					Ordering example
1	**Series**	Si C1	Compact safety valve		Si C1
2	**Design**	1	Conventional, open bonnet		3
		3	Conventional, closed bonnet		
		4	Bellows, closed bonnet		
		5	Bellows, open bonnet		
3	**Characteristic**	2	Normal capacity "Regular Flow"		2
4	**Pressure class**	1	PN 10 - PN 40/Class 150		1
		2	PN 63 - PN 160/Class 300-600		
		3	PN 250 - PN 320/Class 900-1500		
		9	Thread		
5	**Cap**	G	Gas-tight cap		A
		GB	Gas-tight cap with test gag		
		A	Packed lifting lever		
		AB	Packed lifting lever with test gag		
6	**Material code**	00	GP240GH/1.0619/SA-216 Gr.WCB		04
		04	GX5CrNiMo19-11-2/1.4408/SA-351 Gr.CF8M		
7	**Options**	.09	Locking sleeve (government ring)		.28
		.18	Heating jacket		
		.22a	Weld end at inlet		
		.22b	Weld end at outlet		
		.25	Block body design		
		.28	Oil and grease free		
		.35	With lift restriction ring		
		.57	With direct weight loading		
		.59	Stellited disc		
		.60	Stellited seat		
		.85	With lift limitation bolt		

Type: ►	**Si C1321 A 04.28**
Please state: ►	
Set pressure	15.0 bar g
Fluid temperature	50°C
Fluid and state	Oxygen Gaseous
Inlet	DN 25, PN 40
Outlet	DN 25, PN 40
Flow diamete	12.2 mm
Approval	CE approval

Si C132

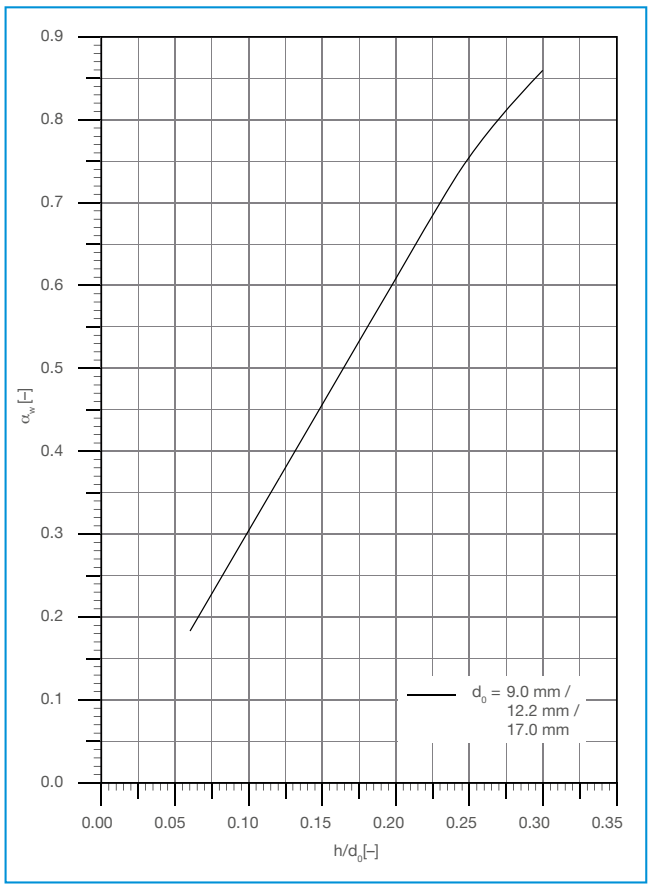
Coefficient of discharge in accordance with PED type examination 97/23/EC

Fluid group	Inlet size	Flow diameter	$h/d_0 \geq$	$p_b/p_0 \leq$	α_w
Vapours / gases (D / G)	DN 15 to DN 20 DN 20 to DN 25 DN 25	9 mm 12.2 mm 17 mm	0.3	0.18 0.28 0.18	0.86
Liquids (F)	DN 15 to DN 20 DN 20 to DN 25 DN 25	9 mm 12.2 mm 17 mm	0.3	0.18 0.28 0.18	0.6

