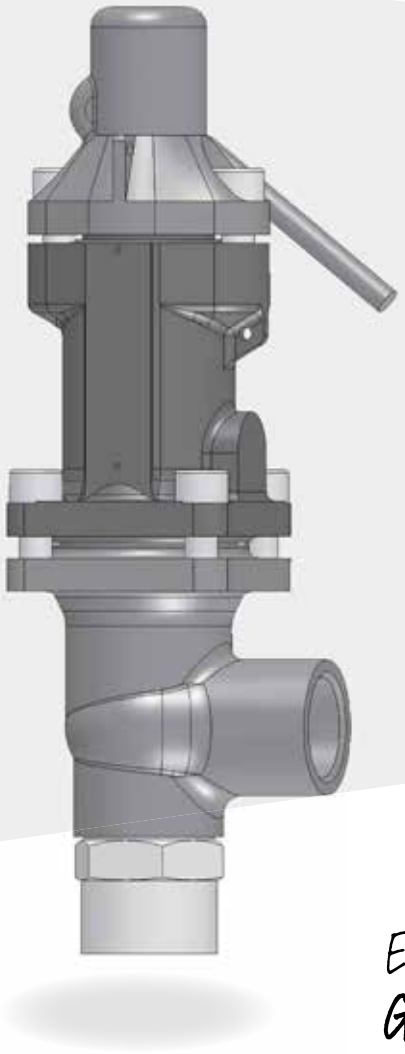
IMI BOPP & REUTHER

Regular Flow Safety valves



Engineering GREAT Solutions

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

IMI Critical Engineering

Valve overview

Si 032

Size
DN 15 to DN 25

Material
1.4571

Set pressure
up to 400 bar

Applications
Small capacities and high pressures in the chemical industry, high back pressures

Si C132

Size
DN 10 to DN 25

Material
1.0619 (WCB) and 1.4408 (CF8M)

Set pressure
up to 200 bar

Applications
Thermal expansion, pumps and compressors

Si 2321

Size
DN 20 to DN 150

Material
0.6025 / GG25

Set pressure
up to 16 bar

Applications
Potable water, water

Si 4322

Size
DN 25 to DN 100

Material
1.0619 and 1.4408

Set pressure
up to 40 bar

Applications
Thermal expansion, vapours, gases and liquids in all industrial applications

Si 2323 / Si 2324 / Si 2325

Size
DN 15 to DN 50

Material
1.0619 and 1.4408

Set pressure
up to 400 bar

Applications
Protection of system components at high pressure, feed water supply

Options

Useful knowledge

Useful knowledge

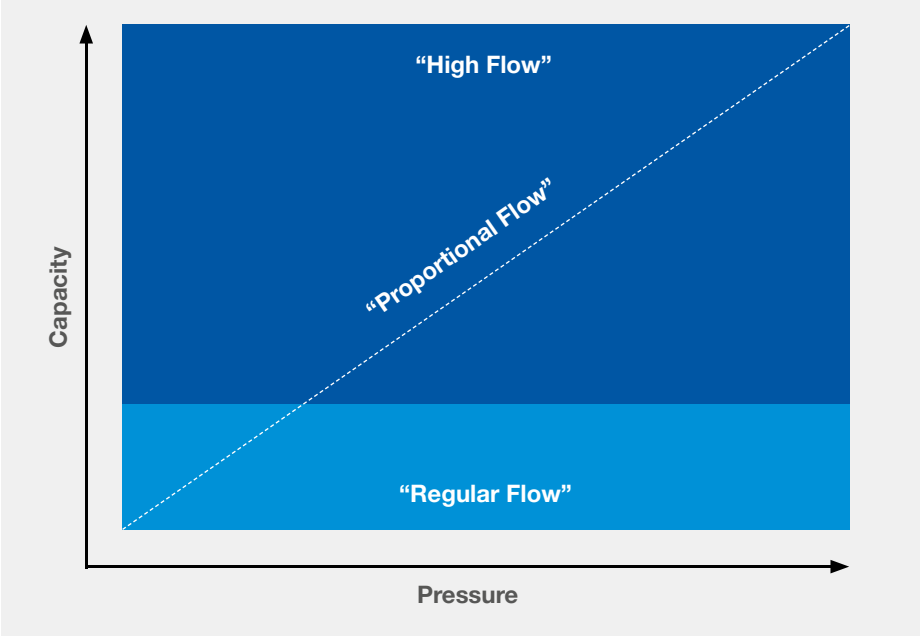
Safety valves have the function of preventing inadmissible overpressure in pipe systems, pressure vessels and boilers, in order to avoid danger to people, plant and the environment. They are set to a higher pressure than the operating pressure of the system to be protected.

Safety valves…

… open once the set pressure is reached.

… steady discharge the required mass flow.

… close after the pressure has dropped.



In the IMI Bopp & Reuther application category **"High Flow"**, the required capacity is usually the most important criteria for selecting a size. The size of the outlet is always larger than that of the inlet.

The application category **"Proportional Flow"** comprises safety valves with proportional functional characteristics for special operating conditions.

Safety valves for pressure systems with low mass flow or where the mass flow is of marginal importance, e.g. with thermal expansion, pumps or plant components for the process industry, are grouped in the IMI Bopp & Reuther application category **"Regular Flow"**.

The inlet and outlet are often the same size and the construction is compact to save space.

Features and benefits

> **Feature**
Large number of types, sizes and materials

Benefit
A versatile selection of optimum and cost-effective safety valves is available – particularly for small valve sizes – so that appropriate products are available for the varied applications.

> **Feature**
Extensive selection of connection types

Benefit
Flange, weld-end, threaded and clamp-type connections can be selected to suit the pressure system. Special connections are easy to provide, if requested by the customer.

> **Feature**
One-trim design for vapours, gases and liquids.

Benefit
Little effort for using the same valve when operating conditions change, as well as operational reliability in 2-phase flow. Reduction of spare part inventories and inexpensive maintenance.

> **Feature**
One-piece spindle, valve disassembly possible without set pressure change.

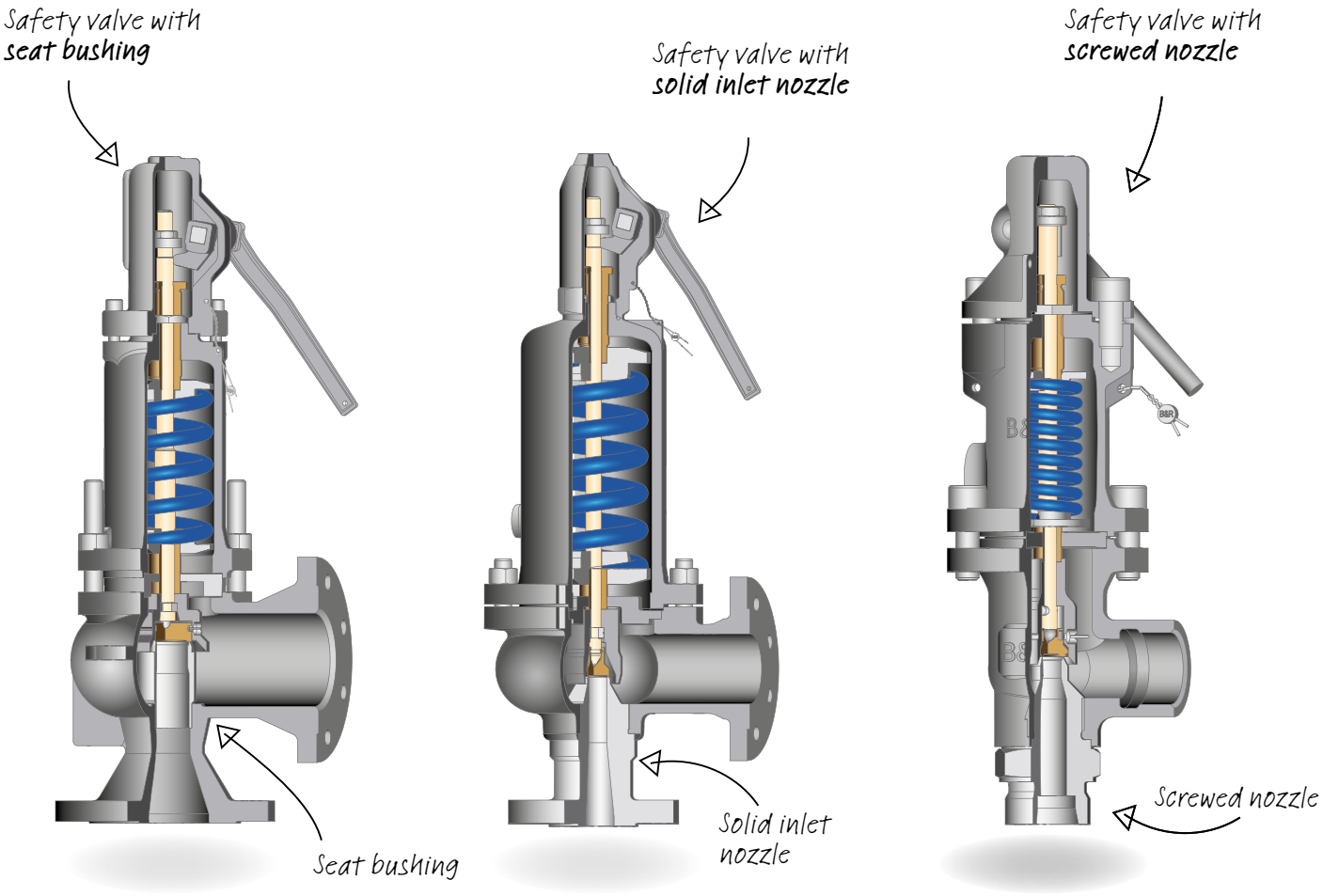
Benefit
Easy maintenance and repair, high functional reliability.

> **Feature**
Maximum lift with lift stop for the certified capacity.

Benefit
Stable position of the disc at full lift.

> **Feature**
Self-draining body design without a recess where fluid may collect.

Benefit
Residues or condensate drain off, thus reducing corrosion.



Safety valve with seat bushing

On safety valves with a seat bushing, the safety valve inlet on the process side is in two parts – a body and rolled-in seat bushing (semi-nozzle valve). Because of the comparatively low forces acting on the safety valve body and the attainable sealing requirement on the rolled-in connection between the seat bushing and the body, this design for the body is an efficient solution for small to medium-sized safety valves with a set pressure up to 40 bar (flange pressure rating at inlet up to PN 40). The seat bushing is always made of stainless steel with a lapped sealing surface (also stellited upon request). When selecting the material it must be noted that in closed valve position during normal operation not only the seat bushing and disc but also the body is always in contact with the fluid.

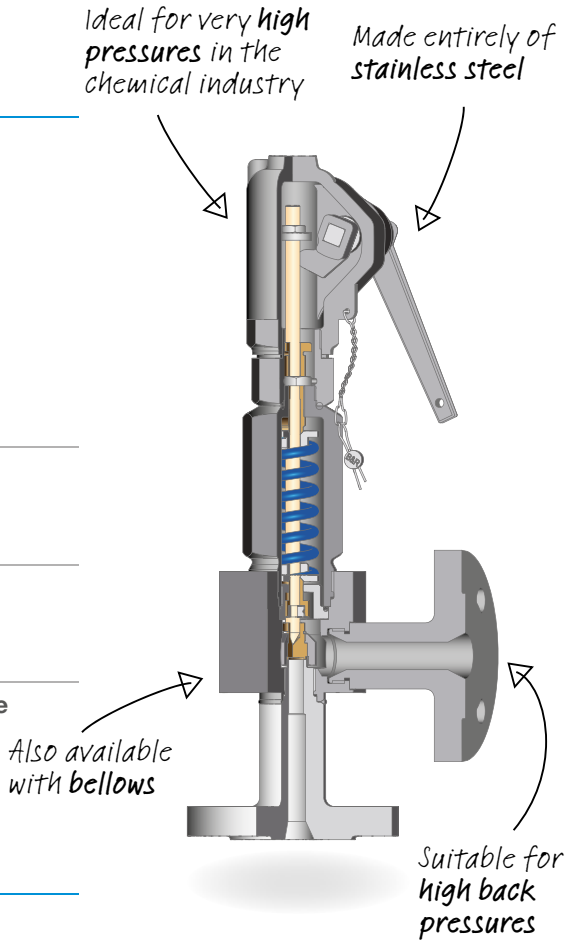
Safety valve with solid inlet nozzle

Solid body construction is required because of the considerable forces for large sizes and high pressures. The inlet, from the connection to the pressure system and to the seat, is made out of one solid part (full-nozzle valve). The inlet flange or the weld end is integral part of the inlet nozzle. The inlet nozzle is screwed into the outlet body and secured with a weld seam to prevent it from twisting and the connection is therefore sealed. When the safety valve is closed, only the inlet nozzle and disc are in contact with the fluid.

Safety valve with screwed nozzle

On safety valves with a screwed nozzle, the inlet flange is an integral part of the body and the nozzle contains as one part the pressure of the system to be protected (full-nozzle valve). Sealing between the body and the nozzle is provided by a gasket (such as for type Si 83) or sealing edge (type Si 13). Screwed nozzles can be replaced and the choice of material can be made independently of the body material (e.g. carbon steel body with Monel nozzle is feasible). Parts in contact with the fluids in the closed safety valve, nozzle and disc, are always made of stainless steel or higher quality material for this design.

Si 032



Features

Compact safety valve made of stainless steel 1.4571 for high pressures

- Forged steel body with variable connections
- Wear resistant with hard-faced seat (Stellite)

Inlet sizes
DN 15 to DN 25

Inlet pressure rating
PN 40 to PN 400

Set pressures
0.45 bar g up to 400 bar g

Temperature range
-270°C to +400°C

Overpressure

Vapours/gases	10%
Liquids	10%

Blowdown

Vapours/gases	10%
Liquids	20%

Allowable built-up back pressure without bellows
15% of the set pressure

Applications

- For vapours, gases and liquids
- Chemical industry
- Petrochemical industry
- Technical gases, cooling and oxygen applications
- Equipment engineering and chemical reactors
- Suitable for mobile pressure vessels
- Suitable for back pressures above 60 bar g

Approvals and standards

EC type examination

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

VdTÜV type approval acc. to

TÜV.SV.12-1077.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 to safety valves), DIN EN 1092 parts I and II Flanges, AD 2000 Merkblatt A4, AD 2000 Merkblatt HP0, technical rules for steam boiler TRD108, TRD 110, TRD 421

Si 032

Type code

Type code					Ordering example
1	**Series**	Si 0	High-pressure compact safety valve		Si 0
2	**Design**	3	Conventional, closed bonnet		3
		4	Bellows, closed bonnet		
3	**Characteristic**	2	Regular Flow		2
4	**Druckklasse**	1	PN 10 – PN 40		2
		2	PN 63 – PN 160		
		3	PN 250 – PN 320		
		4	PN 400		
		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**	34	X6CrNiMoTi17-12-2/1.4571		34
7	**Options**	.09	Locking sleeve (government ring)		19.25.28.60
		.18	Heating jacket		
		.19 [1)]	High set pressure design		
		.22a	Weld end inlet		
		.22b	Weld end outlet		
		.25 [2)]	Block body design		
		.28	Oil and grease free		
		.35	With lift restriction ring		
		.59	Stellited disc		
		.60 [3)]	Stellited seat		

[1)] The high pressure design (.19) is required for the flow diameter d_0 = 7 mm with set pressure >100 bar g and d_0 = 12.5 mm with set pressure >50 bar g.
[2)] The block body design (.25) is standard for the type Si 0.
[3)] Stellited seat is standard for the type Si 0.

