

Compact Performance

Safety Relief Valves

Series 437

Series 459



CATALOG

LESER

The-Safety-Valve.com

LESER Safety Valves for every industrial application



Compact Performance



High Performance

Series 437

Type 437



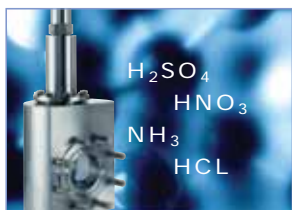
API

Type 438

Type 439



Clean Service



Critical Service

Series 459

Type 459

Type 459 HDD



Modulate Action

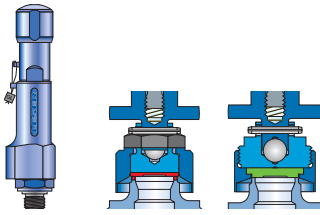
Type 462

Type 462 HDD



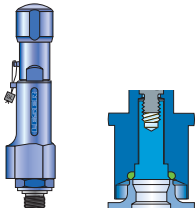
Best Availability

General



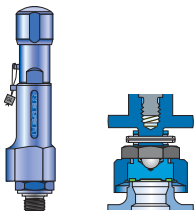
Type 437

Orifice diameter d_0 6, 10 mm
Set pressure 0,1 – 365 bar, 1,5 – 5294 psig
Sealing metal to metal and soft seal (sealing plate)



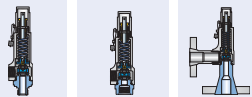
Type 438

Orifice diameter d_0 10 mm
Set pressure 5 – 180 bar, 72,5 – 2610 psig
O-ring soft seal

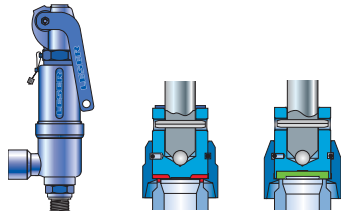


Type 439

Orifice diameter d_0 10 mm
Set pressure 0,1 – 16 bar, 1,5 – 232 psig
Vulcanized soft seal

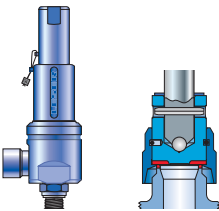


Options Series 437



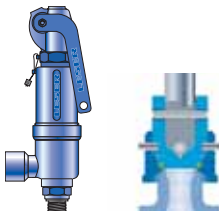
Type 459

Orifice diameter d_0 9, 13, 17,5 mm
Set pressure 0,2 – 250 bar, 2,9 – 3626 psig
Sealing metal to metal and soft seal (sealing plate)



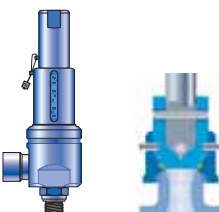
Type 459 HDD

Orifice diameter d_0 6, 9, 13 mm
Set pressure 0,2 – 850 bar, 2,9 – 12328 psig
Sealing stellited metal to metal



Type 462

Orifice diameter d_0 9, 13, 17,5 mm
Set pressure 0,5 – 250 bar, 7,2 – 3626 psig
O-ring soft seal



Type 462 HDD

Orifice diameter d_0 9, 13 mm
Set pressure 0,5 – 350 bar, 7,2 – 5076 psig
O-ring soft seal



Options Series 459

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LESER Type

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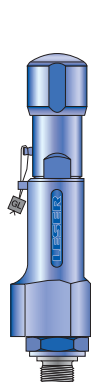
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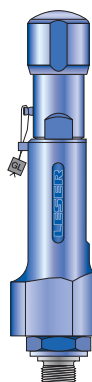
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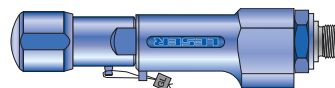
Type 437
Packed knob H4



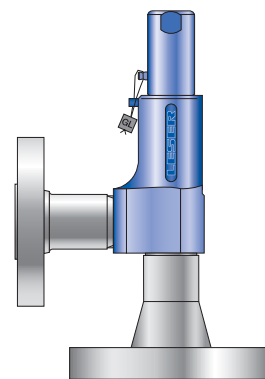
Type 437
Packed knob H4
Long version



Type 437
Pull button H3



Type 437
Packed knob H4
Certified for horizontal fitting



Type 437
Cap H2
Flange connection

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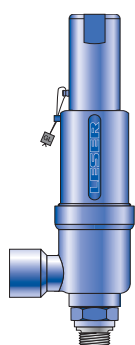
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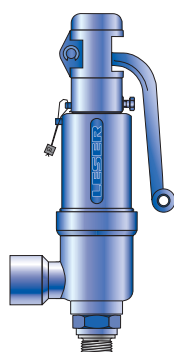
Type 462		
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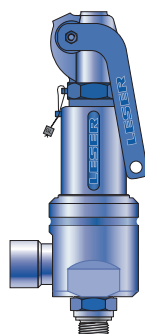
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Lift restriction		
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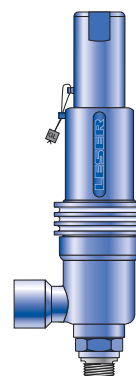
Type 459
Cap H2



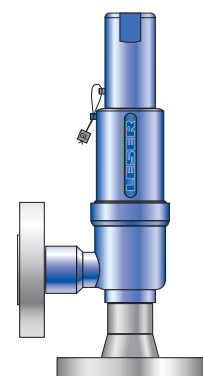
Type 459
Plain lever H3



Type 459 HDD
Packed lever H4



Type 459
Cap H2
Balanced bellows design



Type 459
Cap H2
Flange connection



LESER – Compact Performance Safety Valves

This product group stands for

- ✓ Compact dimensions with high capacity relative to the safety valve size
- ✓ Great variety of threaded and flanged connections
- ✓ Wide pressure range

LESER's Compact Performance Safety Valves

- Are designed to meet all industrial applications up to F orifice
- Open rapidly with an overpressure of max. 5 % (Series 459) resp. 10 % (Series 437) to the full design lift.
- Have a maximum blowdown of minus 10 % for steam / gas service and minus 20 % for liquid service.
- Are developed in a close cooperation with plant engineers and service specialists.
- Serve for protection of processes and equipment.
- Are approved by all important approval organisations worldwide which ensures the worldwide applicability e. g.:
 - European Community: CE-marking according to the Pressure Equipment Directive (PED) 97/23/EC and EN ISO 4126-1
 - USA: UV-stamp according to ASME Section VIII Division 1, National Board certified capacities
 - Germany: VdTÜV approval according to PED, EN ISO 4126-1, TÜV SV 100 and AD 2000-Merkblatt A2
 - Canada: Canadian Registration Number according to the requirements of particular provinces
 - China: AOSIQ based on the approval according to ASME Section VIII Division 1 and AD 2000-Merkblatt A2

Furthermore, all LESER Compact Performance Safety Valves are designed, marked, produced and approved according to the requirements of the following regulations (directives, codes, rules and standards).

EN ISO 4126-7, EN 12266-1 / -2, ISO 7-1 threads, ISO 228 threads, EN 1092 Part I and II flanging ASME PTC 25, ASME-Code Sec. II, ASME B 16.34, ASME B1.20.1 threads and ASME B16.5 flanging, API Std. 527, API RP 576
AD 2000-Merkblatt A4, AD 2000-Merkblatt HP0, TRD 110, TRD 421, TRD 721



Applications

LESER – Compact Performance Safety Valves

offer ultimate protection against unallowable overpressures in all applications for steam, gases and liquids where smaller capacities are required.

Typical applications for LESER Compact Performance Safety Valves are:

- Air / gas compressors and pumps
- Technical gases and CO₂ plants
- Cylinder filling stations
- Chemical equipment and piping
- Pressure vessels and piping systems containing gas, air, liquid or steam
- LPG / LNG terminals, carriers etc.
- Cryogenic systems and oxygen applications
- Thermal relief
- High pressure extraction plants

General Design Features

LESER's Compact Performance Safety Valves

cover a large variety of types, materials and options to fit any application:

- Connection sizes from $\frac{3}{8}$ " to 1 $\frac{1}{2}$ " and 5 orifices (D through F) provide high suitability to the application
- Threaded connections, male and female, according to all international standards guarantee worldwide applicability
- Flanged connections according ANSI, DIN and JIS guarantee a worldwide applicability
- Inlet pressure ratings up to PN 700 / Class 2500 to fit all required design pressures
- 2 standard based / inlet body materials, Chrome steel and stainless steel as well as 3 standard body materials, ductile iron, steel and stainless steel can be selected according to the application
- All parts can be machined from bar materials to cover special material requirements such as Hastelloy[®], Duplex, Super Duplex, Tantalum or Titanium within unrivalled lead time
- Set pressures from 0,1 to 850 bar / 1,5 to 12328 psig make Compact Performance safety valves suitable for all industrial processes
- Operating temperatures from -270 to 550 °C / -454 to 1022 °F cover a wide range of applications
- One design and spring (single trim) for steam, gas and liquid applications reduces the number of spare parts and ensures low cost maintenance management
- Ringless design needs no trim adjustments for easy maintenance
- One-piece spindle reduces friction which leads to high operation accuracy
- Self-draining body design, avoids residues and reduces corrosion

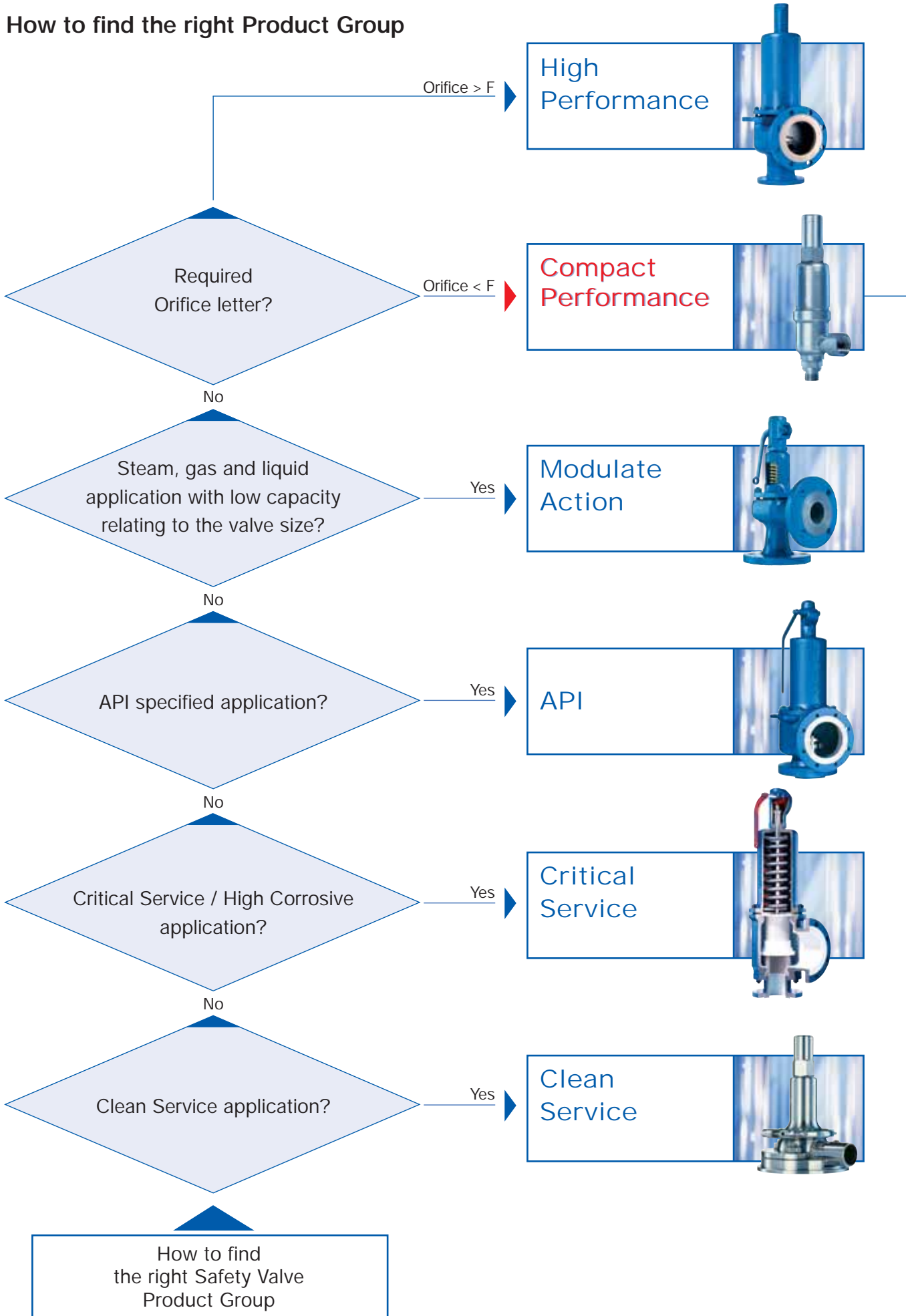
LESER's Compact Performance Safety Valves

can be customized with a great variety of options, e. g.:

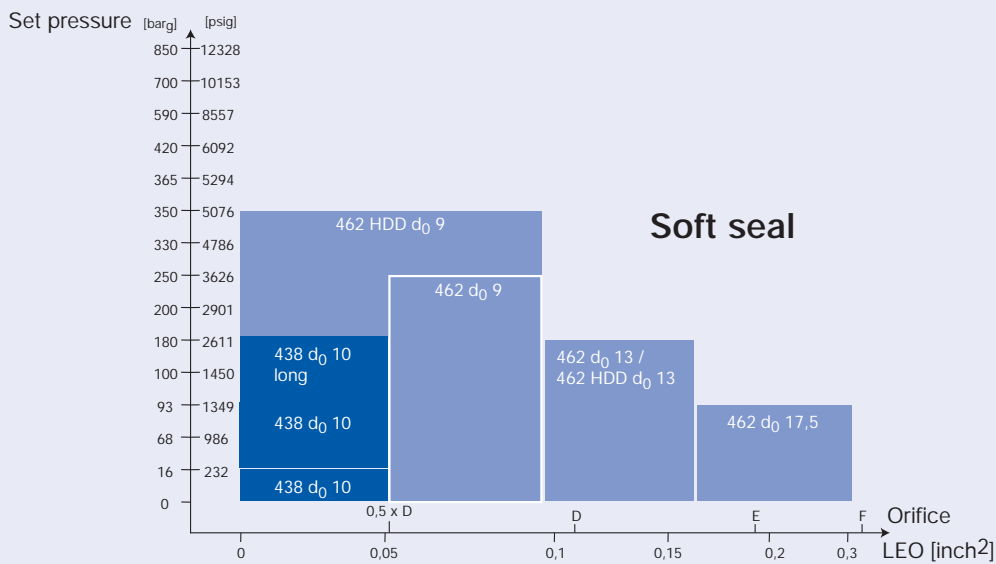
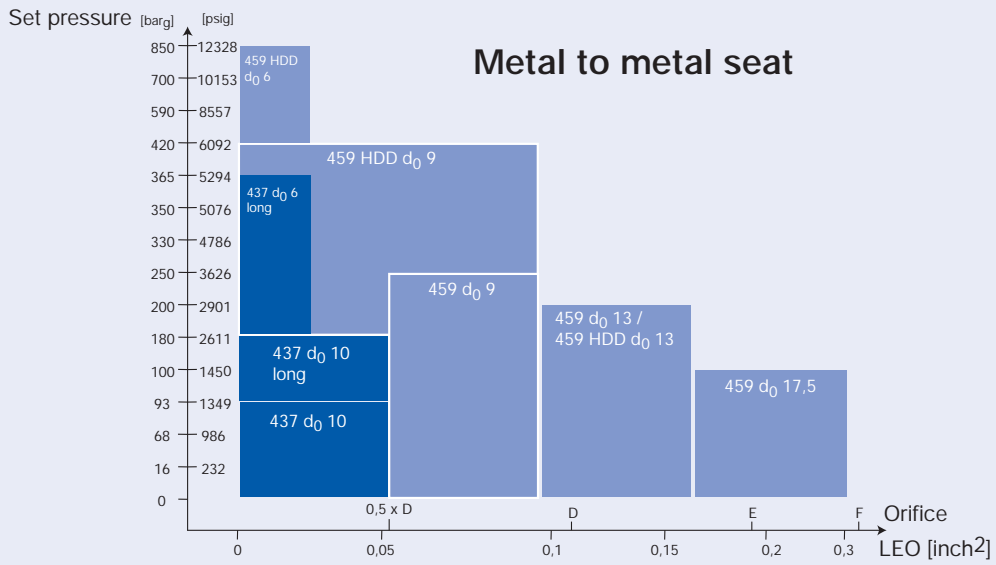
- Special connections specified by the customer for optimised adaptation to the plant
- Stellite or hardened metal sealing for longer product life
- Soft seat solutions for superior tightness
- Stainless steel bellows for back pressure compensation
- Heating jackets for applications with high viscosity fluids
- Base / inlet body, body, bonnet and all internal parts can be produced in special materials exactly to meet customer specification requirements

Valve finder

How to find the right Product Group

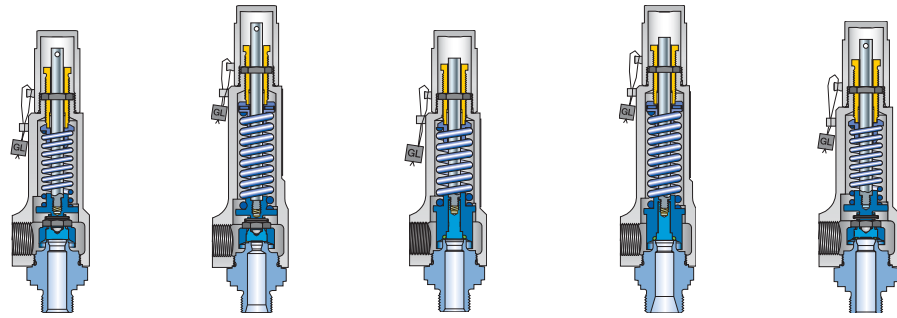


How to find the right Safety Valve



How to find the right Compact Performance Safety Valve

Valve selection



Valve size

	Type	4373	4374	4373	4374	4383	4384	4383	4384	4393	4394
		Long Version				Long Version					
Act. Orifice diameter d_0 [mm] min.		-		6		-		-		-	
Act. Orifice diameter d_0 [inch] min.		-		0,236		-		-		-	
Act. Orifice diameter d_0 [mm] max.		10		10		10		10		10	
Act. Orifice diameter d_0 [inch] max.		0,394		0,394		0,394		0,394		0,394	

Materials

1.4104	SA 479 430	✓		✓		✓		✓		✓	
1.4404	SA 479 316L	✓		✓		✓		✓		✓	
1.4104/0.7043	430/Ductile Gr. 60-40-18	-		-		-		-		-	
1.4404/1.0460	316L/Carbon steel	-		-		-		-		-	
1.4404	SA 479 316L	-		-		-		-		-	

Set pressure

Metric Units	min.	p [bar]	0,1		180		5		93		68		0,1
US Units	min.	p [psig]	1,5		2611		72,5		986		1348		1,5
Metric Units	max.	p [bar]	93		68		365		93		68		180
US Units	max.	p [psig]	986		1348		5294		986		1348		2611

Temperature range

acc. to DIN EN	min.	[°C]	-10	-270	-10	-270	-10	-45	-10	-45	-10	-45
	max.	[°C]	220	280	220	280	150	150	150	150	150	150
	min.	[°F]	14	-454	14	-454	14	-49	14	-49	14	-49
	max.	[°F]	428	536	428	536	302	302	302	302	302	302
acc. to ASME	min.	[°C]	-29	-268	-29	-268	-29	-268	-29	-268	-29	-268
	max.	[°C]	220	280	220	280	150	150	150	150	150	150
	min.	[°F]	-20	-450	-20	-450	-20	-450	-20	-450	-20	-450
	max.	[°F]	428	536	428	536	302	302	302	302	302	302

The temperature is limited by soft seal material. The stated values are valid for EPDM.

Capacities

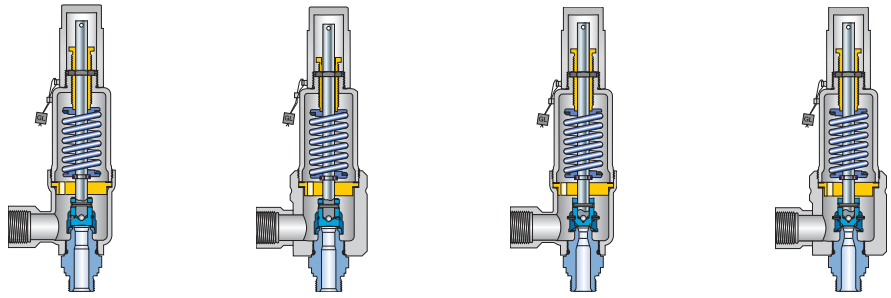
LEO _{S/G}	min.	-		0,021		-		-		-	
LEO _{S/G}	max.	0,057		0,057		0,057		0,051		0,051	
Orifices _G	min.	-		-		-		-		-	
Orifices _G	max.	-		-		-		-		-	
LEO _L	min.	-		0,022		-		-		-	
LEO _L	max.	0,062		0,062		0,060		0,060		0,060	
Orifice _L	min.	-		-		-		-		-	
Orifice _L	max.	-		-		-		-		-	

Approvals

Country	Code	Type	4373	4374	4373	4374	4383	4384	4383	4384	4393	4394
		Media	Long Version				Long Version					
Europe	DIN EN ISO 4126-1 CE-Marking	S/G/L	072020111Z 0008/0/21-1		072020111Z 0008/0/21-1		072020111Z 0008/0/21-1		072020111Z 0008/0/21-1		072020111Z 0008/0/21-1	
Germany	AD 2000- Merkblatt A2	S/G/L	TÜV SV 980		TÜV SV 980		TÜV SV 980		TÜV SV 980		TÜV SV 980	
United States	ASME VIII only d_0 10 mm	S/G	M37213		M37213		M37190		M37190		M37190	
		L	M37189		M37189		M37202		M37202		M37202	
Canada	CRN	S/G/L	OG0772.9C		OG0772.9C		OG0772.9C		OG0772.9C		OG0730.95	
China	CSBQTS	S/G/L	02301T		02301T		02301T		02301T		02301T	
Russia	DIN GOST GOSGOTTECHNAZDOR		✓		✓		✓		✓		✓	

Classification societies

Bureau Veritas	BV	✓		✓		✓		✓		✓	
Det Norske Veritas	DNV	✓		✓		✓		✓		✓	
Germanischer Lloyd	GL	✓		✓		✓		✓		✓	
Lloyd's Register EMEA	LREMEA	✓		✓		✓		✓		✓	
Registro Italiano Navale	RINA	✓		✓		✓		✓		✓	



Valve size		Type	4593	4592	4594	4594	4623	4622	4624	4624
						HDD				HDD
Act. Orifice diameter d_0 [mm]	min.		9			6		9		9
Act. Orifice diameter d_0 [inch]	min.		0,236			0,236		0,354		0,354
Act. Orifice diameter d_0 [mm]	max.		17,5			13		17,5		13
Act. Orifice diameter d_0 [inch]	max.		0,689			0,512		0,689		0,512

Materials										
1.4104	SA 479 430		-			-		-		-
1.4404	SA 479 316L		-			-		-		-
1.4104/0.7043	430/Ductile Gr. 60-40-18	✓	-	-		-	✓	-	-	-
1.4404/1.0460	316L/Carbon steel	-	✓	-		-	-	✓	-	-
1.4404	SA 479 316L	-	-	✓		✓	-	-	✓	✓

Set pressure										
Metric Units	min. p [bar]		0,1			180		93		0,1
US Units	min. p [psig]		1,5			2610		1349		1,5
Metric Units	max. p [bar]		180			330		180		16
US Units	max. p [psig]		2610			4786		2611		232

Temperature range										
acc. to DIN EN	min. [°C]	-10	-85	-200	-270	-10	-45	-45	-45	-45
	max. [°C]	300	400	400	300	150	150	150	150	150
	min. [°F]	14	-121	-328	-454	-10	-49	-49	-49	-49
	max. [°F]	572	752	752	572	302	302	365	302	302
acc. to ASME	min. [°C]	-29	-29	-184	-268	-29	-45	-45	-268	-268
	max. [°C]	300	427	472	300	150	150	180	150	150
	min. [°F]	-20	-20	-300	-450	-20	-20	-49	50	50
	max. [°F]	572	800	800	572	302	302	302	302	302

The temperature is limited by soft seal material. The stated values are valid for EPDM.

Capacities										
LEO _{S/G}	min.	0,082			0,036			0,082		0,082
LEO _{S/G}	max.	0,310			0,171			0,310		0,171
Orifices _{S/G}	min.	-			-			-		-
Orifices _{S/G}	max.	1,01 x F			1,5 x D			1,01 x F		1,5 x D
LEO _L	min.	0,086			0,038			0,086		0,086
LEO _L	max.	0,325			0,179			0,325		0,179
Orifice _L	min.	-			-			-		-
Orifice _L	max.	1,05 x F			1,6 x D			1,05 x F		1,05 x F

Approvals		Type	4593	4592	4594	4594	4623	4622	4624	4624
Country	Code	Media				HDD				HDD
Europe	DIN EN ISO 4126-1 CE-Marking	S/G/L	072020111Z 0008/0/13			072020111Z 0008/0/13		072020111Z 0008/0/13		072020111Z 0008/0/13
Germany	AD 2000- Merkblatt A2	S/G/L	TÜV SV 909			TÜV SV 909		TÜV SV 909		TÜV SV 909
United States	ASME VIII	S/G	M37112			M37112		M37112		M37112
		L	M37101			M37101		M37101		M37101
Canada	CRN	S/G/L	OG0730.95			OG0730.95		OG0730.95		OG0730.95
China	CSBQTS	S/G/L	02301T			02301T		02301T		02301T
Russia	DIN GOST GOSGOTTECHNADZOR		✓			✓		✓		✓

Classification societies										
Bureau Veritas	BV		✓			✓		✓		✓
Det Norske Veritas	DNV		✓			✓		✓		✓
Germanischer Lloyd	GL		✓			✓		✓		✓
Lloyd's Register EMEA	LREMEA		✓			✓		✓		✓
Registro Italiano Navale	RINA		✓			✓		✓		✓

General signs and symbols

*	This option is covered by standard design
✓	Available
–	Not possible

Signs and symbols for flange drillings and flange facings

*	Standard design, no option code required
(*)	Flange dimensions except flange thickness are in accordance with flange standard (e. g. ASME B16.5) Flange thickness is smaller (max. 2 mm), see "Multiple pressure rating"
–	Flange drilling / facing is not possible

Option code for flange drilling and dimension, e. g. I22

I22	Flange drilling as specified in flange standard Outer flange diameter, flange thickness and height of flange facing may be larger, see "Dimensions"
-----	--

Option code for flange facing, e. g. H62

H62	Flange facing as specified in flange standard
-----	---

General information concerning flange drillings and flange facings

Dimensions	<p>Flange dimensions of LESER Series 437, 459 exceed flange dimension as mentioned in ASME / ANSI B16.5 and DIN EN 1092. This exceed is in accordance with API Standard 526, Section 2.4.</p> <p>Dimensions: "For some valve designs, the inlet raised face height may substantially exceed the nominal dimension specified in ASME / ANSI B16.5 (and DIN EN 1092). Consult the manufacturer for exact dimension." The reason for this exceed is:</p> <ul style="list-style-type: none"> - height of nozzle placed in the inlet of valve - the slip on flange construction
Multiple pressure rating	The flange standard shows the same drilling, facing and outer diameter for several pressure ratings, e. g. PN 16 up to PN 40 Due to the pressure rating of the machined slip on flanges LESER fulfills the requirements for flange thickness e. g. of PN 16 but not PN 40
Smooth finish	<p>The effective MSS SP-6 (Edition 2001) does not mention "smooth finish" anymore. In MSS SP-6 (Edition 1980) "smooth finish" is defined for finishes of contact flanges as "250 µinch (6,3 µm) AARH max." LESER supplies flange facings according to ASME B16.5 – 1996, paragraph 6.4.4.3: "Either a serrated concentric or serrated spiral finish resulting in service finish from 125 µinch to 250 µinch average roughness shall be furnished." This finish meets the requirements of MSS SP-6 (Edition 1980), which is not valid anymore!</p>
Stock finish	Stock finish is not defined in any technical standard. If purchase orders show "stock finish" LESER supplies standard facing according to DIN or ASME (marked with * in table "Flange facings" of each valve series).

Materials

Please find below a summary of material codes at LESER. Please note that

- for every body material an inspection certificate 3.1 according to EN 10204 is available
- many materials have a multiple inspection certificate 3.1.

Material code	Flanged safety valve body Threaded safety valve inlet body	Body material is certified with 3.1 (EN 10204) for the following materials	
		EN	ASME
2	Stainless steel	1.4404	SA 479 316L
3	Chrome steel	1.4104	SA 479 430
4	Stainless steel	1.4404, 1.4571	SA 479 316L, 316Ti
X	Other materials on request	e. g. 2.4610	e. g. Hastelloy®

Sample Determination of K_{dr}/α_w : Type 459, d_0 13 mm

Type 459

Determination of coefficient of discharge in case of lift restriction or back pressure

Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)

1 $d_0 \text{ } \varnothing$ 13 mm

$K_{dr} = \alpha_w = f(h/d_0) - S/G$

LESER

- h = Lift [mm]
- d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d_0 = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p_0 = Set pressure [bar_a]
- p_{a0}/p_0 = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)

2 $d_0 \text{ } \varnothing$ 13 mm

$K_{dr} = \alpha_w = f(p_{a0}/p_0)$ and $K_b = f(p_{a0}/p_0)$

Explanation

Sample – Type 459, flow diameter $d_0 = 13\text{mm}$, rated lift $h = 3,0\text{mm}$, K_{dr}/α_w S/G = 0,81

1 Diagram 1 Determination of the restricted lift due to reduced K_{dr}/α_w		2 Diagram 2 Determination of reduced K_{dr}/α_w or K_b ¹⁾ due to back pressure			
Step	Description	Sample	Step	Description	Sample
1	Calculate the required coefficient of discharge of the selected safety valve. Applicable formulas are stated in codes and standards.	1a $K_{dr}/\alpha_w = 0,60$	1	Calculate the back pressure ratio p_{a0}/p_0 using the actual values for set pressure p_0 [bar _a] 100 and back pressure p_{a0} [bar _a] 30	2a $p_{a0}/p_0 = 0,30$
2	Select the starting point (0,60) at the Y-axis of the diagram.		2	Select the starting point (0,30) at the X-axis of the diagram.	
3	Lay a horizontal line onto the ratio graph for identify the intersection point.		3	Lay a vertical line onto the ratio graph to identify the intersection point.	
4	Lay a vertical line to the X-axis to identify the ratio of lift / flow diameter (h/d_0).	1b $h/d_0 = 0,175$	4	Lay a horizontal line to the Y-axis to identify the reduced K_{dr}/α_w or K_b .	2b $K_{dr}/\alpha_w = 0,79$ 2c $K_b = 0,97$
5	Calculate the restricted lift using the formulas $h = d_0 \times h/d_0$. (For ordering a lift restriction please use option code J51 ref. to page 09/16)	$h = 13 \times 0,175$ $h = 2,3 \text{ mm}$	5	Calculate the sizing with the established K_{dr}/α_w or K_b .	

How to use

Sample Capacity sheet –

How to select capacities for steam: Type 459 d₀ 9 mm

Capacities

Capacities for saturated steam according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure. **7**

Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2		
Actual Orifice diameter d ₀ [mm]		9		
Actual Orifice area A ₀ [mm ²]		63,6		
	LEO ^{*)} [inch ²]		S/G = 0,082 L = 0,086	
Set pressure		Capacities		
		Steam saturated	Air 0° C and 1013 mbar	Water 20° C
		[kg/h]	[m _n ³ /h]	[10 ³ kg/h]
	[bar]			
	0,2			
	0,5			
	1			
	1,5	77	92	2,54
	2	93	113	2,93

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure.

Capacities at 2,07 bar (30 psig) and below are based on 0,207 bar (3 psig) overpressure.

US Units		ASME Section VIII		
Actual Orifice diameter d ₀ [inch]		0,354		
Actual Orifice area A ₀ [inch ²]		0,099		
	LEO ^{*)} [inch ²]	S/G = 0,082 L = 0,086		
Set pressure		Capacities		
		Steam saturated	Air 60° F and 14,5 psig	Water 70° F
		[lb/h]	[S.C.F.M.]	[US-G.P.M.]
	[psig]			
	15	134	48	9,02
	20	155	55	10,2
	30	196	70	12,2
	40	242	86	14,1
	50	287	103	15,8

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11

Explanation		Type 459 d ₀ 9 mm			
No.	Description		Metric Units	US Units	Example
1	Code				AD 2000-Merkblatt A2
2	Actual orifice diameter	d ₀	[mm]	[inch]	9
3	Actual orifice area	A ₀	[mm ²]	[inch ²]	63,6
4	LESER Effective Orifice	LEO _{S/G}	[inch ²]	[inch ²]	0,082
5	Set pressure		[bar _g]	[psig]	2
6	Capacity		[kg/h]	[lb/h]	93
7	Base of calculation				see table page 00/10

7

Base of capacity calculation

		Metric Units		US Units	
Code		Capacity calculation according to AD 2000-Merkblatt A2		Capacity calculation according to ASME Section VIII (UV)	
Media					
Steam (saturated steam)	Standard conditions	Steam table IAPWS-IF97 IAPWS Industrial Formulation for the Thermodynamic Properties of Water and Steam	[kg/h]	Steam table IAPWS-IF97 IAPWS Industrial Formulation for the Thermodynamic Properties of Water and Steam	[lb/h]
Air	Standard conditions	0 °C and 1013 mbar	[m _n ³ /h]	16 °C (60 °F)	[S.C.F.M.]
Water	Standard conditions	20 °C (68 °F)	[10 ³ kg/h]	21 °C (70 °F)	[US-G.P.M.]
All Media					
	Calculation pressure	Set pressure plus 10 % overpressure		Set pressure plus 10 % overpressure	
	Calculation pressure for low set pressure	Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.		Capacities at 2,07 bar (30 psig) and below are based on 0,207 bar (3 psig) overpressure.	

Example

Capacity calculation pressure

Metric Units		US Units	
Set pressure	Capacity calculation pressure	Set pressure	Capacity calculation pressure
10 bar	10 bar + 10% overpressure = 11 bar	145 psig	145 psig + 10% overpressure = 159,5 psig
0,5 bar	0,5 bar + 0,1 bar overpressure = 0,6 bar	20 psig	20 psig + 3 psig overpressure = 23 psig

4

LESER Effective Orifice

Pressure relief devices may be initially sized using the equations shown in API RP 520, topic 3.6 through 3.10 as appropriate for vapors, gases, liquids, or two phase flow. These equations utilize effective coefficient of discharge (S/G 0,975, L 0,650) and effective areas (acc. to API Std. 526, Fifth Edition, June 2002, table 1) which are independent of any specific

valve design. In this way the designer can determine a preliminary pressure relief valve size.