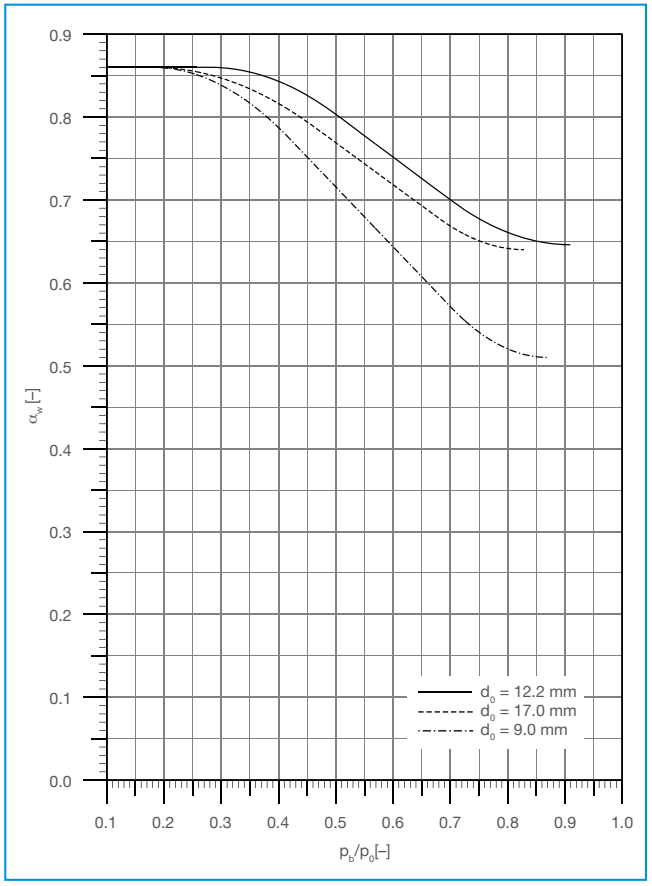
The coefficient of discharge for gases / vapours in a pressure ratio of p_b/p_0 is shown in the diagram below.

The capacity of the safety valve can be adjusted to the required capacity by reducing the lift, thus reducing undesirable extra performance.

The following applies: $\alpha_{w(reduced))} = \alpha_w \times q_m/q_{mc}$. The required ratio h/d_0 is shown in the diagram below, and the reduced lift is calculated with $h_{(reduced)} = d_0 \times (h/d_0)$.

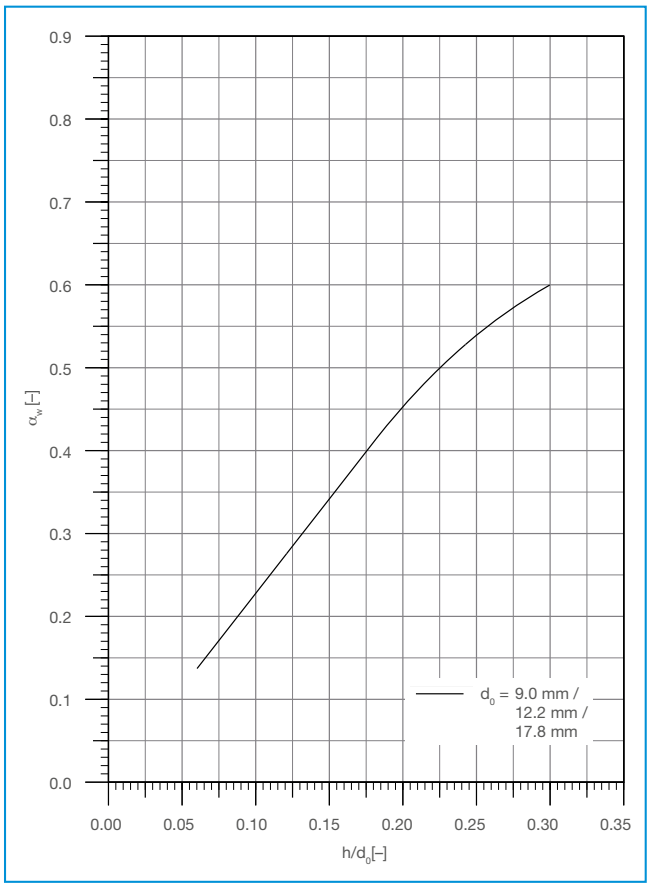


Si C132x coefficient of discharge α_w depending on h/d_0 for gases and vapours



Si C132x coefficient of discharge α_w depending on p_b/p_0 for gases and vapours

Si C132



Si C132 coefficient of discharge α_w depending on h/d_0 for liquid

The coefficients of discharge K_{dr} acc. to DIN EN ISO 4126-1 in this series are identical to the above coefficients of discharge α_w and the values in the diagrams.