Type ▶	**Si 0322 A 34 .19.25.28.60**
Please state ▶	
Set pressure	54.0 bar g
Fluid temperature	-190 °C
Fluid and state	Oxygen Liquid
Inlet	DN 25, PN 160, B2
Outlet	DN 25, PN 40, B1
Flow diameter	12.5 mm
Approval	97/23/EG (CE)

Si 032

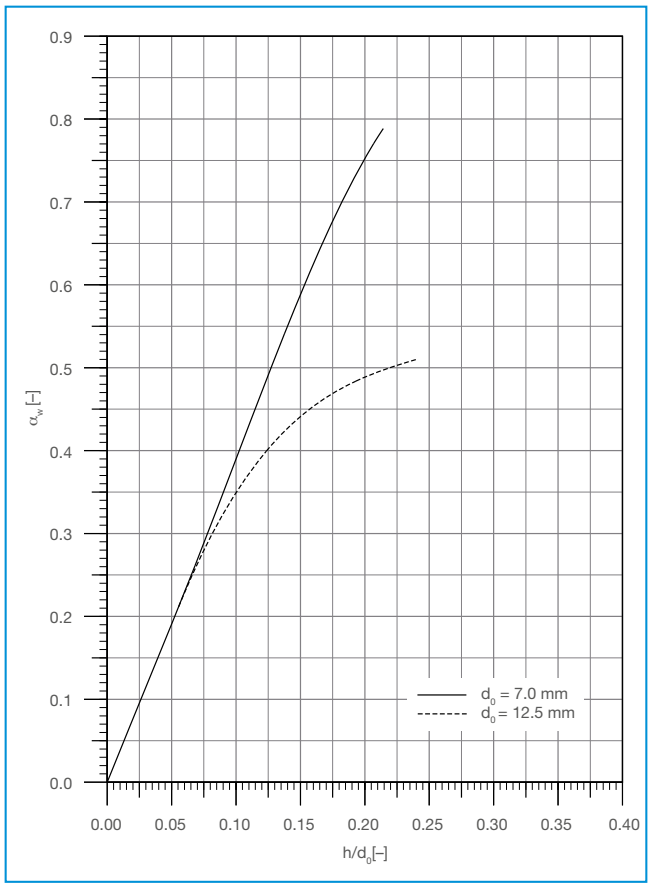
Coefficient of discharge

Fluid group	Inlet size	Flow diameter	$h/d_0 \geq$	Pressure $p_0 \geq$ [bar g]	$p_b/p_0 \leq$	α_w
Vapours/gases (D/G)	DN 15 to DN 25	7.0 mm	0.214	2.0	0.20	0.79
	DN 15 to DN 25	12.5 mm	0.240	2.0	0.20	0.51
Liquids (F)	DN 20 to DN 25	7.0 mm	0.214		-	0.54
	DN 20 to DN 25	12.5 mm	0.240		-	0.44

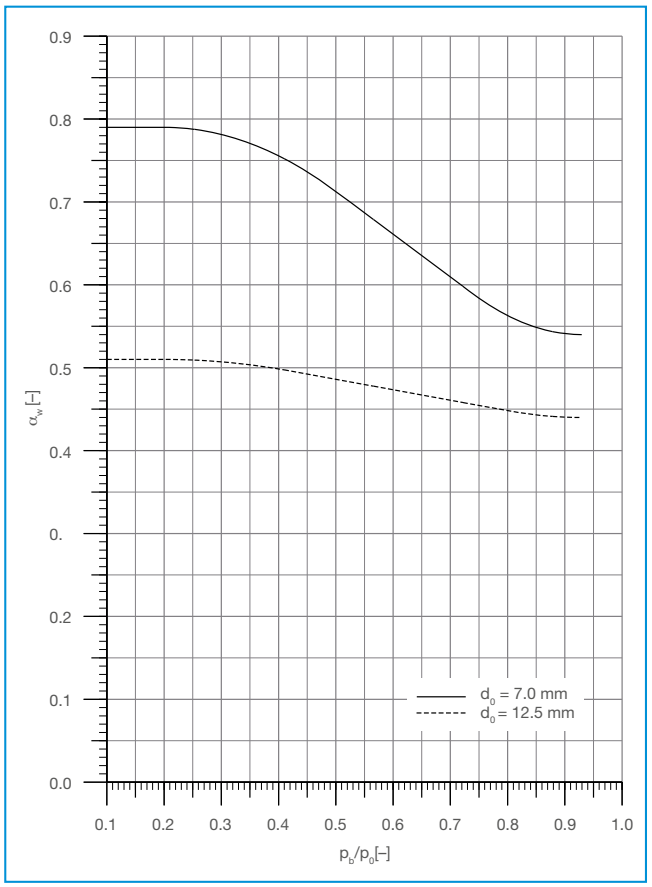
The coefficient of discharge for gases/vapours in a pressure ratio of $p_b/p_0 > 0.3$ and set pressure < 2.0 bar-g is shown in the diagram below.

The capacity of the selected 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 calculated with $h_{(reduced)} = d_0 \times (h/d_0)$.



Si 032 coefficient of discharge α_w depending on h/d_0 for gases and vapours



Si 032 coefficient of discharge α_w depending on p_b/p_0 for gases and vapour

Si 032

Sample calculation for a safety valve for use with gas in accordance with DIN EN ISO 4126-7

Fluid
Oxygen

Temperature T_0
87°C = 360.15 K

Isentropic exponent k
1.4

Molecular mass M
32 kg/kmol

Compressibility factor Z
0.992

Set pressure
67 bar g

Opening pressure p_0 at 10% accumulation
(67 × 1.1) + 1.01 = 74.71 bar a

Back pressure p_b
8.01 bar a

Required mass flow q_m
956 kg/hr

The pressure ratio $p_b/p_0 = 0.107$ is used to read the coefficient of discharge $K_{dr} = 0.790$ from the diagram "Si 032 coefficient of discharge α_w depending on p_b/p_0 gases and vapours". (α_w is identical to K_{dr})

As the condition for critical relief

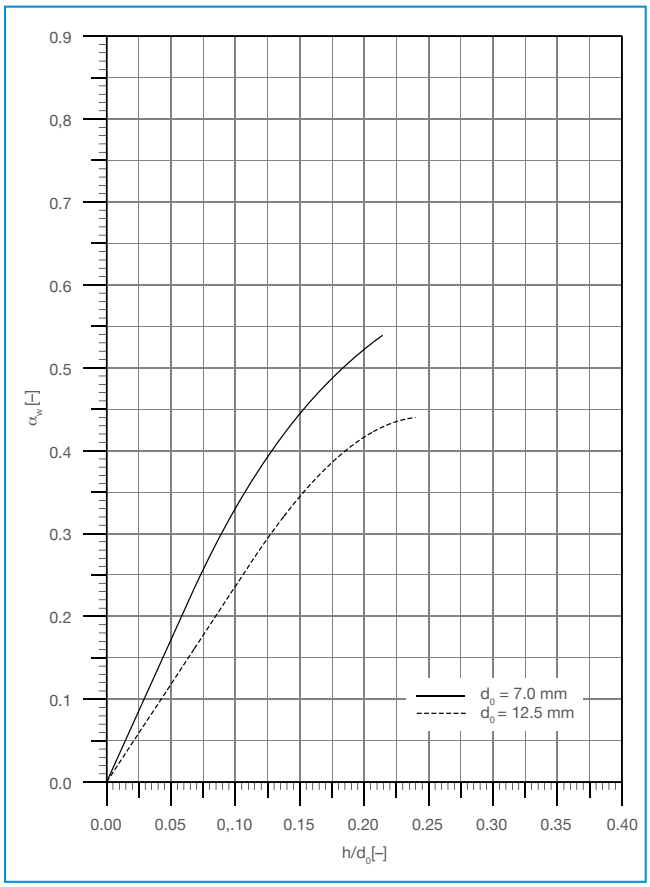
$$\frac{p_b}{p_0} > \left(\frac{2}{k+1}\right)^{\frac{k}{k-1}}$$

is met, the required flow area is calculated: $A = \dfrac{q_m}{p_0 \times C \times K_{dr} \sqrt{\dfrac{M}{Z \times T_0}}}$

where $C = 3.948 \sqrt{k \times \left(\dfrac{2}{k+1}\right)^{\frac{k+1}{k-1}}} = 2.703$, is added to

$$A = \frac{956}{74.71 \times 2.703 \times 0.790 \sqrt{\dfrac{32}{0.992 \times 360.15}}} = 20 \text{ mm}^2$$

With the flow area $A_0 = 39$ mm² the safety valve Si 0329 A 00, G¾ × G1, d_0 7.0 mm is suitable for the application (see page 12 for valve data).



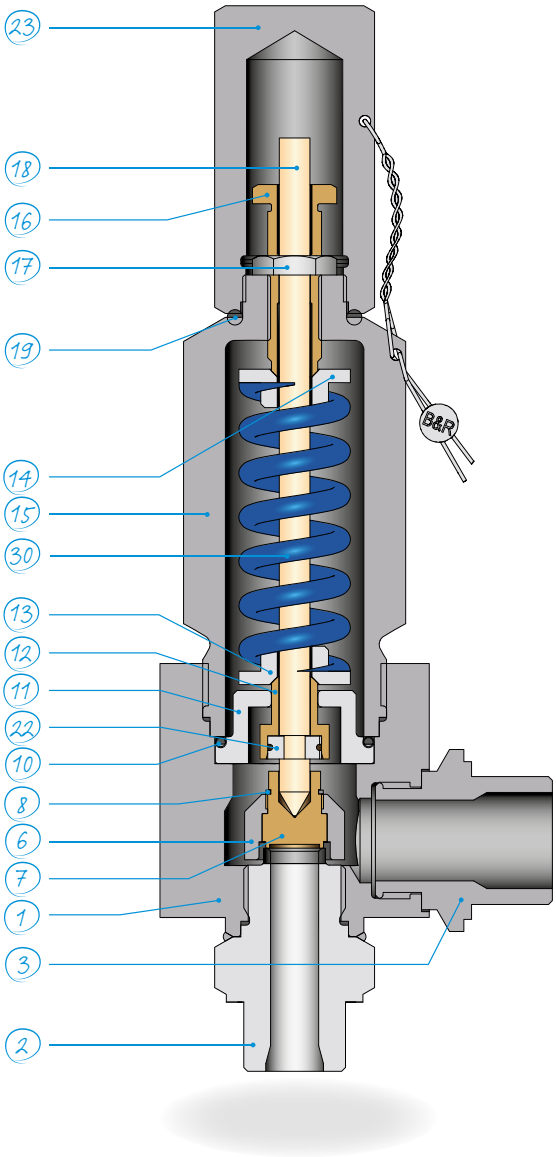
Si 032 coefficient of discharge α_w depending on h/d_0 for liquid

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 0329

Material code



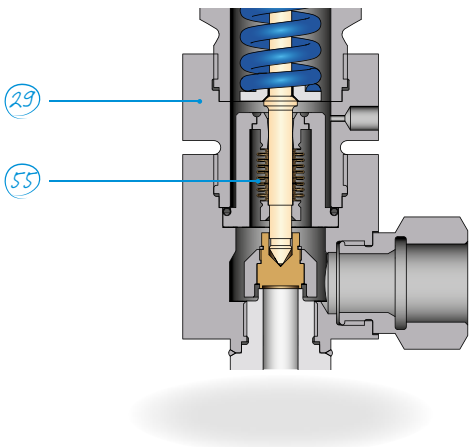
Material code			34
Temperature application range			-270°C to 400°C
Part	**Name**	**Spare part**	**Material**
1	Body		1.4571
2	Inlet nozzle		1.4571 / Seat hard-faced with Stellite
3	Outlet nozzle		1.4571
6	Disc holder	*2, 3 [1)]	1.4571
7	Disc	*2, 3 [1)]	1.4980
8	Locking ring	*2, 3 [1)]	Spring steel
10	Sealing ring	*1, 2, 3	1.4541
11	Intermediate cover		1.4571
12	Lift stop		1.4571
13	Spring washer, bottom		1.4571
14	Spring washer, top		1.4571
15	Bonnet		1.4571
16	Adjusting screw		1.4571
17	Locknut		1.4571
18	Spindle		1.4571
19	Sealing ring	*1, 2, 3	1.4301 / Graphite
22	Ring (two-parts)		1.4571
23	Cap		1.4571
29	Intermediate spacer		1.4571
30	Spring	*3	1.4310
55	Bellows	*3	1.4571

[1)] For the spare part we recommend the whole disc assembly consisting of disc, lift collar and locking ring.

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

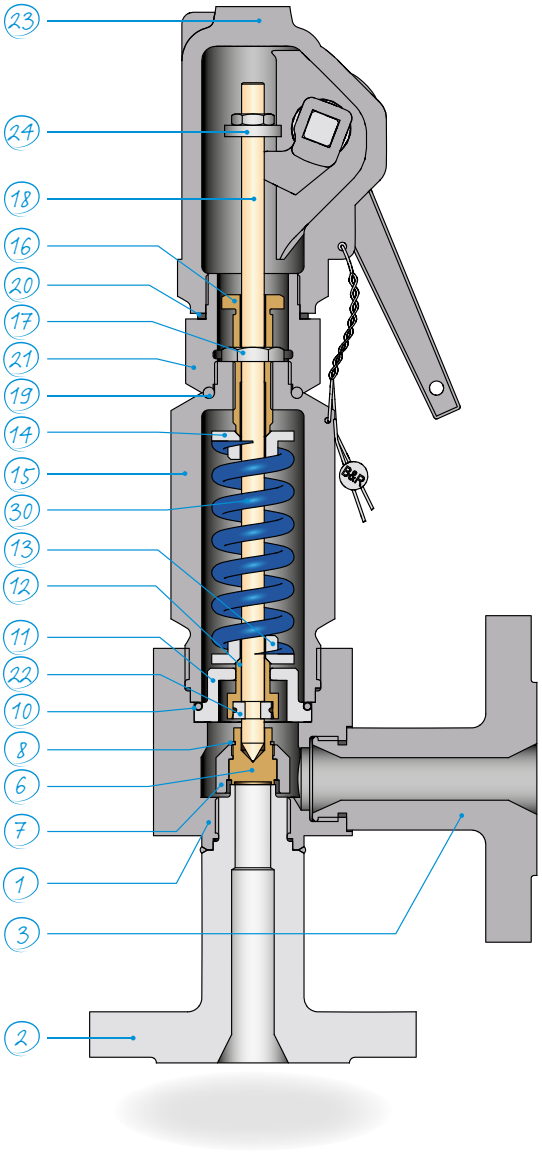
IMI Bopp & Reuther reserve the right to technical changes or selection of higher quality materials without prior notice. The material design can be adapted to customer specifications at any time upon request.

Bellows design Si 0429



Si 032

Material code



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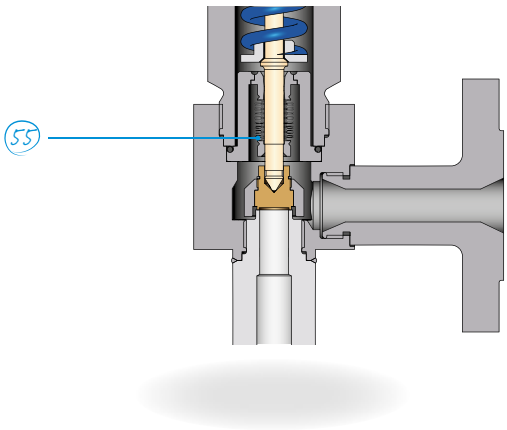
Temperature application range			-270°C to 400°C
Part	**Name**	**Spare part**	**Material**
1	Body		1.4571
2	Inlet nozzle		1.4571 /Seat hard-faced with Stellite
3	Outlet nozzle		1.4571
6	Disc holder	*2, 3 [1]	1.4571
7	Disc	*2, 3 [1]	1.4980
8	Locking ring	*2, 3 [1]	Spring steel
10	Sealing ring	*1, 2, 3	1.4541
11	Intermediate cover		1.4571
12	Lift stop		1.4571
13	Spring washer, bottom		1.4571
14	Spring washer, top		1.4571
15	Bonnet		1.4571
16	Adjusting screw		1.4571
17	Locknut		1.4571
18	Spindle		1.4571
19	Sealing ring	*1, 2, 3	1.4571
20	Seal	*1, 2, 3	1.4301 / Graphite
21	Adapter		1.4571
22	Ring (two-parts)		1.4571
23	Packed lifting lever (Cap)		1.4408
24	Lifting nut		1.4571
30	Spring	*3	1.4310
55	Bellows	*3	1.4571

Bellows design Si 042



[1] For the spare part we recommend the whole disc assembly consisting of disc, lift collar and locking ring.