By using the LESER Effective Orifice the designer can directly select a LESER safety relief valve after calculating. A verification of the sizing with the selected actual orifice and the rated coefficient of discharge is not necessary.

LEO _{S/G}	LESER Effective Orifice (for steam, gas and vapor)	[inch ²]	refer to page 00/11
LEO _L	LESER Effective Orifice (for liquid)	[inch ²]	refer to page 00/11

For further information refer to LESER Engineering Handbook

This table based on the rated coefficient of discharge for steams and gases of LESER safety valves certified by ASME.
The appropriated K-values are shown in the column "K-value" of the table.

LEO _{S/G}		LESER Effective Orifice (for steam, gas and vapor)							
Orifice acc. API 526	LESER-Series	DN	Inlet size	d ₀ [inch]	d ₀ [mm]	K-value	LEO _{S/G} [inch ²]	% of higher orifice	% of lower orifice
	437		1/2"	0,236	6,0	0,458	0,021	18,7%	
	459	10	1/2"	0,236	6,0	0,811	0,036	33,1%	
	438		1/2"	0,394	10,0	0,406	0,051	46,1%	
	439		1/2"	0,394	10,0	0,406	0,051	46,1%	
	437		1/2"	0,394	10,0	0,458	0,057	52,0%	
	459	15	3/4"	0,354	9,0	0,811	0,082	74,6%	
	462	15	3/4"	0,354	9,0	0,811	0,082	74,6%	
D							0,110	100,0%	100,0%
	459	15	3/4"	0,512	13,0	0,811	0,171	87,3%	155,6%
	462	15	3/4"	0,512	13,0	0,811	0,171	87,3%	155,6%
E							0,196	100,0%	100,0%
F							0,307	100,0%	100,0%
	459	20	1"	0,689	17,5	0,811	0,310	61,7%	101,0%
	462	20	1"	0,689	17,5	0,811	0,310	61,7%	101,0%

LEO _L		LESER Effective Orifice (for liquid)							
Orifice acc. API 526	LESER-Series	DN	Inlet size	d ₀ [inch]	d ₀ [mm]	K-value	LEO _L [inch ²]	% of higher orifice	% of lower orifice
	437		1/2"	0,236	6,0	0,333	0,022	20,4%	
	459	10	1/2"	0,236	6,0	0,566	0,038	34,7%	
	438		1/2"	0,394	10,0	0,322	0,060	54,8%	
	439		1/2"	0,394	10,0	0,322	0,060	54,8%	
	437		1/2"	0,394	10,0	0,333	0,062	56,7%	
	459	15	3/4"	0,354	9,0	0,566	0,086	78,1%	
	462	15	3/4"	0,354	9,0	0,566	0,086	78,1%	
D							0,110	100,0%	100,0%
	459	15	3/4"	0,512	13,0	0,566	0,179	91,4%	162,9%
	462	15	3/4"	0,512	13,0	0,566	0,179	91,4%	162,9%
E							0,196	100,0%	100,0%
F							0,307	100,0%	100,0%
	459	20	1"	0,689	17,5	0,566	0,325	64,5%	105,7%
	462	20	1"	0,689	17,5	0,566	0,325	64,5%	105,7%

Normative basis

In accordance with NACE standard MR 0175-2003 sour gas service means the presence of H₂S in the following conditions:

Part 1.4.1.1.: All gas, gas condensate, and sour crude oil – When the partial pressure of H₂S in a wet (water as a liquid) gas phase of a gas, gas condensate, or crude oil system is equal to or exceeds 0,003 bar_a (0,05 psia)

Exceptions are:

Part 1.4.2.1.: **Low-pressure gas:** When the total pressure is lower than 4,5 bar_a (65 psia)

Part 1.4.2.2.: **Low-pressure oil and gas multiphase systems:** ...

Other Sour gas standards:

NACE MR 0103-2003: Materials resistance to sulfide stress cracking in corrosive petroleum refining environments.

DIN EN ISO 15156-1: Petroleum and natural gas industries – Materials for use in H₂S-containing environments in oil and gas production – Part 1: General principles for selection of cracking-resistant materials (ISO 15156-1:2001)

Miscellaneous

Workstandards: Please refer to LWN 001.91

General requirements for sour gas service

The above mentioned standards require a maximum hardness of 22 HRC for the most steels. For the actual requirements of a specific material please refer to the applied standard.

LESER sour gas level

General: Sour gas material requirements must be fulfilled if pressure and partial pressure conditions according to the applied standard exist.

Based on these general statement LESER defines two sour gas level for safety valves:

		Level 1		Level 2	
Part definition		Contact with the medium in closed position		Contact with the medium in opened position	
		Conventional	Balanced bellows	Conventional	Balanced bellows
Conact area					
Pressure requirements		Set pressure ≥ 4,5 bar _a (65 psia)		Back pressure ≥ 4,5 bar _a (65 psia)	
Safety valve operation		closed		closed/opened	
Parts concerned	Standard	Base / Inlet body Disc		All	
	Balanced bellows	Base / Inlet body Disc		Base / Inlet body Disc Outlet body Bonnet spacer Bellows	

Necessary material modification

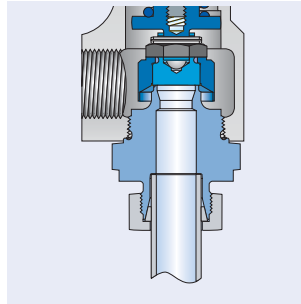
Type	Design	Part	Material	Option code	Material	Option code
4592	Conventional	Disc	1.4404 / 316L	L44	Please choose balanced bellows design	
	Balanced bellows	Disc	1.4404 / 316L	L44	1.4404 / 316L	L44
		Bellows		1.4571 / 316Ti	J78 / J55	1.4571 / 316Ti
4593	Conventional	Base/Inlet body	1.4404 / 316L	L18	Please select type 4594	
		Disc	1.4404 / 316L	L44		
	Balanced bellows	Base/Inlet body	1.4404 / 316L	L18	Please select type 4592 or 4594	
		Disc	1.4404 / 316L	L44		
		Bellows	1.4571 / 316Ti	J78 / J55		
4594 + 4594 HDD	Conventional		No modification required		No modification required	
	Balanced bellows	Bellows	1.4571 / 316Ti	J78 / J55	1.4571 / 316Ti	J78 / J55

Special connections

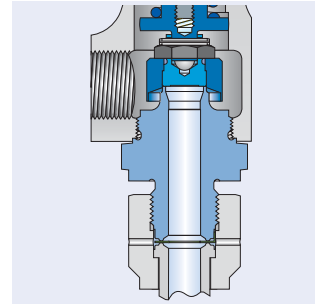
Except the shown standard connections illustrated on the pages 04/05 and 09/06, LESER realize further customer specific connections. Sample are shown on this page.
For ordering please state in writing standard, size or specify by drawing.

Threads

Threaded connection with special seals



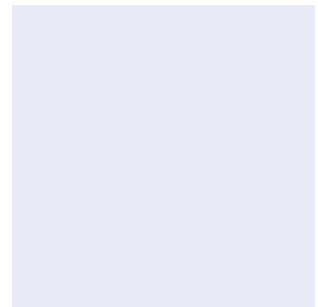
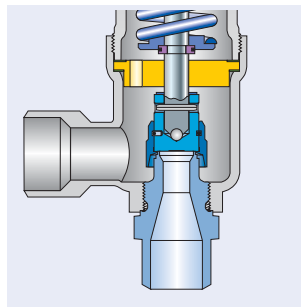
Sleeve fitting, e. g. SWAGELOK, ERMETO



Metal gasket, e. g. CAJON

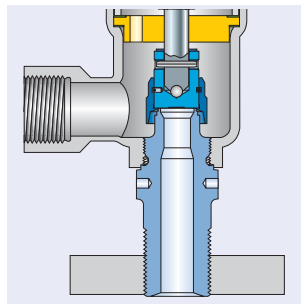
Welding end

For manual or automatic welding equipment

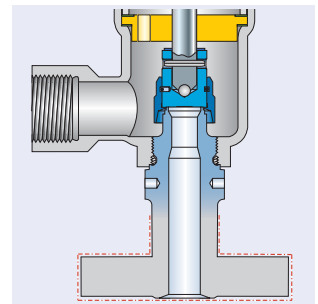


Flange

High pressure technology



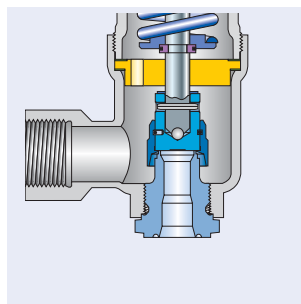
Chemical high pressure flange
IG325 up to IG700



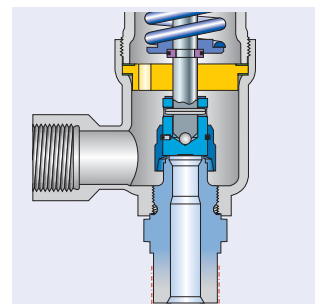
Customer specification

Other

All kind of standards



for integrated pipework,
e. g. LESER type 5034



Customer specification

Type 437



Type 437
Packed knob H4
Conventional design

Type 437
Packed knob H4
Flanged connection



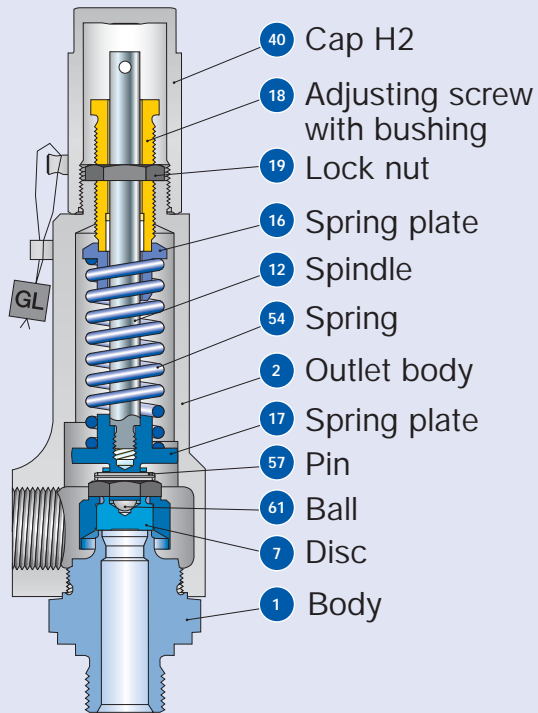
Type 437
Cap H2
Long version

Safety Relief Valves – spring loaded

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Capacities	
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• Air [Metric Units + US Units]	01/17
• Water [Metric Units + US Units]	01/18
Determination of coefficient of discharge K_{dr}/α_w	01/19
Application range of conventional design and long version	01/20

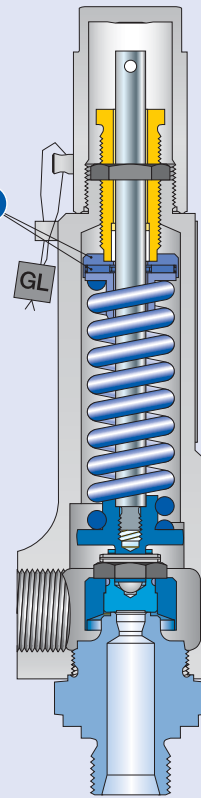
Available designs

Type 437

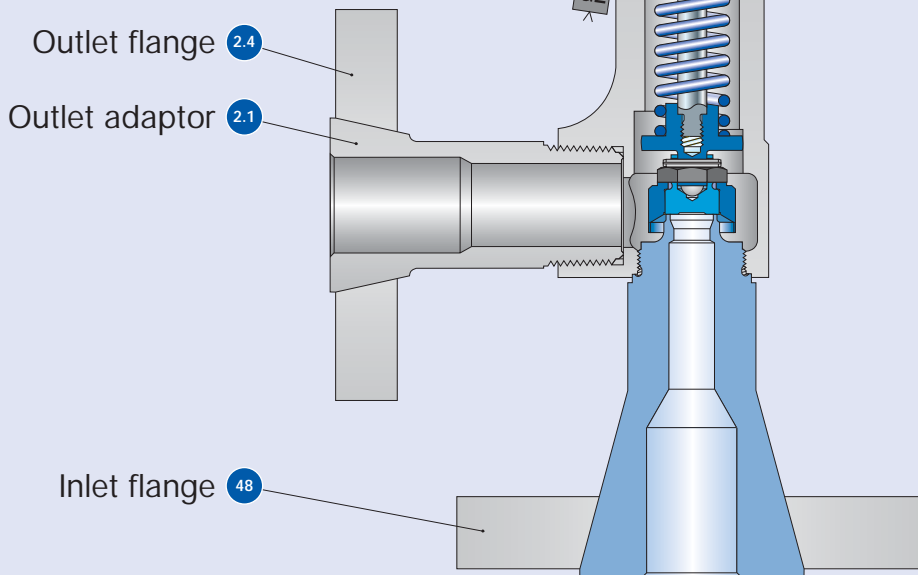


Conventional design
Threaded connection

Axial needle bearing 69



Long version
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials			Type 4373	Type 4374
Item	Component	Remarks	Type 4373	Type 4374
1	Base / Inlet body	Threaded connection	1.4104 SA 479 430	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L
		Long version	1.4404 Stellite SA 479 316L Stellite	1.4404 Stellite SA 479 316L Stellite
2	Outlet body		1.4104 SA 479 430	1.4404 SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L	1.4404 316L
7	Disc		1.4122 Hardened stainless steel	1.4404 SA 316L
		Long version	1.4404 Stellite 316L Stellite	1.4404 Stellite 316L Stellite
12	Spindle		1.4021 420	1.4404 316L
16/17	Spring plate		1.4104 Chrome steel	1.4404 316L
18	Adjusting screw with bushing		1.4104 / PTFE Chrome steel / PTFE	1.4104 / PTFE 316L / PTFE
19	Lock nut		1.0718 Steel	1.4404 316L
40	Cap H2		1.0718 Steel	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L
54	Spring		1.4310 Stainless steel	1.4310 Stainless steel
57	Pin		1.4310 Stainless steel	1.4310 Stainless steel
61	Ball		1.3541 Hardened stainless steel	1.4401 316
69	Axial needle bearing	Long version	1.4404 316L	1.4404 316L

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

Type 437

1

Article Number

1	2	3	4
437	4	314	2

1 Type 437

Types of sealing

Metal seat

Metal-to-metal

Metal-to-metal stellited

Soft seal (Sealing plate)

SP Vespel-SP1

PCTFE Kel-F

PTFE-FDA Teflon

2 Material code

Code	Body material
3	1.4104 (430)
4	1.4404 (316L)

3 Valve code

Identifies valve size, body material and orifice, refer to page 01/07 and following.

4 Code for lifting device

Code	Lifting device	
2	Screwed cap	H2
3	Pull button	H3
4	Packed knob	H4

4374.3142

Article No.

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

10 bar_g

Set Pressure

3

Connections

Please refer to table "Available Connections" on pages 04/04 and 04/05.

Please state one option code for each, inlet **and** outlet.

V62

V71

Connections

4 Options

Type 437	Option code
• Base / Inlet body stellited (Type 437 Standard only)	L20
• Disc stellited	J25
• Plastic seal material	
PTFE	"A" J44
PCTFE	"G" J48
VESPEL SP	"T" J49
• Heating jacket	H29

J44

Options

5 Documentation

Please select requested documentation:

Inspections, tests: **Option code**
 DIN EN 10204-3.2: TÜV-Nord
 Certificate for test pressure **M33**

LESER Certificate for Global Application **H03**
 - Inspection certificate 3.1 acc. to DIN EN 10204
 - Declaration of conformity acc. to PED 97/23/EC

Material test certificate:
 DIN EN 10204-3.1

Part **Option code**
 Base / Inlet body **H01**
 Outlet body **L34**
 Cap / lever cover **L31**
 Disc **L23**

H01 L23

Documentation

6 Code and Medium

1 **2**
2 **0**

1 Code
 1. ASME Section VIII
 2. CE / VdTUEV
 3. ASME Section VIII + CE / VdTUEV

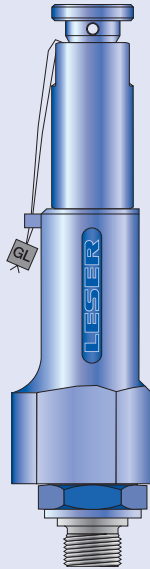
2 Medium
 .1 Gases
 .2 Liquids
 .3 Steam
 .0 Steam / Gases / Liquids (valid only for CE / VdTUEV)

2.0

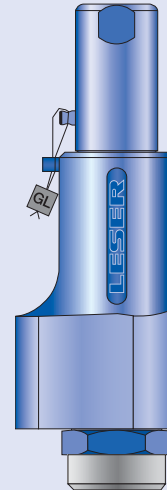
Code and Medium

How to order - Article numbers

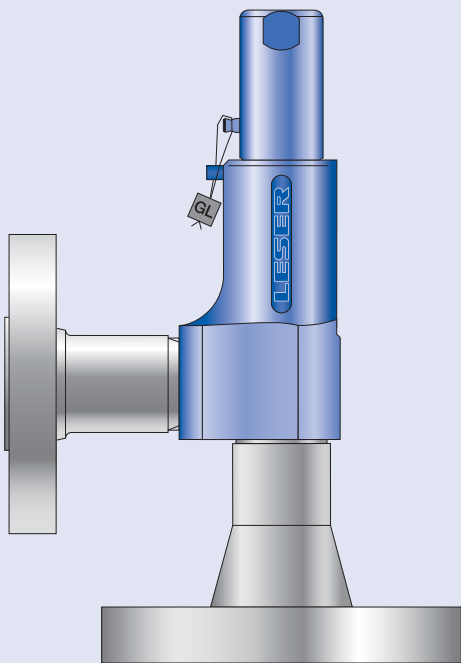
Type 437



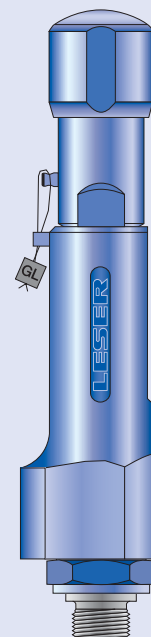
Type 437 Male
Outlet body 1/2"
Pull button H3
Conventional design



Type 437 Female
Outlet body 1"
Cap H2
Conventional design



Type 437 Flanged connection
Outlet body 1"
Cap H2
Conventional design



Type 437 Male
Outlet body 1/2"
Packed knob H4
Long version

How to order – Article numbers

Article numbers

		Conventional design	
Actual Orifice diameter d_0 [mm]		10	
Actual Orifice area A_0 [mm ²]		78,5	
Actual Orifice diameter d_0 [inch]		0,394	
Actual Orifice area A_0 [inch ²]		0,122	
Base / Inlet body material: 1.4104 (430)			
H2	Art.-No. 4373.	2602	
H3	Art.-No. 4373.	2603	
$p_{max} = 10 \text{ bar}_g$			
H4	Art.-No. 4373.	2604	
p [bar _g]	S/G/L	0,1 – 93	
p [psig]	S/G/L	1,5 – 1349	
Base / Inlet body material: 1.4404 (316L)			
H2	Art.-No. 4374.	3142	
H4	Art.-No. 4374.	3144	
p [bar _g]	S/G/L	0,1 – 68	
p [psig]	S/G/L	1,5 – 986	

Article numbers

		Long version		
Actual Orifice diameter d_0 [mm]		6	6	10
Actual Orifice area A_0 [mm ²]		28,3	28,3	78,5
Actual Orifice diameter d_0 [inch]		0,236	0,236	0,394
Actual Orifice area A_0 [inch ²]		0,044	0,044	0,122
Base / Inlet body material: 1.4104 (430)				
H2	Art.-No. 4373.	2622	–	2612
H4	Art.-No. 4373.	2624	–	2614
p [bar _g]	S/G/L	180 – 365	–	93 – 180
p [psig]	S/G/L	2611 – 5294	–	1349 – 2611
Base / Inlet body material: 1.4404 (316L)				
H2	Art.-No. 4374.	3122	3132	3153
H4	Art.-No. 4374.	3124	3134	3154
p [bar _g]		S/G 180 – 365	L 180 – 380 ¹⁾	S/G/L 68 – 180
p [psig]		S/G 2611 – 4786	L 2611 – 5511	S/G/L 986 – 2611

¹⁾ At the moment no TÜV approval, useable for thermal expansion.
 Use "Long version" only for set pressure exceeding set pressure range of "Standard" model.
 For selection of inlet and outlet connection please refer to page 04/04 – 04/05.

Dimensions and weights – Metric Units

Type 437

Threaded connections

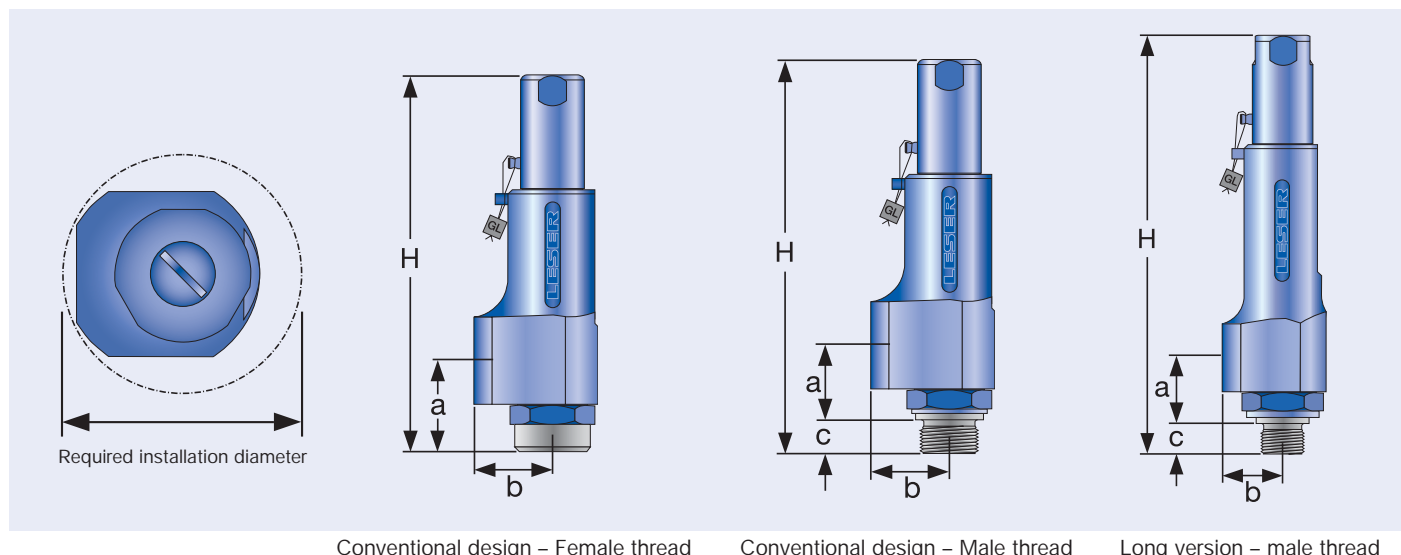
		Conventional design			Long version						
Size Outlet body		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"	
Actual Orifice diameter d_0 [mm]		10	10	10	6	6	6	10	10	10	
Actual Orifice area A_0 [mm ²]		78,5	78,5	78,5	28,3	28,3	28,3	78,5	78,5	78,5	
Weight [kg]		1,2	1,6	1,6	1,4	2,1	2,1	1,4	2,1	2,1	
Required installation diameter [mm]		65	80	80	65	80	80	65	80	80	
Inlet thread "Female"											
DIN ISO 228-1	G	Inlet a	45	55	55	45	55	55	45	55	55
Center to face	[mm]	Outlet b	30	37	37	30	37	37	30	37	37
Height	[mm]	H max.	210	220	220	230	240	240	230	240	240
ISO 7-1/BS 21	Rc	Inlet a	45	55	55	45	55	55	45	55	55
Center to face	[mm]	Outlet b	30	37	37	30	37	37	30	37	37
Height	[mm]	H max.	210	220	220	230	240	240	230	240	240
ANSI/ASME B1.20.1	NPT	Inlet a	45	55	55	45	55	55	45	55	55
Center to face	[mm]	Outlet b	30	37	37	30	37	37	30	37	37
Height	[mm]	H max.	210	220	220	230	240	240	230	240	240
Inlet thread "Male"											
DIN ISO 228-1	G	Inlet a	33	33	36	33	33	36	33	33	36
Center to face	[mm]	Outlet b	30	37	37	30	37	37	30	37	37
ISO 7-1/BS 21	R	Inlet a	31	31	34	31	31	34	31	31	34
Center to face	[mm]	Outlet b	30	37	37	30	37	37	30	37	37
ANSI/ASME B1.20.1	NPT	Inlet a	31	31	34	31	31	34	31	31	34
Center to face	[mm]	Outlet b	30	37	37	30	37	37	30	37	37

Height inlet thread "Male"

		Conventional design				Long version				
Inlet thread		Size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[mm] G	H max.	210	212	214	216	230	232	234	236
ISO 7-1/BS 21	[mm] R	H max.	–	215	216	219	–	235	236	239
ASME B1.20.1	[mm] NPT	H max.	–	218	218	223	–	238	238	243

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[mm] G		12	14	16	18
ISO 7-1/BS 21	[mm] R		–	19	20	23
ASME B1.20.1	[mm] NPT		–	22	22	27



Conventional design – Female thread

Conventional design – Male thread

Long version – male thread

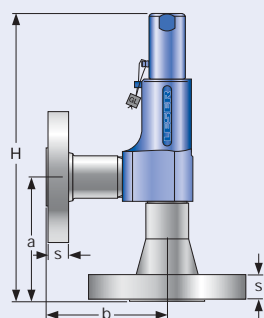
Dimensions and weights – Metric Units

Flanged connection

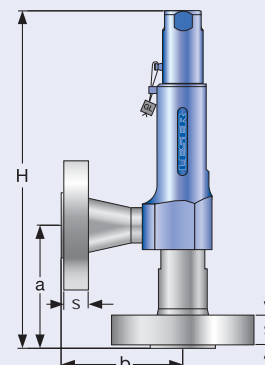
		Conventional design			Long version		
Actual Orifice diameter d_0 [mm]		6	10	6	10		
Actual Orifice area A_0 [mm ²]		28,3	78,5	28,3	78,5		
DIN ISO 1092-1 (Available flange sizes refer to page 04/05)							
Flange rating PN 40							
Center to face [mm]	Inlet a	100	100	100	100		
	Outlet b	100	100	100	100		
Height [H4] [mm]	H max.	263	263	284	284		
Flange rating \geq PN 160							
Center to face [mm]	Inlet a	103	103	103	103		
	Outlet b	100	100	100	100		
Height [H4] [mm]	H max.	266	266	287	287		
ASME B 16.5 (Available flange sizes refer to page 04/05)							
Flange rating class 150							
Center to face [mm]	Inlet a	100	100	100	100		
	Outlet b	100	100	100	100		
Height [H4] [mm]	H max.	263	263	284	284		
Flange rating class \geq 300							
Center to face [mm]	Inlet a	103	103	103	103		
	Outlet b	100	100	100	100		
Height [H4] [mm]	H max.	266	266	287	287		
Weight							
For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)							
Weight net (without inlet and outlet flange) [kg]	W_N	2,4	2,4	2,8	2,8		

Flange dimensions and availability

		DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
Size		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS 1/2"						
Flange thickness [mm]	s	18	22	26	26	30		14	18		26		30,2
Weight slip on flange [kg]	W_F	0,8	1,2	2,5	2,5	3,6		0,6	0,9		2,1		3
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓				✓	✓		✓		
DN 20							NPS 3/4"						
Flange thickness [mm]	s	20	22					15	18		25,4		32
Weight slip on flange [kg]	W_F	1,1	1,3					0,8	1,4		2,3		3,5
Available at Inlet		✓	✓					✓	✓		✓		✓
Available at Outlet		✓	✓					✓	✓		✓		
DN 25							NPS 1"						
Flange thickness [mm]	s	22	26	30	36	40		17	21,5		32,5		40
Weight slip on flange [kg]	W_F	1,3	2,6	3,5	5	7,5		1	2,1		4,1		5,1
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓	✓	✓		✓	✓		✓		



Conventional design



Long version

Dimensions and weights – US Units

Type 437

Threaded connections

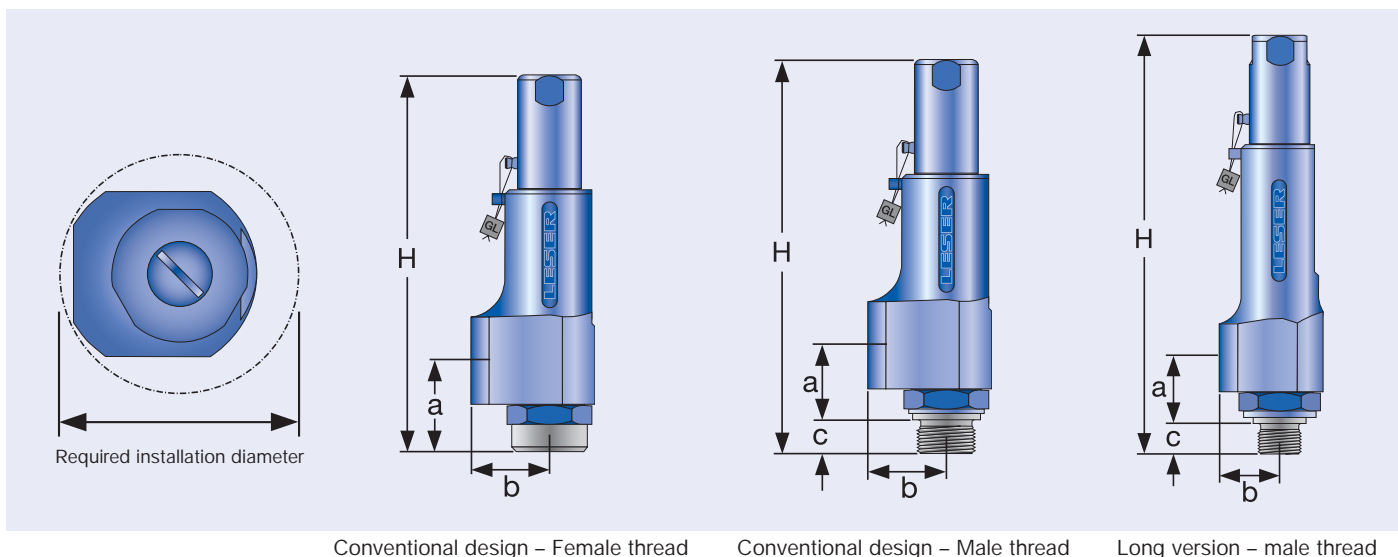
		Conventional design			Long version						
Size Outlet body		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"	
Actual Orifice diameter d_0 [inch]		0,394	0,394	0,394	0,236	0,236	0,236	0,394	0,394	0,394	
Actual Orifice area A_0 [inch ²]		0,122	0,122	0,122	0,044	0,044	0,044	0,122	0,122	0,122	
Weight [lbs]		2,6	3,5	3,5	3,1	4,6	4,6	3,1	4,6	4,6	
Required installation diameter [inch]		2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂	2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂	2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂	
Inlet thread "Female"											
DIN ISO 228-1	G	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆
Height [inch]		H max.	8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆	9 ⁷ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆	9 ⁷ / ₁₆
ISO 7-1/BS 21	Rc	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆
Height [inch]		H max.	8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆	9 ⁷ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆	9 ⁷ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆
Height [inch]		H max.	8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆	9 ⁷ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆	9 ⁷ / ₁₆
Inlet thread "Male"											
DIN ISO 228-1	G	Inlet a	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁷ / ₁₆	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁷ / ₁₆	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁷ / ₁₆
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆
ISO 7-1/BS 21	R	Inlet a	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈	1 ⁷ / ₁₆

Height inlet thread "Male"

		Conventional design				Long version			
Inlet thread	Size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1 [inch]	G H max.	8 ¹ / ₂	8 ⁶ / ₁₆	8 ⁷ / ₁₆	8 ¹ / ₂	9 ¹ / ₁₆	9 ² / ₁₆	9 ³ / ₁₆	9 ⁵ / ₁₆
ISO 7-1/BS 21 [inch]	R H max.	–	8 ⁷ / ₁₆	8 ¹ / ₂	8 ⁵ / ₂	–	9 ¹ / ₄	9 ¹ / ₄	9 ³ / ₈
ASME B1.20.1 [inch]	NPT H max.	–	8 ⁵ / ₈	8 ⁵ / ₈	8 ³ / ₄	–	9 ³ / ₈	9 ³ / ₈	9 ⁵ / ₈

Length of screwed end "c" inlet thread "Male"

Inlet thread	Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1 [inch]	G	1/2	9/16	5/8	6/8
ISO 7-1/BS 21 [inch]	R	–	3/4	13/16	7/8
ASME B1.20.1 [inch]	NPT	–	7/8	7/8	1 ¹ / ₈



Dimensions and weights – US Units

Flanged connection

	Conventional design		Long version	
Actual Orifice diameter d_0 [inch]	0,236	0,394	0,236	0,394
Actual Orifice area A_0 [inch ²]	0,044	0,122	0,044	0,122

DIN ISO 1092-1 (Available flange sizes refer to page 04/05)

Flange rating PN 40

Center to face [inch]	Inlet a	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$
	Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4] [inch]	H max.	$10\frac{3}{8}$	$10\frac{3}{8}$	$11\frac{3}{16}$	$11\frac{3}{16}$

Flange rating \geq PN 160

Center to face [inch]	Inlet a	$4\frac{1}{16}$	$4\frac{1}{16}$	$4\frac{1}{16}$	$4\frac{1}{16}$
	Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4] [inch]	H max.	$10\frac{1}{2}$	$10\frac{1}{2}$	$11\frac{3}{16}$	$11\frac{3}{16}$

ASME B 16.5 (Available flange sizes refer to page 04/05)

Flange rating class 150

Center to face [inch]	Inlet a	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$
	Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4] [inch]	H max.	$10\frac{3}{8}$	$10\frac{3}{8}$	$11\frac{3}{16}$	$11\frac{3}{16}$

Flange rating class \geq 300

Center to face [inch]	Inlet a	$4\frac{1}{16}$	$4\frac{1}{16}$	$4\frac{1}{16}$	$4\frac{1}{16}$
	Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4] [inch]	H max.	$10\frac{1}{2}$	$10\frac{1}{2}$	$11\frac{3}{16}$	$11\frac{3}{16}$

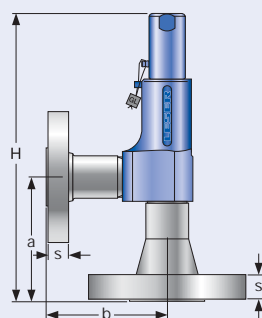
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