h	=	Lift [mm]
d_0	=	Flow diameter of the selected safety valve [mm]
h/d_0	=	Lift/flow diameter ratio
p_b	=	Absolute back pressure [bar a]
p_0	=	Absolute relieving pressure [bar a]
p_b/p_0	=	Absolute back pressure/absolute relieving pressure ratio
α_w	=	Coefficient of discharge acc. to AD 2000-Merkblatt A2
q_m	=	Required mass flow [kg/hr]
q_{mc}	=	Certified mass flow [kg/hr

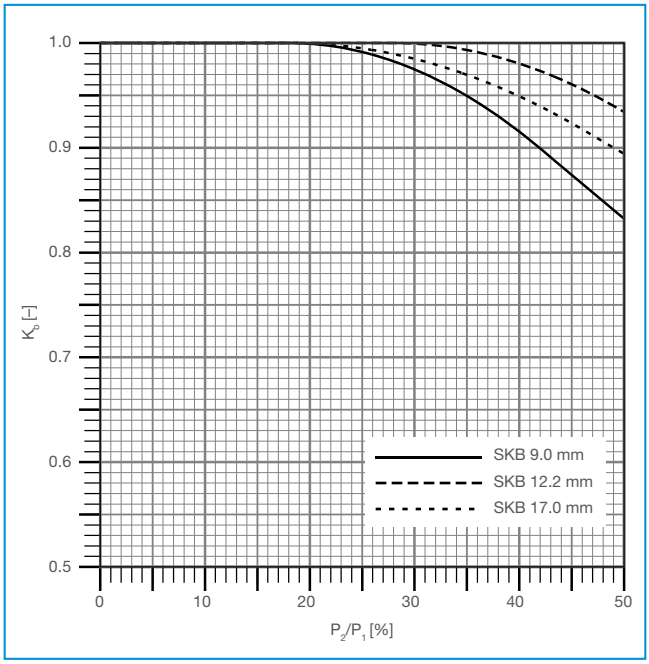
Si C132

Coefficient of discharge acc. to ASME Section VIII Div. 1

Fluid group	Inlet size	Flow diameter	Set pressure range	Certified coefficient of discharge K
Vapours / gases (D / G)	DN 15 to DN 20 NPS ½ to NPS ¾	9 mm	1.03-200 bar g 15-2900 psi	0.878
	DN 20 to DN 25 NPS ¾ to NPS	12.2 mm	1.03-103 bar g 15-1500 psi	
	DN 25 NPS 1	17 mm	1.03-52 bar g 15-750 psi	
Liquids (F)	DN 15 to DN 20 NPS ½ to NPS ¾	9 mm	1.03-200 bar g 15-2900 psi	0.647
	DN 20 to DN 25 NPS ¾ to NPS 1	12.2 mm	1.03-103 bar g 15-1500 psi	
	DN 25 NPS 1	17 mm	1.03-52 bar g 15-750 psi	

IMI Bopp & Reuther series Si C132 safety valves are designed, manufactured, tested and marked in accordance with ASME Boiler and Pressure Vessel Code, Section VIII.

The performance for air, steam and water are certified by the National Board of Boiler and Pressure Vessel Inspectors. The basis for calculating the size and capacity are described in the regulations ASME Section VIII Division 1, section UG-131. Section UG-131 is also used for determining the rated capacity for air, saturated steam and water.



Si C132 back pressure K_b depending on P_2/P_1 for gases and vapours

The following diagram shows the correction factor for back pressure K_b of the series Si C142 for gases and vapours. This correction factor takes into account the capacity-reducing influence of the back pressure during discharge and is to be used when calculating the capacity or the necessary flow area in accordance with API 520 and ASME VIII. The factor K_b shown is also valid for pressures of less than 3.45 bar-g (50 psig) and for the version Si C132 without bellows.