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

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Si 0329

Sizes, pressure ranges and dimensions: Series Si 0 with threaded connection

Type	Size		Threaded connection [1]		Flow diameter [mm]	Flow area [mm²]	Min. set pressure [bar g]		Max. set pressure [bar g] [3]	Max. back pressure [bar g]	Centre to face dimension		Height [4] [5]		Weight [kg]
	Inlet	Outlet	Inlet, male thread	Outlet, female thread			Si 03	Si 04			S1 [mm]	S2 [mm]	Si 03 H1 [mm]	Si 04 H2 [mm]	
Si 0329	20	25	G¾	G1	7	38.48	0.45	[2]	400	200	67	60	280	[2]	7
Si 0x29					12.5	122.7		8						325	8
Si 0329	¾“	1“	NPT	NPT	7	38.48		[2]						[2]	7
Si 0x29					12.5	122.7		8						325	8

[1] 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.

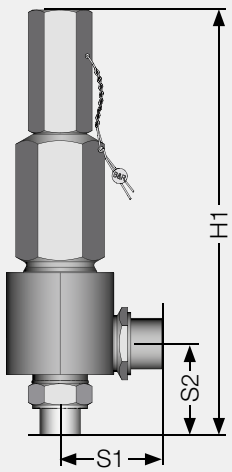
[2] The bellows design Si 04 is only available for valves with the flow diameter d_0 = 12.5.

[3] The high pressure design (.19) is required for the flow diameter d_0 = 7 mm with set pressure >100 bar g and d_0 = 12.5 mm with set pressure >50 bar g.

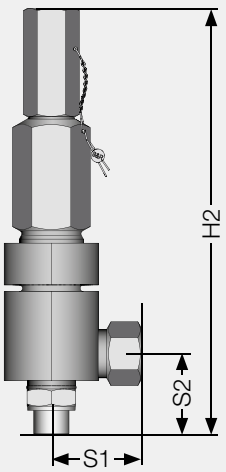
[4] The height increases by +40 mm for the high pressure design (.19).

[5] If lifting lever A or AB is selected, the height increases by +55 mm.

Si 0329



Si 0429

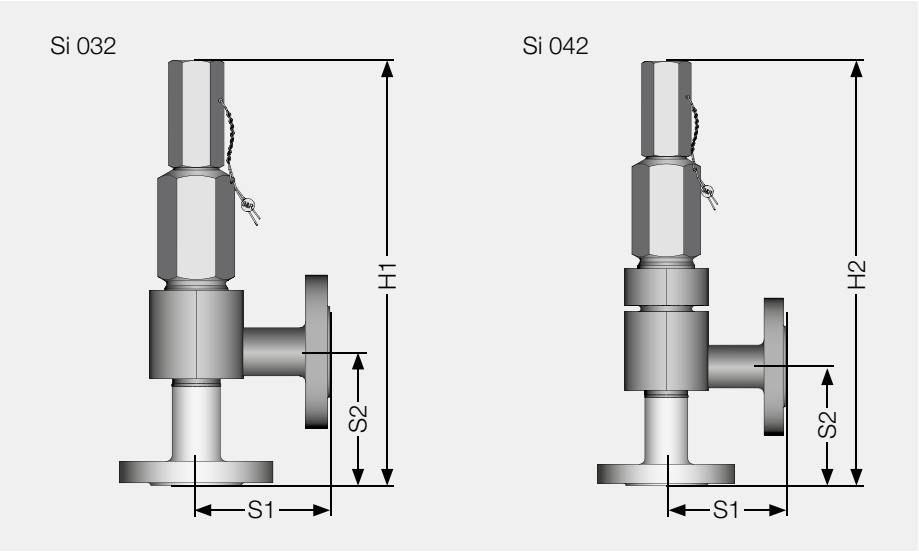


Si 032

Sizes, pressure ranges and dimensions: Series Si 0 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) 3)]	Max. back pressure [bar g]	Centre to face dimension		Height [5) 6)]		Weight [kg]
	Inlet	Outlet	Inlet	Outlet			Si 03	Si 04			S1 [mm]	S2 [mm]	Si 03 H1 [mm]	Si 04 H2 [mm]	
Si 0321	15	25	PN 40	PN 40	7	38.48	0.45	4)	40	20	100	100	320	4)	9
Si 0322			PN 63 - 160						160	40					
				PN 63 - 160						80					10
Si 0323			PN 250 - 320	PN 40					320	40					
				PN 63 - 160						160					
Si 0324			PN 400	PN 250					400	200					
Si 0321	25	25	PN 40	PN 40					40	20					9
Si 0322			PN 63 - 160						160	40					
				PN 63 - 160						80					10
Si 0x21	15	25	PN 40	PN 40	12.5	122.7	0.45	8	40	20	100	100	320	365	9
Si 0x22			PN 63 - 160						160	40					
				PN 63 - 160						80					10
Si 0x23			PN 250	PN 40					240	40					
				PN 63 - 160						120					
Si 0x21	25	25	PN 40	PN 40					40	20					9
Si 0x22			PN 63 - 160						160	40					
				PN 63 - 160						80					10

1) Flanges PN 10-40 acc. to DIN EN 1092 x 2; facing type B1, from PN 63 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 high pressure design (.19) is required for the flow diameter d_0 = 7 mm with set pressure >100 bar g and d_0 = 12.5 mm with set pressure >50 bar g.
4) The bellows design Si 04 is only available for valves with the flow diameter d_0 = 12.5.
5) The height increases by +40 mm for the high pressure design (.19).
6) If lifting lever A or AB is selected, the height increases by +55 mm.



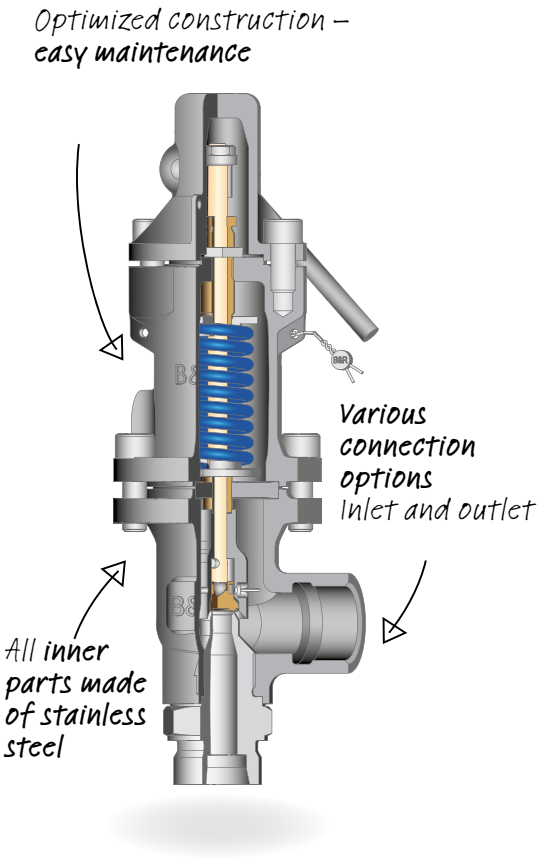
Si C132

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



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

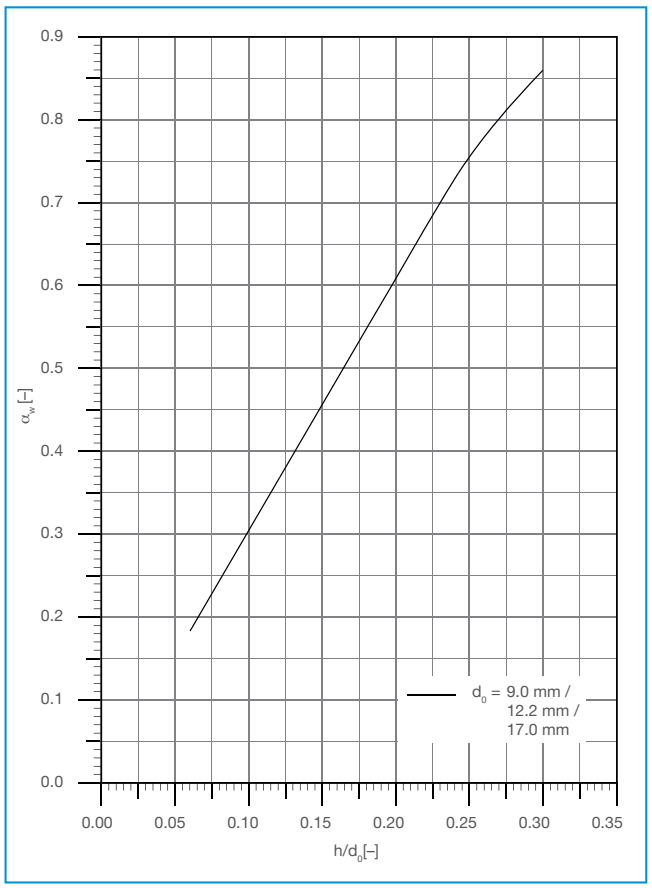
Coefficient of discharge in accordance with PED type examination 97/23/EC

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

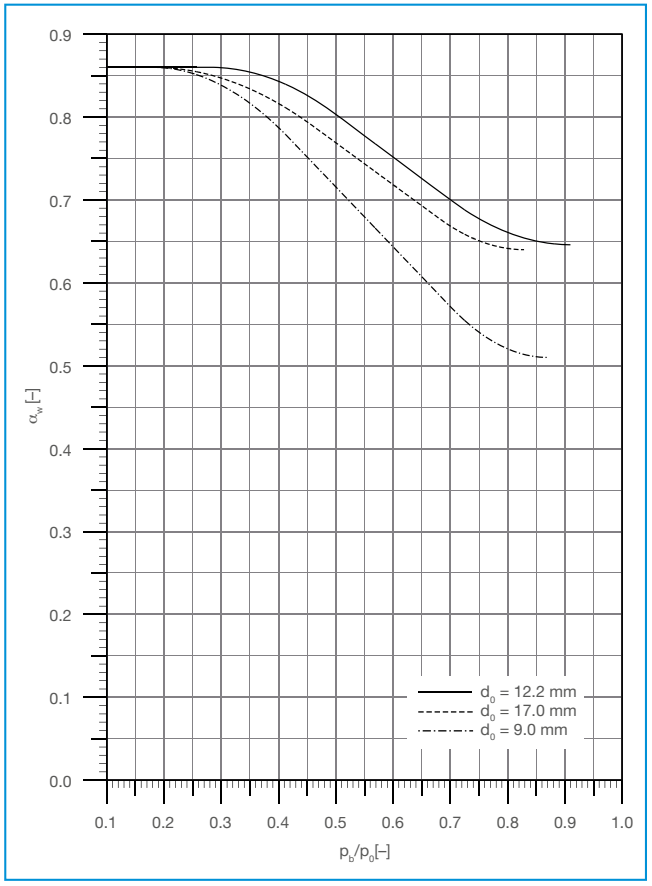
The coefficient of discharge for gases / vapours in a pressure ratio of p_b/p_0 is shown in the diagram below.

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 $h_{(reduced)} = d_0 \times (h/d_0)$.

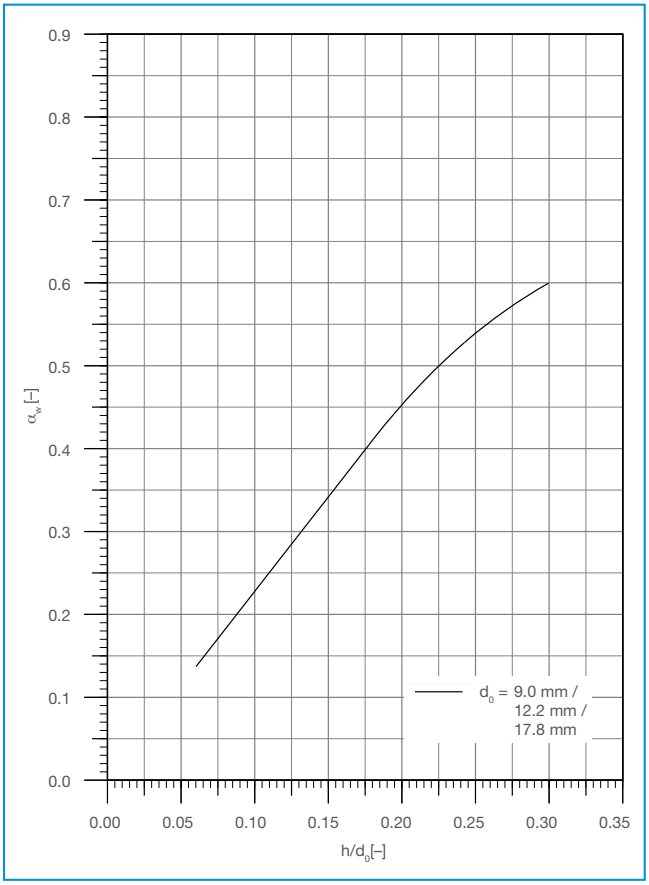


Si C132x coefficient of discharge α_w depending on h/d_0 for gases and vapours



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

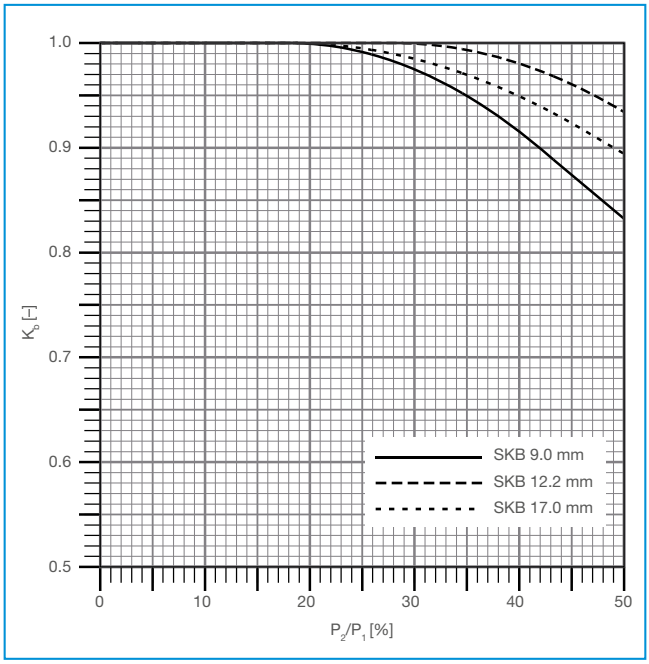
Si C132

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:

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

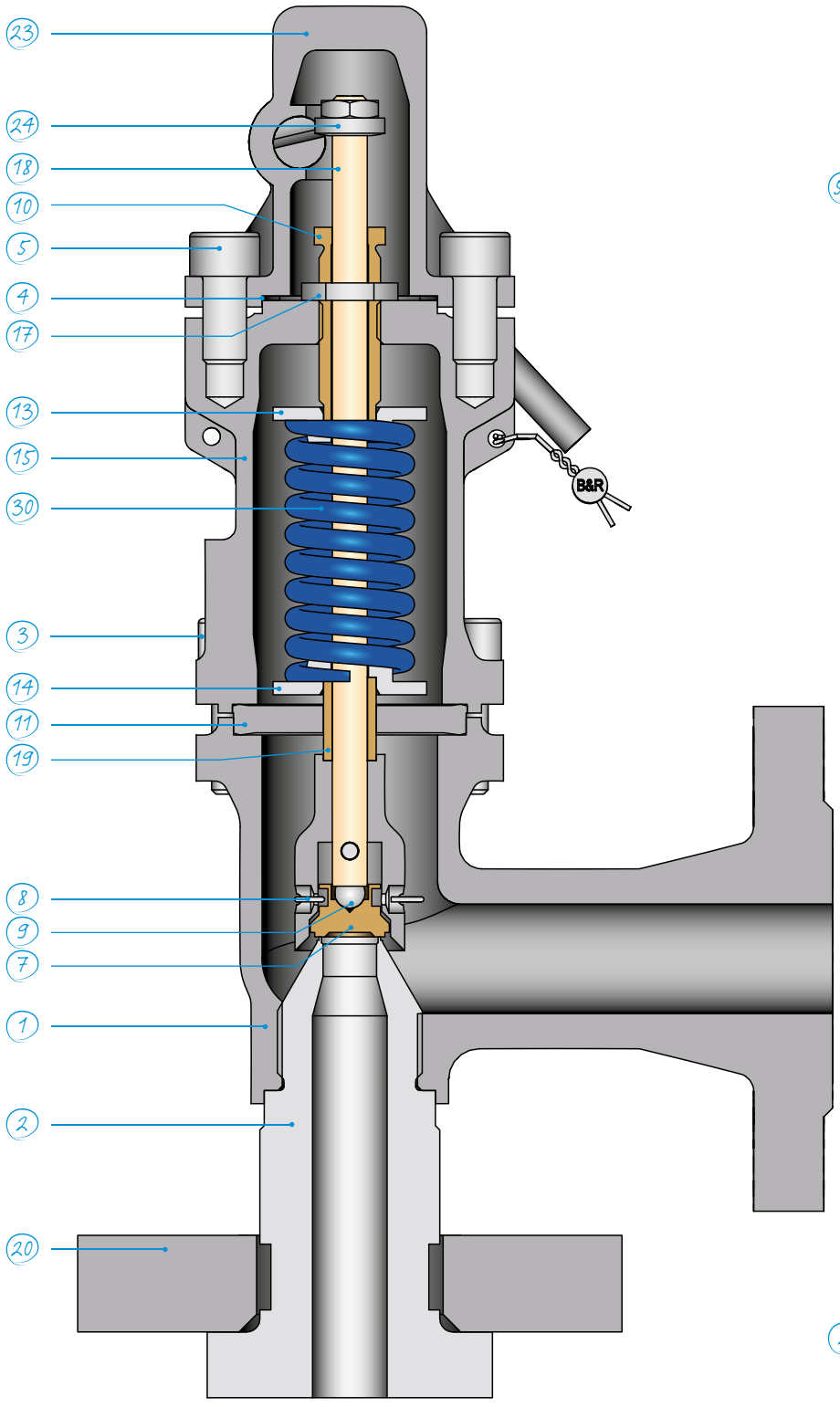
Capacity acc. to ASME Section VIII

	Air at 16°C [Nm³/min]			Saturated steam [kg/hr]			Water [l/min]		
Set pressure P [bar g]	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		

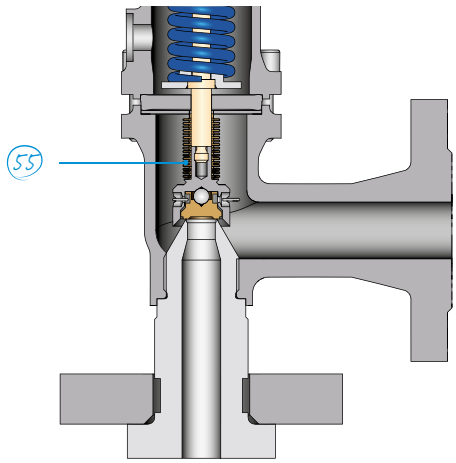
Capacity is calculated at 10% accumulation. Set pressure less than 2.1 bar with 0.21 bar accumulation. Valve discharging against atmospheric pressure is applied.

Si C132

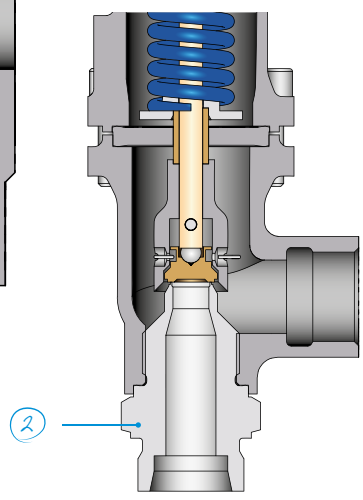
Material code



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		8.8	CS	A4-70	Stainless steel
4	Flat gasket	*1,2,3	Graphite/1.4401	Graphite/316	Graphite/1.4401	Graphite/316
5	Cylinder bolt		8.8	B8M	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 316Ti	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 316Ti	1.4571	SA-479 316Ti
14	Spring washer, bottom		1.4571	SA-479 316Ti	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	1		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			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.

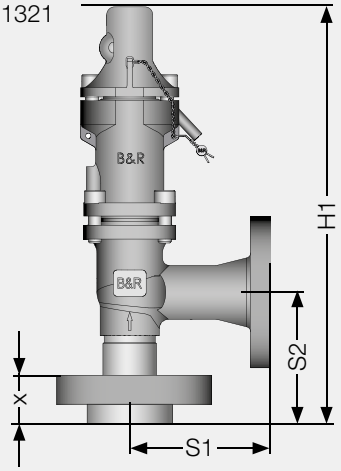
[2] Min. set pressure in brackets with direct weight loading option only .57.

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.

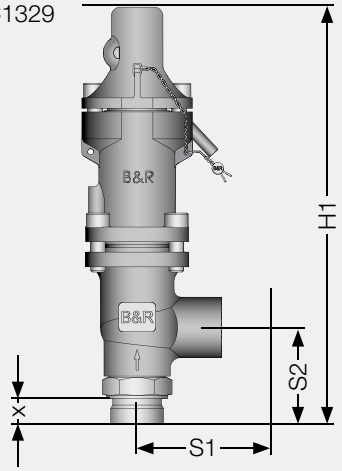
The stud ends comply with DIN 3852 – A or NPT accordingly.

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

Si C1321



Si C1329

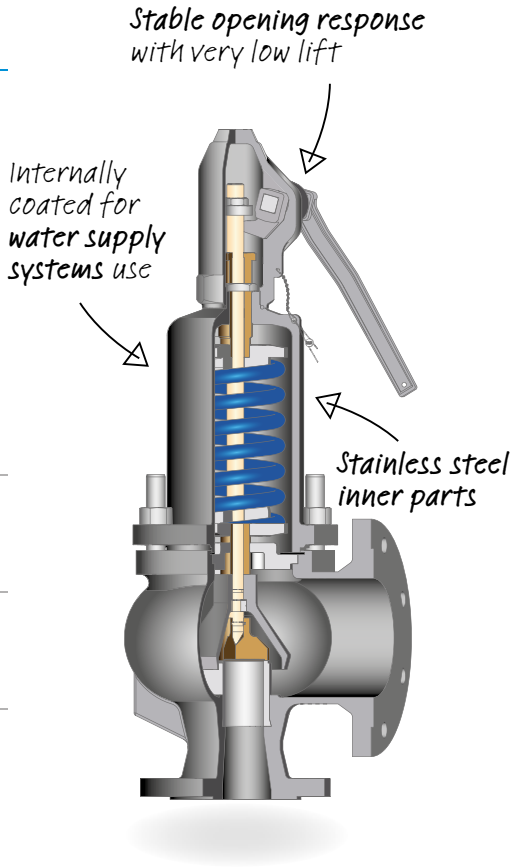


Si 2321

Features

The regular safety valve for low pressures:

- Cost-effective body design with seat bushing
- Smooth and stable behaviour thanks to comparatively low lift
- Cast iron body with inner parts mainly out of stainless steel



Inlet sizes
DN 20 to DN 150

Pressure rating
PN 10 to PN 16

Set pressures
0.45 bar g to 16 bar g

Temperature range
-10 °C to +300 °C

Overpressure

Vapours/gases	10%
Liquids	10%

Blowdown

Vapours/gases	10%
Liquids	20%

Allowable built-up back pressure
15% of set pressure

Applications

- For vapours, gases and liquids
- Protecting the systems downstream of control valves
- Water supply up to PN 16
- Approved for drinking water

Approvals and standards

EC type examination

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

VdTÜV type approval acc. to

TÜV.SV.12-209.d_0.D / G / F.α_w.p

IMI Bopp & Reuther will not renew the existing VdTÜV type approvals. 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 4126-1, 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 2321

Type code

Type code					Ordering example
1	**Series**	Si 2	DIN/EN regular safety valve		Si 2
2	**Design**	3	Conventional, closed bonnet		3
3	**Characteristic**	2	Regular Flow		2
4	**Pressure class**	1	Up to PN 16		1
5	**Cap**	A	Packed lifting lever		A
6	**Material code**	05	EN-GJL-250/5.1301 GG25/0.6025/EN-JL 1040		05
7	**Options**	.11a	Disc with soft seal EPDM		.11a .41
		.35	With lift restriction ring		
		.41	Luberpox[1)] coated internal and external		

[1)] Luperpox is a coating for potable water and approved in accordance with the “UBA-Leitlinie” (federal environment agency guideline) for contact with potable water and in accordance with DVGW worksheet W 270 with KTW approval.

Type ►	**Si 2321 A 05 .11a .41**
Please state: ►	
Set pressure	6 bar g
Fluid temperature	20 °C
Fluid and state	Water Liquid
Inlet	DN 50, PN 16, B1
Outlet	DN 50, PN 10, B1
Flow diameter	32 mm
Approval	97/23/EG (CE)

Si 2321

Coefficient of discharge

Fluid group	Inlet size	Flow diameter	$h/d_0 \geq$	Pressure $p_0 \geq$ [bar g]	$p_b/p_0 \leq$	α_w
Vapours/gases (D/G)	DN 20 to DN 150	12 mm to 93 mm	0.1	0.6	0.62	0.25
Liquids (F)	DN 20 to DN 150	12 mm to 93 mm	0.1	0.45	-	0.25

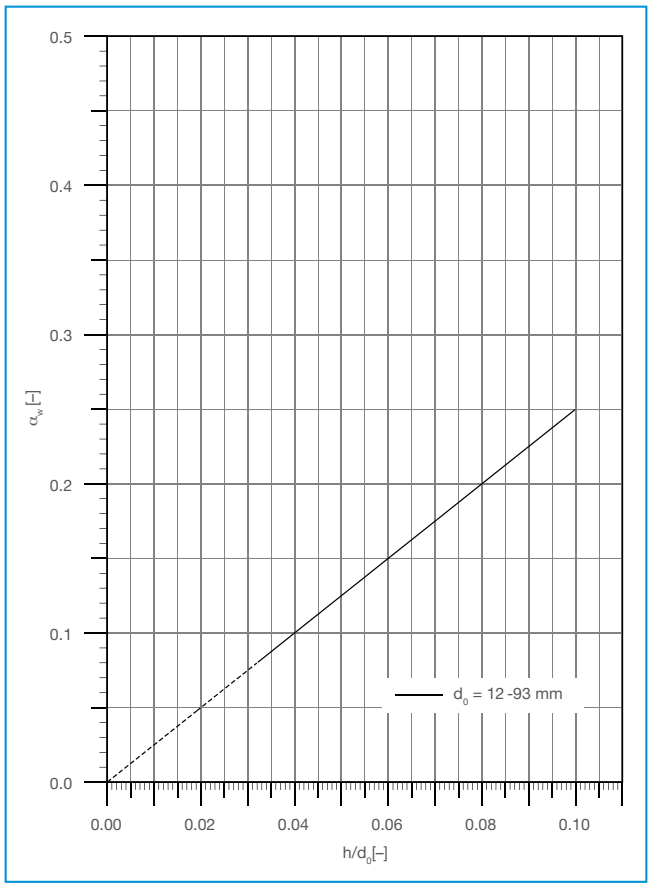
The coefficient of discharge for gases/vapours in a pressure ratio of $p_b/p_0 > 0.62$ is shown in the diagram below.

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

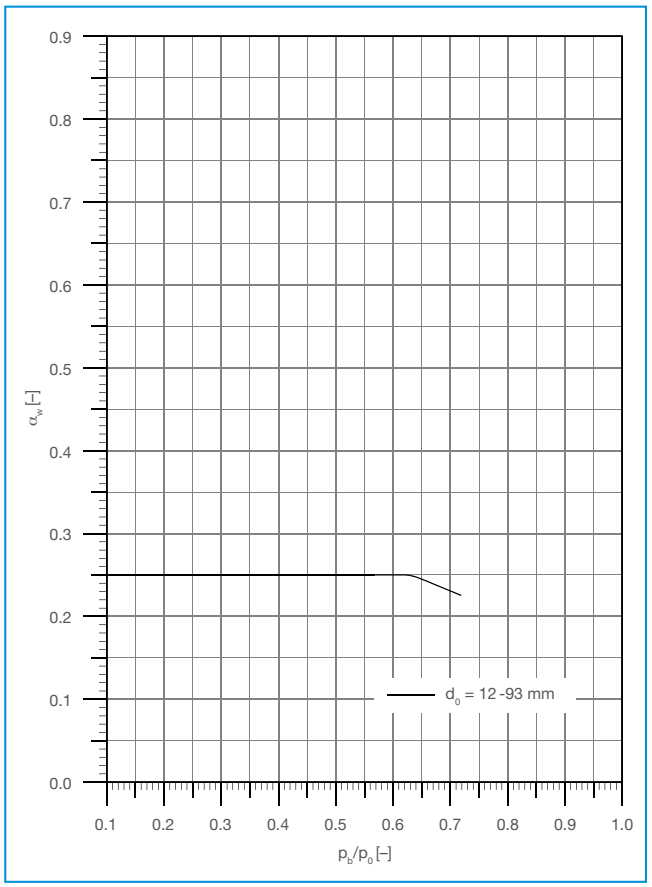
The following applies $\alpha_{w(reduced)} = \alpha_w \times q_m/q_{mc}$. The required ratio h/d_0 is shown in the diagram below, and the reduced lift calculated with $h_{(reduced)} = d_0 \times (h/d_0)$.

The coefficients of discharge K_{dr} acc. to DIN EN ISO 4126-1 for this valve 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 2321 coefficient of discharge α_w depending on h/d_0 for gases and vapours, liquids



Si 2321 coefficient of discharge α_w depending on p_b/p_0 for gases and vapours

Si 2321

Sample calculation for a safety valve for use with liquid in accordance with AD 2000-Merkblatt A 2

Fluid
Water

Density ρ
998 kg/m³

Set pressure
7.5 bar g

Opening pressure p_0 at 10% accumulation
(7.5 × 1.1) + 1,01 = 9.26 bar a

Back pressure p_b
1.01 bar a

Required mass flow q_m
12,300 kg/hr

The coefficient of discharge for all these pressures is $\alpha_w = 0.25$.

The required area is

$$A_0 = 0.6211 \cdot \frac{q_m}{\alpha_w \cdot \sqrt{(p_0 - p_b) \cdot \rho}}$$

$$= 0.6211 \cdot \frac{12300}{0.25 \cdot \sqrt{(9.26 - 1.01) \cdot 998}} = 337 \text{ mm}^2$$

With the flow area of A_0 = 491 mm² the safety valve Si 2321 A 05, DN 40 × DN 40, PN 16 × PN 16, d_0 25 mm is adequately dimensioned for the application. The certified capacity of the selected safety valve is 17,928 kg/hr.