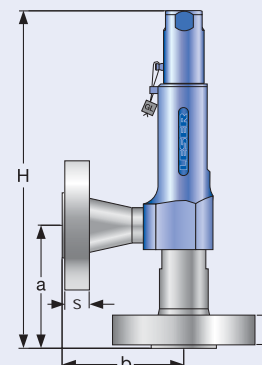
Weight net [lbs] (without inlet and outlet flange) W_N	5,3	5,3	6,2	6,2
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Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class					
		40	160	250	320	400	Size	150	300	600	900	1500
DN 15		NPS $\frac{1}{2}$"										
Flange thickness [inch] s		$\frac{6}{8}$	$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{1}{8}$	$\frac{9}{16}$	$\frac{11}{16}$		$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{3}{16}$
Weight slip on flange [lbs] W_F		1,8	2,6	5,5	5,5	7,9	1,3	2		4,6		6,6
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓
Available at Outlet		✓	✓	✓			✓	✓		✓		
DN 20		NPS $\frac{3}{4}$"										
Flange thickness [inch] s		$\frac{6}{8}$	$\frac{7}{8}$				$\frac{5}{8}$	$\frac{11}{16}$		1		$1\frac{1}{4}$
Weight slip on flange [lbs] W_F		2,4	2,9				1,8	3,1		5		7,7
Available at Inlet		✓	✓				✓	✓		✓		✓
Available at Outlet		✓	✓				✓	✓		✓		
DN 25		NPS 1"										
Flange thickness [inch] s		$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$		$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{5}{8}$
Weight slip on flange [lbs] W_F		2,9	5,7	7,7	11	16,5	2,2	4,6		9		11,2
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓
Available at Outlet		✓	✓	✓	✓	✓	✓	✓		✓		



Conventional design



Long version

Pressure temperature ratings

Metric Units

Actual Orifice diameter d_0 [mm]		6				10			
Actual Orifice Area A_0 [mm ²]		28,3				78,5			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 400				PN 250			
Outlet body	Pressure rating	PN 160				PN 160			
Minimum set pressure	p [bar _g] S/G/L	180 [S/G only]				0,1			
Maximum set pressure	p [bar _g] S/G/L	365 [S/G only]				10 only H3 180			
Temperature acc. to DIN EN	min [°C]	-10				-10			
	max [°C]	+220				+220			
Temperature acc. to ASME	min [°C]	-29				-29			
	max [°C]	+220				+220			
Body material: 1.4404 (316L)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 400				PN 250			
Outlet body	Pressure rating	PN 160				PN 160			
Minimum set pressure	p [bar _g] S/G/L	180 [S/G only]				0,1			
Maximum set pressure	p [bar _g] S/G/L	365 [S/G only]				10 only H3 180			
Temperature acc. to DIN EN	min [°C]	-270				-270			
	max [°C]	+280				+280			
Temperature acc. to ASME	min [°C]	-268				-268			
	max [°C]	+280				+280			

US Units

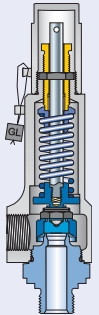
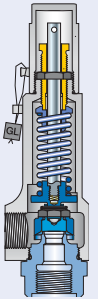
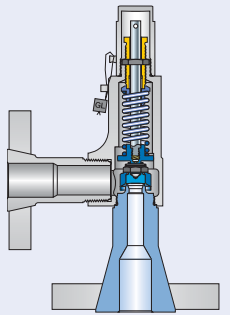
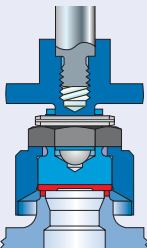
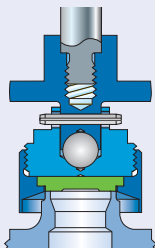
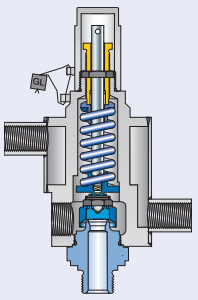
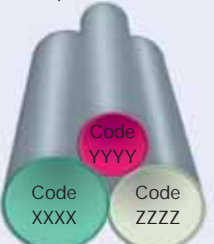
Actual Orifice diameter d_0 [inch]		0,236				0,394			
Actual Orifice area A_0 [inch ²]		0,044				0,122			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
Minimum set pressure	p [bar _g] S/G/L	2610				1,			
Maximum set pressure	p [bar _g] S/G/L	5294				145 only H3 2610			
Temperature acc. to DIN EN	min [°F]	+14				+14			
	max [°F]	+428				+428			
Temperature acc. to ASME	min [°F]	-20				-20			
	max [°F]	+428				+428			
Body material: 1.4404 (316L)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
Minimum set pressure	p [bar _g] S/G/L	2610				1,5			
Maximum set pressure	p [bar _g] S/G/L	5294				145 only H3 2610			
Temperature acc. to DIN EN	min [°F]	-450				-450			
	max [°F]	+536				+536			
Temperature acc. to ASME	min [°F]	-450				-450			
	max [°F]	+536				+536			

Order information – Spare parts

Spare parts									
Actual Orifice diameter d_0 [mm]		6		10					
Actual Orifice area A_0 [mm ²]		28,3		78,5					
Actual Orifice diameter d_0 [inch]		0,236		0,394					
Actual Orifice area A_0 [inch ²]		0,044		0,122					
Body (Item 1): Male thread				Material-No. / Art.-No.					
Connection Size		3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	G	1.4104	-	-	-	136.5239.9000	136.4439.9000	136.4539.9000	136.5839.9000
		316L	-	-	-	136.5249.9000	136.4449.9000	136.4549.9000	136.4849.9000
	316L stellited	136.5169.9000	136.4369.9000	136.5569.9000	136.6769.9000	-	-	-	-
R	316L	-	-	-	-	-	136.4449.9220	136.4549.9220	136.5849.9220
	316L stellited	-	136.4369.9220	136.5569.9220	136.6769.9220	-	-	-	-
ANSI/ASME B1.20.1	NPT	316L	-	-	-	-	136.4449.9204	136.4549.9204	136.5849.9204
		316L stellited	-	136.4369.9204	136.5569.9204	136.6769.9204	-	-	-
Body (Item 1): Female thread				Material-No. / Art.-No.					
Connection Size		3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	G	316L	-	-	-	-	136.4449.9210	136.4549.9210	136.5849.9210
		316L stellited	-	136.4369.9210	136.5569.9210	136.6769.9210	-	-	-
ISO 7-1/BS 21	Rc	316L	-	-	-	-	136.4449.9222	136.4549.9222	136.5849.9222
		316L stellited	-	136.4369.9222	136.5569.9222	136.6769.9222	-	136.4449.9222	136.4549.9222
ANSI/ASME B1.20.1	NPT	316L	-	-	-	-	136.4449.9211	136.4549.9211	136.5849.9211
		316L stellited	-	136.4369.9211	136.5569.9211	136.6769.9211	-	-	-
Body (Item 1): Flange design				Material-No. / Art.-No.					
DN 15 / NPS 1/2"	PN 40 – 400	316L	-	-	-	-	-	136.6349.9208	-
		CL 150	316L	-	-	-	-	136.4449.9202	-
		CL 300 – 2500	316L	-	136.4369.9208	-	-	136.6349.9208	-
DN 20 / NPS 3/4"	PN 40 – 160	316L	-	136.5569.9208	-	-	136.4549.9208	-	
		CL 150 – 2500	316L	-	136.5569.9208	-	-	136.4549.9208	-
DN 25 / NPS 1"	PN 40 – 400	316L	-	136.6769.9208	-	-	136.4449.9208	-	
		CL 150 – 2500	316L	-	136.6769.9208	-	-	136.4449.9208	-
Disc (Item 7): Metal to metal				Material-No. / Art.-No.					
Disc	1.4122	420 RM	-	-	-	-	-	200.8739.9000	-
		316L	-	-	-	-	-	200.8749.9000	-
		316L stellited	-	200.8869.9000	-	-	-	-	-
Disc with sealing plate (Item 7)				Material-No. / Art.-No.					
Disc	1.4404	PTFE "A"	-	200.9249.9005	-	-	-	200.8449.9005	-
		PCTFE "G"	-	200.9249.9006	-	-	-	200.8449.9006	-
		SP "T"	-	200.9249.9007	-	-	-	200.8449.9007	-
Sealing plate (Item 7.3)				Material-No. / Art.-No.					
Sealing plate	1.4404	PTFE "A"	-	236.3259.0000	-	-	-	236.2859.0000	-
		PCTFE "G"	-	236.3269.0000	-	-	-	236.2869.0000	-
		SP "T"	-	236.3279.0000	-	-	-	236.2879.0000	-
Pin (Item 57)				Material-No. / Art.-No.					
Pin	1.4310	-	480.0305.0000	-	-	-	480.0305.0000	-	
Ball (Item 61)				Material-No. / Art.-No.					
Ball	Ball \varnothing [mm]	6		6					
	1.4401	-	510.0104.0000	-	-	-	510.0104.0000	-	

Available Options

Type 437

<p>Male thread</p> 	<p>Female thread</p> 	<p>Flanged version</p> 	
<p>Stellited sealing surface J25: Disc stellited L20: Base/inlet body</p> 	<p>Disc with inserted sealing plate J44: PTFE-FDA "A" J48: PCTFE "G" J49: VESPEL-SP1 "T"</p> 		
<p>Heating jacket H29</p> 			
<p>Special material 2.4610 Hastelloy® C4 2.4360 Monel® 400 1.4462 Duplex</p> 			

Approvals

Approvals			
Actual Orifice diameter d_0 [mm]		6	10
Actual Orifice area A_0 [mm ²]		28,3	78,5
Actual Orifice diameter d_0 [inch]		0,236	0,394
Actual Orifice area A_0 [inch ²]		0,044	0,122
Europe		Coefficient of discharge K_{dr}	
DIN EN ISO 4126-1	Approval No.	0720201110008/0/21-1	
	S/G	0,72	0,50
	L	-	0,35
Germany		Coefficient of discharge α_w	
AD 2000-Merkblatt A2	Approval No.	TÜV SV 980	
	S/G	0,72	0,50
	L	-	0,35
United States		Coefficient of discharge K	
ASME Sec. VIII	Approval No.	-	M 37213
	S/G	-	0,509
	Approval No.	-	M 37189
	L	-	0,370
Canada		Coefficient of discharge K	
CRN	Approval No.	OG0772.9C	
	S/G	-	0,509
	L	-	0,370
China		Coefficient of discharge α_w	
CSBQTS	Approval No.		
	S/G	0,72	0,50
	L	-	0,35
Russia		Coefficient of discharge α_w	
GGTN /	Approval No.	PPC 00-18458	
GOSGOTECHNADZOR	S/G	0,72	0,50
GOST R	L	-	0,35
Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every renewal. A sample certificate including the valid certification number can be taken from the homepage of the classification societies.
Det Norske Veritas	DNV	www.dnv.com	
Germanischer Lloyd	GL	www.gl-group.com	
Lloyd' s Register EMEA	LREMEA	www.lr.org	
Registo Italiano Navale	RINA	www.rina.org	

Capacities – Steam

Capacities for saturated steam according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure. Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

Metric Units		AD 2000-Merkblatt A2 [kg/h]	
Act. Orifice dia. d_0 [mm]		6	10
Act. Orifice area A_0 [mm ²]		28,3	78,5
LEO _{S/G} ^{*)} [inch ²]		0,021	0,057
Set pressure [bar]	Capacities [kg/h]		
0,1			12
0,2			17
0,5			29
1			43
2			70
3			94
4			118
5			141
6			164
7			186
8			209
9			232
10			255
12			301
14			346
16			392
18			437
20			483
22			528
24			573
26			619
28			666
30			712
32			758
34			803
36			849
38			896
40			943
42			990
44			1038
46			1085
48			1133
50			1181
60			1421
70			1670
80			1921
90			2185
100			2451
110			2735
120			3032
130			3345
140			3688
150			4044
160			4445
170			4880
180			5401

No saturated steam application in set pressure range

US Units		ASME Section VIII [lb/h]	
Act. Orifice dia. d_0 [inch]		0,236	0,394
Act. Orifice area A_0 [inch ²]		0,044	0,122
LEO _{S/G} ^{*)} [inch ²]		0,021	0,057
Set pressure [psig]	Capacities [lb/h]		
15			94
20			108
30			137
40			168
50			200
60			232
70			263
80			295
90			326
100			358
120			421
140			484
160			547
180			611
200			674
220			737
240			800
260			863
280			926
300			990
320			1053
340			1116
360			1179
380			1242
400			1306
420			1369
440			1432
460			1495
480			1558
500			1621
600			1937
700			2253
800			2569
900			2885
1000			3201
1100			3516
1200			3832
1300			4148
1400			4458
1500			4803
2000			6641
2500			8788

No saturated steam application in set pressure range

^{*)} LEO_{S/G} = LESER Effective Orifice steam / gas please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Capacities – Air

Capacities for air according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure at 0 °C and 1013 mbar. Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 60°F (16 °C). Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

Metric Units		AD 2000-Merkblatt A2 [m _n ³ /h]	
Act. Orifice dia. d ₀ [mm]		6	10
Act. Orifice area A ₀ [mm ²]		28,3	78,5
LEO _{S/G} ^{*)} [inch ²]		0,021	0,057
Set pressure [bar]	Capacities [m _n ³ /h]		
0,1			14
0,2			19
0,5			34
1			51
2			84
3			115
4			145
5			174
6			204
7			233
8			262
9			292
10			321
12			380
14			439
16			498
18			556
20			615
22			674
24			733
26			792
28			851
30			909
32			968
34			1027
36			1086
38			1145
40			1204
42			1262
44			1321
46			1380
48			1439
50			1498
60			1792
70			2086
80			2380
90			2674
100			2969
110			3263
120			3557
130			3851
140			4145
150			4439
160			4734
170			5028
180			5322
190		2911	
200		3064	
210		3216	
220		3369	
230		3521	
240		3674	
250		3826	
260		3979	
270		4131	
280		4284	
290		4436	
300		4589	
310		4741	
320		4894	
330		5046	
340		5199	
350		5351	
360		5504	
370		5656	
380		5809	

US Units		ASME Section VIII [S.C.F.M.]	
Act. Orifice dia. d ₀ [inch]		0,236	0,394
Act. Orifice area A ₀ [inch ²]		0,044	0,122
LEO _{S/G} ^{*)} [inch ²]		0,021	0,057
Set pressure [psig]	Capacities [S.C.F.M.]		
15			33
20			39
30			49
40			60
50			71
60			83
70			94
80			105
90			117
100			128
120			150
140			173
160			195
180			218
200			241
220			263
240			286
260			308
280			331
300			353
320			376
340			398
360			421
380			443
400			466
420			489
440			511
460			534
480			556
500			579
600			692
700			804
800			917
900			973
1000			1143
1100			1255
1200			1368
1300			1481
1400			1594
1500			1706
2000			2270
2500			2834
3000		1225	
3500		1429	
4000		1632	
4500		1835	
5000		2039	
5500		2242	

*) LEO_{S/G} = LESER Effective Orifice steam / gas please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Capacities – Water

Capacities for water according to AD 2000-Merkblatt A2, based on set pressure plus 10 % overpressure at 20 °C (68 °F). Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 70 °F (21 °C). Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

Metric Units		AD 2000-Merkblatt A2 [10^3 kg/h]	
Act. Orifice dia. d_0 [mm]		6	10
Act. Orifice area A_0 [mm ²]		28,3	78,5
LEO _L ^{*)} [inch ²]		0,021	0,062
Set pressure [bar]	Capacities [10^3 kg/h]		
0,1			0,63
0,2			0,77
0,5			1,08
1			1,5
2			2,1
3			2,5
4			2,9
5			3,3
6			3,6
7			3,9
8			4,1
9			4,4
10			4,6
12			5,1
14			5,5
16			5,9
18			6,2
20			6,6
22			6,9
24			7,2
26			7,5
28			7,8
30			8
32			8,3
34			8,6
36			8,8
38			9
40			9,3
42			9,5
44			9,7
46			9,9
48			10,2
50			10,4
60			11,4
70			12,3
80			13,1
90			13,9
100			14,7
110			15,4
120			16,1
130			16,7
140			17,4
150			18
160			18,5
170			19,1
180			19,7

No TÜV approval, useable for thermal expansion

US Units		ASME Section VIII [US-G.P.M.]	
Act. Orifice dia. d_0 [inch]		0,236	0,394
Act. Orifice area A_0 [inch ²]		0,044	0,122
LEO _L ^{*)} [inch ²]		0,021	0,062
Set pressure [psig]	Capacities [US-G.P.M.]		
15			6,54
20			7,39
30			8,86
40			10,2
50			11,4
60			12,5
70			13,5
80			14,5
90			15,3
100			16,2
120			17,7
140			19,1
160			20,5
180			21,7
200			22,9
220			24
240			25
260			26,1
280			27,1
300			28
320			28,9
340			29,8
360			30,7
380			31,5
400			32,3
420			33,1
440			33,9
460			34,7
480			35,4
500			36,2
600			39,6
700			42,8
800			45,7
900			48,5
1000			51,5
1100			53,6
1200			56
1300			58,3
1400			60,5
1500			62,6
2000			72,3
2500			80,8

No TÜV approval, useable for thermal expansion

^{*)} LEO_L = LESER Effective Orifice liquids please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d₀) in reference to the coefficient of discharge (K_{dr}/α_w)

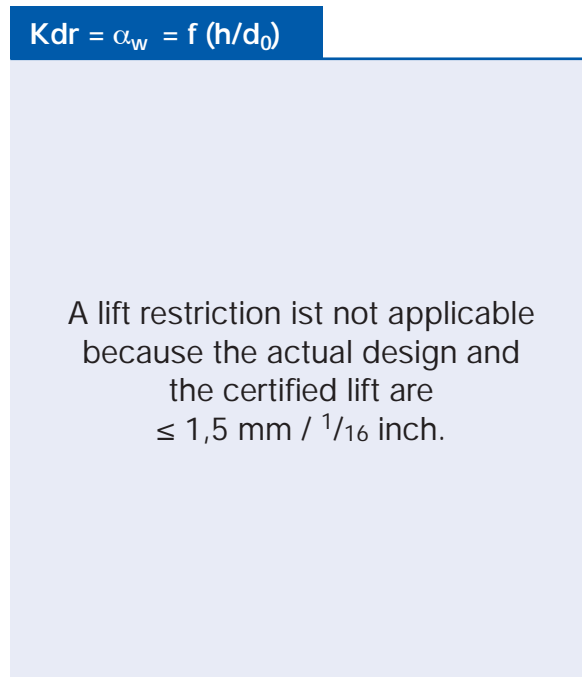
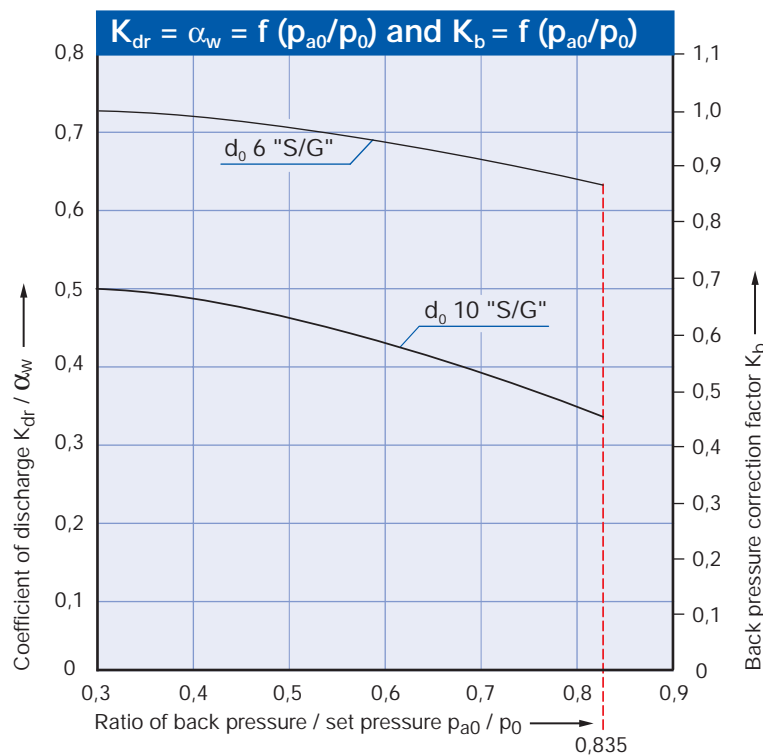



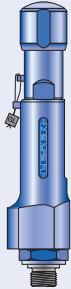
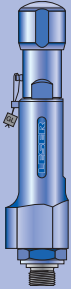
Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)



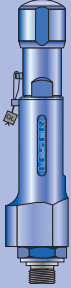


Application range of conventional design and long version

Type 437

Application range

Type 4373	Conventional design		Long version				Set pressure p [psig]																																						
	S/G/L		S/G/L	S/G																																									
 <table border="1"> <tr><th colspan="2">S/G/L</th></tr> <tr><td>Act. Orifice diameter</td><td>d_0 [mm] 10 [inch] 0,394</td></tr> <tr><td>Act. Orifice area</td><td>A_0 [mm²] 78,5 [inch²] 0,122</td></tr> <tr><th>Components</th><th>Materials</th></tr> <tr><td>Base / Inlet Body</td><td>1.4104 SA 479 430</td></tr> <tr><td>Disc</td><td>1.4122 Hardened stainless steel</td></tr> </table>	S/G/L		Act. Orifice diameter	d_0 [mm] 10 [inch] 0,394	Act. Orifice area	A_0 [mm ²] 78,5 [inch ²] 0,122	Components	Materials	Base / Inlet Body	1.4104 SA 479 430	Disc	1.4122 Hardened stainless steel	 <table border="1"> <tr><th colspan="2">S/G/L</th></tr> <tr><td>Act. Orifice diameter</td><td>d_0 [mm] 10 [inch] 0,394</td></tr> <tr><td>Act. Orifice area</td><td>A_0 [mm²] 78,5 [inch²] 0,122</td></tr> <tr><th>Components</th><th>Materials</th></tr> <tr><td>Base / Inlet Body</td><td>1.4104 SA 479 430</td></tr> <tr><td>Disc</td><td>1.4122 Hardened stainless steel</td></tr> </table>	S/G/L		Act. Orifice diameter	d_0 [mm] 10 [inch] 0,394	Act. Orifice area	A_0 [mm ²] 78,5 [inch ²] 0,122	Components	Materials	Base / Inlet Body	1.4104 SA 479 430	Disc	1.4122 Hardened stainless steel	 <table border="1"> <tr><th colspan="2">S/G</th></tr> <tr><td>Act. Orifice diameter</td><td>d_0 [mm] 6 [inch] 0,236</td></tr> <tr><td>Act. Orifice area</td><td>A_0 [mm²] 28,3 [inch²] 0,044</td></tr> <tr><th>Components</th><th>Materials</th></tr> <tr><td>Base / Inlet Body</td><td>1.4404 Stellite SA 479 316L Stellite</td></tr> <tr><td>Disc</td><td>1.4404 Stellite SA 479 316L Stellite</td></tr> </table>	S/G		Act. Orifice diameter	d_0 [mm] 6 [inch] 0,236	Act. Orifice area	A_0 [mm ²] 28,3 [inch ²] 0,044	Components	Materials	Base / Inlet Body	1.4404 Stellite SA 479 316L Stellite	Disc	1.4404 Stellite SA 479 316L Stellite	0	986	1349	2611	4786	5294	5511
	S/G/L																																												
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Disc	1.4404 Stellite SA 479 316L Stellite																																												
	0	68	93	180	330	365	380																																						

Type 4374	Conventional design		Long version				Set pressure p [bar]																																			
	S/G/L		S/G/L	S/G																																						
 <table border="1"> <tr><th colspan="2">S/G/L</th></tr> <tr><td>Act. Orifice diameter</td><td>d_0 [mm] 10 [inch] 0,394</td></tr> <tr><td>Act. Orifice area</td><td>A_0 [mm²] 78,5 [inch²] 0,122</td></tr> <tr><th>Components</th><th>Materials</th></tr> <tr><td>Base / Inlet Body</td><td>1.4404 SA 479 316L</td></tr> <tr><td>Disc</td><td>1.4404 SA 479 316L</td></tr> </table>	S/G/L		Act. Orifice diameter	d_0 [mm] 10 [inch] 0,394	Act. Orifice area	A_0 [mm ²] 78,5 [inch ²] 0,122	Components	Materials	Base / Inlet Body	1.4404 SA 479 316L	Disc	1.4404 SA 479 316L	 <table border="1"> <tr><th colspan="2">S/G/L</th></tr> <tr><td>Act. Orifice diameter</td><td>d_0 [mm] 10 [inch] 0,394</td></tr> <tr><td>Act. Orifice area</td><td>A_0 [mm²] 78,5 [inch²] 0,122</td></tr> <tr><th>Components</th><th>Materials</th></tr> <tr><td>Base / Inlet Body</td><td>1.4404 SA 479 316L</td></tr> <tr><td>Disc</td><td>1.4404 SA 479 316L</td></tr> </table>	S/G/L		Act. Orifice diameter	d_0 [mm] 10 [inch] 0,394	Act. Orifice area	A_0 [mm ²] 78,5 [inch ²] 0,122	Components	Materials	Base / Inlet Body	1.4404 SA 479 316L	Disc	1.4404 SA 479 316L	 <table border="1"> <tr><th colspan="2">S/G</th></tr> <tr><td>Act. Orifice diameter</td><td>d_0 [mm] 6 [inch] 0,236</td></tr> <tr><td>Act. Orifice area</td><td>A_0 [mm²] 28,3 [inch²] 0,044</td></tr> <tr><th>Components</th><th>Materials</th></tr> <tr><td>Base / Inlet Body</td><td>1.4404 Stellite SA 479 316L Stellite</td></tr> <tr><td>Disc</td><td>1.4404 Stellite SA 479 316L Stellite</td></tr> </table>	S/G		Act. Orifice diameter	d_0 [mm] 6 [inch] 0,236	Act. Orifice area	A_0 [mm ²] 28,3 [inch ²] 0,044	Components	Materials	Base / Inlet Body	1.4404 Stellite SA 479 316L Stellite	Disc	1.4404 Stellite SA 479 316L Stellite	Also usable above 330 bar (4786 psig) but TUV requirements will not be fulfilled			
	S/G/L																																									
Act. Orifice diameter	d_0 [mm] 10 [inch] 0,394																																									
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Disc	1.4404 Stellite SA 479 316L Stellite																																									

Type 438



Type 438
Packed knob H4
Conventional design

Type 438
Packed knob H4
Flanged connection



Type 438
Cap H2
Long version

Safety Relief Valves – spring loaded

Contents

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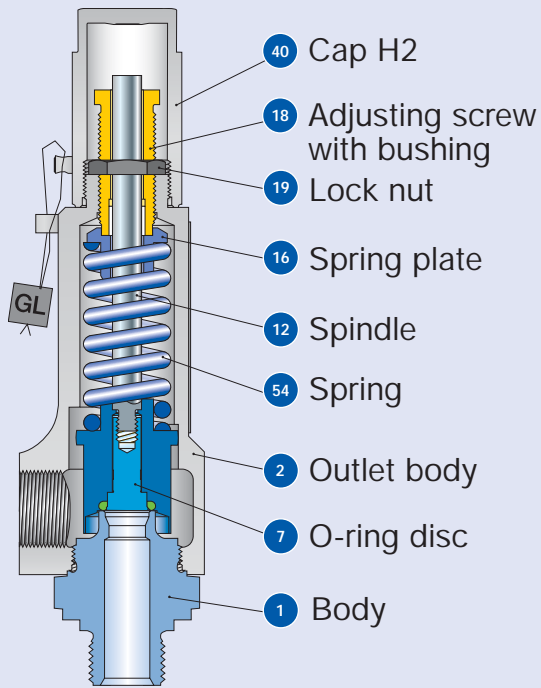
of discharge K_{dr}/α_w

Application range 02/18

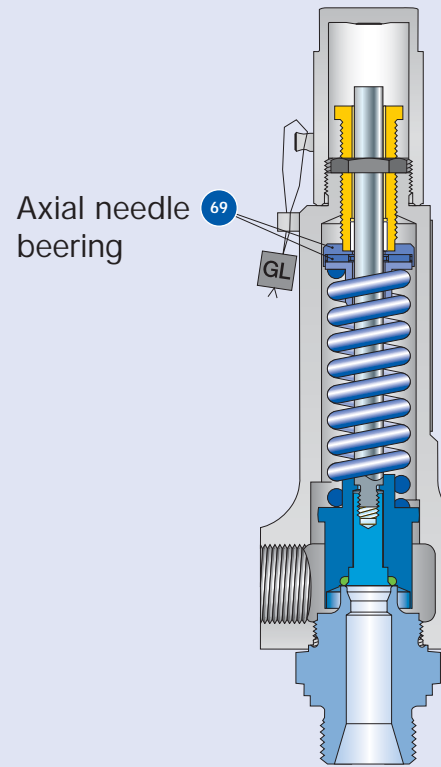
of conventional design and long version

Available designs

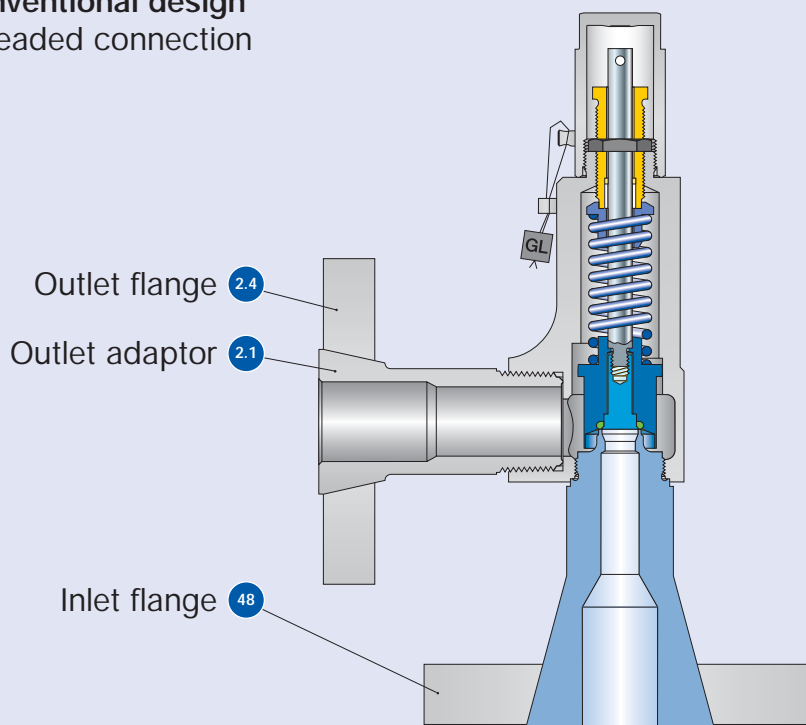
Type 438



Conventional design
Threaded connection



Long version
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials			Type 4383	Type 4384
Item	Component	Remarks	Type 4383	Type 4384
1	Base / Inlet body	Threaded connection	1.4104 SA 479 430	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L
		Long version	1.4404 SA 479 316L	1.4404 SA 479 316L
2	Outlet body		1.4104 SA 479 430	1.4404 SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L	1.4404 316L
7	O-ring disc		1.4404 SA 479 316L	1.4404 SA 479 316L
7.4	Soft seal O-ring	"N"	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene
		"K"	CR Chloroprene	CR Chloroprene
		"D"	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene
		"L"	FKM Fluorocarbon	FKM Fluorocarbon
		"C"	FFKM Perflouro	FFKM Perflouro
12	Spindle		1.4021 420	1.4404 316L
16	Spring plate		1.4104 Chrome steel	1.4404 316L
18	Adjusting screw with bushing		1.4104 / PTFE Chrome steel / PTFE	1.4404 / PTFE 316L / PTFE
19	Lock nut		1.0718 Steel	1.4404 316L
40	Cap H2		1.0718 Steel	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L
54	Spring		1.4310 Stainless steel	1.4310 Stainless steel
57	Pin		1.4310 Stainless steel	1.4310 Stainless steel
61	Ball		1.3541 Hardened stainless steel	1.4401 316
69	Axial needle bearing	Long version	1.4404 316L	1.4404 316L

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

Type 438

1

Article Number

1	2	3	4
438	3	286	2

1 Type 438

Types of sealing

Soft seal	Soft seal material
NBR	Buna-N®
EPDM	Buna-EP®
CR	Neoprene®
FKM	Viton®
FFKM	Kalrez® 6375

2 Material code

Code	Body material
3	1.4104 (430)
4	1.4404 (316L)

3 Valve code

Identifies valve size, body material and orifice, refer to page 02/07 and following.

4 Code for lifting device

Code	Lifting device
2	Screwed cap H2
3	Pull button H3
4	Packed knob H4

4383.2862

Article No.

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

12 bar_g

Set Pressure

3

Connections

Please refer to table "Available Connections" on pages 04/04 and 04/05.

Please state one option code for each, inlet **and** outlet.