P_1 = Absolute relieving pressure (Set pressure + Accumulation + Atmospheric pressure)

P_2 = Absolute back pressure

Si C132

Sample calculation for a safety valve for liquid in accordance with ASME VIII

Fluid
Petrol

Temperature
40 °C

Specific density G_v
0.680

Set pressure
3200 kPa g

Opening pressure P1 at 10% accumulation
(3200 x 1.1) + 101 = 3621 kPa a

Back pressure P2
651 kPa a

Seat diameter
12.2 mm

Flow capacity Q (l/min) is calculated with:

$$Q = \frac{Kd \times Kw \times Kc \times Kv \times A}{k\text{-}1} \times \sqrt{\frac{P1 - P2}{G}}$$

The back pressure correction factor K_w for valves without bellows is 1.0. Without an upstream bursting disc (or rupture disc) the bursting correction factor K_c = 1.0 and with a Reynolds number >60,000 the viscosity correction factor is also K_v = 1.0.

If the coefficient of discharge K_d = 0.647 and the flow area is 117 mm^2, the flow capacity of valve type Si C1329 G 00 is 1" NPT (outside) x 1" NPT (inside, seat diameter 12.2 mm) is:

$$Q = \frac{0.647 \times 1.0 \times 1.0 \times 1.0 \times 117}{11.78} \times \sqrt{\frac{3621\text{-}651}{0.680}} = 425 \text{ (l/min)}$$