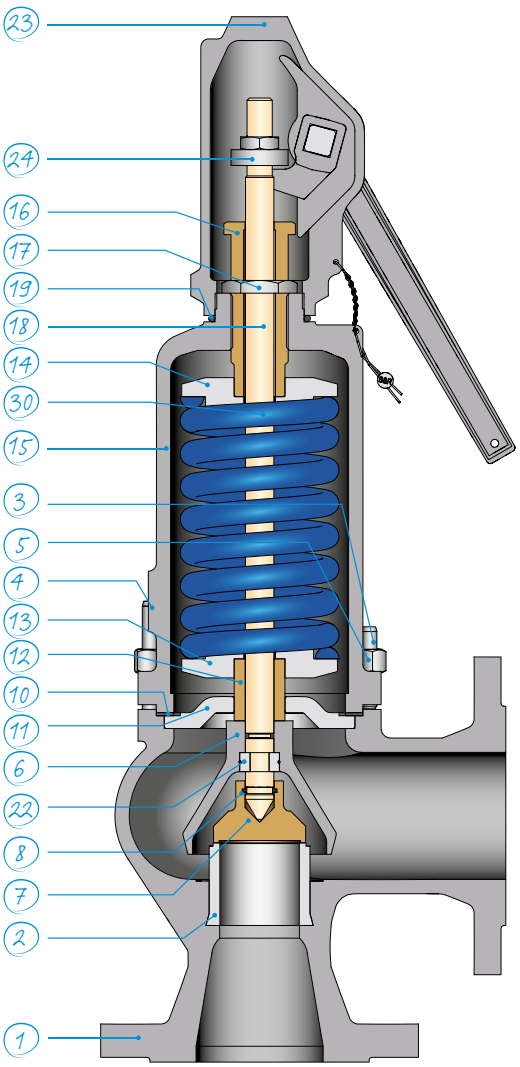
With the application data provided the following capacity table for water results in selecting the same flow area of d_0 = 25 mm. Interim values for the set pressure can be linearly interpolated.

Capacity data for water (20°C and 998 kg/m³) calculated according to AD-2000 Merkblatt A2 with 10% accumulation

$DN_E \times DN_A$	20 x 20	25 x 25	32 x 32	40 x 40	50 x 50	65 x 65	80 x 80	100 x 100	125 x 125	150 x 150
Flow diameter d_0 [mm]	12	16	20	25	32	40	50	63	77	93
Set pressure p [bar g]	10^3 kg/h Water									
1	1.50	2.68	4.18	6.54	10.7	16.7	26.1	41.5	62.1	90.5
2	2.13	3.79	5.92	9.25	15.1	23.7	37.0	58.7	87.8	128
3	2.61	4.64	7.25	11.3	18.5	29.0	45.3	72.0	107	156
4	3.01	5.36	8.37	13.0	21.4	33.5	52.3	83.1	124	181
5	3.37	5.99	9.36	14.6	23.9	37.4	58.5	92.9	138	202
6	3.69	6.56	10.2	16.0	26.2	41.0	64.1	101	152	221
7	3.99	7.09	11.0	17.3	28.3	44.3	69.2	109	164	239
8	4.26	7.58	11.8	18.5	30.3	47.4	74.0	117	175	256
9	4.52	8.04	12.5	19.6	32.1	50.2	78.5	124	186	271
10	4.76	8.47	13.2	20.7	33.9	52.9	82.8	131	196	286
12	5.22	9.28	14.5	22.6	37.1	58.0	90.7	144	215	313
14	5.64	10.0	15.6	24.4	40.1	62.7	97.9	155	232	338
16	6.03	10.7	16.7	26.1	42.9	67.0	104	166	248	362

Si 2321

Material code



Materialcode		05
Temperature application range		-10 °C to +300 °C
Part	**Name**	**Material**
1	Body	EN-GJL-250 / 5.1301 GG25 / 0.6025 / EN-JL 1040
2	Seat bushing	1.4122
3	Stud, short	5.6
4	Stud, long	5.6
5	Hexagon nut	5
6	Disc holder	0.7040
7	Disc [3]	1.4122
8	Disc retainer	1.4571
10	Flat gasket	1.4401 / Graphite
11	Intermediate cover [1]	1.4122 1.4059
12	Pressure sleeve	1.4122
13	Spring washer, bottom	1.0038
14	Spring washer, top	1.0038
15	Bonnet	EN-GJL-250 / 5.1301 GG25 / 0.6025 / EN-JL 1040
16	Adjusting screw	1.4104
17	Locknut	5
18	Spindle	1.4021
19	Flat gasket	1.4401 / Graphite
22	Ring (two-parts)	1.4122
23	Lifting lever [2]	0.7040
24	Lifting nut	1.4021
30	Spring [4]	1.1200 1.8159

1) Intermediate cover to DN 80 made from 1.4122, above that made from 1.4059
2) Packed lifting lever (cap) from DN 150 flanged
3) Disc material may be upgraded to stellited 1.4571 upon request for safety valves in saturated steam service
4) The spring material selection depends on the valve size and set pressure

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

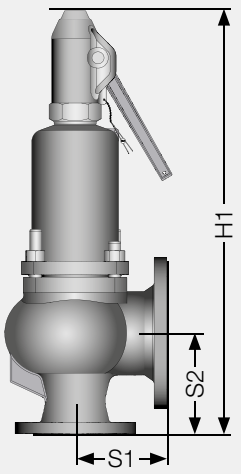
Si 2321

Sizes, pressure ranges and dimensions

Size	**DN_E**	20	25	32	40	50	65 [3]	80	100	125	150
	DN_A	20	25	32	40	50	65 [3]	80	100	125	150
Flow diameter [mm]		12	16	20	25	32	40	50	63	77	93
Flow area [mm²]		113	201	314	491	804	1257	1964	3117	4657	6793
Min. set pressure [bar g]		0.45									
Max. set pressure [bar g] [1]		16									
Max. back pressure [bar g]		4									
Inlet flange DIN EN [2]		PN 10									
		PN 16									
Outlet flange DIN EN [2]		PN 10									
		PN 16									
Centre to face dimension S1 [mm]		95	100	105	115	125	145	155	175	200	225
Centre to face dimension S2 [mm]											
Height H1 [mm]		335	350	390	420	495	550	655	705	810	850
Weight [kg]		8	9	11	13	18	26	38	52	80	90

[1] Stated pressures are maximum values corresponding to the spring forces. The component strength may need to be reviewed depending on the material and temperature.
[2] Flanges PN 10 / 16 acc. to DIN EN 1092-2; flange facing Type B1
[3] 4-hole flange drilling with DN 65 PN 10 / 16

Si 2321



Si 4322

Features

The modern pressure safety valve for regular capacities

- Cost-effective body design with seat bushing developed with the modular principle with other series
- Smooth and stable behaviour thanks to comparatively low lift
- Inner parts made of stainless steel (except spring and spring washer)

Inlet sizes
DN 25 to DN 100

Inlet pressure rating
PN 10 to PN 40

Set pressures
0.1 bar g to 40 bar g

Temperature range
-270°C to +450°C

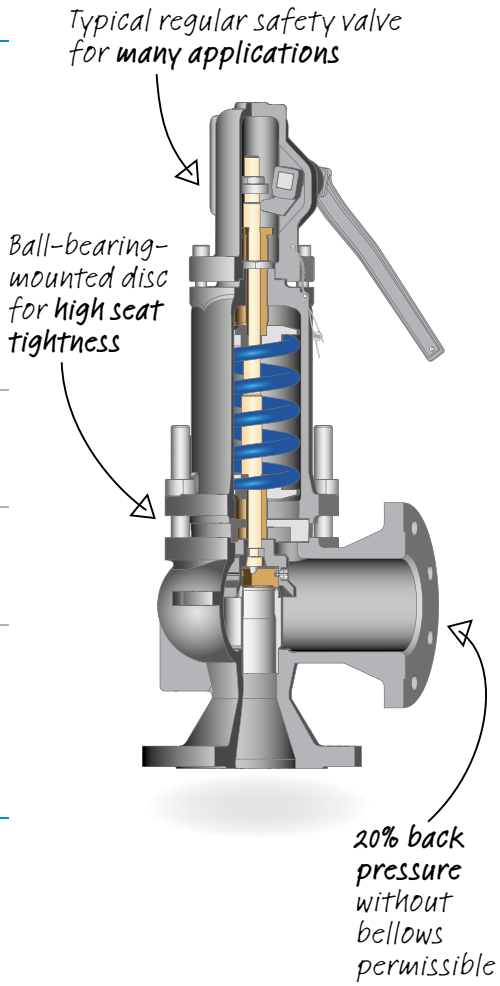
Overpressure

Vapours/gases	5%
Liquids	10%

Blowdown

Vapours/gases	10%
Liquids	20%

Allowable built-up back pressure without bellows
20% of the set pressure



Applications

- For vapours, gases and liquids
- Thermal expansion
- Protection of pipelines, protection of heat exchangers
- Chemical industry
- Petrochemical industry
- Technical gases
- Cooling and oxygen applications
- Other process applications up to PN 40

Approvals and standards

EC type examination

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

VdTÜV type examination acc. to

TÜV.SV.12-1094.d_0.D / G / F.α_w.p

IMI Bopp & Reuther will not renew the existing VdTÜV type approvals. 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 4126-1, 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 4322

Type code

Type code					Ordering example
1	**Series**	Si 4	Pressure safety valve for regular capacities		Si 4
2	**Design**	1	Conventional, open bonnet		4
		3	Conventional, closed bonnet		
		4	Bellows, closed bonnet		
		5	Bellows, open bonnet		
3	**Characteristic**	2	Regular Flow		2
4	**Pressure class**	2	Up to PN 40		2
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		
		AK	Pneumatic actuator		
6	**Material code**	00	GP240GH / 1.0619 +N		00
		04	GX5CrNiMo19-11-2 / 1.4408		
7	**Options**	.09	Locking sleeve (government ring)		.35
		.11t	Disc with soft seal PTFE		
		.14a	Lift indication with inductive proximity switch in the cap		
		.14b	Lift indication with inductive proximity switch in the auxiliary housing		
		.14c	Lift indication with inductive proximity switch for exposed spindle with actuator AK		
		.15	Bonnet insulation spacer for high and low temperatures		
		.18	Heating jacket		
		.28	Oil and grease free		
		.35	With lift restriction ring		
		.36	Body drain		
		.57	Weight loading		
		.59	Stellited disc		
		.60	Stellited seat		

Type ▶	**Si 4422 A 00.35**
Please state: ▶	
Set pressure	18 bar g
Fluid temperature	20 °C
Fluid and state	Petrol Liquid
Inlet	DN 25, PN 40, B1
Outlet	DN 25, PN 16, B1
Flow diameter	13.6 mm
Approval	97/23/EG (CE)

Si 4322

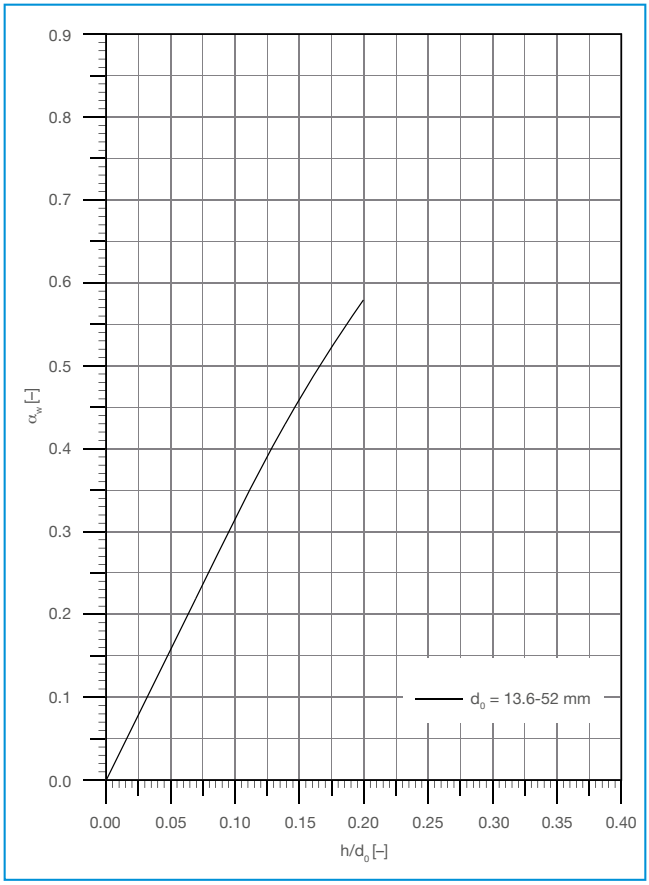
Coefficient of discharge

Fluid group	Inlet size	Flow diameter	$h/d_0 \geq$	$p_b/p_0 \leq$	α_w
Vapours / gases (D / G)	DN 25 to DN 100	13.6 mm to 52 mm	0.2	0.2	0.58
Liquids (F)	DN 25 to DN 100	13.6 mm to 52 mm	0.2	-	0.42

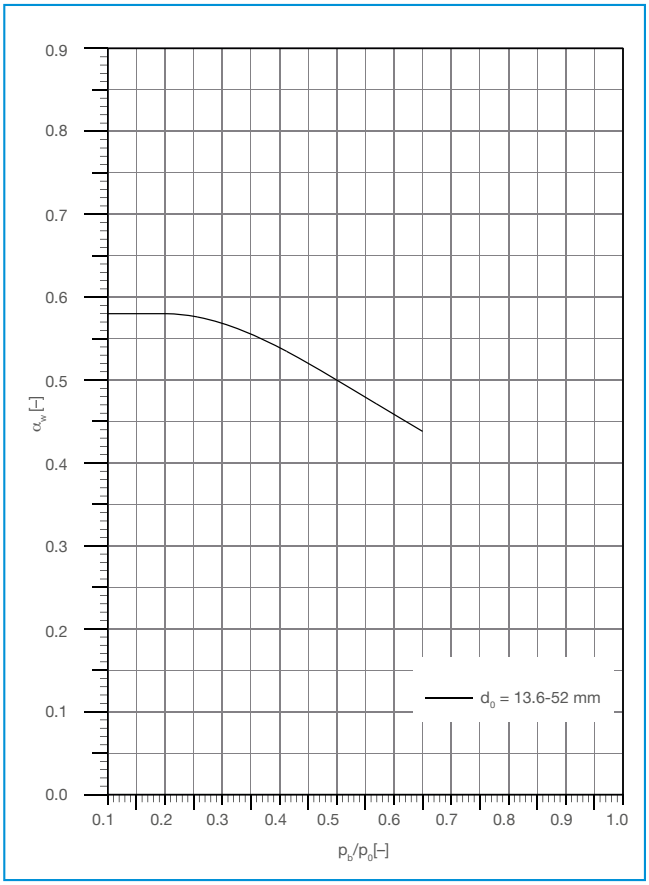
The coefficient of discharge for gases/vapours in a pressure ratio of p_b/p_0 >0,2 is shown in the diagram below.

The capacity of the selected safety valves 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 calculated with $h_{(reduced)} = d_0 \times (h/d_0)$. Please note that the lift is not allowed to be limited to a value of less than 30% of the full lift and must be at least 1 mm.



Si 4322 coefficient of discharge α_w depending on h/d_0 for gases and vapours



Si 4322 coefficient of discharge α_w depending on p_b/p_0 for gases and vapours

Si 4322

Sample calculation for a safety valve for use with liquid in accordance with DIN EN ISO 4126-7

Fluid
Glycerine

Density ρ
1260 kg/m³

Set pressure
3.99 bar g

Opening pressure p_0 at 10% accumulation
(4.0 × 1.1) + 1.01= 5.41 bar a

Back pressure p_b
1.01 bar a

Required mass flow q_m
20,000 kg/hr

Dynamic viscosity μ_0
1.48 Pa·s

Si 4322 coefficient of discharge α_w
0.420

The required flow area is

$$A = \frac{q_m}{1.61 \times K_{dr} \times K_v \times \sqrt{(p_0 - p_b) \times \rho}}$$

As the correction factor of the viscosity depends on the discharge capacity, a preselection and then possibly an iteration is required. With $K_v = 1$

$$A' = \frac{2000}{1.61 \times 0.420 \times 1 \times \sqrt{(5.41 - 1.01) \times 1260}} = 398 \text{ mm}^2$$

and the flow area $A_0 = 594$ mm² is a suitable preselection (see page 36).