V55

V65

Connections

4 Options

Type 438	Option code
• Base / Inlet body 1.4404 (Type 4383 only)	L18
• Soft seal material	
NBR	"N" J30
CR	"K" J21
EPDM	"D" J22
FKM	"L" J23
FFKM	"C" J20
• Heating jacket	H29

J23

Options

5 Documentation

Please select requested documentation:

Inspections, tests: **Option code**
 DIN EN 10204-3.2: TÜV-Nord
 Certificate for test pressure **M33**

LESER Certificate for Global Application **H03**
 - Inspection certificate 3.1 acc. to DIN EN 10204
 - Declaration of conformity acc. to PED 97/23/EC

Material test certificate:
 DIN EN 10204-3.1

Part **Option code**
 Base / Inlet body **H01**
 Outlet body **L34**
 Cap / lever cover **L31**
 Disc **L23**

H01 L23

Documentation

6 Code and Medium

1 **2**
2 . **0**

1 Code
 1. ASME Section VIII
 2. CE / VdTUEV
 3. ASME Section VIII + CE / VdTUEV

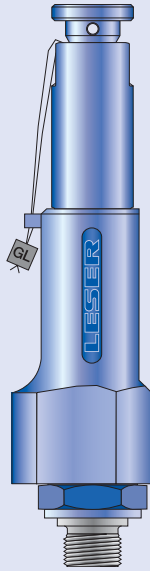
2 Medium
 .1 Gases
 .2 Liquids
 .3 Steam
 .0 Steam / Gases / Liquids (valid only for CE / VdTUEV)

2.0

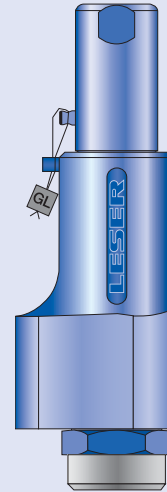
Code and Medium

How to order – Article numbers

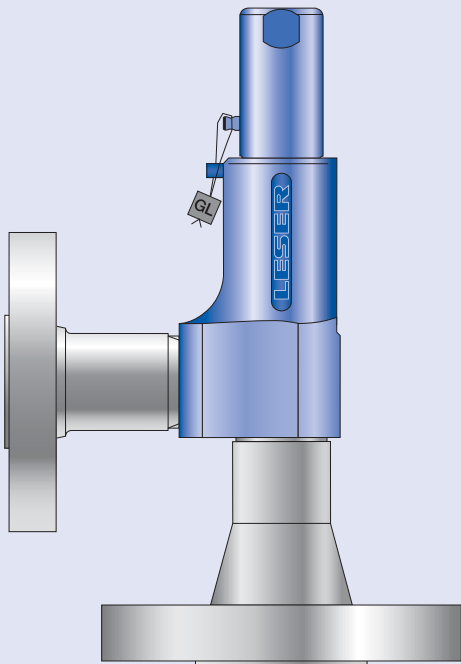
Type 438



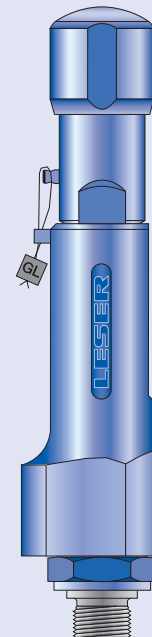
Type 438 Male
Outlet body 1/2"
Pull button H3
Conventional design



Type 438 Female
Outlet body 1"
Cap H2
Conventional design



Type 438 Flanged connection
Outlet body 1"
Cap H2
Conventional design



Type 438 Male
Outlet body 1/2"
Packed knob H4
Long version

How to order – Article numbers

Article numbers

		Conventional design	Long version
Actual Orifice diameter d_0 [mm]		10	10
Actual Orifice area A_0 [mm ²]		78,5	78,5
Actual Orifice diameter d_0 [inch]		0,394	0394
Actual Orifice area A_0 [inch ²]		0,122	0,122
O-ring material		NBR "N" J30	NBR "N" J30
		CR "K" J21	CR "K" J21
		EPDM "D" J22	EPDM "D" J22
		FKM "L" J23	FKM "L" J23
		FFKM "C" J20	FFKM "C" J20
Base / Inlet body material: 1.4104 (430)			
H2	Art.-No. 4383.	2862	2872
H3	Art.-No. 4383. $p_{max} = 10 \text{ bar}_g$	2863	2873
H4	Art.-No. 4383.	2864	2874
p [bar _g]	S/G/L	5 – 93	93 – 180
p [psig]	S/G/L	72,5 – 1349	1349 – 2611
Base / Inlet body material: 1.4404 (316L)			
H2	Art.-No. 4374.	2982	2992
H4	Art.-No. 4374.	2984	2994
p [bar _g]	S/G/L	5 – 68	68 – 180
p [psig]	S/G/L	72,5 – 986	986 – 2611

Dimensions and weights – Metric Units

Threaded connections

Size Outlet body	Conventional design			Long version		
	1/2"	3/4"	1"	1/2"	3/4"	1"
Actual Orifice diameter d_0 [mm]	10	10	10	10	10	10
Actual Orifice area A_0 [mm ²]	78,5	78,5	78,5	78,5	78,5	78,5

Weight [kg]	1,2	1,6	1,6	1,4	2,1	2,1
Required installation diameter [mm]	65	80	80	65	80	80

Inlet thread "Female"

DIN ISO 228-1	G	Inlet a	Conventional design			Long version		
			45	55	55	45	55	55
Center to face [mm]	G	Outlet b	30	37	37	30	37	37
		Height [mm]	H max.	210	220	220	230	240
ISO 7-1/BS 21 <td rowspan="2">Rc <td rowspan="2">Inlet a <td colspan="3">Conventional design</td> <td colspan="3">Long version</td> </td></td>	Rc <td rowspan="2">Inlet a <td colspan="3">Conventional design</td> <td colspan="3">Long version</td> </td>	Inlet a <td colspan="3">Conventional design</td> <td colspan="3">Long version</td>	Conventional design			Long version		
			45	55	55	45	55	55
Center to face [mm]	Rc <td>Outlet b</td> <td>30</td> <td>37</td> <td>37</td> <td>30</td> <td>37</td> <td>37</td>	Outlet b	30	37	37	30	37	37
		Height [mm]	H max.	210	220	220	230	240
ANSI/ASME B1.20.1 <td rowspan="2">NPT <td rowspan="2">Inlet a <td colspan="3">Conventional design</td> <td colspan="3">Long version</td> </td></td>	NPT <td rowspan="2">Inlet a <td colspan="3">Conventional design</td> <td colspan="3">Long version</td> </td>	Inlet a <td colspan="3">Conventional design</td> <td colspan="3">Long version</td>	Conventional design			Long version		
			45	55	55	45	55	55
Center to face [mm]	NPT <td>Outlet b</td> <td>30</td> <td>37</td> <td>37</td> <td>30</td> <td>37</td> <td>37</td>	Outlet b	30	37	37	30	37	37
		Height [mm]	H max.	210	220	220	230	240

Inlet thread "Male"

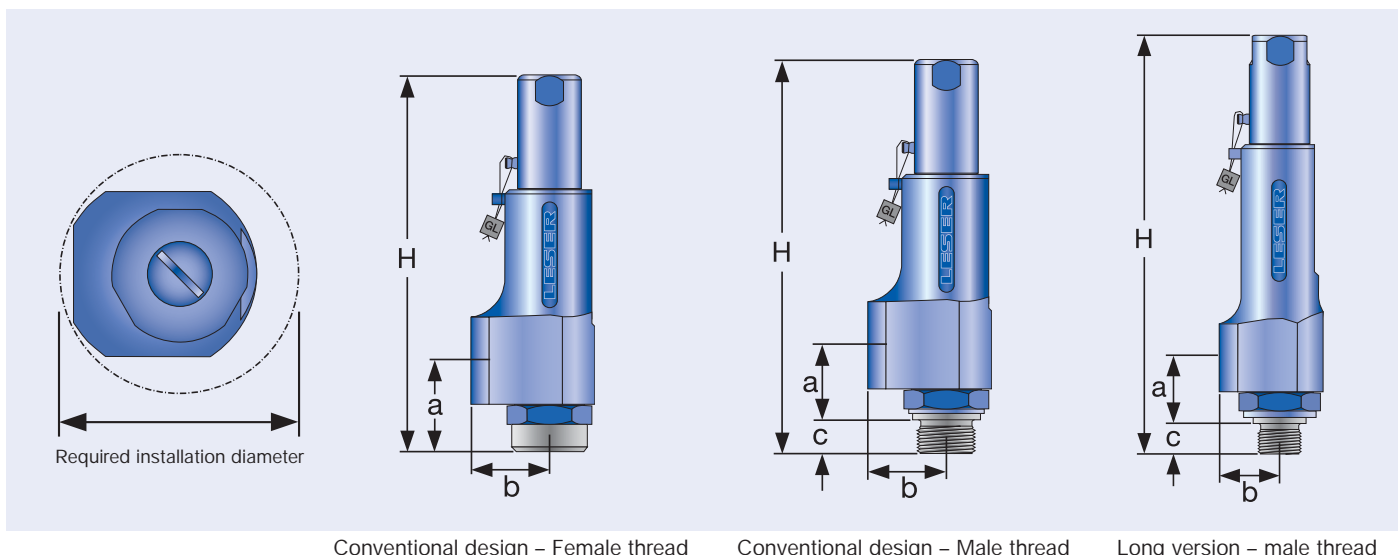
DIN ISO 228-1	G	Inlet a	Conventional design			Long version		
			33	33	36	33	33	36
Center to face [mm]	G <td>Outlet b</td> <td>30</td> <td>37</td> <td>37</td> <td>30</td> <td>37</td> <td>37</td>	Outlet b	30	37	37	30	37	37
		ISO 7-1/BS 21 <td rowspan="2">R <td rowspan="2">Inlet a</td> <td colspan="3">Conventional design</td> <td colspan="3">Long version</td> </td>	R <td rowspan="2">Inlet a</td> <td colspan="3">Conventional design</td> <td colspan="3">Long version</td>	Inlet a	Conventional design			Long version
31	31				34	31	31	34
Center to face [mm]	R <td>Outlet b</td> <td>30</td> <td>37</td> <td>37</td> <td>30</td> <td>37</td> <td>37</td>	Outlet b	30	37	37	30	37	37
		ANSI/ASME B1.20.1 <td rowspan="2">NPT <td rowspan="2">Inlet a</td> <td colspan="3">Conventional design</td> <td colspan="3">Long version</td> </td>	NPT <td rowspan="2">Inlet a</td> <td colspan="3">Conventional design</td> <td colspan="3">Long version</td>	Inlet a	Conventional design			Long version
31	31				34	31	31	34
Center to face [mm]	NPT <td>Outlet b</td> <td>30</td> <td>37</td> <td>37</td> <td>30</td> <td>37</td> <td>37</td>	Outlet b	30	37	37	30	37	37

Height inlet thread "Male"

Inlet thread	Size	Conventional design				Long version				
		3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"	
DIN ISO 228-1	[mm] G	H max.	210	212	214	216	230	232	234	236
ISO 7-1/BS 21	[mm] R	H max.	–	215	216	219	–	235	236	239
ASME B1.20.1	[mm] NPT	H max.	–	218	218	223	–	238	238	243

Length of screwed end "c" inlet thread "Male"

Inlet thread	Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[mm] G	12	14	16	18
ISO 7-1/BS 21	[mm] R	–	19	20	23
ASME B1.20.1	[mm] NPT	–	22	22	27



Conventional design – Female thread

Conventional design – Male thread

Long version – male thread

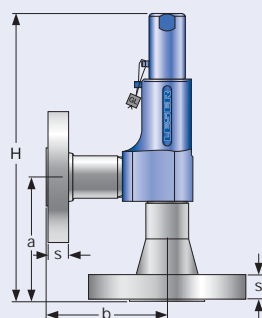
Dimensions and weights – Metric Units

Flanged connection

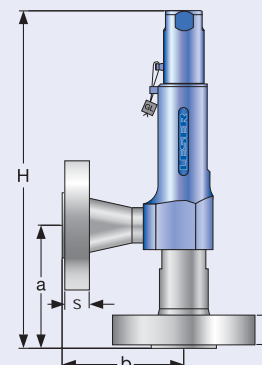
		Conventional design		Long version	
Actual Orifice diameter d_0 [mm]		10		10	
Actual Orifice area A_0 [mm ²]		78,5		78,5	
DIN ISO 1092-1 (Available flange sizes refer to page 04/05)					
Flange rating PN 40					
Center to face	[mm]	Inlet a	100	100	
		Outlet b	100	100	
Height [H4]	[mm]	H max.	263	284	
Flange rating \geq PN 160					
Center to face	[mm]	Inlet a	103	103	
		Outlet b	100	100	
Height [H4]	[mm]	H max.	266	287	
ASME B 16.5 (Available flange sizes refer to page 04/05)					
Flange rating class 150					
Center to face	[mm]	Inlet a	100	100	
		Outlet b	100	100	
Height [H4]	[mm]	H max.	263	284	
Flange rating class \geq 300					
Center to face	[mm]	Inlet a	103	103	
		Outlet b	100	100	
Height [H4]	[mm]	H max.	266	287	
Weight					
For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)					
Weight net	[kg]	W_N	2,4	2,8	
(without inlet and outlet flange)					

Flange dimensions and availability

		DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
Size		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS 1/2"						
Flange thickness	[mm] s	18	22	26	26	30	14	18		26		30,2	
Weight slip on flange	[kg] W_F	0,8	1,2	2,5	2,5	3,6	0,6	0,9		2,1		3	
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Available at Outlet		✓	✓	✓			✓	✓		✓			
DN 20							NPS 3/4"						
Flange thickness	[mm] s	20	22				15	18		25,4		32	
Weight slip on flange	[kg] W_F	1,1	1,3				0,8	1,4		2,3		3,5	
Available at Inlet		✓	✓				✓	✓		✓		✓	✓
Available at Outlet		✓	✓				✓	✓		✓			
DN 25							NPS 1"						
Flange thickness	[mm] s	22	26	30	36	40	17	21,5		32,5		40	
Weight slip on flange	[kg] W_F	1,3	2,6	3,5	5	7,5	1	2,1		4,1		5,1	
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Available at Outlet		✓	✓	✓	✓	✓	✓	✓		✓			



Conventional design



Long version

Dimensions and weights – US Units

Threaded connections

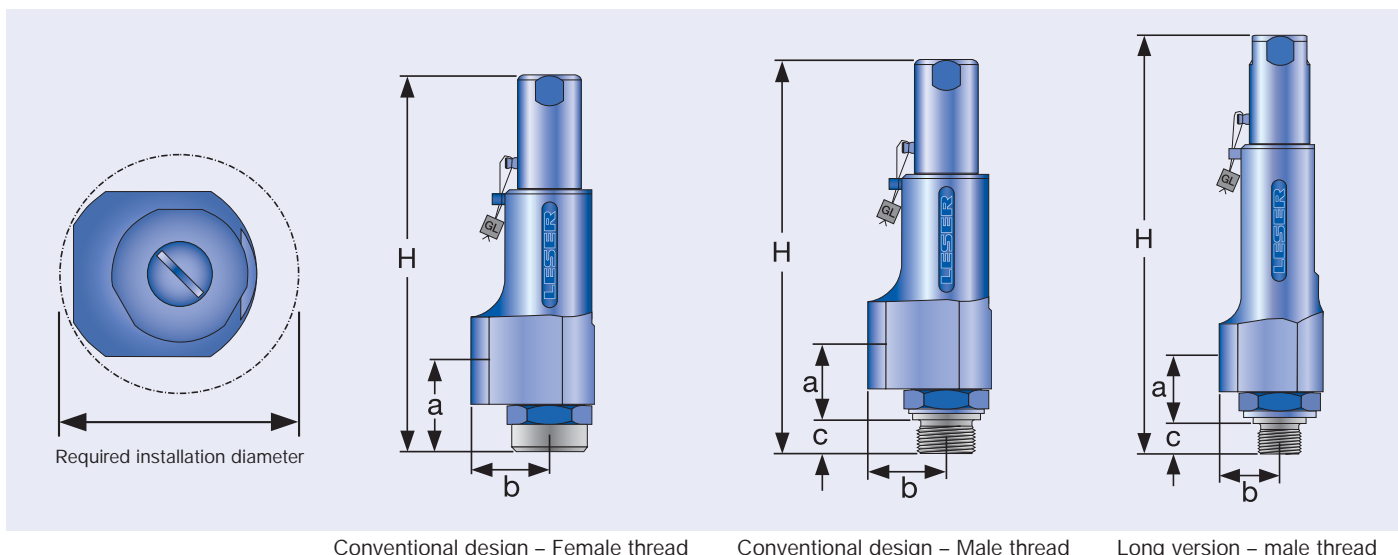
		Conventional design			Long version		
Size Outlet body		1/2"	3/4"	1"	1/2"	3/4"	1"
Actual Orifice diameter d ₀ [inch]		0,394	0,394	0,394	0,394	0,394	0,394
Actual Orifice area A ₀ [inch ²]		0,122	0,122	0,122	0,122	0,122	0,122
Weight [lbs]		2,6	3,5	3,5	3,1	4,6	4,6
Required installation diameter [inch]		2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂	2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂
Inlet thread "Female"							
DIN ISO 228-1	G	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈
Height [inch]	H max.		8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆
ISO 7-1/BS 21	Rc	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈
Height [inch]	H max.		8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄	1 ³ / ₄	2 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈
Height [inch]	H max.		8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆	9 ¹ / ₁₆	9 ⁷ / ₁₆
Inlet thread "Male"							
DIN ISO 228-1	G	Inlet a	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁷ / ₁₆	1 ⁵ / ₁₆	1 ⁵ / ₁₆
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈
ISO 7-1/BS 21	R	Inlet a	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆	1 ¹ / ₄	1 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈
ANSI/ASME B1.20.1	NPT	Inlet a	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆	1 ¹ / ₄	1 ¹ / ₄
		Center to face [inch]	Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆	1 ¹ / ₈

Height inlet thread "Male"

		Conventional design				Long version				
Inlet thread		Size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[inch] G	H max.	8 ¹ / ₂	8 ⁶ / ₁₆	8 ⁷ / ₁₆	8 ¹ / ₂	9 ¹ / ₁₆	9 ² / ₁₆	9 ³ / ₁₆	9 ⁵ / ₁₆
ISO 7-1/BS 21	[inch] R	H max.	–	8 ⁷ / ₁₆	8 ¹ / ₂	8 ⁵ / ₂	–	9 ¹ / ₄	9 ¹ / ₄	9 ³ / ₈
ASME B1.20.1	[inch] NPT	H max.	–	8 ⁵ / ₈	8 ⁵ / ₈	8 ³ / ₄	–	9 ³ / ₈	9 ³ / ₈	9 ⁵ / ₈

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[inch] G		1/2		9/16	5/8
ISO 7-1/BS 21	[inch] R		–		3/4	7/8
ASME B1.20.1	[inch] NPT		–		7/8	1 1/8



Conventional design – Female thread

Conventional design – Male thread

Long version – male thread

Dimensions and weights – US Units

Flanged connection

	Conventional design	Long version
Actual Orifice diameter d_0 [inch]	0,394	0,394
Actual Orifice area A_0 [inch ²]	0,122	0,122

DIN ISO 1092-1 (Available flange sizes refer to page 04/05)

			Flange rating PN 40	
Center to face	[inch]	Inlet a	$3\frac{7}{8}$	$3\frac{7}{8}$
		Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{3}{8}$	$11\frac{3}{16}$

			Flange rating \geq PN 160	
Center to face	[inch]	Inlet a	$4\frac{1}{16}$	$4\frac{1}{16}$
		Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{1}{2}$	$11\frac{3}{16}$

ASME B 16.5 (Available flange sizes refer to page 04/05)

			Flange rating class 150	
Center to face	[inch]	Inlet a	$3\frac{7}{8}$	$3\frac{7}{8}$
		Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{3}{8}$	$11\frac{3}{16}$

			Flange rating class \geq 300	
Center to face	[inch]	Inlet a	$4\frac{1}{16}$	$4\frac{1}{16}$
		Outlet b	$3\frac{7}{8}$	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{1}{2}$	$11\frac{3}{16}$

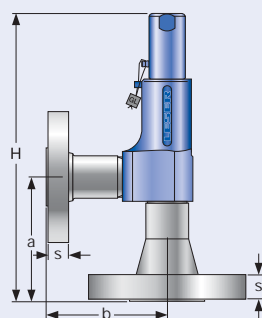
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

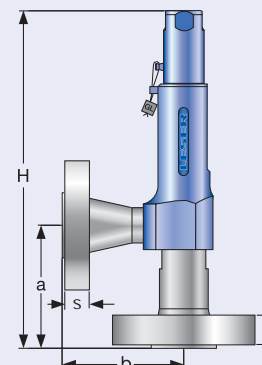
Weight net [lbs] (without inlet and outlet flange) W_N	5,3	6,2
---	-----	-----

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class					
		40	160	250	320	400	Size	150	300	600	900	1500
DN 15		NPS $\frac{1}{2}$"										
Flange thickness [inch]	s	$\frac{6}{8}$	$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{1}{8}$	$\frac{9}{16}$	$\frac{11}{16}$	$1\frac{1}{32}$	$1\frac{3}{16}$		
Weight slip on flange [lbs]	W_F	1,8	2,6	5,5	5,5	7,9	1,3	2	4,6	6,6		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Available at Outlet		✓	✓	✓			✓	✓	✓			
DN 20		NPS $\frac{3}{4}$"										
Flange thickness [inch]	s	$\frac{6}{8}$	$\frac{7}{8}$				$\frac{5}{8}$	$\frac{11}{16}$	1	$1\frac{1}{4}$		
Weight slip on flange [lbs]	W_F	2,4	2,9				1,8	3,1	5	7,7		
Available at Inlet		✓	✓				✓	✓	✓	✓	✓	✓
Available at Outlet		✓	✓				✓	✓	✓			
DN 25		NPS 1"										
Flange thickness [inch]	s	$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$1\frac{1}{4}$	$1\frac{5}{8}$		
Weight slip on flange [lbs]	W_F	2,9	5,7	7,7	11	16,5	2,2	4,6	9	11,2		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Available at Outlet		✓	✓	✓	✓	✓	✓	✓	✓			



Conventional design



Long version

Pressure temperature ratings

Metric Units

		Conventional design				Long version			
Actual Orifice diameter d_0 [mm]		10				10			
Actual Orifice Area A_0 [mm ²]		78,5				78,5			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 320				PN 320			
Outlet body	Pressure rating	PN 160				PN 160			
Minimum set pressure	p [bar _g] S/G/L	5				93			
Maximum set pressure	p [bar _g] S/G/L	10 only H3 93				180			
Temperature acc. to DIN EN	min [°C]	-10				-10			
	max [°C]	+150				+150			
Temperature acc. to ASME	min [°C]	-29				-29			
	max [°C]	+150				+150			
Body material: 1.4404 (316L)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 320				PN 320			
Outlet body	Pressure rating	PN 160				PN 160			
Minimum set pressure	p [bar _g] S/G/L	5				68			
Maximum set pressure	p [bar _g] S/G/L	10 only H3 68				180			
Temperature acc. to DIN EN	min [°C]	-45				-45			
	max [°C]	+150				+150			
Temperature acc. to ASME	min [°C]	-268				-268			
	max [°C]	+150				+150			

US Units

		Standard				Long version			
Actual Orifice diameter d_0 [inch]		0,394				0,394			
Actual Orifice area A_0 [inch ²]		0,122				0,122			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Minimum set pressure	p [psig] S/G/L	72,5				1349		
Maximum set pressure	p [psig] S/G/L	145 only H3 1349				2611			
Temperature acc. to DIN EN	min [°F]	+14				+14			
	max [°F]	+302				+302			
Temperature acc. to ASME	min [°F]	-20				-20			
	max [°F]	+302				+302			
Body material: 1.4404 (316L)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Minimum set pressure	p [psig] S/G/L	72,5				986		
Maximum set pressure	p [psig] S/G/L	145 only H3 986				2611			
Temperature acc. to DIN EN	min [°F]	-49				-49			
	max [°F]	+302				+302			
Temperature acc. to ASME	min [°F]	-450				-450			
	max [°F]	+302				+302			

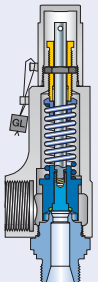
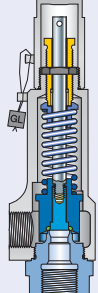
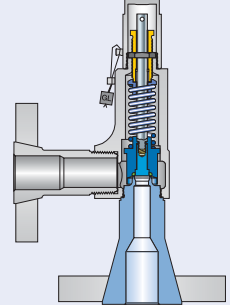
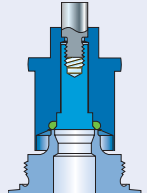
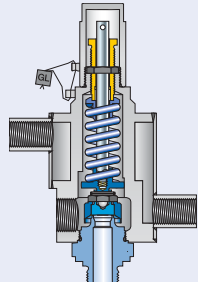
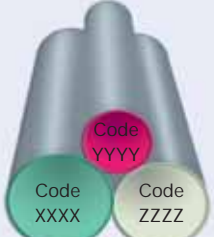
The temperature is limited by soft seal material. The stated values are valid for EPDM.

Order information – Spare parts

Spare parts						
Actual Orifice diameter d_0 [mm]		10				
Actual Orifice area A_0 [mm ²]		78,5				
Actual Orifice diameter d_0 [inch]		0,394				
Actual Orifice area A_0 [inch ²]		0,122				
Body (Item 1): Male thread			Material-No. / Art.-No.			
Connection Size		$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	
DIN ISO 228-1	G	1.4104	136.5339.9000	136.4939.9000	136.5439.9000	136.6839.9000
		316L	136.5349.9000	136.4949.9000	136.5449.9000	136.6849.9000
ISO 7-1/BS 21	R	316L	–	136.4949.9220	136.5449.9220	136.6849.9220
ANSI/ASME B1.20.1	NPT	316L	–	136.4949.9204	136.5449.9204	136.6849.9204
Body (Item 1): Female thread			Material-No. / Art.-No.			
Connection Size		$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	
DIN ISO 228-1	G	316L	–	136.4949.9210	136.5449.9210	136.6849.9210
ISO 7-1/BS 21	Rc	316L	–	136.4949.9222	136.5449.9222	136.6849.9222
ANSI/ASME B1.20.1	NPT	316L	–	136.4949.9211	136.5449.9211	136.6849.9211
Body (Item 1): Flange design			Material-No. / Art.-No.			
DN 15 / NPS $\frac{1}{2}$ "	PN 40 – 400	316L	136.4949.9208			
	CL 150	316L	136.4949.9202			
	CL 300 – 2500	316L	136.4949.9208			
DN 20 / NPS $\frac{3}{4}$ "	PN 40 – 160	316L	136.5449.9208			
	CL 150 – 2500	316L	136.5449.9208			
DN 25 / NPS 1"	PN 40 – 400	316L	136.6449.9208			
	CL 150	316L	136.6849.9202			
	CL 150 – 2500	316L	136.6449.9208			
Disc with O-ring (Item 7)			Material-No. / Art.-No.			
Disc	NBR "N"		200.8349.9781			
	CR "K"		200.8349.9751			
	EPDM "D"		200.8349.9741			
	FKM "L"		200.8349.9771			
	FFKM "C"		200.8349.9791			
O-ring (Item 7.4)			Material-No. / Art.-No.			
O-ring	NBR "N"		502.0107.2681			
	CR "K"		502.0107.2651			
	EPDM "D"		502.0107.2641			
	FKM "L"		502.0107.2671			
	FFKM "C"		502.0107.2691			
Pin (Item 57)			Material-No. / Art.-No.			
Pin	1.4310		480.0305.0000			
Ball (Item 61)			Material-No. / Art.-No.			
Ball	Ball \varnothing [mm]		6			
	1.4401		510.0104.0000			

Available Options

Type 438

<p>Male thread</p> 	<p>Female thread</p> 	<p>Flanged version</p> 	
<p>Soft seal o-ring disc</p> <p>J30: NBR "N" J21: CR "K" J22: EPDM "D" J23: FKM "L" J20: FFKM "C"</p> 			
<p>Heating jacket H29</p> 			
<p>Special material</p> <p>2.4610 Hastelloy® C4 2.4360 Monel® 400 1.4462 Duplex</p> 			

Approvals

Approvals		
Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm ²]		78,5
Actual Orifice diameter d_0 [inch]		0,394
Actual Orifice area A_0 [inch ²]		0,122
Europe		Coefficient of discharge K_{dr}
DIN EN ISO 4126-1	Approval No.	0720201110008/0/21-1
	S/G	0,40
	L	0,33
Germany		Coefficient of discharge α_w
AD 2000-Merkblatt A2	Approval No.	TÜV SV 980
	S/G	0,40
	L	0,33
United States		Coefficient of discharge K
ASME Sec. VIII	Approval No.	M 37190
	S/G	0,406
	Approval No.	M 37202
	L	0,322
Canada		Coefficient of discharge K
CRN	Approval No.	OG0772.9C
	S/G	0,406
	L	0,322
China		Coefficient of discharge α_w
CSBQTS	Approval No.	
	S/G	0,40
	L	0,33
Russia		Coefficient of discharge α_w
GGTN/ GOSGOTECHNADZOR GOST R	Approval No.	PPC 00-18458
	S/G	0,40
	L	0,33
Classification societies		Homepage
Bureau Veritas	BV	www.bureauveritas.com
Det Norske Veritas	DNV	www.dnv.com
Germanischer Lloyd	GL	www.gl-group.com
Lloyd' s Register EMEA	LREMEA	www.lr.org
Registro Italiano Navale	RINA	www.rina.org
<p>The valid certification number is changed with every renewal.</p> <p>A sample certificate including the valid certification number can be taken from the homepage of the classification societies.</p>		

Capacities

Capacities according to AD 2000-Merkblatt A2, based on set pressure plus 10% overpressure. Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2	
Actual Orifice diameter d_0 [mm]		10	
Actual Orifice area A_0 [mm ²]		78,5	
LEO ^{*)} [inch ²]		S/G = 0,051 L = 0,06	
Set pressure		Capacities	
	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]	[kg/h]	[m ³ /h]	[10 ³ kg/h]
0,5	Please select Type 439		
1			
2			
3			
4			
5	113	139	3,09
6	131	163	3,39
7	149	186	3,66
8	168	210	3,91
9	186	233	4,15
10	204	257	4,37
12		304	4,79
14		351	5,17
16		398	5,53
18		445	5,87
20		492	6,18
22		539	6,49
24		586	6,77
26		633	7,05
28		681	7,32
30		728	7,57
32		775	7,82
34		822	8,06
36		869	8,3
38		916	8,52
40		963	8,74
42		1010	8,96
44		1057	9,17
46		1104	9,38
48		1151	9,58
50		1198	9,78
60		1434	10,7
70		1669	11,6
80		1904	12,4
90		2140	13,1
100		2375	13,8
110		2610	14,5
120		2846	15,1
130		3081	15,8
140		3316	16,4
150		3552	16,9
160		3787	17,5
170		4022	18
180		4257	18,5

Capacities according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

US Units		ASME Section VIII	
Actual Orifice diameter d_0 [inch]		0,394	
Actual Orifice area A_0 [inch ²]		0,122	
LEO ^{*)} [inch ²]		S/G = 0,051 L = 0,06	
Set pressure		Capacities	
	Steam saturated	Air 60°F and 14,5 psig	Water 70°F
[psig]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]
10	Please select Type 439		
20			
30			
40			
50			
60	205	73	12,1
70	233	83	13,1
80	261	93	14
90	289	103	14,8
100	317	113	15,6
120	373	133	17,1
140		153	18,5
160		173	19,8
180		193	21
200		213	22,1
220		233	23,2
240		253	24,2
260		273	25,2
280		293	26,2
300		313	27,1
320		333	28
340		353	28,8
360		373	29,7
380		393	30,5
400		413	31,3
420		433	32
440		453	32,8
460		473	33,5
480		493	34,3
500		513	35
600		613	38,3
700		713	41,4
800		813	44,2
900		913	46,9
1000		1013	49,4
1100		1113	51,9
1200		1213	54,2
1300		1313	56,4
1400		1413	58,5
1500		1513	60,5
1600		1613	62,5
1700		1713	64,5
1800		1813	66,3
1900		1912	68,1
2000		2012	69,9
2500		2512	78,2
2650		2662	80,5

*) LEO_{S/G/L} = LESER Effective Orifice steam/gas/liquids please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d₀) in reference to the coefficient of discharge (K_{dr}/α_w)

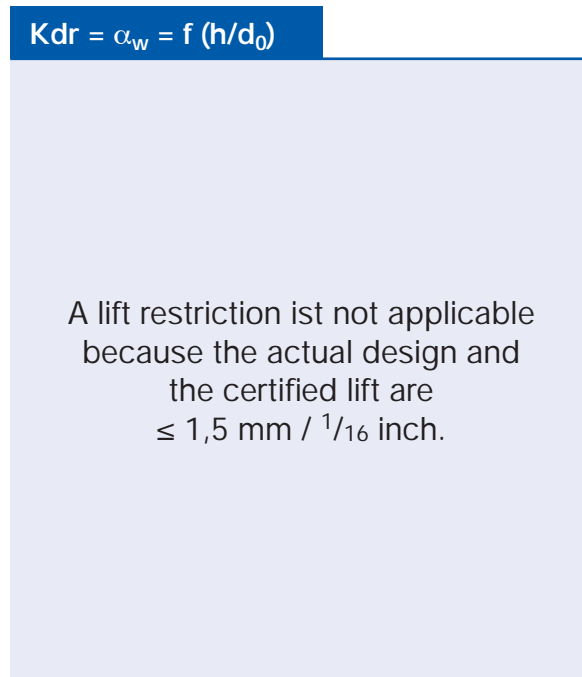
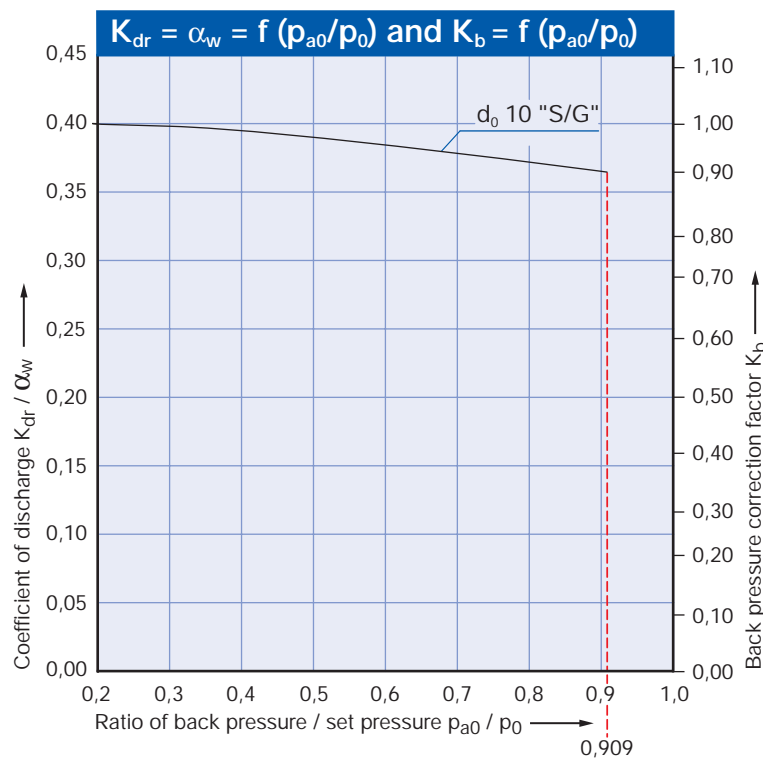


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)





How to use please refer to page 00/08

Application range of conventional design and long version



Application range

Type 438

Type 4383

Conventional design		Long version								
S/G/L		S/G/L								
	Act. Orifice diameter	d_0 [mm]	10							
		[inch]	0,394							
	Act. Orifice area	A_0 [mm ²]	78,5							
		[inch ²]	0,122							
<table border="1"> <thead> <tr> <th>Components</th> <th>Materials</th> </tr> </thead> <tbody> <tr> <td>Base / Inlet Body</td> <td>1.4104 SA 479 430</td> </tr> <tr> <td>Disc</td> <td>1.4404 SA 479 316L</td> </tr> </tbody> </table>		Components	Materials	Base / Inlet Body	1.4104 SA 479 430	Disc	1.4404 SA 479 316L			
Components	Materials									
Base / Inlet Body	1.4104 SA 479 430									
Disc	1.4404 SA 479 316L									
				Set pressure p [psig]						
0	986	1349	2611	→						
0	68	93	180	→						

Type 4384

Conventional design		Long version								
S/G/L		S/G/L								
	Act. Orifice diameter	d_0 [mm]	10							
		[inch]	0,394							
	Act. Orifice area	A_0 [mm ²]	78,5							
		[inch ²]	0,122							
<table border="1"> <thead> <tr> <th>Components</th> <th>Materials</th> </tr> </thead> <tbody> <tr> <td>Base / Inlet Body</td> <td>1.4404 SA 479 316L</td> </tr> <tr> <td>O-ring disc</td> <td>1.4404 SA 479 316L</td> </tr> </tbody> </table>		Components	Materials	Base / Inlet Body	1.4404 SA 479 316L	O-ring disc	1.4404 SA 479 316L			
Components	Materials									
Base / Inlet Body	1.4404 SA 479 316L									
O-ring disc	1.4404 SA 479 316L									
				Set pressure p [bar]						