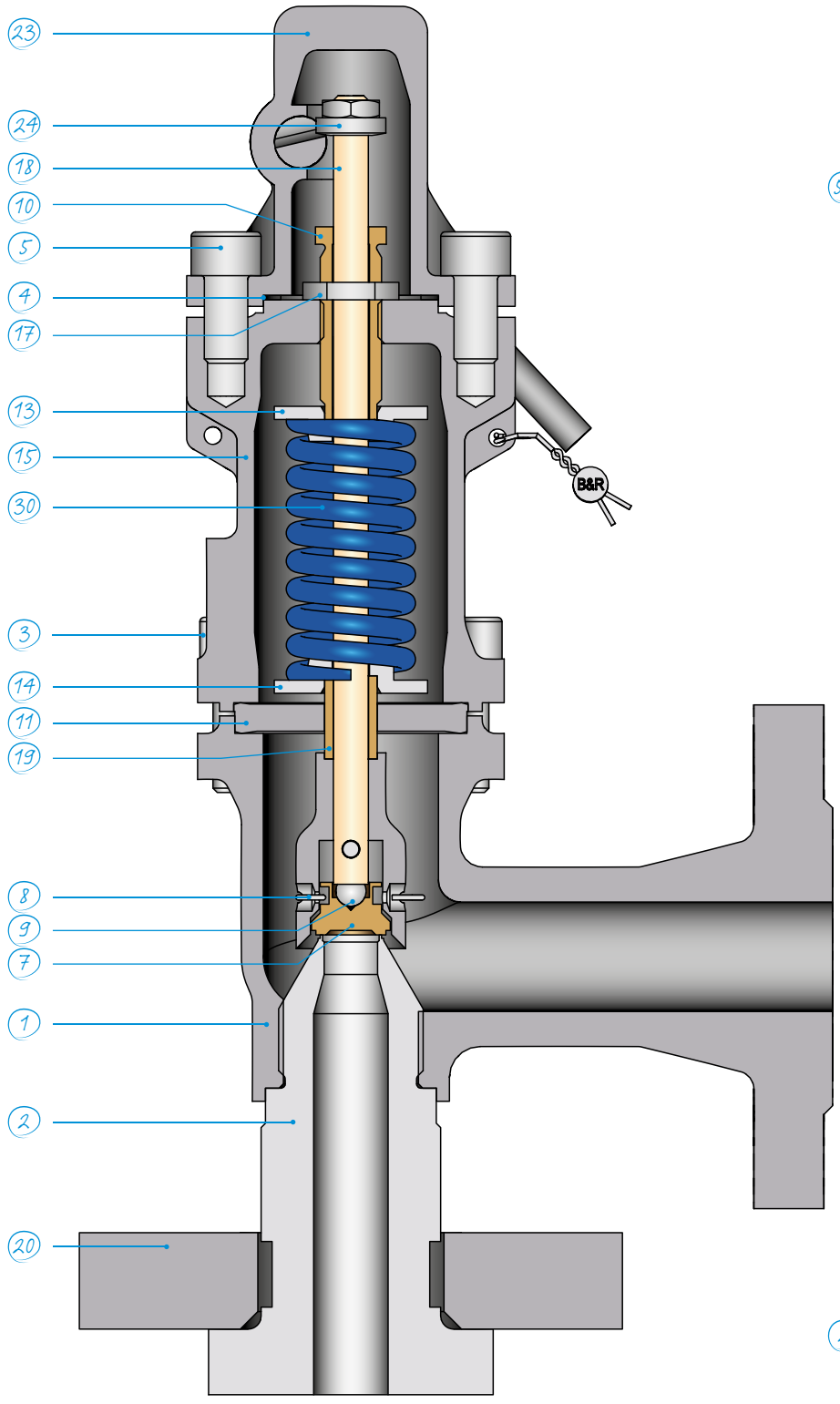
Capacity acc. to ASME Section VIII

Set pressure P [bar g]	Air at 16°C [Nm³/min]			Saturated steam [kg/hr]			Water [l/min]		
	Flow diameter [mm]			Flow diameter [mm]			Flow diameter [mm]		
	9	12.2	17	9	12.2	17	9	12.2	17
1	1.4	2.7	5.2	65	120	232	38	71	137
2	2.1	3.8	7.5	94	174	337	52	95	185
3	2.8	5.2	10	127	233	451	63	117	227
4	3.5	6.5	13	159	292	567	73	135	262
5	4.2	7.8	15	191	351	682	82	151	292
6	4.9	9.1	18	223	410	797	90	165	320
7	5.7	10	20	256	470	912	97	178	346
8	6.4	12	23	288	529	1027	104	190	370
9	7.1	13	25	320	588	1142	110	202	392
10	7.8	14	28	352	648	1257	116	213	414
15	11	21	41	514	944	1833	142	261	506
20	15	28	53	675	1240	2409	164	301	585
30	22	41	79	998	1833	3560	201	369	716
40	29	54	104	1320	2426	4711	232	426	827
50	36	67	130	1643	3019	5862	259	476	925
60	44	80		1966	3612		284	522	
70	51	93		2288	4205		307	564	
80	58	106		2611	4798		328	602	
90	65	120		2934	5391		348	639	
100	72	133		3262	5456		367	674	
120	87			3987			402		
140	101			4762			434		
160	115			5611			464		
180	129			6573			492		
200	144			7726			518		

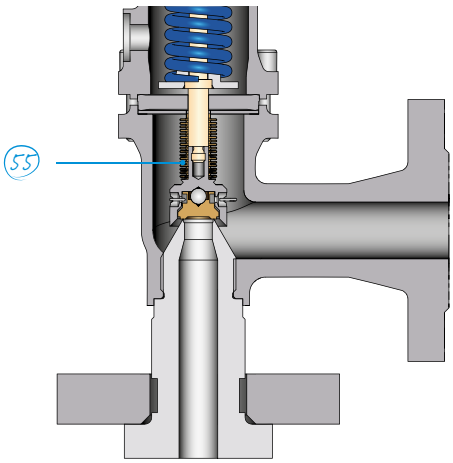
Capacity is calculated at 10% accumulation. Set pressure less than 2.1 bar with 0.21 bar accumulation. Valve discharging against atmospheric pressure is applied.