The Reynolds number is calculated with:

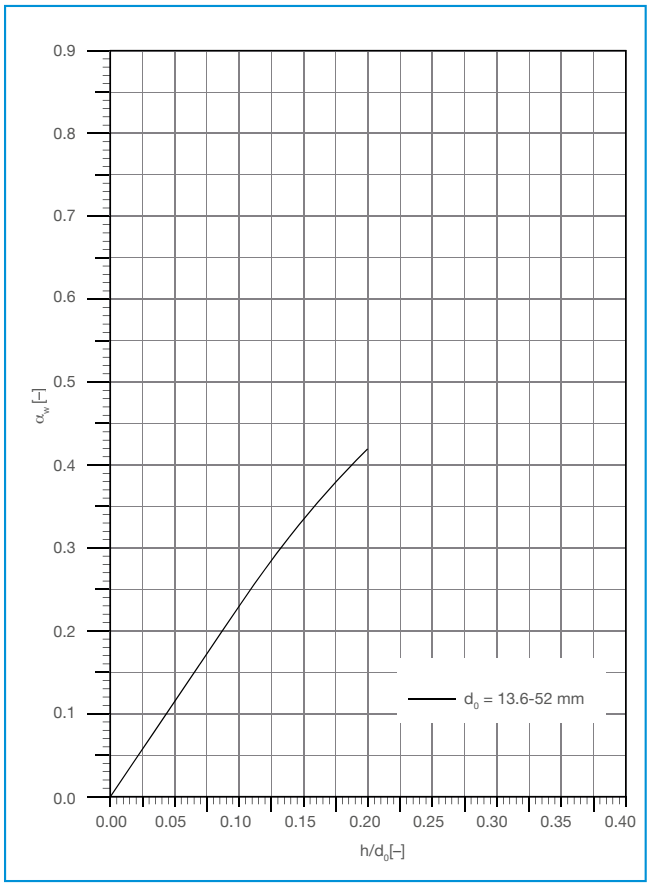
$$Re = \left(\frac{q_m}{3.6 \times \mu_0}\right) \times \sqrt{\frac{4}{\pi \times A}} = \left(\frac{20000}{3.6 \times 1.48}\right) \times \sqrt{\frac{4}{\pi \times 380}} = 174$$

$$K_v = \left(0.9935 + \frac{2.878}{Re^{0,5}} + \frac{342.75}{Re^{1,5}}\right)^{-1,0} = \left(0.9935 + \frac{2.878}{174^{0,5}} + \frac{342.75}{174^{1,5}}\right)^{-1,0} = 0.735$$

The q_m capacity of the safety valve with the flow area $A_0 = 594$ mm² is $K_v = 0.735$:

$$q_{mc} = 1.61 \times A_0 \times K_{dr} \times K_v \times \sqrt{(p_0 - p_b) \times \rho} = 21982 \text{ kg/hr}$$

The safety valve Si 4322 G 00, DN 50 x 50, PN 25 x 16 and the flow area $A_0 = 594$ mm² is adequately dimensioned for the application. For a more precise calculation of the capacity of the selected safety valve, it can be determined more precisely iteratively with the mass flow q_{mc} of the viscosity correction factor. The IMI Bopp & Reuther design program for safety valves Si-Tech 4 calculates K_v precisely iteratively.



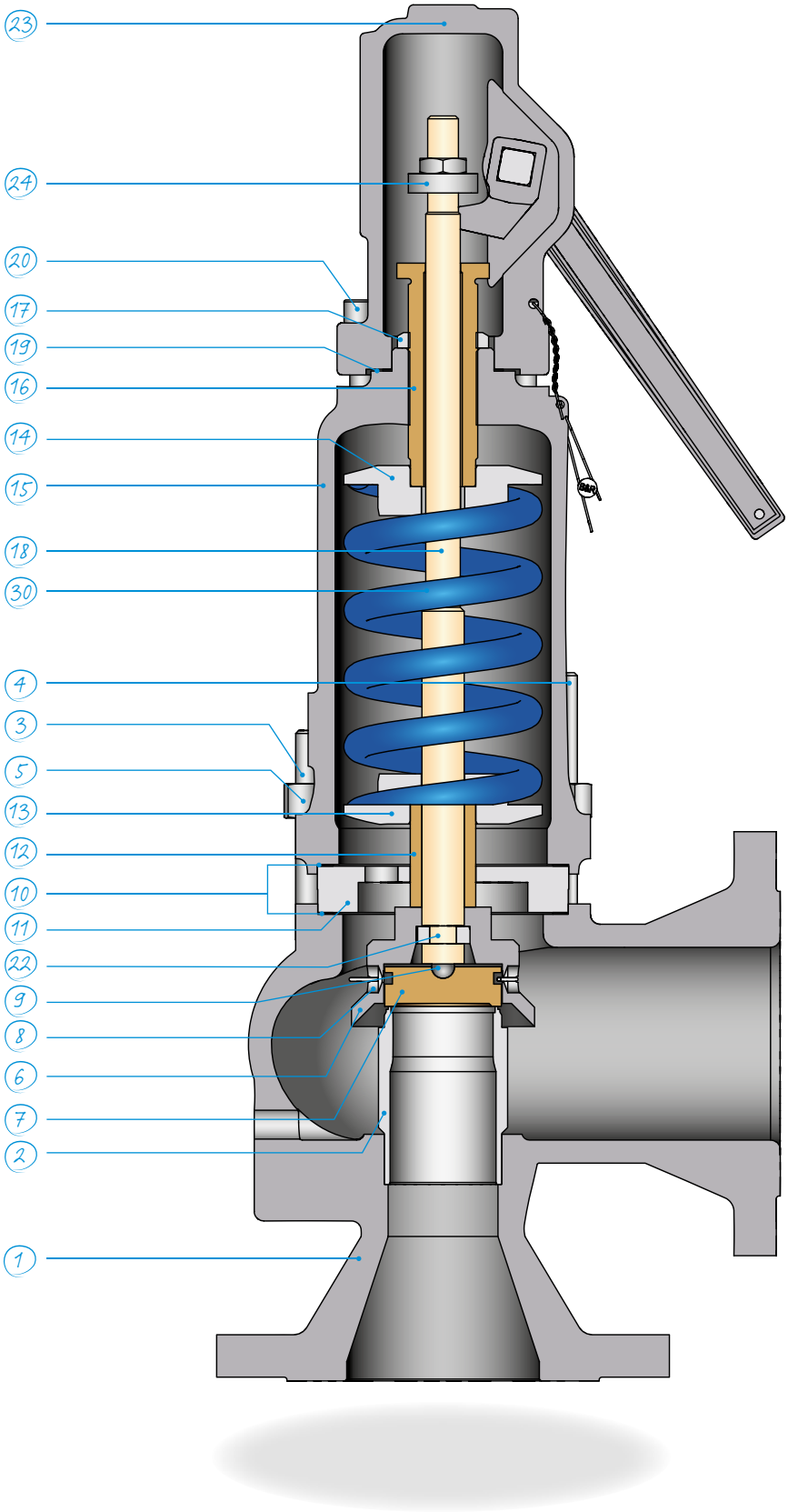
Si 4322 coefficient of discharge α_w depending on h/d_0 for liquid

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.

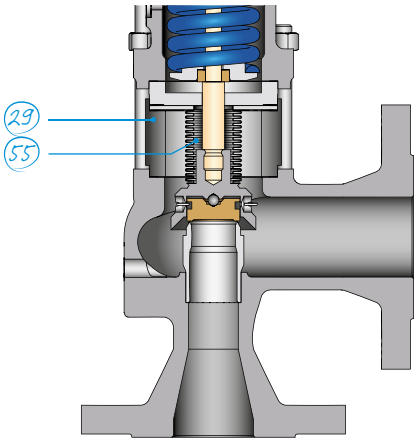
h	=	Lift [mm]
d_0	=	Flow diameter of the selected safety valve [mm]
h/d_0	=	Lift / flow diameter ratio
p_b	=	Absolute back pressure [bar a]
p_0	=	Absolute relieving pressure [bar a]
p_b/p_0	=	Absolute back pressure / absolute relieving pressure ratio
α_w	=	Coefficient of discharge acc. to AD 2000-Merkblatt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

Si 4322

Material code



Bellows design Si 4422



Si 4322

Material code			00	04
Temperature application range			-10 °C to +450 °C [1]	-200 °C to +400 °C [2]
Part	**Name**	**Spare part**	**Material**	**Material**
1	Body		GP240GH / 1.0619	GX5CrNiMo19-11-2 / 1.4408
2	Seat bushing		1.4122	1.4571
3	Stud, short		1.1181	A4-70
4	Stud, long		1.1181	A4-70
5	Hexagon nut		04	04
6	Disc holder		1.4021	1.4571
7	Disc	*2, 3	1.4571	1.4571
8	Disc retainer		1.4571	1.4571
9	Ball		Stainless steel	Ceramic
10	Flat gasket	*1, 2, 3	1.4401 / Graphite	1.4401 / Graphite
11	Intermediate cover		1.4122	1.4571
12	Pressure sleeve		1.4122	1.4571
13	Spring washer, bottom		1.0460	1.4571
14	Spring washer, top		1.0460	1.4571
15	Bonnet [2]		GP240GH / 1.0619	GX5CrNiMo19-11-2 / 1.4408
16	Adjusting screw		1.4021	1.4571
17	Locknut		1.4122	1.4571
18	Spindle		1.4021	1.4571
19	Flat gasket	*1, 2, 3	1.4401 / Graphite	1.4401 / Graphite
20	Cylinder bolt		8.8	A4-70
22	Ring (two-parts)		1.4571	1.4571
23	Lifting lever		1.0619	1.4408
24	Lifting nut		1.4021	1.4571
29	Intermediate spacer		1.0619	1.4408
30	Spring [3]	*3	1.1200 1.8159	1.4310 1.8159, Chem. nickel plated
55	Bellows	*3	1.4571	1.4571

[1] If the specifications in AD 2000-Merkblatt W10 are met, the material can be used at temperatures as low as -85 °C.

[2] If the specifications in AD 2000-Merkblatt W10 are met, the material can be used at temperatures as low as -273 °C.

[3] The spring material selection depends on the valve size and set pressure as well as the temperature. Other spring materials are available for special operating conditions, e.g. temperatures > 400 °C or < -170 °C, and if the customer specifies this.

Spare parts:
*1 For start-up
*2 For 2 years of operation
*3 After several 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 4322

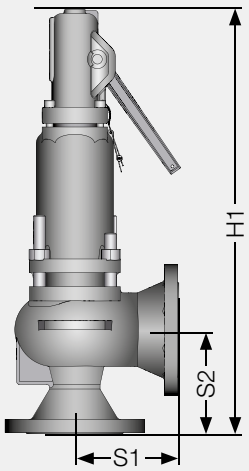
Sizes, pressure ranges and dimensions

Size	**DN_E**	25	40	50	65 [3]	80	100
	DN_A	25	40	50	65	80	100
Flow diameter [mm] d_0		13.6	22	27.5	35	42	52
Flow area [mm²] A_0		145	380	594	962	1385	2124
Min. set pressure [bar g]	**Si 41 / Si 43**	0.8	0.49	0.49	0.49	0.49	0.49
	Si 4322.57 [1]	0.12	0.2	0.1	0.13	0.13	0.16
	Si 44	4.0	1.5	1.5	1.5	1.5	1.5
Max. set pressure [2] **[bar g]**		40	40	40	40	40	40
Max. back pressure [bar g]		16	16	16	16	16	16
Inlet flange DIN EN [4]		PN 10 - 40					
Outlet flange DIN EN [4]		PN 10 - 16					
Centre to face dimension S1 [mm]		100	115	125	145	155	175
Centre to face dimension S2 [mm]		100	115	125	145	155	175
Height H1 [mm]		420	435	450	535	655	710
Height H2 [mm]		470	490	495	585	705	770
Drain size [5]		G¼	G¼	G¼	G¼	G¼	G⅜
Weight Si 41/43 [kg]		9	13	18	25	40	78
Weight Si 45/45 [kg]		11	15	21	28	44	82

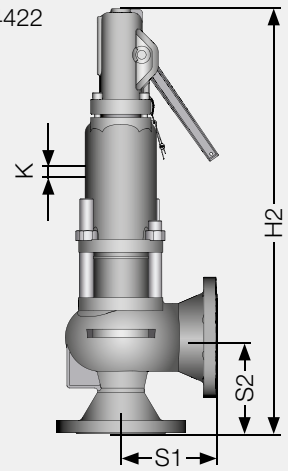
[1] Set pressure if the direct weight load option .57 is used.
[2] Stated pressures are maximum values corresponding to the spring forces. The component strength may need to be reviewed, and the suitable pressure rating selected, depending on the material and temperature.
[3] 4-hole flange drilling with DN 65 PN 10/16
[4] Flange PN 10 - 40 acc. to DIN EN 1092-2; facing type B1
[5] Drain E is only drilled into the body if condensate formation is to be expected.

Bonnet for bellows design with test connection K for bellows check. K to DN 80 x 80 – G¼, above G⅜

Si 4322



Si 4422



Si 4322

Capacity data for air (0°C and 1013 mbar) calculated according to AD-2000 Merkblatt A2 with 10% accumulation

DN_E x DN_A	25 x 25	40 x 40	50 x 50	65 x 65	80 x 80	100 x 100
Flow diameter d_0 [mm]	13.6	22	27.5	35	42	52
Set pressure p [bar g]	Nm^3/h Air					
1	106	277	433	701	1.009	1.547
2	178	465	727	1.178	1.696	2.600
3	245	641	1.002	1.623	2.337	3.582
4	311	813	1.270	2.058	2.963	4.542
5	374	978	1.529	2.476	3.566	5.466
10	690	1.804	2.819	4.467	6.576	10.081
15	1.005	2.630	4.110	6.658	9.587	14.696
20	1.321	3.457	5.401	8.749	12.598	19.311
25	1.637	4.283	6.692	10.840	15.609	23.927
30	1.952	5.109	7.983	12.930	18.620	28.542
35	2.268	5.935	9.273	15.021	21.631	33.157
40	2.584	6.761	10.564	17.112	24.641	37.772

Capacity data for water (20°C and 998 kg/m³) calculated according to AD-2000 Merkblatt A2 with 10% accumulation

DN_E x DN_A	25 x 25	40 x 40	50 x 50	65 x 65	80 x 80	100 x 100
Flow diameter d_0 [mm]	13.6	22	27.5	35	42	52
Set pressure p [bar g]	10^3 kg/h Water					
1	3.25	8.51	13.3	21.5	31.0	47.5
2	4.60	12.0	18.8	30.4	43.8	67.2
3	5.63	14.7	23.0	37.3	53.7	82.4
4	6.50	17.0	26.6	43.1	62.0	95.1
5	7.27	19.0	29.7	48.2	69.4	106
10	10.2	26.9	42.0	68.1	98.1	150
15	12.6	32.9	51.5	83.4	120	184
20	14.5	38.0	59.5	96.4	138	212
25	16.2	42.5	66.5	107	155	237
30	17.8	46.6	72.8	118	170	260
35	19.2	50.3	78.7	127	183	281
40	20.5	53.8	84.1	136	196	300

Si 2323 / Si 2324 / Si 2325

Features

The regular flow safety valve for high pressures:

- Solid body design with one-piece inlet nozzle
- Smooth and stable behaviour thanks to comparatively low lift
- Body made of steel casting as well as stainless steel, with inner parts mainly of stainless steel
- Can also be supplied with weld end at inlet