Type 439



Type 439
Packed knob H4

Safety Relief Valves – spring loaded

Type 439

Contents

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- Metric Units [Threaded connection] 03/08
- [Flanged connection] 03/09
- US Units [Threaded connection] 03/10
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Order information – Spare parts 03/12

Available options 03/13

Approvals 03/14

Capacities

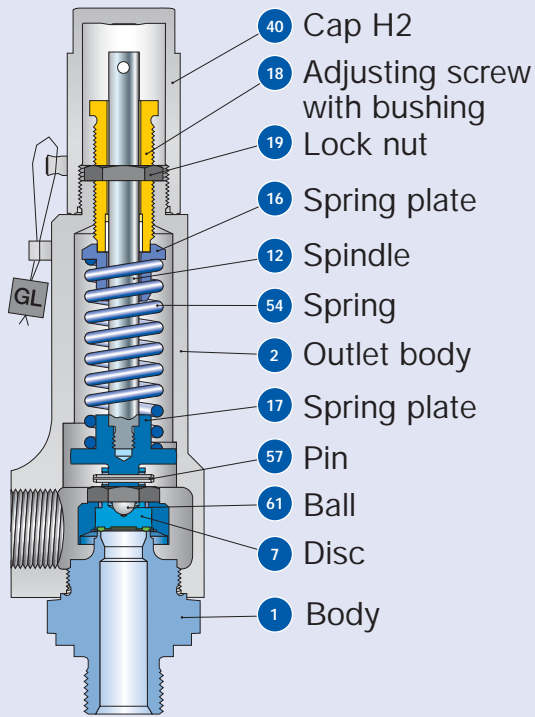
- Steam, Air, Water [Metric Units + US Units] 03/15
- Determination of coefficient of discharge K_{dr}/α_w 03/16



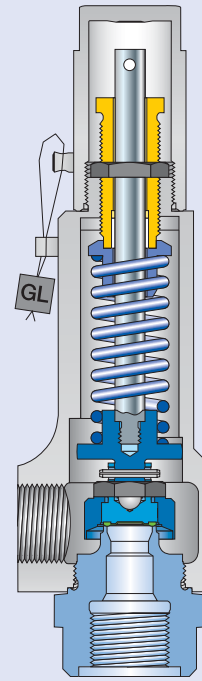
Type 439
Packed knob H4
Flanged connection

Available designs

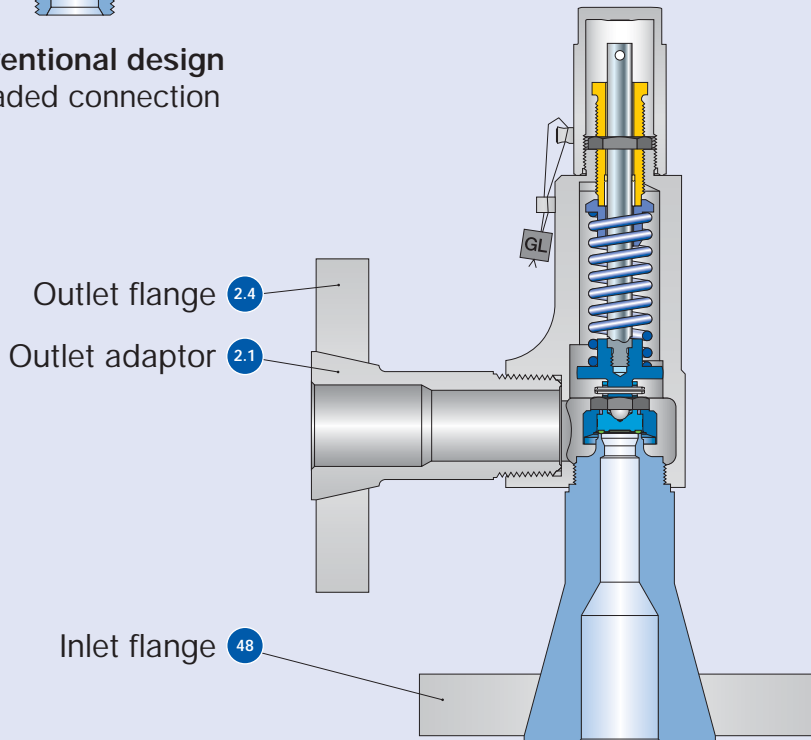
Type 439



Conventional design
Threaded connection



Conventional design
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials			Type 4393	Type 4394
Item	Component	Remarks	Type 4393	Type 4394
1	Base / Inlet body	Threaded connection	1.4104 SA 479 430	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L
2	Outlet body		1.4104 SA 479 430	1.4404 SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L	1.4404 316L
7	Vulcanized soft seal disc		1.4404 SA 479 316L	1.4404 SA 479 316L
7.1	Disc with vulcanized soft seal	"N"	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene
		"K"	CR Chloroprene	CR Chloroprene
		"D"	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene
		"L"	FKM Fluorocarbon	FKM Fluorocarbon
		"C"	FFKM Perflouro	FFKM Perflouro
12	Spindle		1.4021 420	1.4404 316L
16/17	Spring plate		1.4104 Chrome steel	1.4404 316L
18	Adjusting screw with bushing		1.4104 / PTFE Chrome steel / PTFE	1.4404 / PTFE 316L / PTFE
19	Lock nut		1.0718 Steel	1.4404 316L
40	Cap H2		1.0718 Steel	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L
54	Spring		1.4310 Stainless steel	1.4310 Stainless steel
57	Pin		1.4310 Stainless steel	1.4310 Stainless steel
61	Ball		1.3541 Hardened stainless steel	1.4401 316

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

Type 439

1

Article Number

1	2	3	4
439	4	289	4

1 Type 439
Types of sealing

Soft seal	Soft seal material
NBR	Buna-N®
EPDM	Buna-EP®
CR	Neoprene®
FKM	Viton®
FFKM	Kalrez® J9515

2 Material code

Code	Body material
3	1.4104 (430)
4	1.4404 (316L)

3 Valve code

Identifies valve size, body material and orifice, refer to page 03/06 and following.

4 Code for lifting device

Code	Anlüftung	
2	Screwed cap	H2
3	Pull button	H3
4	Packed knob	H4

4394.2894

Article No.

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

12 bar_g

Set Pressure

3

Connections

Please refer to table "Available Connections" on pages 04/04 and 04/05.

Please state one option code for each, inlet **and** outlet.

I31

I46

Connections

4 Options

Type 439	Option code
• Base / Inlet body 1.4404 (Type 4393 only)	L20
• Soft seal material	
NBR	"N" J30
CR	"K" J21
EPDM	"D" J22
FKM	"L" J23
FFKM	"C" J20
• Heating jacket	H29

J23 [] [] []

Options

5 Documentation

Please select requested documentation:

Inspections, tests:	Option code
DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	M33
LESER Certificate for Global Application	H03
- Inspection certificate 3.1 acc. to DIN EN 10204	
- Declaration of conformity acc. to PED 97/23/EC	
Material test certificate:	
DIN EN 10204-3.1	
Part	Option code
Base / Inlet	H01
Outlet body	L34
Cap / lever cover	L31
Disc	L23

H01 L23 []

Documentation

6 Code and Medium

1	2
2	0
1 Code	
1. ASME Section VIII	
2. CE / VdTUEV	
3. ASME Section VIII + CE / VdTUEV	
2 Medium	
.1 Gases	
.2 Liquids	
.3 Steam	
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)	

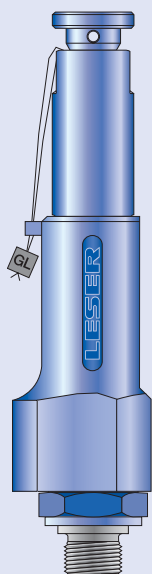
2.0

Code and Medium

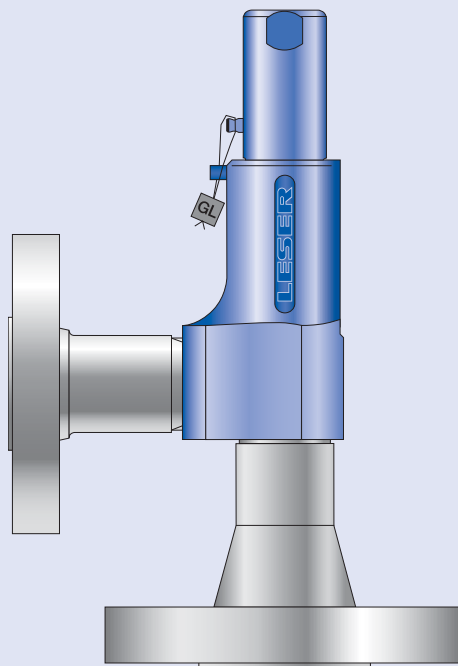
Type 439

How to order – Article numbers

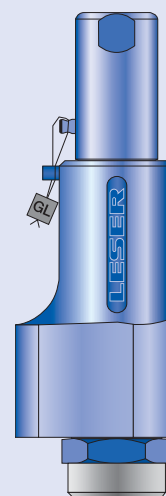
Article numbers		
Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm ²]		78,5
Actual Orifice diameter d_0 [inch]		0,394
Actual Orifice area A_0 [inch ²]		0,122
Soft seal material	NBR "N"	J30
	CR "K"	J21
	EPDM "D"	J22
	FKM "L"	J23
	FFKM "C"	J20
Base / Inlet body material: 1.4104 (430)		
H2	Art.-No. 4393.	2882
H3	Art.-No. 4393.	2883
$p_{max} = 10 \text{ bar}_g$		
H4	Art.-No. 4393.	2884
p [bar _g]	S/G/L	0,1 – 16
p [psig]	S/G/L	1,5 – 232
Base / Inlet body material: 1.4404 (316L)		
H2	Art.-No. 4394.	2892
H4	Art.-No. 4394.	2894
p [bar _g]	S/G/L	0,1 – 16
p [psig]	S/G/L	1,5 – 232



Type 439 Male
Outlet body 1/2"
Pull button H3
Conventional design



Type 439 Flanged connection
Outlet body 1"
Cap H2
Conventional design



Type 439 Female
Outlet body 1"
Cap H2
Conventional design

Pressure temperature ratings

Metric Units					
Actual Orifice diameter d_0 [mm]		10			
Actual Orifice Area A_0 [mm ²]		78,5			
Body material: 1.4104 (430)					
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 320			
Outlet body	Pressure rating	PN 160			
Minimum set pressure	p [bar _g] S/G/L	0,1			
Maximum set pressure	p [bar _g] S/G/L	10 only H3 16			
Temperature acc. to DIN EN	min [°C]	-10			
	max [°C]	+150			
Temperature acc. to ASME	min [°C]	-29			
	max [°C]	+150			
Body material: 1.4404 (316L)					
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 320			
Outlet body	Pressure rating	PN 160			
Minimum set pressure	p [bar _g] S/G/L	0,1			
Maximum set pressure	p [bar _g] S/G/L	10 only H3 16			
Temperature acc. to DIN EN	min [°C]	-45			
	max [°C]	+150			
Temperature acc. to ASME	min [°C]	-268			
	max [°C]	+150			
US Units					
Actual Orifice diameter d_0 [inch]		0,394			
Actual Orifice area A_0 [inch ²]		0,122			
Body material: 1.4104 (430)					
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"
Minimum set pressure	p [psig] S/G/L	1,5			
Maximum set pressure	p [psig] S/G/L	145 only H3 232			
Temperature acc. to DIN EN	min [°F]	+14			
	max [°F]	+302			
Temperature acc. to ASME	min [°F]	-20			
	max [°F]	+302			
Body material: 1.4404 (316L)					
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"
Minimum set pressure	p [psig] S/G/L	0,1			
Maximum set pressure	p [psig] S/G/L	145 only H3 232			
Temperature acc. to DIN EN	min [°F]	-49			
	max [°F]	+302			
Temperature acc. to ASME	min [°F]	-450			
	max [°F]	+302			

Dimensions and weights – Metric Units

Threaded connections

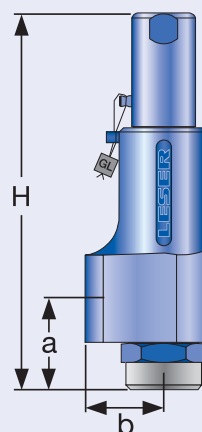
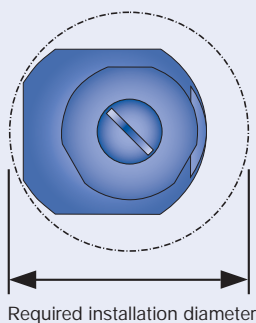
Size Outlet body		1/2"	3/4"	1"	
Actual Orifice diameter d_0 [mm]		10	10	10	
Actual Orifice area A_0 [mm ²]		78,5	78,5	78,5	
Weight [kg]		1,2	1,6	1,6	
Required installation diameter [mm]		65	80	80	
Inlet thread "Female"					
DIN ISO 228-1	G	Inlet a	45	55	55
Center to face [mm]		Outlet b	30	37	37
Height [mm]		H max.	210	220	220
ISO 7-1/BS 21	Rc	Inlet a	45	55	55
Center to face [mm]		Outlet b	30	37	37
Height [mm]		H max.	210	220	220
ANSI/ASME B1.20.1	NPT	Inlet a	45	55	55
Center to face [mm]		Outlet b	30	37	37
Height [mm]		H max.	210	220	220
Inlet thread "Male"					
DIN ISO 228-1	G	Inlet a	33	33	36
Center to face [mm]		Outlet b	30	37	37
ISO 7-1/BS 21	R	Inlet a	31	31	34
Center to face [mm]		Outlet b	30	37	37
ANSI/ASME B1.20.1	NPT	Inlet a	31	31	34
Center to face [mm]		Outlet b	30	37	37

Height inlet thread "Male"

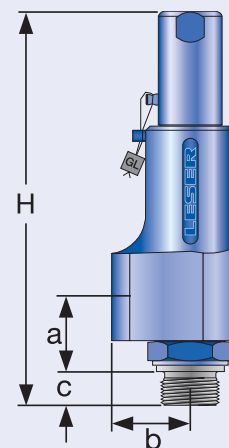
Inlet thread		Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[mm] G	H max.	210	212	214	216
ISO 7-1/BS 21	[mm] R	H max.	-	215	216	219
ASME B1.20.1	[mm] NPT	H max.	-	218	218	223

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[mm] G		12	14	16	18
ISO 7-1/BS 21	[mm] R		-	19	20	23
ASME B1.20.1	[mm] NPT		-	22	22	27



Conventional design – Female thread



Conventional design – Male thread

Dimensions and weights – Metric Units

Flanged connection

Actual Orifice diameter d_0 [mm]	10
Actual Orifice area A_0 [mm ²]	78,5

DIN ISO 1092-1 (Available flange sizes refer to page 04/05)

			Flange rating PN 40
Center to face	[mm]	Inlet a	100
		Outlet b	100
Height [H4]	[mm]	H max.	263
			Flange rating \geq PN 160
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height [H4]	[mm]	H max.	266

ASME B 16.5 (Available flange sizes refer to page 04/05)

			Flange rating class 150
Center to face	[mm]	Inlet a	100
		Outlet b	100
Height [H4]	[mm]	H max.	263
			Flange rating class \geq 300
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height [H4]	[mm]	H max.	266

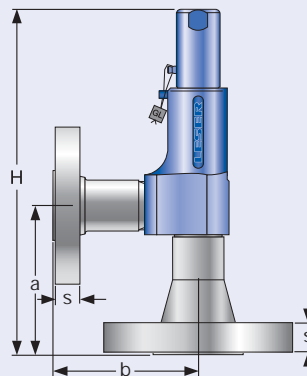
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

Weight net [kg] (without inlet and outlet flange) W_N	2,4
---	-----

Flange dimensions and availability

		DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
Size		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS 1/2"						
Flange thickness [mm]	s	18	22	26	26	30		14	18		26		30,2
Weight slip on flange [kg]	W_F	0,8	1,2	2,5	2,5	3,6		0,6	0,9		2,1		3
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓				✓	✓		✓		
DN 20							NPS 3/4"						
Flange thickness [mm]	s	20	22					15	18		25,4		32
Weight slip on flange [kg]	W_F	1,1	1,3					0,8	1,4		2,3		3,5
Available at Inlet		✓	✓					✓	✓		✓		✓
Available at Outlet		✓	✓					✓	✓		✓		
DN 25							NPS 1"						
Flange thickness [mm]	s	22	26	30	36	40		17	21,5		32,5		40
Weight slip on flange [kg]	W_F	1,3	2,6	3,5	5	7,5		1	2,1		4,1		5,1
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓	✓	✓		✓	✓		✓		



Conventional design

Dimensions and weights – US Units

Threaded connections

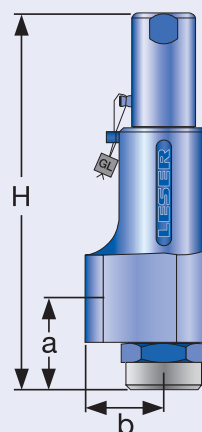
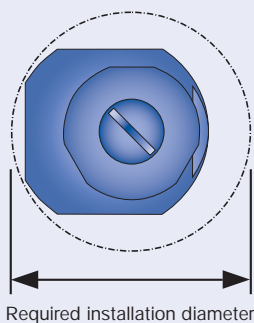
Size Outlet body		1/2"	3/4"	1"	
Actual Orifice diameter d_0 [inch]		0,394	0,394	0,394	
Actual Orifice area A_0 [inch ²]		0,122	0,122	0,122	
Weight [lbs]		2,6	3,5	3,5	
Required installation diameter [inch]		2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂	
Inlet thread "Female"					
DIN ISO 228-1	G	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄
Center to face [inch]		Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆
Height [inch]		H max.	8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆
ISO 7-1/BS 21	Rc	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄
Center to face [inch]		Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆
Height [inch]		H max.	8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	1 ³ / ₄	2 ¹ / ₄	2 ¹ / ₄
Center to face [inch]		Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆
Height [inch]		H max.	8 ¹ / ₂	8 ¹¹ / ₁₆	8 ¹¹ / ₁₆
Inlet thread "Male"					
DIN ISO 228-1	G	Inlet a	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ⁷ / ₁₆
Center to face [inch]		Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆
ISO 7-1/BS 21	R	Inlet a	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆
Center to face [inch]		Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	1 ¹ / ₄	1 ¹ / ₄	1 ⁵ / ₁₆
Center to face [inch]		Outlet b	1 ¹ / ₈	1 ⁷ / ₁₆	1 ⁷ / ₁₆

Height inlet thread "Male"

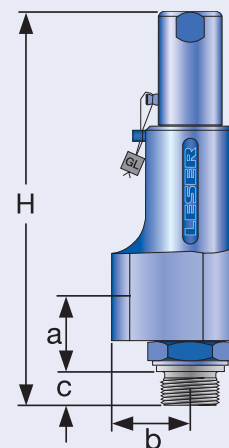
Inlet thread		Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[inch]	G H max.	8 ¹ / ₂	8 ⁶ / ₁₆	8 ⁷ / ₁₆	8 ¹ / ₂
ISO 7-1/BS 21	[inch]	R H max.	–	8 ⁷ / ₁₆	8 ¹ / ₂	8 ⁵ / ₈
ASME B1.20.1	[inch]	NPT H max.	–	8 ⁵ / ₈	8 ⁵ / ₈	8 ³ / ₄

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	[inch]	G	1 ¹ / ₂	9 ¹ / ₁₆	5 ¹ / ₈	6 ¹ / ₈
ISO 7-1/BS 21	[inch]	R	–	3 ¹ / ₄	13 ¹ / ₁₆	7 ¹ / ₈
ASME B1.20.1	[inch]	NPT	–	7 ¹ / ₈	7 ¹ / ₈	1 ¹ / ₈



Conventional design – Female thread



Conventional design – Male thread

Dimensions and weights – US Units

Flanged connections

Actual Orifice diameter d_0 [inch]	0,394
Actual Orifice area A_0 [inch ²]	0,122

DIN ISO 1092-1 (Available flange sizes refer to page 04/05)

			Flange rating PN 40
Center to face	[inch]	Inlet a	$3\frac{7}{8}$
		Outlet b	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{3}{8}$

			Flange rating \geq PN 160
Center to face	[inch]	Inlet a	$4\frac{1}{16}$
		Outlet b	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{1}{2}$

ASME B 16.5 (Available flange sizes refer to page 04/05)

			Flange rating class 150
Center to face	[inch]	Inlet a	$3\frac{7}{8}$
		Outlet b	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{3}{8}$

			Flange rating class \geq 300
Center to face	[inch]	Inlet a	$4\frac{1}{16}$
		Outlet b	$3\frac{7}{8}$
Height [H4]	[inch]	H max.	$10\frac{1}{2}$

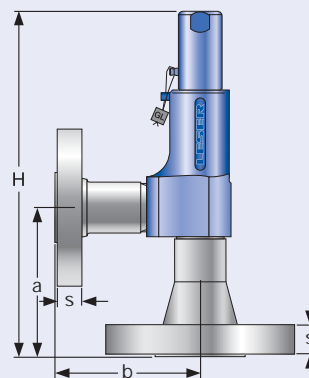
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

Weight net (without inlet and outlet flange)	[lbs]	W_N	5,3
--	-------	-------	-----

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15		NPS $\frac{1}{2}$"											
Flange thickness [inch]	s	$\frac{6}{8}$	$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{1}{8}$	$\frac{9}{16}$	$\frac{11}{16}$		$1\frac{1}{32}$	$1\frac{3}{16}$		
Weight slip on flange [lbs]	W_F	1,8	2,6	5,5	5,5	7,9	1,3	2		4,6	6,6		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
Available at Outlet		✓	✓	✓			✓	✓		✓			
DN 20		NPS $\frac{3}{4}$"											
Flange thickness [inch]	s	$\frac{6}{8}$	$\frac{7}{8}$				$\frac{5}{8}$	$1\frac{1}{16}$		1	$1\frac{1}{4}$		
Weight slip on flange [lbs]	W_F	2,4	2,9				1,8	3,1		5	7,7		
Available at Inlet		✓	✓				✓	✓		✓	✓		✓
Available at Outlet		✓	✓				✓	✓		✓			
DN 25		NPS 1"											
Flange thickness [inch]	s	$\frac{7}{8}$	$1\frac{1}{32}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$\frac{5}{8}$	$\frac{7}{8}$		$1\frac{1}{4}$	$1\frac{5}{8}$		
Weight slip on flange [lbs]	W_F	2,9	5,7	7,7	11	16,5	2,2	4,6		9	11,2		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
Available at Outlet		✓	✓	✓	✓	✓	✓	✓		✓			



Conventional design

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]	10
Actual Orifice area A_0 [mm ²]	78,5
Actual Orifice diameter d_0 [inch]	0,394
Actual Orifice area A_0 [inch ²]	0,122

Body (Item 1): Male thread

Connection Size		$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	
DIN ISO 228-1	G	1.4104	136.5339.9000	136.4939.9000	136.5439.9000	136.6839.9000
		316L	136.5349.9000	136.4949.9000	136.5449.9000	136.6849.9000
ISO 7-1/BS 21	R	316L	-	136.4949.9220	136.5449.9220	136.6849.9220
ANSI/ASME B1.20.1	NPT	316L	-	136.4949.9204	136.5449.9204	136.6849.9204

Body (Item 1): Female thread

Connection Size		$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	
DIN ISO 228-1	G	316L	-	136.4949.9210	136.5449.9210	136.6849.9210
ISO 7-1/BS 21	R	316L	-	136.4949.9222	136.5449.9222	136.6849.9222
ANSI/ASME B1.20.1	NPT	316L	-	136.4949.9211	136.5449.9211	136.6849.9211

Body (Item 1): Flange design

DN 15 / NPS $\frac{1}{2}$ "	PN 40 – 400	316L	136.4949.9208
	CL 150	316L	136.4949.9202
	CL 300 – 2500	316L	136.4949.9208
DN 20 / NPS $\frac{3}{4}$ "	PN 40 – 160	316L	123.5449.9208
	CL 150 – 2500	316L	123.5449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.6449.9208
	CL 150	316L	136.6849.9202
	CL 300 – 2500	316L	136.6449.9208

Vulcanized soft seal disc (Item 7)

Material-No. / Art.-No.

Disc	NBR "N"	200.9049.9781
	CR "K"	200.9049.9051
	EPDM "D"	200.9049.9741
	FKM "L"	200.9049.9771
	FFKM "C"	200.9049.9791

Disc (Item 7.1): With vulcanized soft seal

Material-No. / Art.-No.

Soft seal	NBR "N"	212.5249.9081
	CR "K"	212.5249.9051
	EPDM "D"	212.5249.9041
	FKM "L"	212.5249.9071
	FFKM "C"	212.5249.9091

Pin (Item 57)

Material-No. / Art.-No.

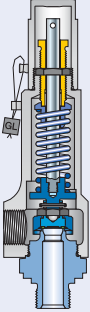
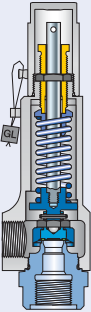
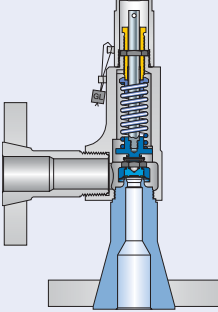
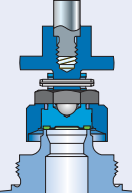
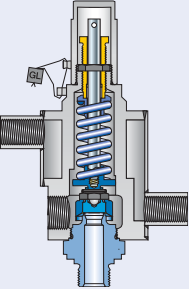
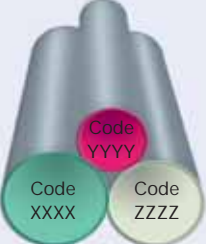
Pin	1.4310	480.0305.0000
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Ball (Item 61)

Material-No. / Art.-No.

Ball	Ball \varnothing [mm]	6
	1.4401	510.0104.0000

Available Options

<p>Male thread</p> 	<p>Female thread</p> 	<p>Flanged version</p> 	
<p>Vulcanized soft seal disc J30: NBR "N" J21: CR "K" J22: EPDM "D" J23: FKM "L" J20: FFKM "C"</p> 			
<p>Heating jacket H29</p> 			
<p>Special material 2.4610 Hastelloy® C4 2.4360 Monel® 400 1.4462 Duplex</p> 			

Type 439

Approvals

Approvals		
Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm ²]		78,5
Actual Orifice diameter d_0 [inch]		0,394
Actual Orifice area A_0 [inch ²]		0,122
Europe Coefficient of discharge K_{dr}		
DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/21-2
	S/G	0,45
	L	0,37
Germany Coefficient of discharge α_w		
AD 2000-Merkblatt A2	Approval No.	TÜV SV 980
	S/G	0,45
	L	0,37
United States Coefficient of discharge K		
ASME Sec. VIII	Approval No.	M 37190
	S/G	0,406
	Approval No.	M 37202
	L	0,322
Canada Coefficient of discharge K		
CRN	Approval No.	OG0772.9C
	S/G	0,406
	L	0,322
China Coefficient of discharge α_w		
CSBQTS	Approval No.	
	S/G	0,45
	L	0,37
Russia Coefficient of discharge α_w		
GGTN/	Approval No.	PPC 00-18458
GOSGOTECHNADZOR	S/G	0,45
GOST R	L	0,37
Classification societies Homepage		
Bureau Veritas	BV	www.bureauveritas.com
Det Norske Veritas	DNV	www.dnv.com
Germanischer Lloyd	GL	www.gl-group.com
Lloyd' s Register EMEA	LREMEA	www.lr.org
Registro Italiano Navale	RINA	www.rina.org
<p>The valid certification number is changed with every renewal.</p> <p>A sample certificate including the valid certification number can be taken from the homepage of the classification societies.</p>		

Capacities

Capacities according to AD 2000-Merkblatt A2, based on set pressure plus 10% overpressure. Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2	
Actual Orifice diameter d_0 [mm]		10	
Actual Orifice area A_0 [mm ²]		78,5	
LEO ^{*)} [inch ²]		S/G = 0,051 L = 0,06	
Set pressure		Capacities	
	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]
0,1	15	18	0,66
0,2	19	22	0,81
0,3	23	26	0,93
0,4	26	30	1,05
0,5	29	34	1,14
0,6	32	37	1,24
0,7	33	40	1,32
0,8	36	43	1,40
0,9	38	45	1,48
1,0	41	49	1,55
1,1	43	51	1,63
1,2	45	54	1,70
1,3	47	56	1,77
1,4	50	60	1,83
1,5	52	63	1,90
1,6	54	65	1,96
1,7	56	68	2,02
1,8	58	70	2,08
1,9	60	73	2,14
2,0	63	76	2,19
2,1	65	78	2,25
2,2	68	83	2,30
2,3	70	85	2,35
2,4	72	88	2,40
2,5	74	90	2,45
2,6	76	93	2,50
2,7	79	96	2,55
2,8	81	98	2,59
2,9	83	101	2,64
3	85	104	2,69
4	106	130	3,10
5	127	157	3,47
6	148	183	3,80
7	168	210	4,10
8	189	236	4,38
9	209	263	4,65
10	230	289	4,90
11		316	5,14
12		342	5,37
13		368	5,59
14		395	5,80
15		421	6,00
16		448	6,20

Capacities according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

US Units		ASME Section VIII	
Actual Orifice diameter d_0 [inch]		0,394	
Actual Orifice area A_0 [inch ²]		0,122	
LEO ^{*)} [inch ²]		S/G = 0,051 L = 0,06	
Set pressure		Capacities	
	Steam saturated	Air 60°F and 14,5 psig	Water 70°F
[psig]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]
5	58	21	4,22
10	70	25	5,37
15	83	30	6,32
20	96	34	7,15
25	109	39	7,89
30	121	43	8,56
35	135	48	9,25
40	149	53	9,90
45	163	58	10,50
50	177	63	11,10
55	191	68	11,60
60	205	73	12,10
65	219	78	12,60
70	233	83	13,10
75	247	88	13,50
80	261	93	14,00
85	275	98	14,40
90	289	103	14,80
95	303	108	15,20
100	317	113	15,60
110	345	123	16,40
120	373	133	17,10
130	401	143	17,80
140	429	153	18,50
150	457	163	19,10
160		173	19,80
170		183	20,40
180		193	21,00
190		203	21,50
200		213	22,10
210		223	22,70
220		233	23,20
230		243	23,70

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11
How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

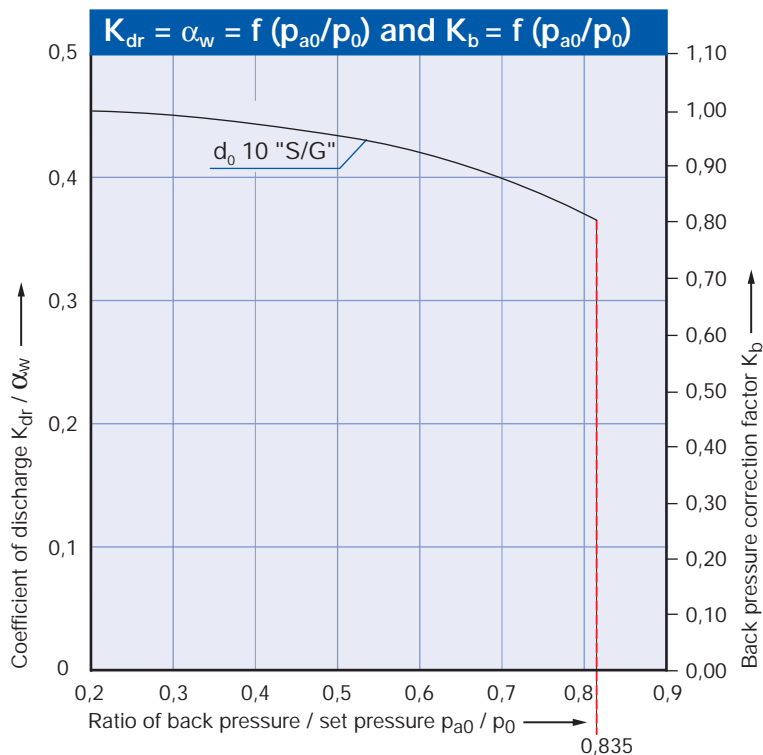
- h = Lift [mm]
- d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d_0 = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p_0 = Set pressure [bar_a]
- p_{a0}/p_0 = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)

$$K_{dr} = \alpha_w = f(h/d_0)$$

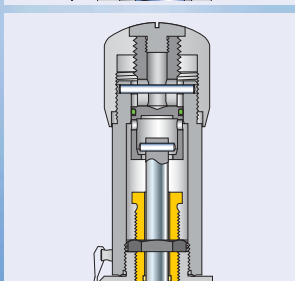
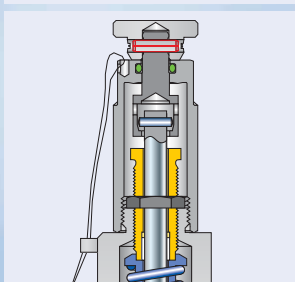
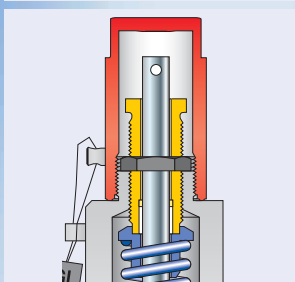
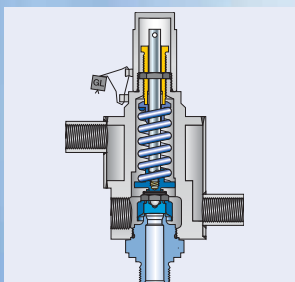
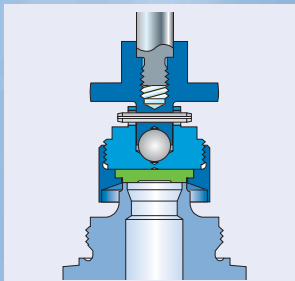
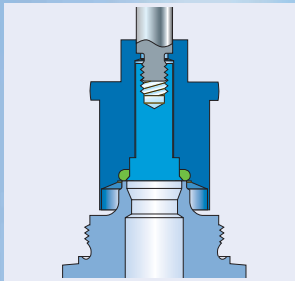
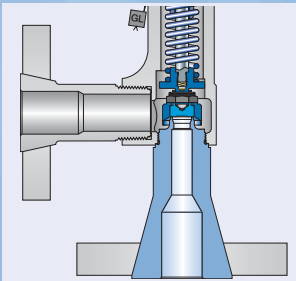
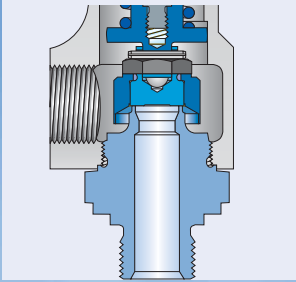
A lift restriction is not applicable because the actual design and the certified lift are $\leq 1,5 \text{ mm} / 1/16 \text{ inch}$.

Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)



How to use please refer to page 00/08

Accessories and Options

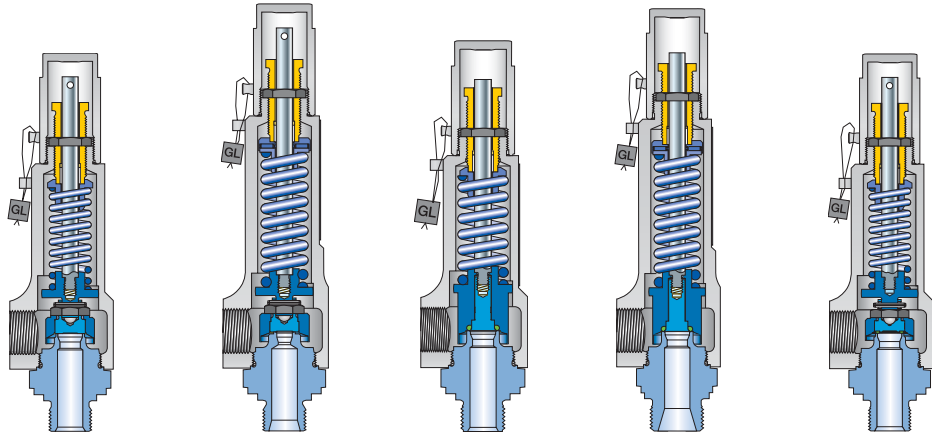


Contents

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Heating jacket	04/09
Installing instructions	04/10

Overview



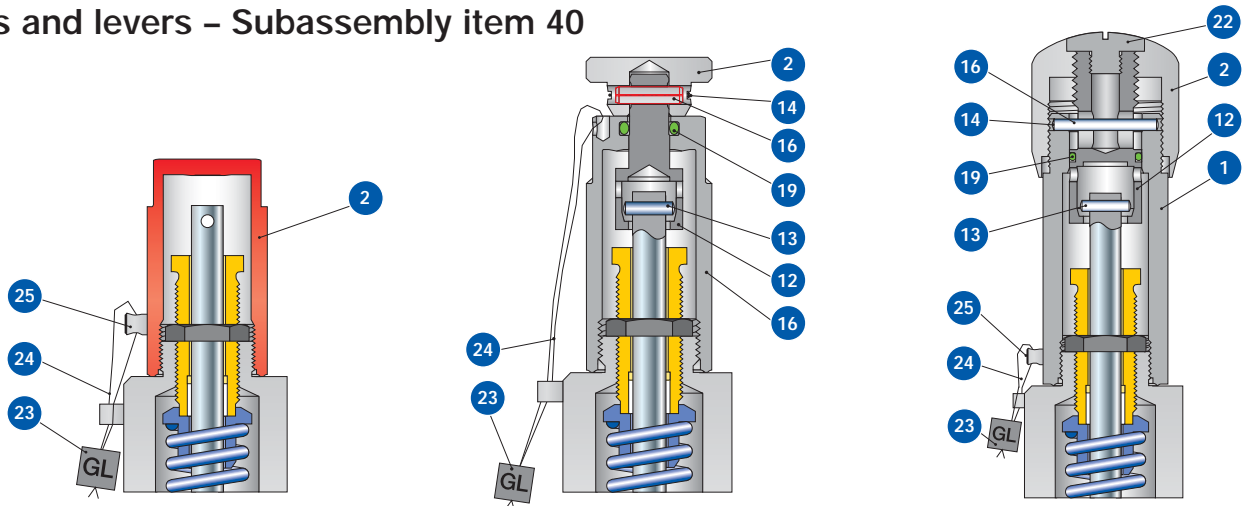
Options

Type	437	437 Long version	438	438 Long version	439	
Base / Inlet body						
Male thread	✓	✓	✓	✓	✓	
Female thread	✓	✓	✓	✓	✓	
Flanged version – DIN ISO 1092-1						
Size DN 15	✓	✓	✓	✓	✓	
Inlet	Flange rating PN 40 – 400					
Outlet	Flange rating PN 40 – 250					
Size DN 20	✓	✓	✓	✓	✓	
Inlet	Flange rating PN 40 + PN 160					
Outlet	Flange rating PN 40 + PN 160					
Size DN 25	✓	✓	✓	✓	✓	
Inlet	Flange rating PN 40 – 400					
Outlet	Flange rating PN 40 – 250					
Flanged version – ASME B16.5						
Size NPS 1/2"	✓	✓	✓	✓	✓	
Inlet	Flange rating class 150 – 2500					
Outlet	Flange rating class 150 – 900					
Size NPS 3/4"	✓	✓	✓	✓	✓	
Inlet	Flange rating class 150 – 2500					
Outlet	Flange rating class 150 – 900					
Size NPS 1"	✓	✓	✓	✓	✓	
Inlet	Flange rating class 150 – 2500					
Outlet	Flange rating class 150 – 900					
Type of sealing						
Metal seat	Metal to metal	✓	✓	-	-	-
	Metal to metal stellite	-	✓	-	-	-
Soft seal	Sealing plate	✓	✓	-	-	-
	O-ring	-	-	✓	✓	-
	Vulcanized soft seal	-	-	-	-	✓
Caps and levers						
H2	✓	✓	✓	✓	✓	
H3	✓	✓	✓	✓	✓	
H4	✓	✓	✓	✓	✓	
Heating jacket						
	✓	✓	✓	✓	✓	

Options

Accessories and Options

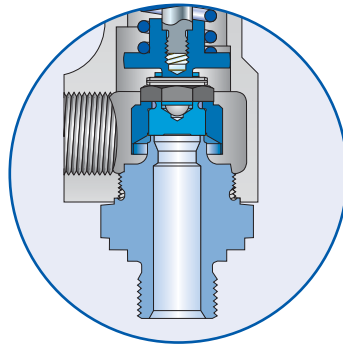
Caps and levers – Subassembly item 40



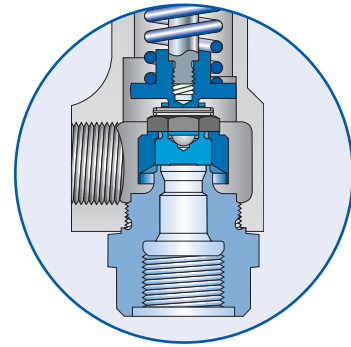
Materials		Steel			Stainless steel	
Item	Component	Cap H2	Pull button H3	Packed knob H4	Cap H2	Packed knob H4
1	Lever cover	-	1.0718 Steel	1.4104 430	-	1.4404 316L
2	Cap	1.0718 Steel	-	1.0718 Steel	1.4404 316L	1.4404 316L
	Knob	-	1.0718 Steel	-	-	-
12	Spindle cap	-	1.4021 420	1.4021 420	-	1.4404 31 6L
		-	-	-	-	-
13	Pin	-	A4 Stainless steel	A4 Stainless steel	-	A4 Stainless steel
		-	-	-	-	-
14	Retaining clip	-	1.4571 316Ti	1.4571 316Ti	-	1.4571 316Ti
		-	-	-	-	-
16	Pin	-	1.4310 Stainless steel	1.4310 Stainless steel	-	1.4310 Stainless steel
		-	-	-	-	-
19	O-ring	-	FKM Fluorocarbon	FKM Fluorocarbon	-	FKM Fluorocarbon
		-	-	-	-	-
22	Stop unit	-	-	1.4104 430	-	1.4404 316L
		-	-	-	-	-
23	Seal	Plastic	Plastic	Plastic	Plastic	Plastic
		-"-	-"-	-"-	-"-	-"-
24	Seal wire	1.4541 321	1.4541 321	1.4541 321	1.4541 321	1.4541 321
		-	-	-	-	-
25	Sealing nose	1.4435 316L	-	1.4435 316L	1.4435 316L	1.4435 316L
		-	-	-	-	-

Available connections

For dimensions and weights refer to:
 Type 437 – page 01/08 + 01/10
 Type 438 – page 02/08 + 02/10
 Type 439 – page 03/08 + 03/10



Male thread



Female thread

Threaded connections

Available for complete 437 series

Valve size		Option code	Inlet	Option code	Outlet
Male thread DIN ISO 228-1					
G	3/8"	V49	✓	-	-
	1/2"	V54	✓	-	-
	3/4"	V55	✓	-	-
	1"	V56	✓	-	-
Female thread DIN ISO 228-1					
G	1/2"	V50	✓	V65	✓
	3/4"	V51	✓	V76	✓
	1"	V52	✓	V66	✓
Male thread DIN ISO 7-1/BS 21					
R/BSPT	1/2"	V30	✓	-	-
	3/4"	V31	✓	-	-
	1"	V32	✓	-	-
Female thread DIN ISO 7-1/BS 21					
Rc/BSPT	1/2"	V38	✓	V34	✓
	3/4"	V39	✓	V35	✓
	1"	V40	✓	V36	✓
Male thread ANSI/ASME B1.20.1					
NPT	1/2"	V61	✓	-	-
	3/4"	V62	✓	-	-
	1"	V63	✓	-	-
Female thread ANSI/ASME B1.20.1					
NPT	1/2"	V58	✓	V70	✓
	3/4"	V59	✓	V71	✓
	1"	V60	✓	V72	✓

Flanged and threaded connections can be combined.
 Threads according to other standards are available.
 Please specify in writing (diameter, pressure rating, standard).

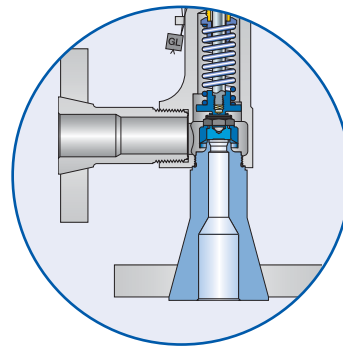
Available connections

For dimensions and weights refer to:

Type 437 – page 01/09 + 01/11

Type 438 – page 02/09 + 02/11

Type 439 – page 03/09 + 03/11



Flanged version

Flanged connections

Available for complete 437 series

	PN	Option code	Inlet	Option code	Outlet
DIN ISO 1092-1 (PN > 100: DIN 2501)					
DN 15	40	I21	✓	I40	✓
	160	I22	✓	I41	✓
	250	I23	✓	I42	✓
	320	I24	✓	–	–
	400	I25	✓	–	–
DN 20	40	I26	✓	I43	✓
	160	I27	✓	I44	✓
	250	–	–	–	–
DN 25	40	I31	✓	I46	✓
	160	I32	✓	I47	✓
	250	I33	✓	I48	✓
	320	I34	✓	–	–
	400	I35	✓	–	–

	Class	Option code	Inlet	Option code	Outlet
ANSI/ASME B 16.5					
NPS 1/2"	150	V01	✓	V24	✓
	300	V02	✓	V13	✓
	600	V02	✓	V13	✓
	900	V03	✓	V14	✓
	1500	V03	✓	–	–
	2500	V04	–	–	–
NPS 3/4"	150	V05	✓	V15	✓
	300	V06	✓	V16	✓
	600	V06	✓	V16	✓
	900	V07	✓	V17	✓
	1500	V07	✓	–	–
	2500	V08	✓	–	–
NPS 1"	150	V09	✓	V18	✓
	300	V10	✓	V19	✓
	600	V10	✓	V19	✓
	900	V11	✓	V20	✓
	1500	V11	✓	–	–
	2500	V12	✓	–	–

Flanged and threaded connections can be combined.

Threads according to other standards are available.

Please specify in writing (diameter, pressure rating, standard).

Sealing surface

Type 437 – Metal seat

LESER metal seats (disc and nozzle) are lapped to optical flatness to ensure a tight seal. LESER safety relief valves are supplied with standard leak tightness according to API 527. Improved tightness is available on request.

Stellited sealing surface – Option code L20 (base/inlet body) and J25 (disc)

The sealing surfaces of the stainless steel disc and nozzle can be stellited by build-up welding. Stellite is a cobalt-chromium based, non-ferrous alloy with increased hardness, corrosion resistance and wear resistance at high temperatures.

LESER recommends stellited sealing surfaces for type 4374 (seat and disc 1.4404 / 316L) in the following cases:

- high pressure applications, due to the high stress of the sealing surfaces
- high temperature applications to avoid a permanent deformation of the sealing surfaces, due to the material properties of the seat and disc
- applications with abrasive fluids to increase the wear resistance of the sealing surfaces.

The stellited sealing surfaces of the disc and base/inlet body are standard for type 437 long version.

Hardness metal seat

Item	Component	Type	Option code	Material		Hardness of sealing surface		
				EN	ASME	Values from standards or manufacturers specification	Average value LESER stock	
1	Base/ Inlet body	4373	*	EN 10088-3, 1.4104	SA 479 430	≤ 220 HBW	EN 10088-3 Table 8	17 – 20 HRC ¹⁾
		4374	*	EN 10272, 1.4404	SA 479 316L	≤ 215 HBW	EN 10272 Table 7	16 – 19 HRC ¹⁾
		4374	L20	EN 10272, 1.4404 stellited	SA 479 316L stellited	≥ 35 HRC	Manufacturers specification	40 HRC
7.1	Disc	4373	*	EN 10088-3, 1.4122 hardened	Hardened stainless steel	≥ 40 HRC	LWN 325.01 Hardening procedure	42 – 46 HRC
		4374	*	EN 10272, 1.4404	SA 479 316L	≤ 215 HBW	EN 10272 Table 7	16 – 19 HRC ¹⁾
		4374	J25	EN 10272, 1.4404 stellited	SA 479 316L stellited	≥ 35 HRC	Manufacturers specification	40 HRC

Standard material of LESER balanced bellows is stainless steel 1.4571 / 316Ti.

HBW: BRINELL hardness acc. DIN EN ISO 6506-1

HRC: ROCKWELL hardness acc. DIN EN ISO 6508-1

¹⁾ Rockwell hardness values below 20 HRC are not allowed according to DIN EN ISO 6508-1. Lower, values are shown for better comparison.

Sealing surface

Types 437, 438, 439 – Soft seal

LESER soft seal solutions allow for superior tightness.

Features and benefits

- 3 different designs for a wide variety application
- large selection of soft seal materials to best adapt to the application
- increased service life of sealing surfaces compared to a metal to metal seat
- simple replacement of the soft seal reduces maintenance costs
- standard ARP O-ring sizes for easy worldwide procurement
- one standard durometer per O-ring material for all set pressures to reduce stocking expenses

Soft seal solutions		Series 437		
Type	437 – sealing plate	438 – O-ring disc	439 – Vulcanized soft seal disc	
Requirements	Improved tightness related to metal seat is required and the temperature is lower than -20°C / -4°F	Superior tightness is required and the set pressure is higher than 5 bar / 75 psig.	Superior tightness is required and the set pressure is below 16 bar / 230 psig.	
Tightness according to LWN 220.01	9,4 x 10 ⁻² mbarl/s	9 x 10 ⁻⁵ mbarl/s	9 x 10 ⁻⁵ mbarl/s	
Example application	Liquefied gases	Gas storage tanks, compressors	Glass systems at laboratories	

Options

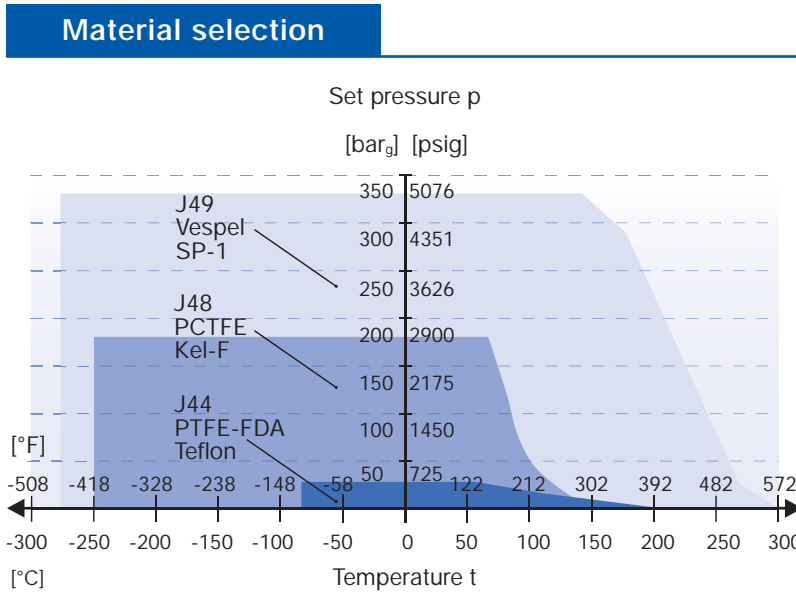
Subassembly of the disc (item 7), bill of materials

Component						
Disc	Item 7.1	1.4404	Item 7.1	1.4404	Item 7.1	1.4404
		SA 479 316L		SA 479 316L		SA 479 316L
Soft seal Materials refer to next page	Item 7.3	sealing plate	Item 7.3	O-ring		vulcanized disc
Lifting aid	Item 7.2	1.4404	Item 7.2	1.4404	Item 7.2	1.4404
		316L		316L		316L
Lock nut		-		-	Item 7.5	1.4404
		-		-		316L

For temperature limits and medium resistance please refer to the soft seal material selection, page 04/08.

Soft seal material selection

Type 437 – Sealing plate



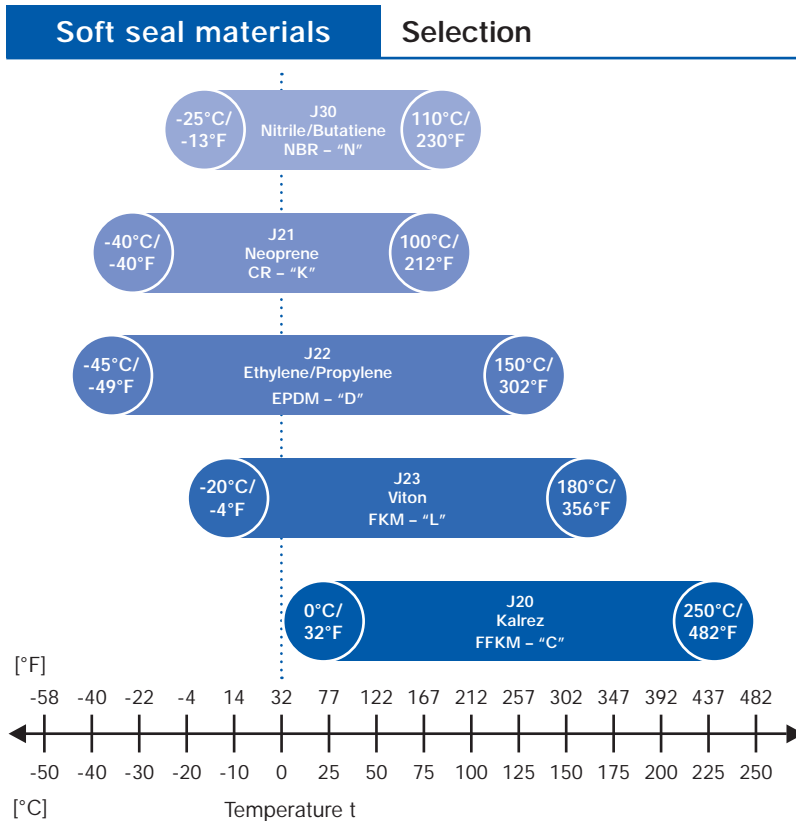
Option code

Option code	Code letter ¹⁾	Application ²⁾
J44	PTFE-FDA "A"	Nearly all chemicals
J48	PCTFE "G"	Cryogenic and refrigeration applications, flammable media applications (e.g. gaseous oxygen) up to 50 bar, 725 psig at 60°C, 140°F
J49	VESPEL-SP1 "T"	High temperature and high pressure applications (no steam), for chemical resistance see www.DuPont.com
Other	"X"	For other materials please contact: your local representative or sales@leser.com

Type 438 – O-ring disc

Type 439 – Vulcanized soft seal disc

The LESER compact performance valves with soft seal disc and broad elastomer material selection represents the ultimate solution for critical applications with special tightness requirements.



Option code

Option code	Code letter ¹⁾	Application ²⁾
J30	NBR "N"	Hydraulic oil, vegetable and animal grease and oil
J21	CR "K"	Parafin oil, silicone oil and grease, water and water based solvents, refrigerants, ozone
J22	EPDM "D"	Hot water and superheated steam up to 150 °C, 302 °F, some organic and inorganic acids, silicone oil and grease, FDA compliant
J23	FKM "L"	High temperature service (no superheated steam), mineral oil and grease, silicone oil and grease, vegetable and animal grease and oil, ozone, FDA compliant compound available on request
J20	FFKM "C"	Nearly all chemicals, standard O-ring compound for type 438 is Kalrez® 6375 with steam resistance, FDA compliant compound available on request. For type 439 the FDA compliant ISOLAST J9515 is standard
Other then listed	"X"	For other materials contact: your local representative or sales@leser.com

¹⁾ The code letters will be stamped on the disc.

²⁾ Pressure and temperature service must be considered in any case.

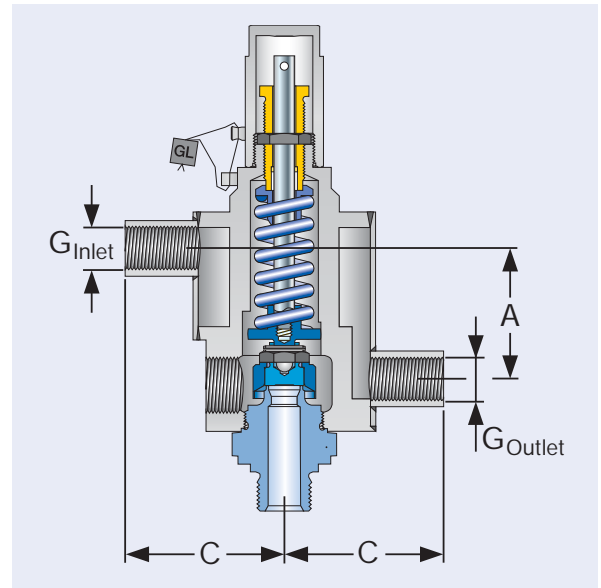
Chemical resistance information is supplied by the O-ring manufacturer.

Heating jacket

Safety valves in systems which need to be protected from media that are viscous, sticky, or have the tendency to crystallize out of solution can be fitted with a heating jacket.

The heating jacket is constructed with a welded design and covers the outlet body (Item 2), allowing heating medias (steam, heat transfer oil, etc.) to pass through the space created.

For the balanced bellows design a separate heating of the bonnet spacer (Item 11) is not necessary. Sufficient heat will transfer to the spacer by convection, due to the compact design of the Series 437.



Heating jacket		
Actual Orifice diameter d_0 [mm]	6	10
Actual Orifice area A_0 [mm ²]	28,3	78,5
Actual Orifice diameter d_0 [inch]	0,236	0,394
Actual Orifice area A_0 [inch ²]	0,044	0,122
Materials		
Outlet body	Series 437	1.4404 316L
	Heating jacket	1.4541 321
Connection		
Couplings DIN 2986	G 3/8" female	1.4571 316Ti

Metric Units			
Size outlet body	1/2"	3/4"	1"
Dimensions			
A [mm]	50	50	50
C [mm]	61	71	71
G ["]	3/8	3/8	3/8
Operating conditions		Operating pressure [bar]	
Temperature	20 [°C]	25	
	210 [°C]	18	

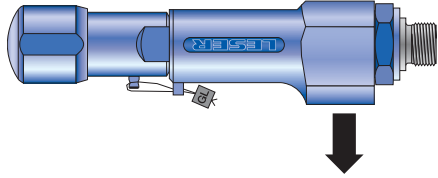
US Units			
Size outlet body	1/2"	3/4"	1"
Dimensions			
A [inch]	1 ¹⁵ / ₁₆	1 ¹⁵ / ₁₆	1 ¹⁵ / ₁₆
C [inch]	2 ³ / ₈	2 ³ / ₄	2 ³ / ₄
G ["]	3/8	3/8	3/8
Operating conditions		Operating pressure [psig]	
Temperature	68 [°F]	363	
	410 [°F]	261	

Options

Installing instructions

Horizontal fitting

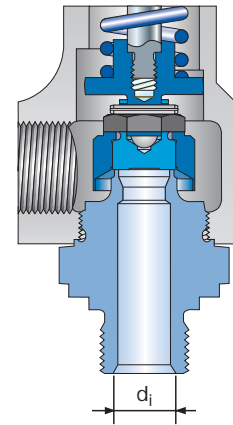
For horizontal fitting certified



Attention! Only with outlet in direction downwards.

Inlet pipe dimension

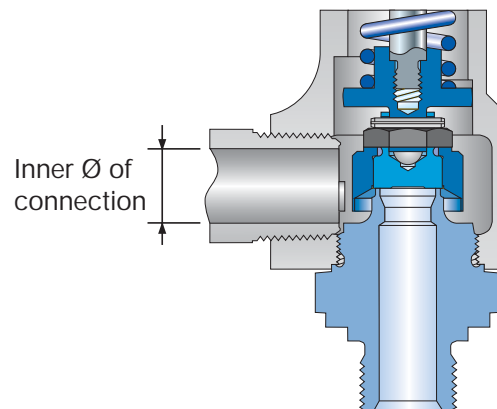
Actual orifice diameter d_0	[mm]	6	10
	[inch ²]	0,236	0,394
Actual orifice area A_0	[mm ²]	28,3	78,5
	[inch ²]	0,044	0,122
Inner \varnothing of pipe d_i	[mm]	10	12,5
	[inch]	3/8"	1/2"



Outlet connection

Caution!

To achieve the certified function and capacity it is important to use an outlet pipe or an outlet connection with an inner diameter \geq than 16 mm / ⁵/₈" inch.



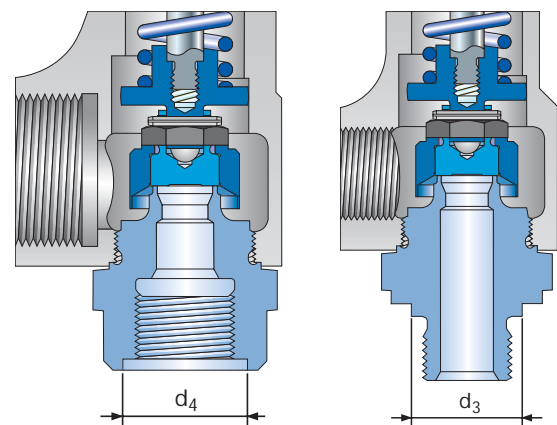
Screwed plugs – DIN ISO 228 / G

Male

Design of diameter d_3 according to DIN 3852 – Part 2, form A for small gasket.

Female

Design of diameter d_4 according to DIN 3852 – Part 2, form Y for small gasket.



Type 459

Safety Relief Valves – spring loaded

Type 459
Plain lever H3



Type 459
Cap H2



Contents

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- US Units [Threaded connection] 05/10
- [Flanged connection] 05/11

Pressure temperature ratings

- Metric Units 05/12
- US Units 05/13

Order information – Spare parts 05/14

Available options 05/16

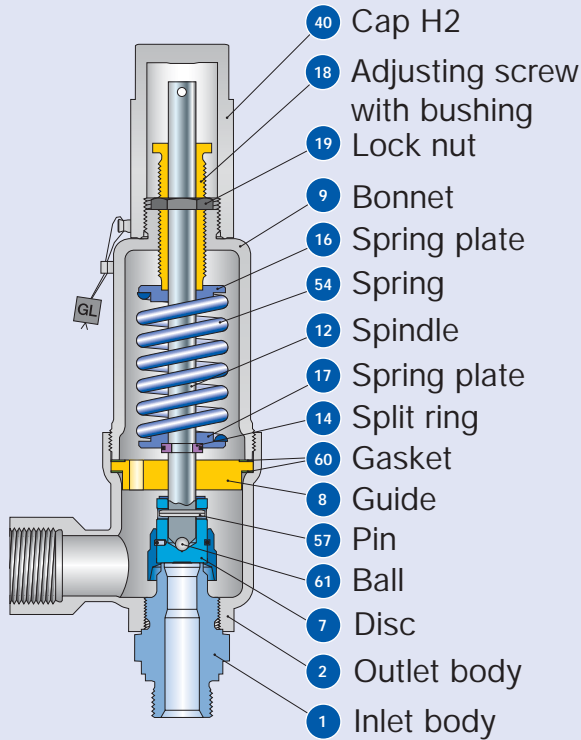
Approvals 05/17

Capacities

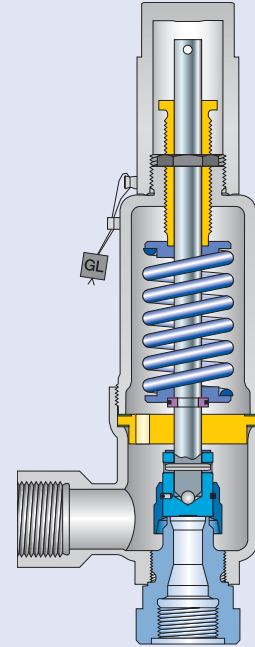
- Metric Units [Steam, Air, Water] 05/18
- US Units [Steam, Air, Water] 05/19

Determination of coefficient of discharge K_{dr}/α_w 05/20

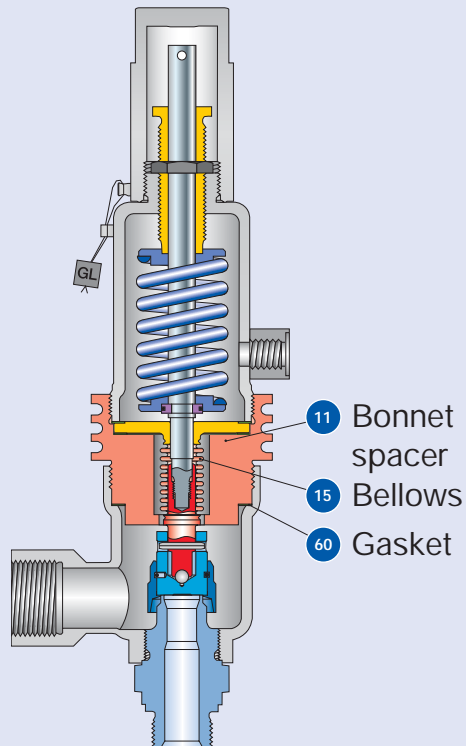
Available designs



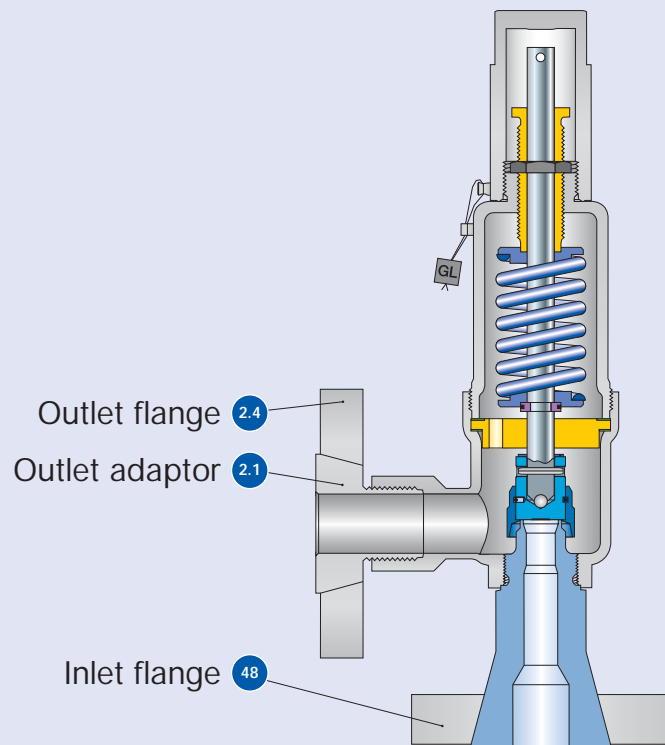
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials					
Item	Component	Remarks	Type 4593	Type 4592	Type 4594
1	Base / Inlet body	Threaded connection	1.4104 SA 479 430	1.4404 SA 479 316L	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L	1.4404 SA 479 316L
2	Outlet body		0.7043 Ductile Gr. 60-40-18	1.4404 SA 479 316L	1.4404 SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
7	Disc	Metal seat	1.4122 Hardened stainless steel	1.4122 Hardened stainless steel	1.4404 316L
8	Guide		1.4104 tenifer Chrome steel tenifer	1.4104 tenifer Chrome steel tenifer	1.4404 316L
		Balanced bellows design	1.4404 / SA 316L Upper conn. part of balanced bellows	1.4404 / SA 316L Upper conn. part of balanced bellows	1.4404 / SA 316L Upper conn. part of balanced bellows
9	Bonnet		0.7043 Ductile Gr. 60-40-18	1.0460 105	1.4404 316L
		Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
11	Bonnet spacer	Balanced bellows design	1.0460 Carbon steel	1.0460 Carbon steel	1.4404 316L
12	Spindle		1.4021 420	1.4404 316L	1.4404 316L
		Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
14	Split ring		1.4104 Chrome steel	1.4104 Chrome steel	1.4404 316L
15	Bellows	Balanced bellows design	1.4571 SA 316Ti	1.4571 316Ti	1.4571 316Ti
16/17	Spring plate		1.0718 Steel	1.0718 Steel	1.4404 316L
18	Adjusting screw with bushung		1.4104 / PTFE Chrome steel / PTFE	1.4104 / PTFE Chrome steel / PTFE	1.4404 / PTFE 316L / PTFE
19	Lock nut		1.4104 Chrome steel	1.4104 Chrome steel	1.4404 316L
40	Cap H2		1.0718 Steel	1.0718 Steel	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
54	Spring	Standard	1.1200 / 1.8159 / 1.7107 Carbon steel	1.1200 / 1.8159 / 1.7107 Carbon steel	1.4310 Stainless steel
		Optional	1.4310 Stainless steel	1.4310 Stainless steel	- -
57	Pin		1.4310 Stainless steel	1.4310 Stainless steel	1.4310 Stainless steel
60	Gasket		Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316
61	Ball		1.3541 Hardened stainless steel	1.3541 Hardened stainless steel	1.4401 316

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

1

Article Number

1	2	3	4
459	4	255	2

1 Type 459

Types of sealing

Metal seat	
Metal-to-metal	
Metal-to-metal stellited	
Soft seal (Sealing plate)	
SP	Vespel-SP1
PCTFE	Kel-F
PTFE-FDA	Teflon

2 Material code

Code	Body material
2	Steel
3	SG iron
4	Stainless steel

3 Valve code

Identifies valve size and body material, refer to page 05/07.

4 Code for lifting device

Code	Lifting device	
2	Screwed cap	H2
3	Plain lever	H3
4	Packed knob	H4

4594.2552

Article No.

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

12 bar_g

Set Pressure

3

Connections

Please refer to table "Available Connections" on pages 09/06 and 09/07.

Please state one option code for each, inlet **and** outlet.