Si C132

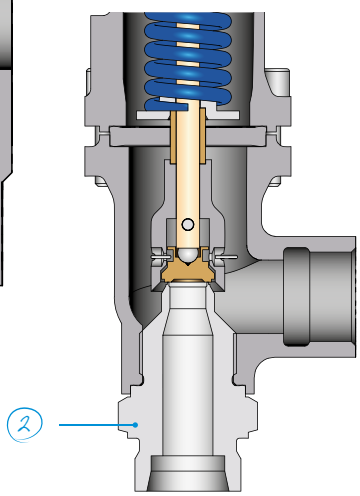
Material code



Bellows design Si C1421



Thread design Si C1329



Si C132

Material code			00		04	
Temperature application range			-10°C to +427°C	-29°C to +427°C 20°F to +800°F	-200°C to +400°C	-268°C to +427° C -450°F to +800° F
Part	**Name**	**Spare part**	**Material**	**ASME material**	**Material**	**ASME material**
1	Body		1.0619	SA-216 WCB	1.4408	SA-351 CF8M
2	Inlet nozzle	*3	1.4404	SA-182M 316L	1.4404	SA-182M 316L
3	Cylinder bolt		A4-70	B8M	A4-70	B8M
4	Flat gasket	*1,2,3	Graphite/1.4401	Graphite/316	Graphite/1.4401	Graphite/316
5	Cylinder bolt		8.8	CS	A4-70	B8M
6	Disc holder		1.4571	SA-479 316Ti	1.4571	SA-479 316Ti
7	Disc	*2,3	1.4571	SA-479 316Ti	1.4571	SA-479 316Ti
8	Disc retainer		1.4571	SA-479 316Ti	1.4571	SA-479 316Ti
9	Ball		1.3541	Stainless steel	Ceramic	Ceramic
10	Adjusting screw		1.4571	SA-479 316T	1.4571	SA-479 316Ti
11	Intermediate cover		1.4571	SA-479 316Ti	1.4571	SA-479 316Ti
13	Spring washer, top		1.4571	SA-479 316T	1.4571	SA-479 316Ti
14	Spring washer, bottom		1.4571	SA-479 316T	1.4571	SA-479 316Ti
15	Bonnet		1.0619	SA-216 WCB	1.4408	SA-351 CF8M
17	Locknut		Stainless steel	Stainless steel	Stainless steel	Stainless steel
18	Spindle		1.4571	SA-479 316Ti	1.4571	SA-479 316Ti
19	Pressure sleeve		1.4571	SA-479 316Ti	1.4571	SA-479 316Ti
20	Loose flange		1.0460	SA 105	1.4571	SA-479 316Ti
23	Lifting lever		1.0619	SA-216 WCB	1.4408	SA-351M CF8M
24	Lifting nut		Stainless steel	Stainless steel	Stainless steel	Stainless steel
30	Spring	*3	1.4310	302	1.4310	302
55	Bellows	*3	1.4571	SA-479 316Ti	1.4571	SA-479 316Ti

Spare parts:
*1 For start-up
*2 For 2 years of operation
*3 After many years of operation

IMI Bopp & Reuther reserve the right to technical changes or selection of higher quality materials without prior notice. The material design can be adapted to customer specifications at any time upon request.

Si C132

Sizes, pressure ranges and dimensions: Series Si C1 with flange connection DIN/EN

Type	Size		Flange connection [1]		Flow diameter [mm]	Flow area [mm²]	Min. set pressure [bar g]		Max. set pressure [bar g] [2]	Max. back pressure [bar g]	Centre to face dimension		Height	x [mm] [4]	Weight [kg]
	Inlet	Outlet	Inlet	Outlet			Si C13 [4]	Si C14 [3]			S1 [mm]	S2 [mm]	H1 [mm]		
Si C1x21	15	25	PN 10-40	PN 10-40	9	64	0.7 (0.25)		40	20	110	100	317	16	5.5
Si C1x22			PN 63-160						160	40				33	6.5
Si C1x23			PN 250-320						200					39	7.5
Si C1x21	20	25	PN 10-40						40	20				33	6
Si C1x22					12.2	117	0.7 (0.2)	3.0					324	31	
Si C1x21	25	25													6.5
Si C1x22			PN 63-160						100					37	7.5
Si C1x21	25	40	PN 10-40		17	227	0.55 (0.15)		40		125		319	31	8
Si C1x22			PN 63-160						50	16				37	9

[1] Flange PN 10-40 acc. to DIN EN 1092-2, gasket facing type B1, from PN 63 gasket facing type B2.
[2] Stated pressures are maximum values corresponding to the spring forces. The component strength may need to be reviewed, and the suitable pressure rating selected, depending on the material and temperature
[3] The bellows design Si C14 is only available for valves with the flow diameter d_0 = 12.2 mm and 17 mm. Si C14 with bellows has a G¼ test connection in the bonnet for the bellows check.
[4] Min. set pressure in brackets with direct weight loading option only .57.