Inlet sizes
DN 15 to DN 50

Inlet pressure rating
PN 63 to PN 400

Set pressures
0.45 bar g up 400 bar g

Temperature range
-200°C to +450°C

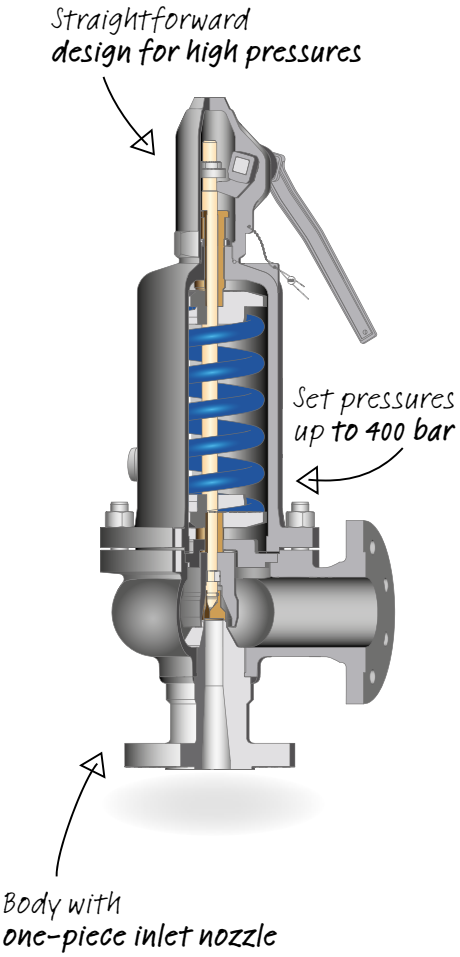
Overpressure

Vapours / gases	10%
Liquids	10%

Blowdown

Vapours / gases	10%
Liquids	20%

Allowable built-up back pressure without bellows
15% of the set pressure



Applications

- For vapours, gases and liquids
- Power generation
- Feed water supply up to PN 400
- Suitable for outlet flange with loading up to PN 100

Approvals and standards

EC type examination

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

VdTÜV type examination acc. to

TÜV.SV.10-209.d_0.D / G / F.α_w.p

IMI Bopp & Reuther will not renew the existing VdTÜV type approvals. The requirements by VdTÜV guidelines 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 to safety valves), EN 1092 parts I and II Flanges, AD 2000-Merkblatt A4, AD 2000-Merkblatt HP0, TRD 110, TRD 421

Si 2323 / Si 2324 / Si 2325

Type code

Type code				Ordering example
1	**Series**	Si 2	DIN/EN regular flow safety valve	Si 2
2	**Design**	1	Conventional, open bonnet	3
		3	Conventional, closed bonnet	
		4	Bellows, closed bonnet	
		5	Bellows, open bonnet	
3	**Characteristic**	1	Proportional Flow	2
		2	Regular Flow	
4	**Pressure class**	3	max. PN 160 (up to 100 bar g)	4
		4	max. PN 250 (up to 250 bar g)	
		5	max. PN 400 (up to 400 bar g)	
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	00
		04	GX5CrNiMo19-11-2 / 1.4408	
7	**Options**	.09	Locking sleeve (government ring)	.22a.60
		.11a	Disc with soft seal EPDM (pressure class 3 only)	
		.14a	Lift indication with inductive proximity switch in the cap	
		.14b	Lift indication with inductive proximity switch in the auxiliary housing	
		.15	Bonnet insulation spacer for high and low temperatures	
		.18	Heating jacket	
		.22a [1)]	Weld end at inlet	
		.22b	Weld end at outlet	
		.25	Block body design	
		.28	Oil and grease free	
		.35	With lift restriction ring	
		.38	Vibration damper	
		.59	Stellited disc	
		.60	Stellited seat	

[1)] For valves with weld ends, please state the pipe's outer diameter, wall thickness and joint type code in your order. See page 45 for information on standard dimensions.

Type ►
Please state ►

Si 2324 A 00.22a.60

Set pressure	165 bar g
Fluid temperature	280 °C
Fluid and state	Water Liquid
Inlet	DN 25, PN 250, B2
Outlet	DN 40, PN 40, B1
Flow diameter	16 mm
Approval	97 / 23 / EG (CE)

Si 2323 / Si 2324 / Si 2325

Coefficient of discharge

Fluid group	Inlet size	Flow diameter	$h/d_0 \geq$	Pressure $p_0 \geq$ [bar g]	$p_b/p_0 \leq$	α_w
Vapours / gases (D / G)	DN 15 to DN 50	12 mm to 32 mm	0.1	0.6	0.62	0.25
Flüssigkeiten (F)	DN 15 to DN 50	12 mm to 32 mm	0.1	0.45	-	0.25

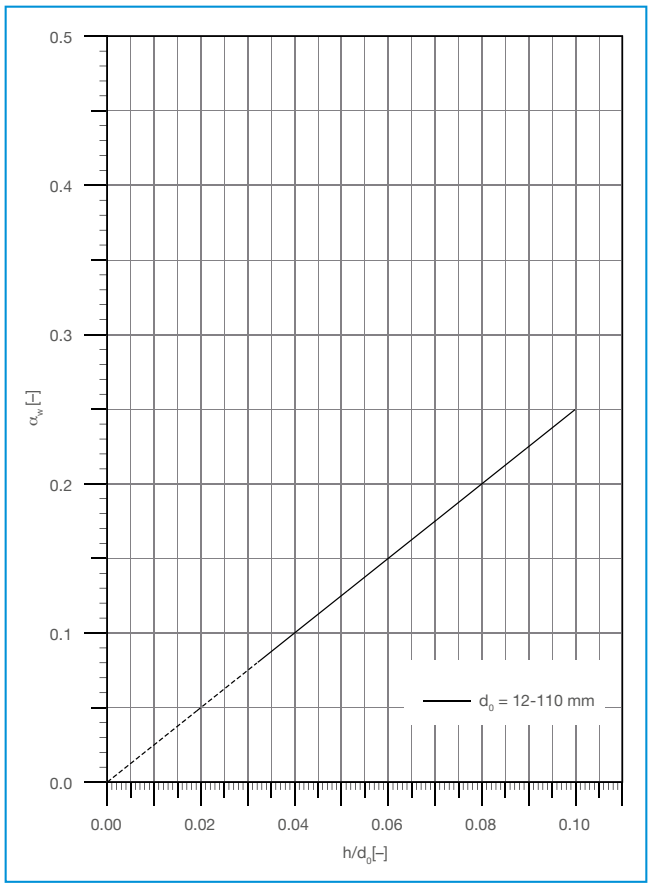
The coefficient of discharge for gases/ vapours in a pressure ratio of $p_b/p_0 > 0.62$ is shown in the diagram below.

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

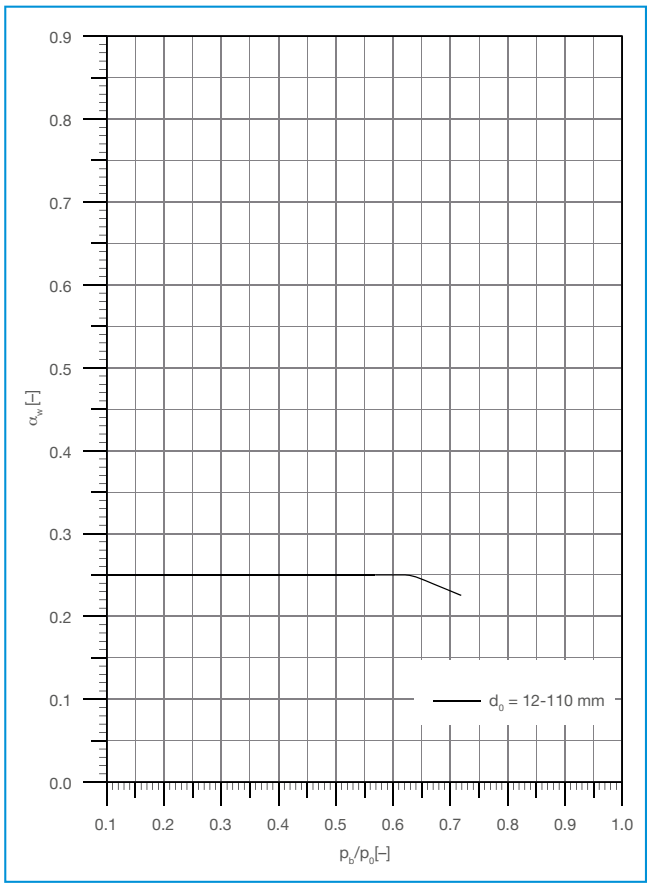
Here the following applies: $\alpha_{w(reduced)} = \alpha_w \times q_m/q_{mc}$. The required ratio h/d_0 is shown in the diagram below, and the reduced lift calculated with $h_{(reduced)} = d_0 \times (h/d_0)$.

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 2323 / Si 2324 / Si 2325 coefficient of discharge α_w depending on h/d_0 for gases and vapours, liquids



Si 2323 / Si 2324 / Si 2325 coefficient of discharge α_w depending on p_b / p_0 for gases and vapours

Si 2323 / Si 2324 / Si 2325

Weld end (option .22) for series Si 2323, Si 2324 and Si 2325

Weld ends are mainly used for applications with high pressure and high temperatures. The following table shows the standard IMI Bopp & Reuther dimensions acc. to DIN EN 12627. This European standard defines the dimensions for weld ends of steel valves that are welded to standardized pipes. The outside diameters and wall thicknesses of the standardized pipes are described in DIN EN 1092-1.

We can vary the shape and dimensions of weld ends upon request.

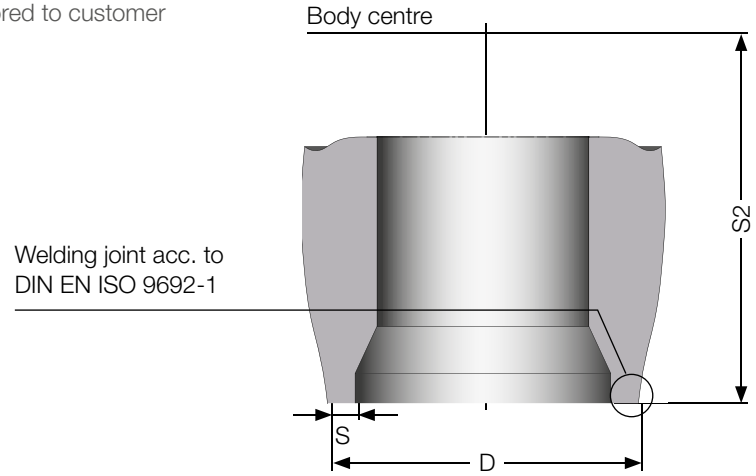
Specification of the weld end

(must be stated in your order):

1. Material of the inlet nozzle
2. Dimensions of the weld end
   - 2. 1 Overall diameter D
   - 2. 2 Wall thickness S

The centre to face dimensions S2 for safety valves with weld end are as standard identical with the centre to face dimensions of the same type with flange at the inlet. The centre to face dimensions can also be tailored to customer specifications.

Example:
Weld end P 250 GH (1.0460);
33.7 x 3.6 (corresponds to DN 25 PN 100)



Weld end with V-seam for connection to a pipe with wall thickness 4 < S ≤ 22 mm

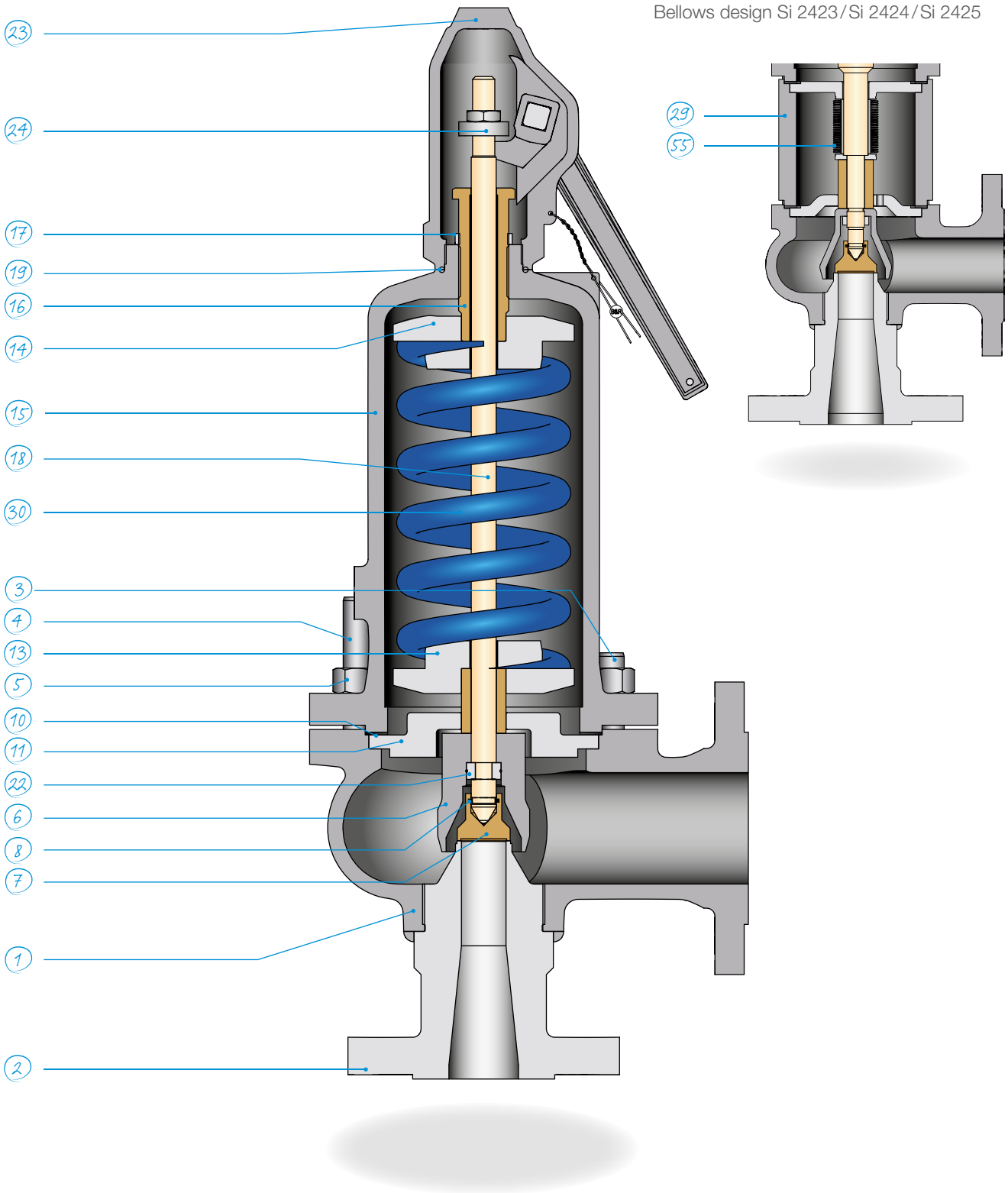
Standard dimensions

DN	ØD [mm] DIN EN 1267	PipeØ [mm] DIN EN 1092-1	Wall thickness S [mm]							
			PN 16	PN 25	PN 40	PN 63	PN 100	PN 160	PN 250	PN 320
15	22	21.3	2.0	2.0	2.0	2.0	3.2	3.2	3.2	3.2
20	28	26.9	2.3	2.3	2.3	2.6	3.2	n. a.	n. a..	n. a.
25	35	33.7	2.6	2.6	2.6	2.6	3.6	3.6	3.6	5.0
32	44	42.4	2.6	2.6	2.6	2.9	3.6	n. a..	n. a.	n. a.
40	50	48.3	2.6	2.6	2.6	2.9	3.6	3.6	5.0	6.3
50	62	60.3	2.9	2.9	2.9	4.0	4.0	4.0	6.3	8.0

n. a. not available

Si 2323 / Si 2324 / Si 2325

Material code



Si 2323 / Si 2324 / Si 2325

Material code			00	04
Temperature application range			-10 to +450 °C [1]	-200°C to +400°C [2]
Part	**Name**	**Spare part**	**Material**	**Material**
1	Body		GP240GH / 1.0619	GX5CrNiMo19-11-2 1.4408
2	Inlet nozzle		1.0460 Seat hard-faced with Stellite	1.4571 Seat hard-faced with Stellite
3	Stud, short		1.7709	A4-70
4	Stud, long		1.7709	A4-70
5	Hexagon nut		04	04
6	Disc holder		5.3106 / GGG-40	1.4408
7	Disc	*2,3	1.4122 hardened [3]	1.4571 Seat hard-faced with Stellite
8	Disc retainer		1.4571	1.4571
10	Flat gasket	*1,2,3	1.4401 / Graphite	1.4401 / Graphite
11	Intermediate cover		1.4122	1.4571
13	Spring washer, bottom		1.0460	1.4571
14	Spring washer, top		1.0460	1.4571
15	Bonnet		GP240GH / 1.0619	GX5CrNiMo19-11-2 1.4408
16	Adjusting screw		1.4021	1.4571
17	Locknut		1.7258	1.4571
18	Spindle		1.4021	1.4580
19	Flat gasket	*1,2,3	1.4401 / Graphite	1.4401 / Graphite
22	Ring (two-parts)		1.4571	1.4571
23 [1]	Lifting lever		1.0619	1.4408
24	Lifting nut		1.4401	1.4401
29	Intermediate spacer		1.0460	1.4571
30	Spring [4]	*3	1.1200 1.8159	1.4310 1.8159, chem. nickel plated
55	Bellows	*3	1.4571	1.4571

[1] If the specifications in AD 2000-Merkblatt W10 are met, the material can be used at temperatures as low as -85°C.