V62

V71

Connections

4 Options

Type 459	Option code
• Base / Inlet body stellited (Type 4593, 4592 only)	L20
• Base / Inlet body material 316L (Type 4593 only)	L18
• Disc stellited	J25
• Plastic seal material	
PTFE	"A" J44
PCTFE	"G" J48
Vespel SP	"T" J49
• Stainless steel bellows	
p ≤ 40 bar _g	J78
p > 40 bar _g	J55
• Elastomer bellows	J79
• Heating jacket	H29
• High temperature alloy spring	X01
• Stainless steel spring	X04

J78

Options

5 Documentation

Please select requested documentation:

Inspections, tests: DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	Option code M33
LESER Certificate for Global Application - Inspection certificate 3.1 acc. to DIN EN 10204 - Declaration of conformity acc. to PED 97/23/EC	H03
Material test certificate: DIN EN 10204-3.1	
Part	Option code
Base / Inlet body	H01
Outlet body	L34
Cap / lever cover	L31
Disc	L23

H01 L23

Documentation

6 Code and Medium

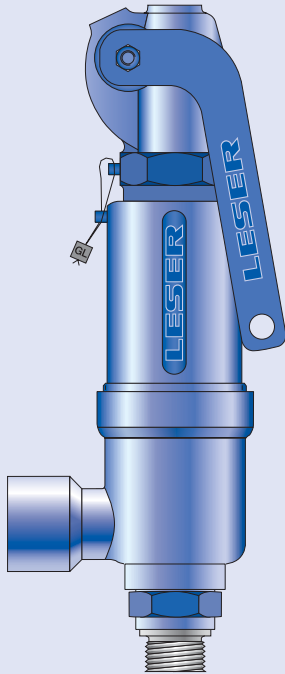
1	2
2	0
1 Code	
1. ASME Section VIII	
2. CE / VdTUEV	
3. ASME Section VIII + CE / VdTUEV	
2 Medium	
.1 Gases	
.2 Liquids	
.3 Steam	
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)	

2.0

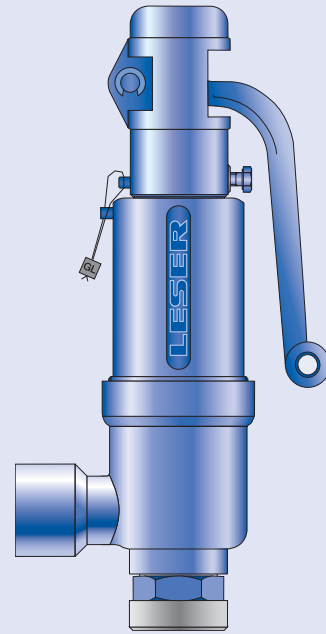
Code and Medium

Type 459

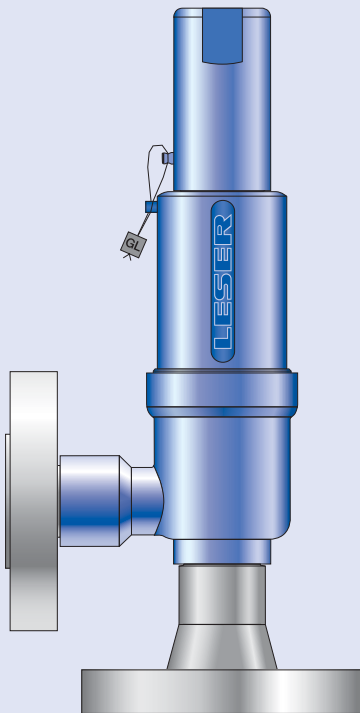
How to order – Article numbers



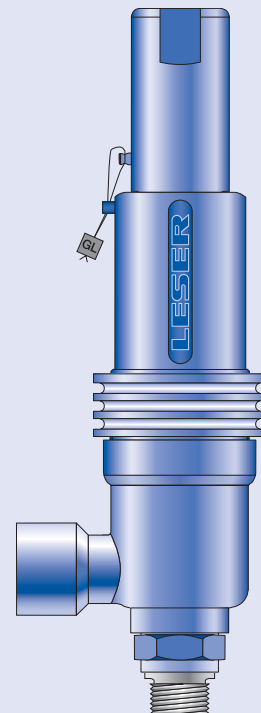
Type 459 Male
Packed lever H4
Conventional design



Type 459 Female
Plain lever H3
Conventional design



Type 459
Cap H2
Conventional design
Flanged connection



Type 459
Cap H2
Balanced bellows

How to order – Article numbers

Article numbers						
	Actual Orifice diameter d_0 [mm]			9	13	17,5
	Actual Orifice area A_0 [mm ²]			63,9	133	241
	Actual Orifice diameter d_0 [inch]			0,354	0,512	0,689
	Actual Orifice area A_0 [inch ²]			0,099	0,206	0,374
Outlet chamber casted						
Inlet body	1.4104	H2	Art.-No. 4593.	2502	2512	2522
Outlet body	0.7043	H3	Art.-No. 4593.	2503	2513	2523
Bonnet	0.7043	H4	Art.-No. 4593.	2504	2514	2524
	p [bar _g]		S/G/L	1,5 – 250	0,2 – 200	0,2 – 100
	p [psig]			21,7 – 3626	2,9 – 2901	2,9 – 1450
Outlet chamber deep-drawn						
Inlet body	1.4404	H2	Art.-No. 4592.	2472	2992	2492
Outlet body	1.4404	H3	Art.-No. 4592.	2473	2994	2493
Bonnet	1.0460	H4	Art.-No. 4592.	2474	68 – 180	2494
	p [bar _g]		S/G/L	1,5 – 250	0,2 – 200	0,2 – 100
	p [psig]			21,7 – 3626	986 – 2611	2,9 – 1450
Outlet chamber deep-drawn						
All body and trim parts	1.4404	H2	Art.-No. 4594.	2552	2562	2572
		H4	Art.-No. 4594.	2554	2564	2574
	p [bar _g]		S/G/L	1,5 – 250	0,2 – 200	0,2 – 100
	p [psig]			21,7 – 3626	2,9 – 2901	2,9 – 1450

For selection of inlet and outlet connection please refer to page 09/06 – 09/07.

Dimensions and weights – Metric Units

Threaded connections

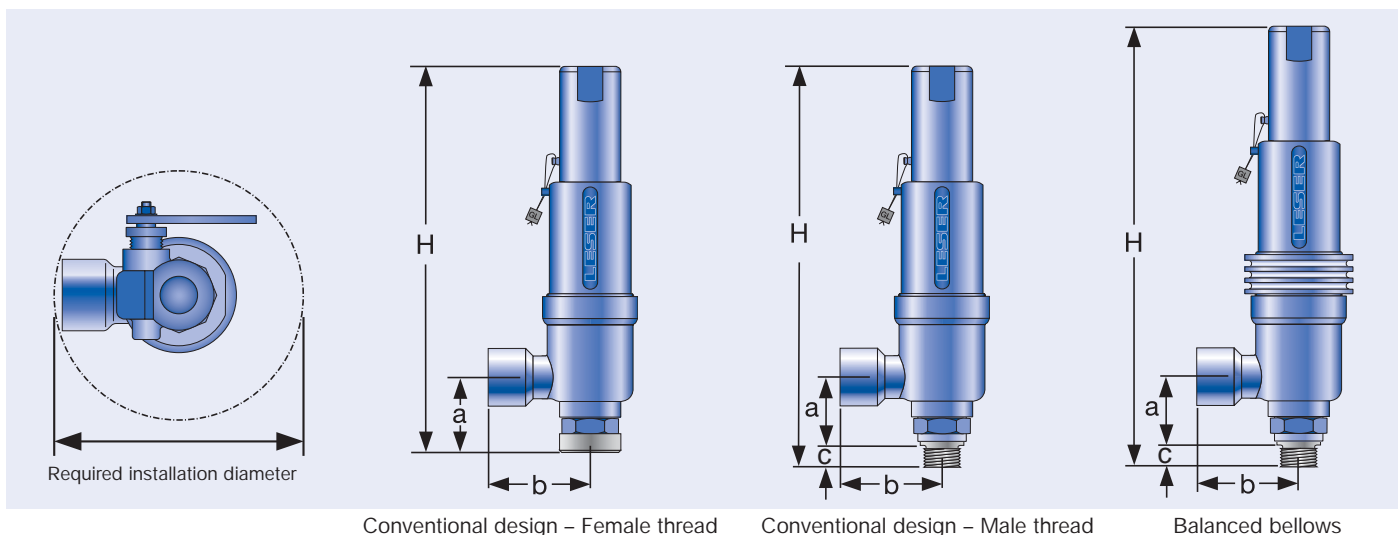
Size Outlet body		1"	1"	1"	1"	1"	1"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	
Actual Orifice diameter d ₀ [mm]		9	9	9	13	13	13	17,5	17,5	17,5	17,5	17,5	
Actual Orifice area A ₀ [mm ²]		63,6	63,6	63,6	133	133	133	241	241	241	241	241	
Weight	Standard	[kg]	2,6	2,6	2,6	2,6	2,6	3,0	3,0	3,0	3,0	3,0	
	Balanced bellows		3,4	3,4	3,4	3,4	3,4	3,8	3,8	3,8	3,8	3,8	
Required installation diameter		[mm]	165	165	165	165	165	165	165	165	165	165	
Inlet thread "Male"													
DIN ISO 228-1	G	Inlet a	-	55,5	55,5	-	55,5	55,5	55,5	55,5	55,5	55,5	-
		Center to face [mm]	Outlet b	-	75	75	-	75	75	75	75	75	75
ISO 7-1/BS 21	R	Inlet a	-	52,5	52,5	-	52,5	52,5	-	52,5	-	52,5	-
		Center to face [mm]	Outlet b	-	75	75	-	75	75	-	75	-	75
ANSI/ASME B1.20.1	NPT	Inlet a	-	52,5	52,5	-	52,5	52,5	-	52,5	52,5	52,5	53
		Center to face [mm]	Outlet b	-	75	75	-	75	75	-	75	75	75
Inlet thread "Female"													
DIN ISO 228-1	G	Inlet a	60,5	65,5	70	60,5	65,5	70,5	65,5	70,5	75,5	80,5	-
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	75	75
Height	[mm]	H max.	290,5	295,5	300,5	290,5	295,5	300,5	292,5	297,5	302,5	307,5	-
ISO 7-1/BS 21	Rc	Inlet a	60,5	70,5	70,5	60,5	70,5	70,5	70,5	70,5	-	-	-
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	-	-
Height	[mm]	H max.	290,5	300,5	300,5	290,5	300,5	300,5	297,5	297,5	-	-	-
ANSI/ASME B1.20.1	NPT	Inlet a	60,5	70,5	70,5	60,5	70,5	70,5	70,5	70,5	75,5	80,5	-
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	75	75
Height	[mm]	H max.	290,5	300,5	300,5	290,5	300,5	300,5	297,5	297,5	302,5	307,5	-

Height inlet thread "Male"

Inlet thread		Size		Conventional design						Balanced bellows					
				1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	[mm]	G	H max.	-	301,5	303,5	302,5	304,5	-	-	346,5	348,5	347,5	349,5	-
ISO 7-1/BS 21	[mm]	R	H max.	-	302,5	305,5	-	307,5	-	-	347,5	350,5	-	352,5	-
ASME B1.20.1	[mm]	NPT	H max.	-	304,5	309,5	307,5	307,5	308	-	349,5	354,5	352,5	352,5	353

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	[mm]	G	14	16	18	20	22	-
ISO 7-1/BS 21	[mm]	R	19	20	23	-	28	-
ASME B1.20.1	[mm]	NPT	22	22	27	28	28	28



Dimensions and weights – Metric Units

Flanged connection

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [mm]	9	13	17,5	9	13	17,5
Actual Orifice area A_0 [mm ²]	63,6	133	241	63,6	133	241

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

Flange rating PN 40 – PN 400

Center to face [mm]	Inlet a	Conventional design			Balanced bellows		
		100	100	105	100	100	105
	Outlet b	100	100	100	100	100	
Height [H4] [mm]	H max.	330	330	333	375	375	378

ASME B 16.5 (Available flange sizes refer to page 09/07)

Flange rating class 150 – 2500

Center to face [mm]	Inlet a	Conventional design			Balanced bellows		
		100	100	105	100	100	105
	Outlet b	100	100	100	100	100	
Height [H4] [mm]	H max.	330	330	333	375	375	378

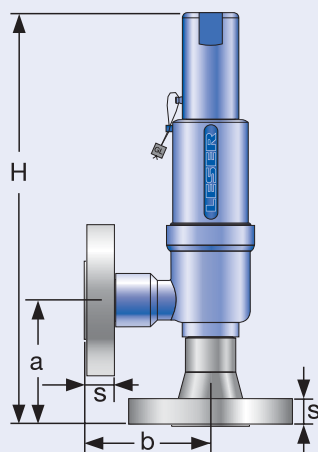
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

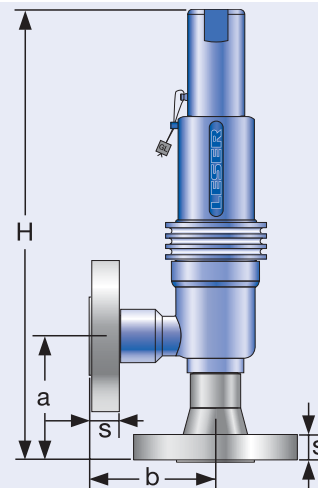
Weight net [kg]	Conventional design			Balanced bellows		
(without inlet and outlet flange) W_N	2,6	2,6	3	3,8	3,8	4,2

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class					
		40	160	250	320	400	Size	150	300	600	900	1500
DN 15		NPS 1/2"										
Flange thickness [mm]	s	18	22	26	26	30	14	18	26	30,2		
Weight slip on flange [kg]	W_F	0,8	1,2	2,5	2,5	3,6	0,6	0,9	2,1	3		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Available at Outlet		✓	✓	✓			✓	✓	✓			
DN 20		NPS 3/4"										
Flange thickness [mm]	s	20	22				15	18	25,4	32		
Weight slip on flange [kg]	W_F	1,1	1,3				0,8	1,4	2,3	3,5		
Available at Inlet		✓	✓				✓	✓	✓	✓		
Available at Outlet		✓	✓				✓	✓	✓			
DN 25		NPS 1"										
Flange thickness [mm]	s	22	26	30	36	40	17	21,5	32,5	40		
Weight slip on flange [kg]	W_F	1,3	2,6	3,5	5	7,5	1	2,1	4,1	5,1		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓	✓	✓		
Available at Outlet		✓	✓	✓			✓	✓	✓			
DN 40		NPS 1 1/2"										
Flange thickness [mm]	s	23	23	34			22	24	38			
Weight slip on flange [kg]	W_F	2,1	2,9	4,3			1,4	2,2	3,9			
Available at Inlet		✓	✓	✓			✓	✓	✓			
Available at Outlet		✓	✓	✓			✓	✓	✓			



Conventional design



Balanced bellows design

Dimensions and weights – US Units

Threaded connections

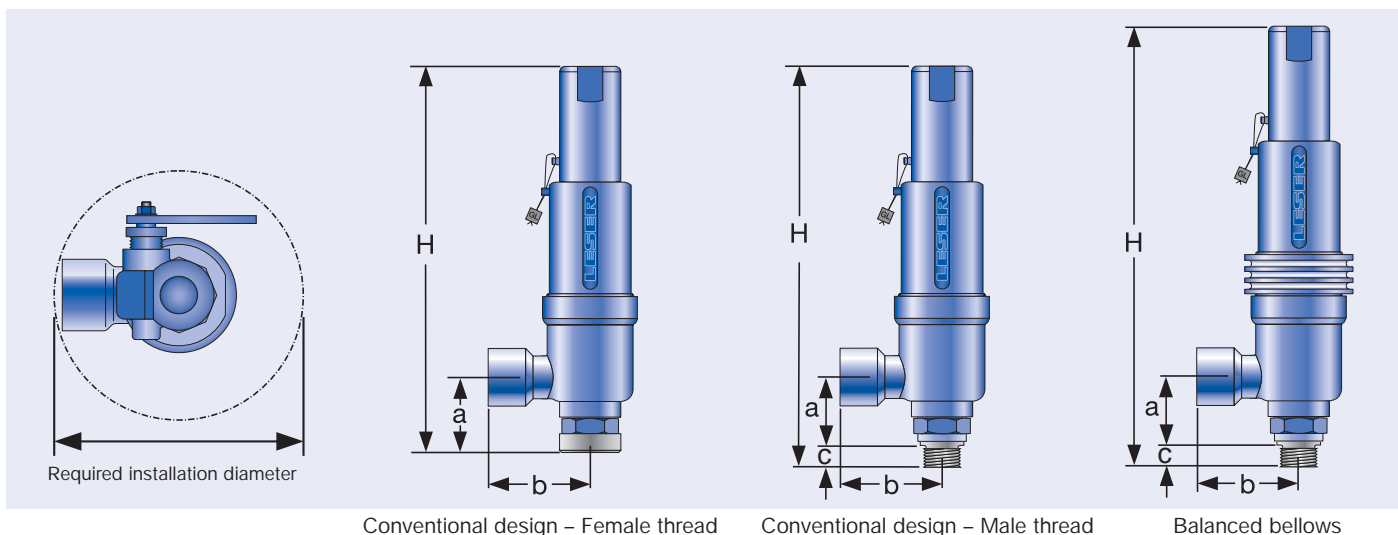
Size Outlet body		1"	1"	1"	1"	1"	1"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	
Actual Orifice diameter d ₀ [inch]		0,354	0,354	0,354	0,512	0,512	0,512	0,689	0,689	0,689	0,689	0,689	
Actual Orifice area A ₀ [inch ²]		0,099	0,099	0,099	0,206	0,206	0,206	0,374	0,374	0,374	0,374	0,374	
Weight	Standard [lbs]	5,7	5,7	5,7	5,7	5,7	5,7	6,6	6,6	6,6	6,6	6,6	
	Balanced bellows	7,5	7,5	7,5	7,5	7,5	7,5	8,4	8,4	8,4	8,4	8,4	
Required installation diameter [inch]		6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	
Inlet thread "Female"													
DIN ISO 228-1	G	Inlet a	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ³¹ / ₃₂	3 ³ / ₁₆	–
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ¹ / ₂	11 ²³ / ₃₂	11 ²⁹ / ₃₂	12 ³ / ₃₂	–
ISO 7-1/BS 21	Rc	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	–	–	–
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	–
Height [inch]		H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ²³ / ₃₂	11 ²³ / ₃₂	–	–	–
ANSI/ASME B1.20.1	NPT	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³¹ / ₃₂	3 ³ / ₁₆	–
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ²³ / ₃₂	11 ²³ / ₃₂	11 ²⁹ / ₃₂	12 ³ / ₃₂	–
Inlet thread "Male"													
DIN ISO 228-1	G	Inlet a	–	2 ³ / ₁₆	2 ³ / ₁₆	–	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	–
		Center to face [inch]	Outlet b	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
ISO 7-1/BS 21	R	Inlet a	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	–	2 ¹⁵ / ₁₆	–
		Center to face [inch]	Outlet b	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆
		Center to face [inch]	Outlet b	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆

Height inlet thread "Male"

Inlet thread		Size	Conventional design					Balanced bellows						
			1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	[inch] G	H max.	–	11 ⁷ / ₈	11 ¹⁵ / ₁₆	11 ²⁹ / ₃₂	12	–	–	13 ⁵ / ₈	13 ²³ / ₃₂	13 ¹¹ / ₁₆	13 ³ / ₄	–
ISO 7-1/BS 21	[inch] R	H max.	–	11 ²⁹ / ₃₂	12 ¹ / ₃₂	–	12 ³ / ₃₂	–	–	13 ¹¹ / ₁₆	13 ¹³ / ₁₆	–	13 ⁷ / ₈	–
ASME B1.20.1	[inch] NPT	H max.	–	12	12 ³ / ₁₆	12 ³ / ₃₂	12 ³ / ₃₂	12 ¹ / ₈	–	13 ³ / ₄	13 ³¹ / ₃₂	13 ⁷ / ₈	13 ⁷ / ₈	13 ²⁹ / ₃₂

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	[inch] G		9/16	5/8	23/32	25/32	7/8	–
ISO 7-1/BS 21	[inch] R		3/4	25/32	29/32	–	13/32	–
ASME B1.20.1	[inch] NPT		7/8	7/8	11/16	13/32	13/32	13/32



Dimensions and weights – US Units

Flanged connection

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [inch]	0,354	0,512	0,689	0,354	0,512	0,689
Actual Orifice area A_0 [inch ²]	0,099	0,206	0,374	0,099	0,206	0,374

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

Flange rating PN 40 – PN 400

Center to face [inch]	Inlet a	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	4 ¹ / ₈	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	4 ¹ / ₈
		Outlet b	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆
Height [H4] [inch]	H max.	13	13	13 ¹ / ₈	14 ³ / ₄	14 ³ / ₄	14 ⁷ / ₈

ASME B 16.5 (Available flange sizes refer to page 09/07)

Flange rating class 150 – 2500

Center to face [inch]	Inlet a	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	4 ¹ / ₈	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	4 ¹ / ₈
		Outlet b	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆
Height [H4] [inch]	H max.	13	13	13 ¹ / ₈	14 ³ / ₄	14 ³ / ₄	14 ⁷ / ₈

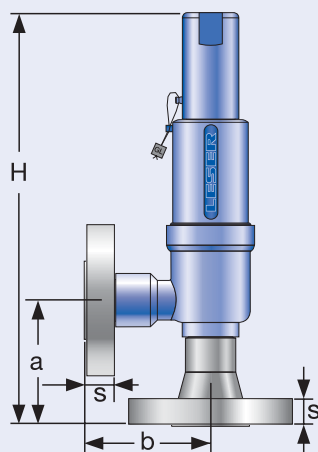
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

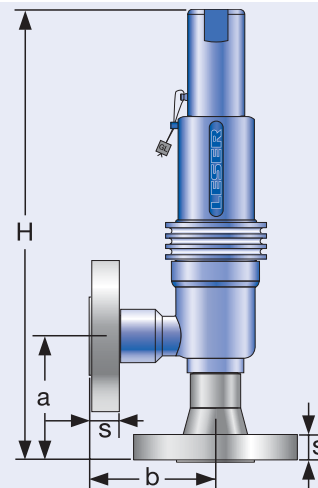
Weight net [lbs] (without inlet and outlet flange) W_N	5,7	5,7	6,6	8,4	8,4	9,3
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Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS 1/2"						
Flange thickness [inch] s		1 ¹ / ₁₆	7/8	1 ¹ / ₃₂	1 ¹ / ₃₂	1 ³ / ₁₆		9/16	1 ¹ / ₁₆		1 ¹ / ₃₂		1 ³ / ₁₆
Weight slip on flange [lbs] W_F		1,8	2,6	5,5	5,5	7,9		1,3	2		4,6		6,6
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓				✓	✓		✓		
DN 20							NPS 3/4"						
Flange thickness [inch] s		2 ⁵ / ₃₂	7/8					1 ⁹ / ₃₂	1 ¹ / ₁₆		1		1 ¹ / ₄
Weight slip on flange [lbs] W_F		2,4	2,9					1,8	3,1		5,1		7,7
Available at Inlet		✓	✓					✓	✓		✓		✓
Available at Outlet		✓	✓					✓	✓		✓		
DN 25							NPS 1"						
Flange thickness [inch] s		7/8	1 ¹ / ₃₂	1 ³ / ₁₆	1 ¹³ / ₃₂	1 ⁹ / ₁₆		1 ¹ / ₁₆	2 ⁷ / ₃₂		1 ⁹ / ₃₂		1 ⁹ / ₁₆
Weight slip on flange [lbs] W_F		2,9	5,7	7,7	11	16,5		2,2	4,6		9		11,2
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓				✓	✓		✓		
DN 40							NPS 1 1/2"						
Flange thickness [inch] s		2 ⁹ / ₃₂	2 ⁹ / ₃₂	1 ¹¹ / ₃₂				7/8	1 ⁵ / ₁₆		1 ¹ / ₂		
Weight slip on flange [lbs] W_F		4,5	6,3	9,5				3,2	4,8		8,6		
Available at Inlet		✓	✓	✓				✓	✓		✓		
Available at Outlet		✓	✓	✓				✓	✓		✓		



Conventional design



Balanced bellows design

Pressure temperature ratings – Metric Units

Metric Units												
Actual Orifice diameter d_0 [mm]		9			13			17,5				
Actual Orifice Area A_0 [mm ²]		63,6			133			241				
Body material: 1.4104 (430)					Type 4593							
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 400			PN 250			PN 160				
Outlet body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	1,5			0,2			0,2				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	40			40			40				
Min. set pressure low press. bellows	p [bar _g] S/G/L	3			3			3				
Maximum set pressure	p [bar _g] S/G/L	250			200			100				
Temperature acc. to DIN EN	min [°C]				-10							
	max [°C]				+300							
Temperature acc. to ASME	min [°C]				-29							
	max [°C]				+300							

Body material: 1.4404 (316L)					Type 4592							
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 250 PN 500 (Option code L20)			PN 160 PN 500 (Option code L20)			PN 160				
Outlet Body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	1,5			0,2			0,2				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	40			40			40				
Min. set pressure low press. bellows	p [bar _g] S/G/L	3			3			3				
Maximum set pressure	p [bar _g] S/G/L	250			200			100				
Temperature acc. to DIN EN	min [°C]				-85							
	max [°C]				+400							
Temperature acc. to ASME	min [°C]				-29							
	max [°C]				+300							

Body material: 1.4404 (316L)					Type 4594							
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 250 PN 500 (Option code L20)			PN 160 PN 500 (Option code L20)			PN 160				
Outlet Body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	1,5			0,2			0,2				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	40			40			40				
Min. set pressure low press. bellows	p [bar _g] S/G/L	3			3			3				
Maximum set pressure	p [bar _g] S/G/L	250			200			100				
Temperature acc. to DIN EN	min [°C]	-200			-200			-200				
	max [°C]	+400			+400			+400				
Temperature acc. to ASME	min [°C]	-184			-184			-184				
	max [°C]	+427			+427			+427				

¹⁾ Min. set pressure standard bellows = Max. pressure low pressure bellows.

Because there is no open bonnet for this type available, please use at a temperature of 300°C (572°F) a stainless steel bellows or a specific high temperature model without a bellows. For DIN EN applications at temperatures under -10°C please proceed according to AD-2000 Merkblatt W 10.

Pressure temperature ratings – US Units

US Units												
Actual Orifice diameter d_0 [inch]		0,354			0,512			0,689				
Actual Orifice Area A_0 [inch ²]		0,099			0,206			0,347				
Body material: 1.4104 (430) Type 4593												
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	21,8			2,9			2,9				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	580			580			580				
Min. set pressure low press. bellows	p [psig] S/G/L	43,5			43,5			43,5				
Maximum set pressure	p [psig] S/G/L	3626			2900			1450				
Temperature acc. to DIN EN	min [°F]				+14							
	max [°F]				+572							
Temperature acc. to ASME	min [°F]				-20							
	max [°F]				+572							
Body material: 1.4404 (316L) Type 4592												
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	21,8			2,9			2,9				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	580			580			580				
Min. set pressure low press. bellows	p [psig] S/G/L	43,5			43,5			43,5				
Maximum set pressure	p [psig] S/G/L	3626			2900			1450				
Temperature acc. to DIN EN	min [°F]				-121							
	max [°F]				+752							
Temperature acc. to ASME	min [°F]				-20							
	max [°F]				+800							
Body material: 1.4404 (316L) Type 4594												
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	21,8			2,9			2,9				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	580			580			580				
Min. set pressure low press. bellows	p [psig] S/G/L	43,5			43,5			43,5				
Maximum set pressure	p [psig] S/G/L	3626			2900			1450				
Temperature acc. to DIN EN	min [°F]				-328							
	max [°F]				+752							
Temperature acc. to AS ME	min [°F]				-300							
	max [°F]				+800							

¹⁾ Min. set pressure standard bellows = Max. pressure low pressure bellows.
 Because there is no open bonnet for this type available, please use at a temperature of 300°C (572°F) a stainless steel bellows or a specific high temperature model without a bellows. For DIN EN applications at temperatures under -10°C please proceed according to AD-2000 Merkblatt W 10.

Order information – Spare parts

Spare parts		Material-No. / Art.-No.					
Body (Item 1): Male thread		Material-No. / Art.-No.					
Connection size		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Actual Orifice diameter d ₀ [mm]		9					
Actual Orifice area A ₀ [mm ²]		63,6					
Actual Orifice diameter d ₀ [inch]		0,354					
Actual Orifice area A ₀ [inch ²]		0,099					
DIN ISO 228-1	G	1.4104	–	136.7539.9000	136.7639.9000	–	–
		316L	–	136.7549.9000	136.7649.9000	–	–
		316L stellited	–	136.7569.9000	136.7669.9000	–	–
ISO 7-1/BS 21	R	316L	–	136.7549.9220	136.7649.9220	–	–
		316L stellited	–	136.7569.9220	136.7669.9220	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.7549.9204	136.7649.9204	–	–
		316L stellited	–	136.7569.9204	136.7669.9204	–	–
DIN ISO 228-1	G	316L	136.7449.9210	136.7549.9210	136.7649.9210	–	–
		316L stellited	136.7469.9210	136.7569.210	136.7669.9210	–	–
ISO 7-1/BS 21	Rc	316L	136.7449.9222	136.7549.9222	136.7649.9222	–	–
		316L stellited	136.7469.9222	136.7569.9222	136.7669.9222	–	–
ANSI/ASME B1.20.1	NPT	316L	136.7449.9211	136.7549.9211	136.7649.9211	–	–
		316L stellited	136.7469.9211	136.7569.9211	136.7669.9211	–	–
Actual Orifice diameter d ₀ [mm]		13					
Actual Orifice area A ₀ [mm ²]		133					
Actual Orifice diameter d ₀ [inch]		0,512					
Actual Orifice area A ₀ [inch ²]		0,206					
DIN ISO 228-1	G	1.4104	–	136.8039.9000	136.8139.9000	–	–
		316L	–	136.8049.9000	136.8149.9000	–	–
		316L stellited	–	136.8069.9000	136.8169.9000	–	–
ISO 7-1/BS 21	R	316L	–	136.8049.9220	136.8149.9220	–	–
		316L stellited	–	136.8069.9220	136.8169.9220	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.8049.9204	136.8149.9204	–	–
		316L stellited	–	136.8069.9204	136.8169.9204	–	–
DIN ISO 228-1	G	316L	136.7949.9210	136.8049.9210	136.8149.9210	–	–
		316L stellited	–	–	–	–	–
ISO 7-1/BS 21	Rc	316L	136.7949.9222	136.8049.9222	136.8149.9222	–	–
		316L stellited	136.7969.9222	136.8069.9222	136.8169.9222	–	–
ANSI/ASME B1.20.1	NPT	316L	136.7949.9211	136.8049.9211	136.8149.9211	–	–
		316L stellited	–	136.7569.9211	136.7669.9211	–	–
Actual Orifice diameter d ₀ [mm]		17,5					
Actual Orifice area A ₀ [mm ²]		241					
Actual Orifice diameter d ₀ [inch]		0,689					
Actual Orifice area A ₀ [inch ²]		0,374					
DIN ISO 228-1	G	1.4104	–	–	136.3639.9000	–	136.8639.9000
		316L	–	–	136.3649.9000	136.8549.9000	136.8649.9000
		316L stellited	–	–	–	–	–
ISO 7-1/BS 21	R	316L	–	–	136.3649.9220	–	136.8649.9220
		316L stellited	–	–	–	–	–
ANSI/ASME B1.20.1	NPT	316L	–	–	136.3649.9204	136.8549.9204	136.8649.9204
		316L stellited	–	–	–	–	136.8749.9204
DIN ISO 228-1	G	316L	–	–	136.3649.9000	136.8549.9000	136.8649.9000
		316L stellited	–	–	–	–	–
ISO 7-1/BS 21	Rc	316L	–	136.8049.9222	136.3649.9222	–	136.8649.9222
		316L stellited	–	136.8069.9222	–	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.8449.9211	136.3649.9211	136.8549.9211	136.8649.9211
		316L stellited	–	–	–	–	–

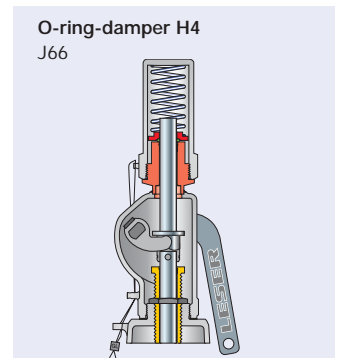
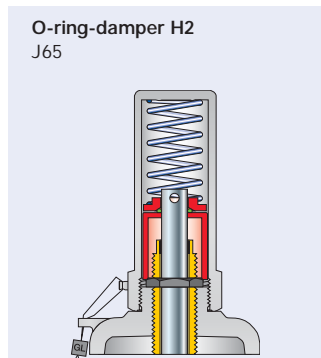
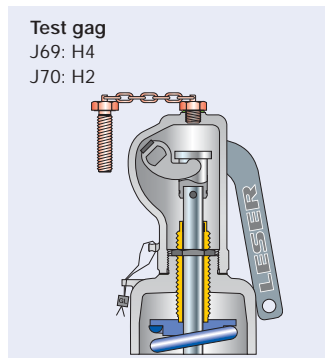
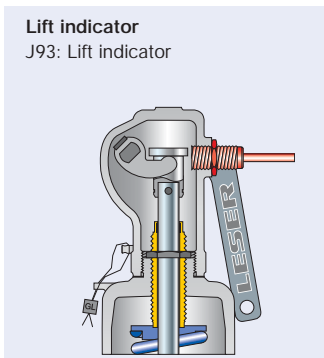
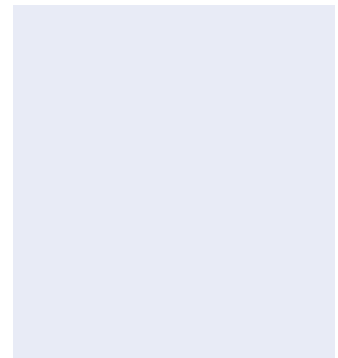
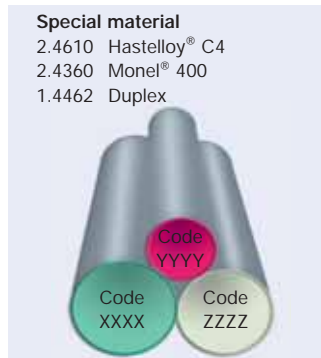
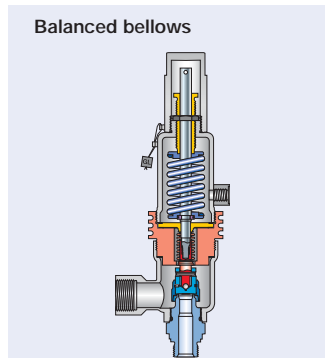
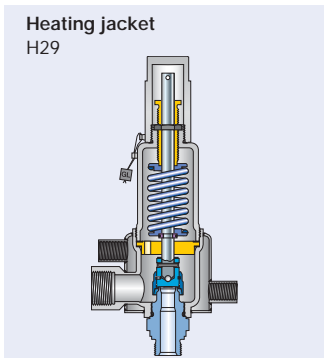
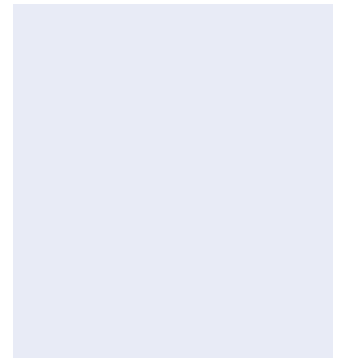
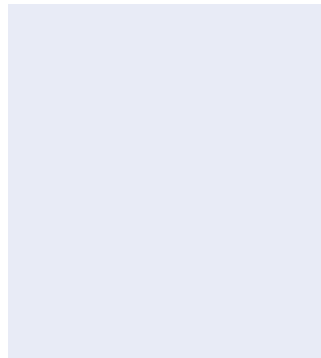
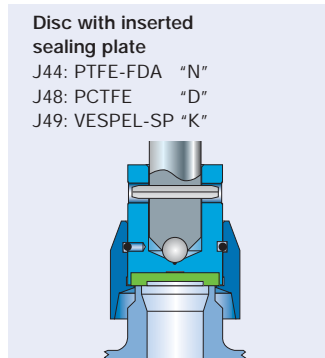
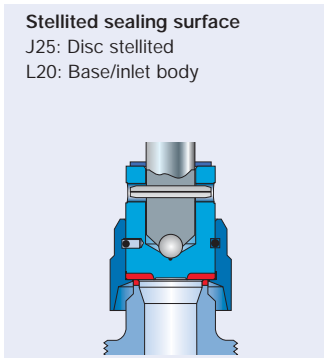
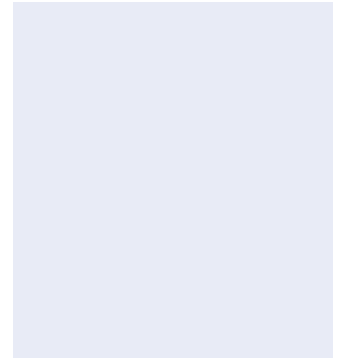
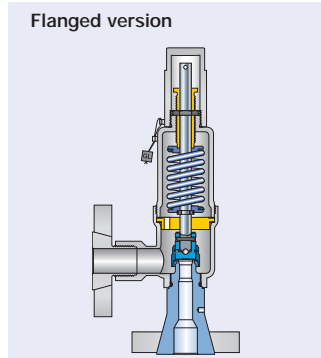
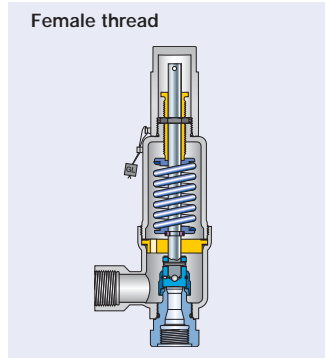
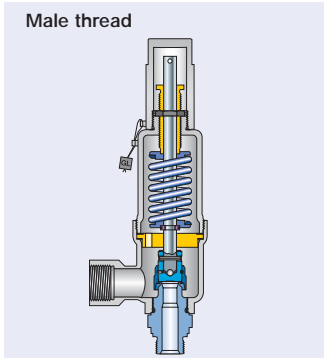
Type 459