Sizes, pressure ranges and dimensions: Series Si C1 with flange connection ASME

Type	Size		Flange connection [1]		Flow diameter [mm]	Flow area [mm²]	Min. set pressure [bar g]		Max. set pressure [bar g] [2]	Max. back pressure [bar g]	Centre to face dimension		Height	x [mm] [4]	Weight [kg]
	Inlet	Outlet	Inlet	Outlet			Si C13 [4]	Si C14 [3]			S1 [mm]	S2 [mm]	H1 [mm]		
Si C1x21	½	1	150	150	9	64	0.7 (0.25)		19.7	9.8	110	100	317	12	5.0
Si C1x22			300/600	150/300					102	51				21	5.0/6.0
Si C1x23			900/1500						200					42	6.5/7.0
Si C1x21	¾		150	150					19.7	9.8				28	5.5
Si C1x22			300/600	150/300					102	51				35	6.0/6.5
Si C1x23			900/1500						200					44	7.0/7.5
Si C1x21			150	150	12.2	117		3	19.7	9.8			324	28	5.5
Si C1x22			300/600	150/300					100	51				35	6.0/6.5
Si C1x23			900/1500											44	7.0/7.5
Si C1x21	1		150	150					19.7	9.8				38	6.0
Si C1x22			300/600	150/300					100	51				37	6.5/7.0
Si C1x23			900/1500											44	8.0/9.0
Si C1x21		1½	150	150	17	227	0.55 (0.15)		19.7	9.8	125		319	33	6.5
Si C1x22			300/600	150/300					50.0	16				37	7.5/8.0

[1] Flange with gasket facing RF, other types possible.
[2] Stated pressures are maximum values corresponding to the spring forces. The component strength may need to be reviewed, and the suitable pressure rating selected, depending on the material and temperature.
[3] The bellows design Si C14 is only available for valves with the flow diameter d_0 = 12.2 mm and 17 mm. Si C14 with bellows has a G¼ test connection in the bonnet for the bellows check.
[4] Min. set pressure in brackets with direct weight loading option only .57.

Si C132

Sizes, pressure ranges and dimensions: Series Si C1 with threaded connection

Type	Size		Threaded connection		Flow diameter [mm]	Flow area [mm²]	Min. set pressure [bar g]		Max. set pressure [bar g]	Max. back pressure [bar g]	Centre to face dimension		Height	x [mm]	Weight [kg]
	Inlet	Outlet	Inlet. male thread	Outlet. female thread			Si C13 [2]	Si C14 [1]			S1 [mm]	S2 [mm]	H1 [mm]		
Si C 1x29	15	25	G½	G1	9	64	0.7 (0.25)	3.0	200	51	57	48	265	14	3.0
	20		G¾		12.2	117	0.7 (0.2)		100				272	16	
	25		G1											18	
	25	40		G1½	17	227	0.55 (0.15)		50	16	62	55	274		
	½	1	NPT½	NPT1	9	64			200	51	57	48	265	20	3
	¾		NPT¾				0.7 (0.25)								
	1		NPT1		12.2	117	0.7 (0.2)	3	100				272	25	
	1	1½		NPT1½	17	227	0.55 (0.15)		50	16	62	55	274		3.5

[1] The bellows design Si C14 is only available for valves with the flow diameter d_0 = 12.2 mm and 17 mm. Si C14 with bellows has a G¼ test connection in the bonnet for the bellows check.

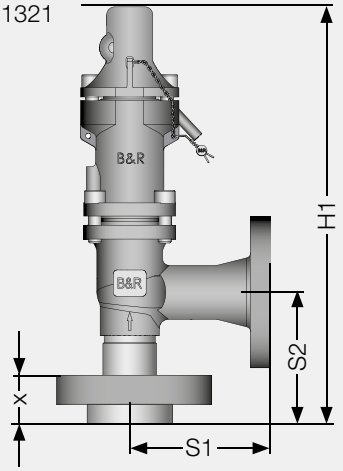
[2] Min. set pressure in brackets with direct weight loading option only .57.

The threads are pipe threads (G) in acc. with ISO 288-1 or National Pipe Thread Taper (NPT) in accordance with ASME B1.20.1.

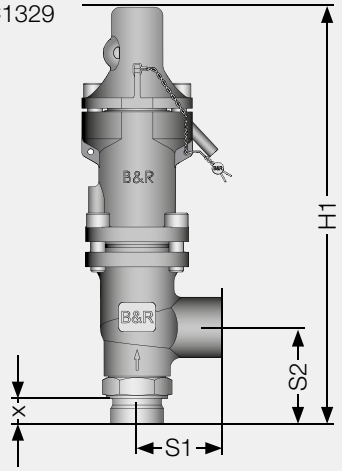
The stud ends comply with DIN 3852 – A or NPT accordingly.

The screw plug holes comply with DIN 3852 – Y or NPT accordingly.

Si C1321



Si C1329



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