[2] If the specifications in AD 2000-Merkblatt W10 are met, the material can be used at temperatures as low as -273°C.

[3] Disc material may be upgraded to stellited 1.4571 upon request for safety valves in saturated steam service

[4] The spring material selection depends on the valve size and set pressure.

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 2323

Sizes, pressure ranges and dimensions

Size	**DN_E**	15	25	32	40	50
	DN_A	20	25	32	40	50
Flow diameter [mm] d_0		12	16	20	25	32
Flow area [mm²] A_0		113	201	314	491	804
Min. set pressure [bar g]	**Si 21 / Si 23**	0,45	0.45	0.45	0.45	0.45
	Si 24 / Si 25		2.0	2.0	2.0	2.0
Max. set pressure [1] [bar g]		100	100	100	100	80
Max. back pressure [bar g]		25	25	25	25	25
Inlet flange DIN EN [2]		PN 63 - 160		PN 63 - 100	PN 63 -160	
Outlet flange DIN EN [2]		PN 25/40				
Centre to face dimension S1 [mm]		95	100	110	125	145
Centre to face dimension S2 [mm]		95	100	110	125	145
Height H1 [mm]		375	405	475	510	635
Height H2 [mm]		- [3]	485	565	620	750
Weight Si 21 / 23 [kg]		9	10	17	22	34
Weight Si 24 / 25 [kg]		- [3]	13	20	26	38

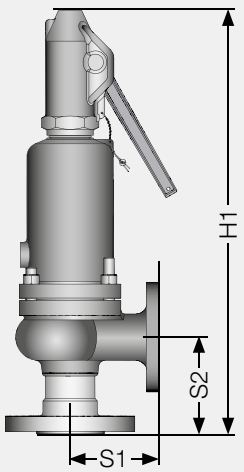
[1] Stated pressures are maximum values corresponding to the spring forces. The component strength may need to be reviewed depending on the material and temperature.

[2] Flange from PN 63 acc. to DIN EN 1092-2 flange facing type B2.

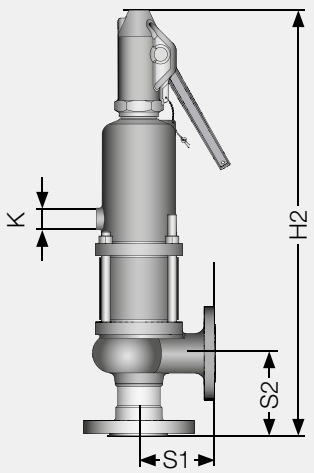
[3] For the flow diameter d_0 = 12 mm the bellows design is not available.

Bonnet for bellows design with test connection K for bellows check.
K to DN 40 x 40 – G¼, above G⅜

Si 2323



Si 2423



Si 2324 / Si 2325

Sizes, pressure ranges and dimensions

		Si 2324			Si 2325	
Size	DN_E	25	40	40	25	25
	DN_A	40	50	65	40	50
Flow diameter [mm] d_0		16	20	25	12	16
Flow area [mm²] A_0		201	314	491	113	201
Min. set pressure [bar g]	Si 21 / Si 23	0.45	0.45	0.45	0.45	0.45
	Si 24 / Si 25	2.0	2.0	2.0	2.0	2.0
Max. set pressure [1] [bar g]		250	250	250	400	250
Max. back pressure [bar g]		25	25	25	40	25
Inlet flange DIN EN [2]		PN 160			PN 160	
					PN 250	
		PN 250			PN 320	
					PN 400	
Outlet flange DIN EN [2]		PN 25/40			PN 25/40	
Centre to face dimension S1 [mm]		125	145	155	125	145
Centre to face dimension S2 [mm]		125	145	160	140	145
Height H1 [mm]		510	635	656	525	635
Height H2 [mm]		620	750	800	-	750
Weight Si 21/23 [kg]		17	34	45	25	40
Weight Si 24/25 [kg]		21	38	50	[3]	44

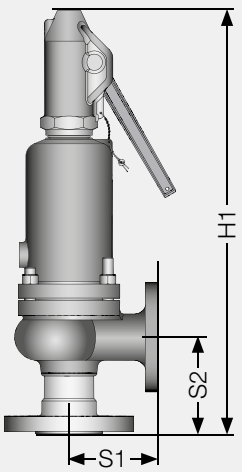
[1] Stated pressures are maximum values corresponding to the spring forces. The component strength may need to be reviewed depending on the material and temperature.

[2] Flange from PN 63 acc. to DIN EN 1092-2 flange facing type B2.

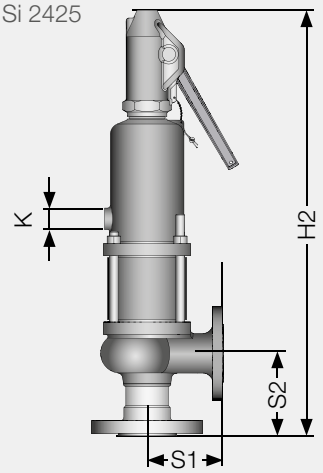
[3] For the flow diameter d_0 = 12 mm the bellows design is not available

Bonnet for bellows design with test connection K for bellows check.
K to DN 25 x 40 – G¼, above G⅜

Si 2324
Si 2325



Si 2424
Si 2425



Safety valve

Safety valve with heating jacket (Option .18)

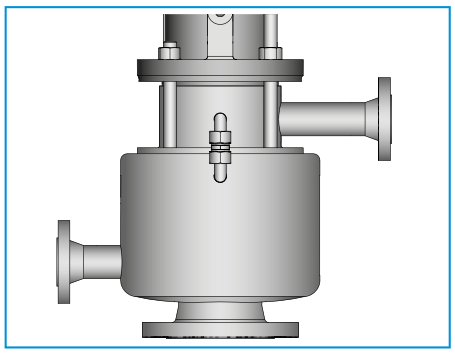
Hardening or solidification of highly viscous media in the safety valve can interfere with the function or closing and hence lead to dangerous operating conditions. Media with a tendency to conglutination or crystallization can block the seat and moving parts. This can usually be remedied by maintaining the temperature of the Fluid before and during the discharge. Monitoring and heating the pipe will often not provide the required heat to the inlet of the safety valve.

Equipping the safety valve with a heating jacket will solve this problem. Typical applications for safety valves with heating jacket include ammonium nitrate, acrylic acid, sulphuric acid, fluoropolymers, polypropylene, olefins and tar.

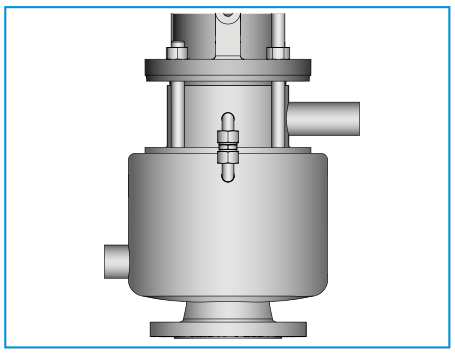
The safety valve should be equipped with bellows to protect the spindle and guides. Additional heating of the insulation spacer is integrated in the heating circuit by means of piping.

The bellows will not be required if the Fluid does not tend to solidify in the outlet of the safety valve.

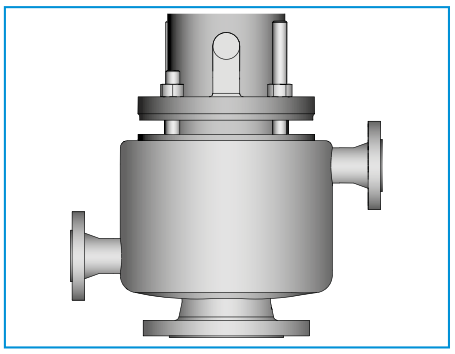
Purging the seat area with steam can serve as a further measure for protecting the safety valve seat from conglutination. The purge connection (option .32) can also be combined with the heating jacket.



.18 Heating jacket with flange connection for safety valve with bellows



.18 Heating jacket with threaded connection for safety valve with bellows



.18 Heating jacket with flange connection for conventional safety valve

Safety valve Inlet size	**DN_E**		25	32	40	50	65	80	100
Connection Heating jacket		Flange	DN 15 PN 25					DN 25 PN 25	
		Thread	G⅜					G¾	
Max. heating jacket Operating pressure [bar g] [1]		50 °C	25						
		150 °C	22						
		200 °C	21						
		300 °C	18						
Heating jacket material			Stainless steel 1.4301 [2]						

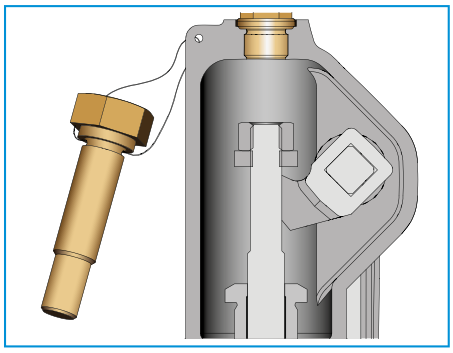
[1] Nominal pressure rating for the heating jacket at 50 °C. The heating jacket is labelled in compliance with the Pressure Equipment Directive.

[2] Depending on the heating jacket design or availability of materials, we reserve the right to use higher quality 1.4404 or 1.4571 stainless steel.

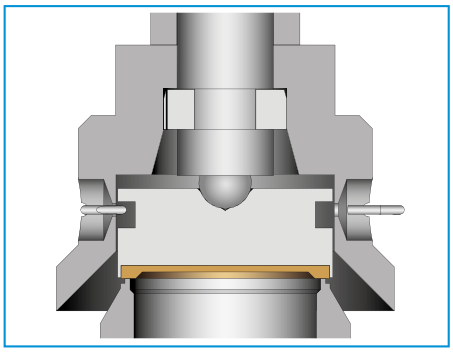
Other connections, pressure ratings or materials available upon request. Safety valves with heating jacket have no support brackets.

Options

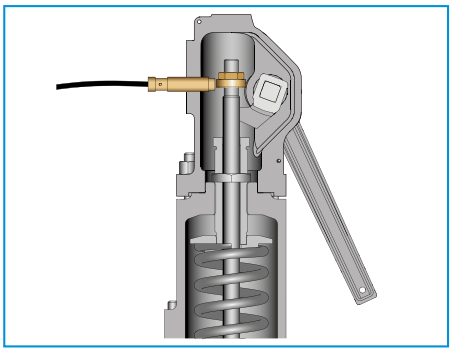
Technical design options



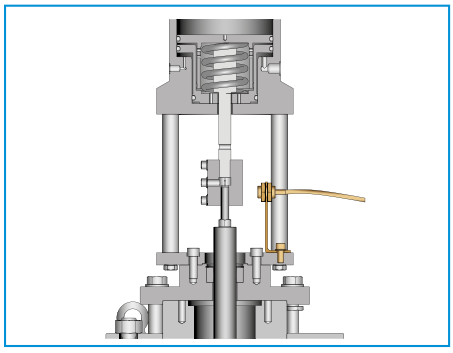
B Blocking of the safety valve for pressure testing the pressure system.



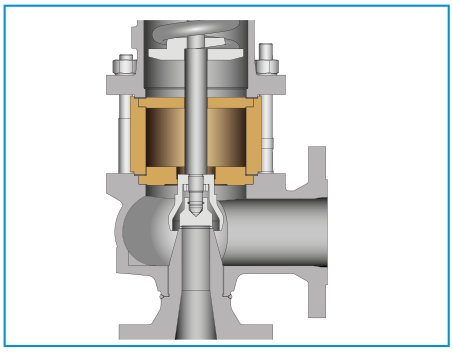
.11 Disc with soft seal for particularly high tightness.



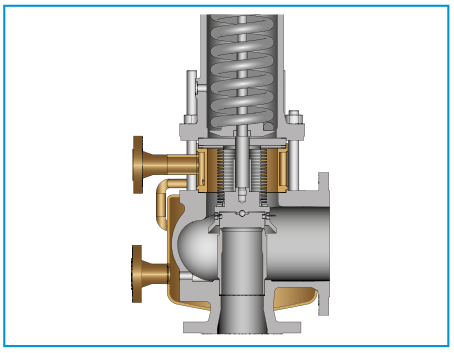
.14a Lift indication with inductive proximity switch in the cap. If the safety valve disc lifts by 1 mm minimum, the proximity switch will change its status and switch.



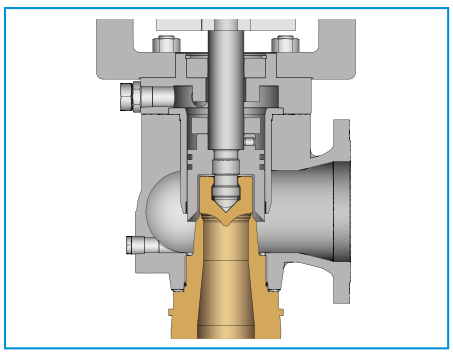
.14c Lift indication with inductive proximity switch for exposed spindle with actuator AK. If the safety valve disc lifts by 1 mm minimum, the proximity switch will change its status and switch.



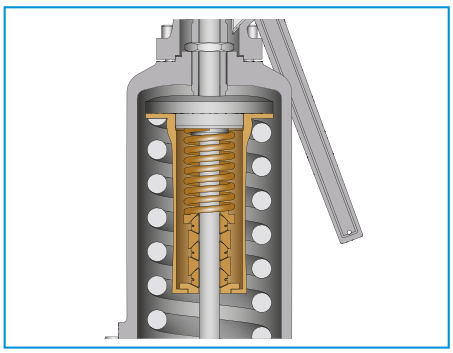
.15 Bonnet insulation spacer for protecting the spring against high and low temperatures.



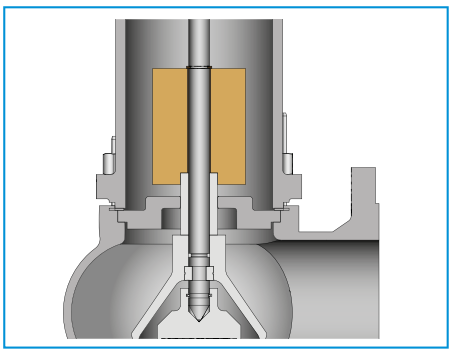
.18 Heating jacket for fluids that can become hard or solidify.



.22a Weld end at inlet



.38 Vibration damper for avoiding valve oscillation in case of unfavourable installation conditions.



.57 Weight load for operation with very low set pressure.

IMI Bopp & Reuther
Bopp & Reuther Sicherheits- und Regelarmaturen GmbH
Carl-Reuther-Straße 1
68305 Mannheim
Deutschland

Tel: +49 (0)621 76220-100
Fax: +49 (0)621 76220-120

www.imi-critical.com
imibur.sales@imi-critical.com

IMI Critical Engineering
Lakeside, Solihull Parkway
Birmingham Business Park
Birmingham B37 7XZ
United Kingdom

Tel: +44 (0)121 717 3700
Fax: +44 (0)121 717 3701

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