Order information – Spare parts

Spare parts					
Actual Orifice diameter d_0 [mm]		9	13	17,5	
Actual Orifice area A_0 [mm ²]		63,6	133	241	
Actual Orifice diameter d_0 [inch]		0,354	0,512	0,689	
Actual Orifice area A_0 [inch ²]		0,099	0,206	0,374	
Body (Item 1): Flange design		Material-No. / Art.-No.			
DN 15 / NPS 1/2"	PN 40 – 400	316L	136.7449.9208	136.7949.9208	-
	CL 300 – 2500				
DN 20 / NPS 3/4"	PN 40 – 400	316L	136.3949.9208	136.5049.9208	136.8449.9208
	CL 150 – 2500				
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208	136.3549.9208	136.3649.9208
	CL 150				
	CL 300 – 2500				
Disc (Item 7): Metal to metal		Material-No. / Art.-No.			
Disc	1.4122	420 RM	200.2039.9000	200.2139.9000	200.2239.9000
	1.4404	316L	200.2049.9000	200.2149.9000	200.2249.9001
		316L stellited	200.2069.9118	200.2169.9118	-
Disc (Item 7): With sealing plate		Material-No. / Art.-No.			
Disc		PTFE "A"	200.2049.9005	200.2149.9005	200.2249.9005
	1.4404	PCTFE "G"	200.2049.9006	200.2149.9006	200.2249.9006
		SP "T"	200.2049.9007	200.2149.9007	200.2249.9007
Disc (Item 7.3): Sealing plate		Material-No. / Art.-No.			
Sealing plate		PTFE "A"	236.3559.0000	236.3559.0000	236.0859.0000
		PCTFE "G"	236.3569.0000	236.3569.0000	236.0869.0000
		SP "T"	236.3579.0000	236.3579.0000	236.0879.0000
Pin (Item 57)		Material-No. / Art.-No.			
Pin		1.4310	480.0505.0000	480.0505.0000	480.0505.0000
Gasket – outlet body / bonnet (Item 60)		Material-No. / Art.-No.			
Gasket		Graphite + 1.4401	500.2407.0000	500.2407.0000	500.2407.0000
	Option code L68	Gylon (Filled PTFE)	500.2405.0000	500.2405.0000	500.2405.0000
Ball (Item 61)		Material-No. / Art.-No.			
Ball	\varnothing [mm]		6	6	6
		1.4401	510.0104.0000	510.0104.0000	510.0104.0000
Bellows and bellows conversion kit (Item 15)		Material-No. / Art.-No.			
Stainless steel bellows	1.4571 / 316Ti		p ≤ 40 bar / 580 psig = 400.7949.0000		
	1.4571 / 316Ti		p > 40 bar / 580 psig = 400.6349.0000		
Conversion kit	≤ PN 40/CL 600		5021.1050		
	> PN 40/CL 600		5021.1051		

Available Options

Type 459



Approvals

Approvals			
Actual Orifice diameter d_0 [mm]	9	13	17,5
Actual Orifice area A_0 [mm ²]	63,6	133	241
Actual Orifice diameter d_0 [inch]	0,354	0,512	0,689
Actual Orifice area A_0 [inch ²]	0,099	0,206	0,374
Europe		Coefficient of discharge K_{dr}	
DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13	
	S/G	0,83	0,81
	L	0,61	0,53
Germany		Coefficient of discharge α_w	
AD 2000-Merkblatt A2	Approval No.	TÜV SV 909	
	S/G	0,83	0,81
	L	0,61	0,53
United States		Coefficient of discharge K	
ASME Sec. VIII	Approval No.	M 37112	
	S/G	0,811	
	Approval No.	M 37101	
	L	0,566	
Canada		Coefficient of discharge K	
CRN	Approval No.	OG0730.95	
	S/G	Refer to ASME Sec. VIII	
	L	Refer to ASME Sec. VIII	
China		Coefficient of discharge α_w	
CSBQTS	Approval No.		
	S/G	0,83	0,81
	L	0,61	0,53
Russia		Coefficient of discharge α_w	
GGTN/ GOSGOTECHNADZOR	Approval No.	PPC 00-18458	
GOST R	S/G	0,83	0,81
	L	0,61	0,53
Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	
Det Norske Veritas	DNV	www.dnv.com	
Germanischer Lloyd	GL	www.gl-group.com	
Lloyd' s Register EMEA	LREMEA	www.lr.org	
Registro Italiano Navale	RINA	www.rina.org	
		The valid certification number is changed with every renewal.	
		A sample certificate including the valid certification number can be taken from the homepage of the classification societies.	

Capacities – Metric Units

Capacities according to AD 2000-Merkblatt A2, based on set-pressure plus 10% overpressure.
 Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2								
Actual Orifice diameter d_0 [mm]		9			13			17,5		
Actual Orifice area A_0 [mm ²]		63,6			133,0			241,0		
LEO*) [inch ²]		S/G = 0,082 L= 0,086			S/G = 0,171 L= 0,179			S/G = 0,310 L= 0,325		
Set pressure		Capacities			Capacities			Capacities		
		Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]		[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]
0,2					53	61	1,96	85	98	3,48
0,5					84	98	2,77	134	157	4,93
1					120	143	3,75	200	238	6,67
1,5		77	92	2,54	156	188	4,6	265	318	8,17
2		93	113	2,93	190	229	5,31	331	400	9,44
3		127	155	3,59	258	316	6,5	456	558	11,6
4		158	195	4,14	322	396	7,51	569	700	13,3
5		189	234	4,63	386	477	8,39	681	842	14,9
6		220	247	5,07	449	557	9,19	793	985	16,3
7		251	313	5,48	511	638	9,93	902	1127	17,7
8		282	353	5,86	573	718	10,6	1013	1269	18,9
9		312	392	6,21	636	799	11,3	1124	1412	20
10		343	432	6,55	699	879	11,9	1235	1554	21,1
12		405	511	7,17	824	1040	13	1457	1839	23,1
14		465	590	7,75	947	1201	14	1674	2123	25
16		527	669	8,28	1072	1363	15	1895	2408	26,7
18		588	748	8,78	1197	1524	15,9	2116	2693	28,3
20		650	827	9,26	1323	1685	16,8	2338	2977	29,8
22		709	906	9,71	1444	1846	17,6	2553	3262	31,3
24		771	986	10,1	1570	2007	18,4	2775	3547	32,7
26		833	1065	10,6	1696	2168	19,1	2997	3831	34
28		895	1144	11	1822	2329	19,9	3221	4116	35,3
30		957	1223	11,3	1949	2490	20,6	3445	4401	36,5
32		1020	1302	11,7	2076	2651	21,2	3669	4685	37,7
34		1079	1381	12,1	2198	2812	21,9	3884	4970	38,9
36		1142	1460	12,4	2325	2973	22,5	4110	5255	40
38		1205	1539	12,8	2453	3134	23,1	4336	5539	41,1
40		1268	1618	13,1	2582	3295	23,7	4564	5824	42,2
42		1332	1698	13,4	2711	3456	24,3	4792	6109	43,2
44		1395	1777	13,7	2841	3617	24,9	5021	6393	44,3
46		1459	1856	14	2971	3779	25,5	5251	6678	45,3
48		1524	1935	14,3	3102	3940	26	5483	6963	46,2
50		1588	2014	14,6	3234	4101	26,5	5715	7247	47,2
60		1910	2409	16	3889	4906	29,1	6874	8671	51,7
70		2245	2805	17,3	4571	5711	31,4	8079	10094	55,8
80		2583	3201	18,5	5259	6517	33,6	9294	11518	59,7
90		2938	3596	19,6	5982	7322	35,6	10572	12941	63,3
100		3296	3992	20,7	6711	8127	37,5	11862	14364	66,7
120		4077	4783	22,7	8302	9738	41,1			
140		4958	5574	24,6	10096	11349	44,4			
160		5977	6365	26,2	12171	12959	47,5			
180		7262	7156	27,8	14786	14570	50,3			
200		8989	7947	29,3	18303	16181	53,1			
220			8738	30,7						
240			9529	32,1						
250			9924	32,7						

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11
 How to use capacity-sheets refer to page 00/09

Capacities – US Units

Capacities according to ASME Section VIII (UV), based on set-pressure plus 10% overpressure.
 Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

US Units		ASME Section VIII								
Actual Orifice diameter d_0 [inch]		0,354			0,512			0,689		
Actual Orifice area A_0 [inch ²]		0,099			0,206			0,374		
LEO ^{*)} [inch ²]		S/G = 0,082 L= 0,086			S/G = 0,171 L= 0,179			S/G = 0,310 L= 0,325		
Set pressure		Capacities			Capacities			Capacities		
		Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]	Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]	Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]
[psig]		[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]
15	134	48	9,02	281	100	18,8	509	181	34	
20	155	55	10,2	324	115	21,2	586	209	38,4	
30	196	70	12,2	410	146	25,4	742	264	46	
40	242	86	14,1	504	180	29,3	913	326	53,1	
50	287	103	15,8	599	213	32,8	1085	387	59,4	
60	332	119	17,3	693	247	35,9	1256	448	65,1	
70	377	135	18,7	788	281	38,8	1427	509	70,3	
80	423	151	19,9	882	315	41,5	1599	570	75,1	
90	468	167	21,2	977	348	44	1770	631	79,7	
100	513	184	22,3	1071	382	46,4	1941	692	84	
120	604	216	24,4	1260	449	50,8	2284	814	92	
140	695	248	26,4	1449	517	54,9	2626	936	99,4	
160	785	281	28,2	1638	584	58,7	2969	1058	106	
180	876	313	29,9	1827	652	62,3	3311	1180	113	
200	966	346	31,5	2016	719	65,6	3654	1302	119	
220	1057	378	33,1	2205	787	68,8	3996	1424	125	
240	1148	410	34,5	2394	854	71,9	4339	1546	130	
260	1238	443	36	2584	921	74,8	4682	1669	135	
280	1329	475	37,3	2773	989	77,6	5024	1791	141	
300	1419	508	38,6	2962	1056	80,4	5367	1913	146	
320	1510	540	39,9	3151	1124	83	5709	2035	150	
340	1601	572	41,1	3340	1191	85,6	6052	2157	155	
360	1691	605	42,3	3529	1259	88	6394	2279	159	
380	1782	637	43,5	3718	1326	90,5	6737	2401	164	
400	1872	670	44,6	3907	1393	92,8	7080	2523	168	
420	1963	702	45,7	4096	1461	95,1	7422	2645	172	
440	2054	734	46,8	4285	1528	97,3	7765	2767	176	
460	2144	767	47,8	4474	1596	100	8107	2889	180	
480	2235	799	48,9	4663	1663	102	8450	3011	184	
500	2326	832	49,9	4852	1731	104	8792	3134	188	
550	2552	913	52,3	5352	1899	109	9649	3439	197	
600	2779	994	54,6	5797	2068	114	10505	3744	206	
650	3005	1075	56,9	6270	2236	118	11362	4049	214	
700	3232	1156	59	6742	2405	123	12218	4354	222	
750	3458	1237	61,1	7215	2573	127	13075	4660	230	
800	3685	1318	63,1	7688	2742	131	13931	4965	238	
850	3911	1399	65	8160	2911	135	14787	5270	245	
900	4138	1480	66,9	8633	3079	139	15644	5575	252	
950	4364	1561	68,7	9105	3248	143	16500	5881	259	
1000	4591	1642	70,5	9578	3416	147	17357	6186	266	
1100	5044	1804	74	10523	3753	154	19070	6796	279	
1200	5497	1966	77,2	11469	4091	161	20782	7407	291	
1300	5950	2128	80,4	12414	4428	167	22495	8017	303	
1400	6394	2290	83,4	13340	4765	174	24174	8628	314	
1500	6889	2452	86,4	14373	5102	180				
1600	7393	2614	89,2	15424	5439	186				
1700	7907	2776	91,9	16497	5776	191				
1800	8433	2938	94,6	17594	6113	197				
1900	8971	3100	97,2	18718	6451	202				
2000	9525	3262	100	19872	6788	208				
2200	10684	3586	105	22292	7462	218				
2400	11935	3910	109	24901	8136	227				
2600	13310	4234	114	27770	8811	237				
2800	14864	4558	118	31012	9485	246				
3000		4882	122							
3200		5206	126							
3400		5530	130							
3600		5854	134							

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11

How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

h = Lift [mm]
 d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
 h/d_0 = Ratio of lift / flow diameter
 p_{a0} = Back pressure [bar_a]
 p_0 = Set pressure [bar_a]
 p_{a0}/p_0 = Ratio of back pressure / set pressure
 K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
 α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
 K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)

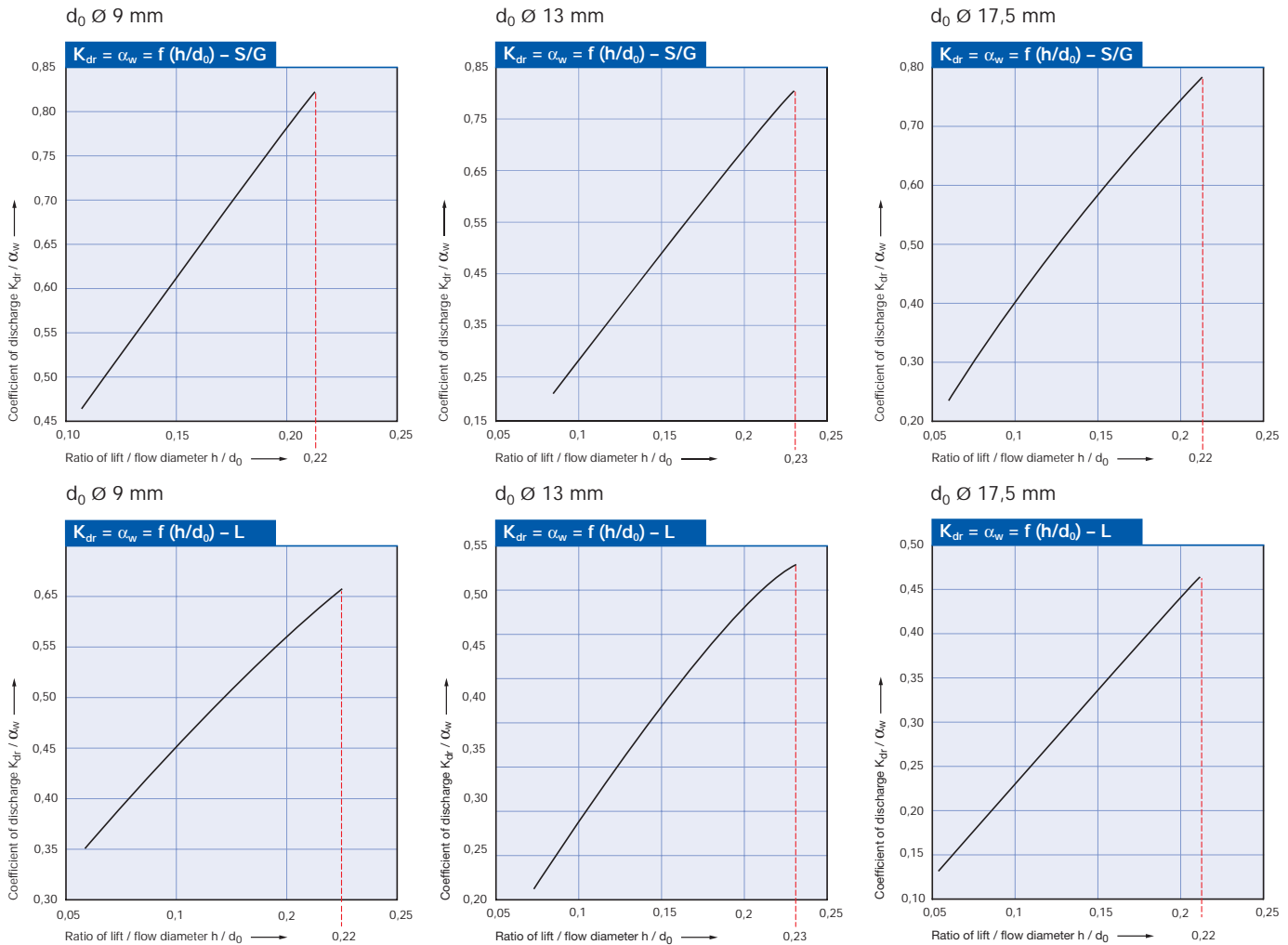
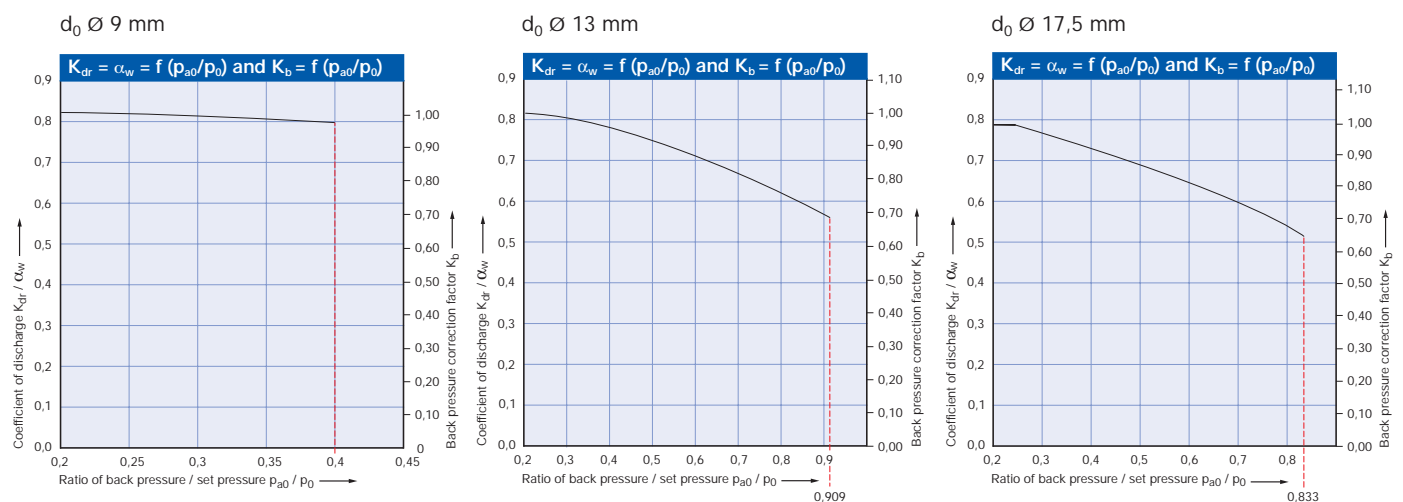


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)



How to use please refer to page 00/08

Type 459 HDD



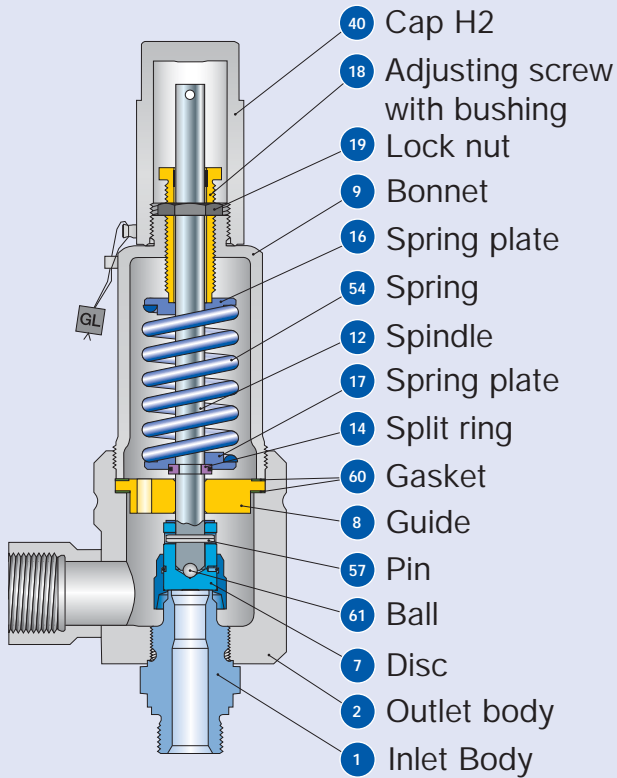
Type 459 HDD
Cap H2

Safety Relief Valves Heavy Duty Design – spring loaded

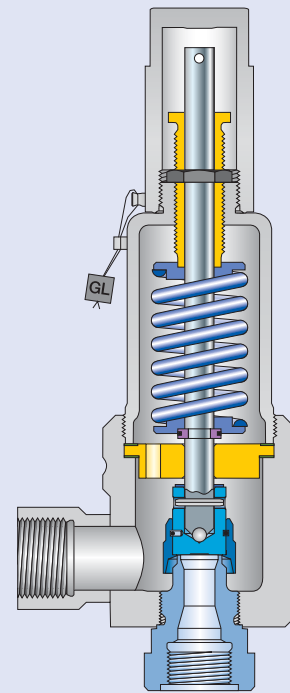
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Determination of coefficient of discharge K_{dr}/α_w	06/18

Type 459 HDD

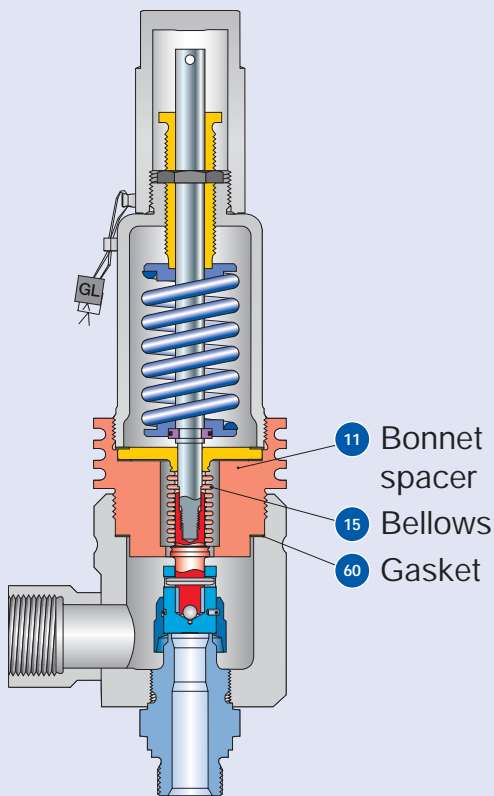
Available designs



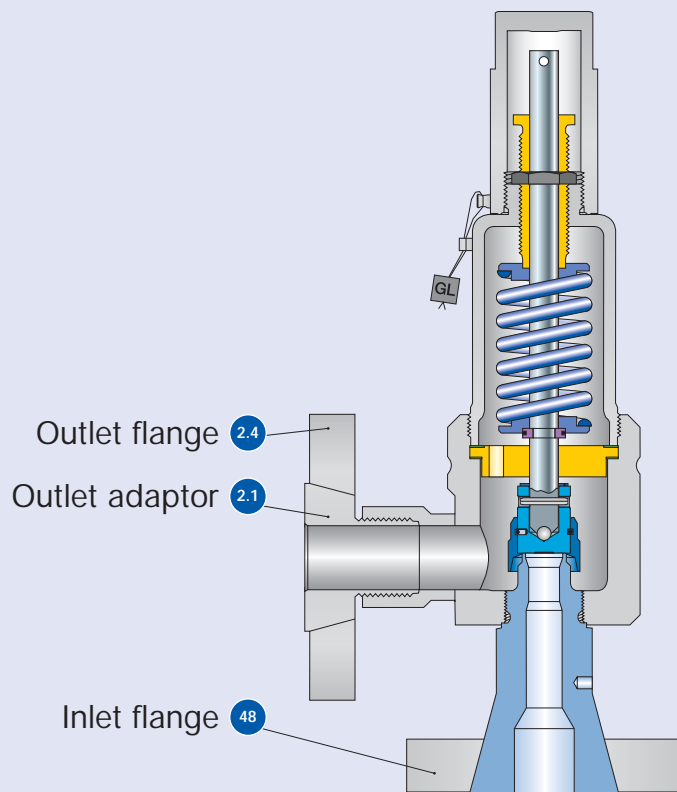
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials			Type 4594 HDD
Item	Component	Remarks	Type 4594 HDD
1	Base / Inlet body	Threaded connection	1.4404 stellited SA 479 316L stellited
		Flange connection	1.4404 stellited SA 479 316L stellited
2	Outlet body		1.4404 SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L
7	Disc	Metal seat	1.4404 SA 479 316L
8	Guide		1.4404 316L
		Balanced bellows design	1.4404 / SA 316L Upper connection of balanced bellows
9	Bonnet		1.4404 316L
		Balanced bellows design	1.4404 316L
11	Bonnet spacer	Balanced bellows design	1.4404 316L
12	Spindle		1.4404 316L
		Balanced bellows design	1.4404 316L
14	Split ring		1.4404 316L
15	Bellows	Balanced bellows design	1.4571 316Ti
16/17	Spring plate		1.4404 316L
18	Adjusting screw with bushung		1.4404 / PTFE 316L / PTFE
19	Lock nut		1.4404 316L
40	Cap H2		1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L
54	Spring	Standard	1.4310 Stainless steel
57	Pin		1.4310 Stainless steel
60	Gasket		Graphite / 1.4301 Graphite / 316L
61	Ball		1.4401 316

Material Options

The Heavy Duty Design of Type 459 HDD offers the possibility to easily obtain special material versions. The fact that all product wetted parts are machined from bar stock materials makes it easier and faster to fulfill almost all material requirements according to the metal availability.

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

1

Article Number

1	2	3	4
459	4	258	2

1 Type 459 HDD

Types of sealing

Metal seat

Metal-to-metal stellite

Soft seal (Sealing plate)

SP	Vespel-SP1
PCTFE	Kel-F

2 Material code

Code	Body material
4	Stainless steel

3 Valve code

Identifies valve size and body material, refer to page 06/07.

4 Code for lifting device

Code	Lifting device
2	Screwed cap H2
4	Packed lever H4

4594.2582

Article No.

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

10 bar_g

Set Pressure

3

Connections

Please refer to pages 09/06 and 09/07.

Please state one option code for each, inlet **and** outlet.

V62

V71

Connections

4 Options

Type 459 HDD	Option code
<ul style="list-style-type: none"> Plastic seal material (only d₀ 9 & d₀ 13) 	
PCTFE	"G" J48
Vespel SP	"T" J49
<ul style="list-style-type: none"> Stainless steel bellows 	<p>p ≤ 40 barg J78</p> <p>p > 40 barg J55</p>
Elastomer bellows	J79
Heating jacket	H29

J48

Options

5 Documentation

Please select requested documentation:

Inspections, tests:	Option code
DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	M33
LESER Certificate for Global Application	H03
- Inspection certificate 3.1 acc. to DIN EN 10204	
- Declaration of conformity acc. to PED 97/23/EC	
Part	Option code
Inlet body	H01
Outlet body	L34
Bonnet	L30
Cap / lever cover	L31
Disc	L23

H01 L30

Documentation

6 Code and Medium

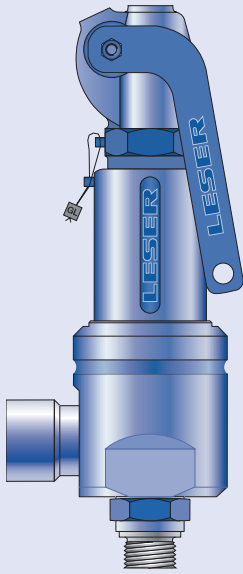
1	2
2	0
1 Code	
1. ASME Section VIII	
2. CE / VdTUEV	
3. ASME Section VIII + CE / VdTUEV	
2 Medium	
.1 Gases	
.2 Liquids	
.3 Steam	
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)	

2.0

Code and Medium

Type 459 HDD

How to order – Article numbers



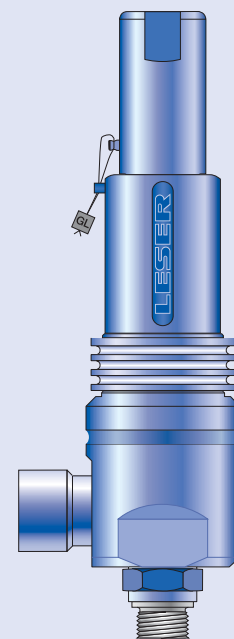
Type 459 HDD male
Packed lever H4
Conventional design



Type 459 HDD female
Packed lever H4
Conventional design



Type 459 HDD
Cap H2
Conventional design
Flanged connection



Type 459 HDD
Cap H2
Balanced bellows

How to order – Article numbers

Article numbers							
Actual Orifice diameter d_0 [mm]			6	6	9	13	
Actual Orifice area A_0 [mm ²]			28,2	28,2	63,9	133	
Actual Orifice diameter d_0 [inch]			0,236	0,236	0,354	0,512	
Actual Orifice area A_0 [inch ²]			0,044	0,044	0,099	0,206	
Body material: 14404 (316L)							
All body and trim parts	1.4404	H2	Art.-No. 4594.	2532	2542	2582	2592
		H4	Art.-No. 4594.	2534	2544	2584	2594
	p [bar _g]		S/G/L	420 - 700	700,01 – 850	1,5 – 420	0,2 – 200
	p [psig]			6091 – 10152	10153 – 12325	21,7 – 6091	2,9 – 2901

For selection of inlet and outlet connection please refer to page 09/06 – 09/07.

Dimensions and weights – Metric Units

Threaded connections

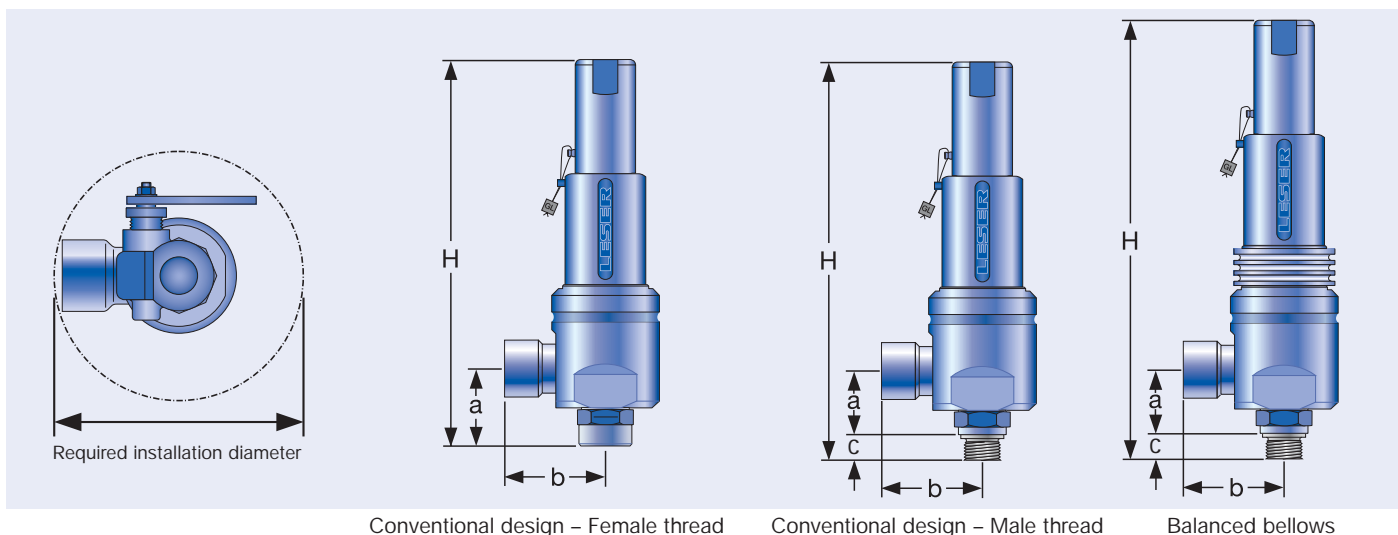
Size Outlet body		1"	1"	1"	1"	1"	1"	1"	1"	
Actual Orifice diameter d_0 [mm]		6	6	6	9	9	13	13	13	
Actual Orifice area A_0 [mm ²]		28,2	28,3	28,3	63,6	63,6	133	133	133	
Weight	Standard [kg]	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9	
	Balanced bellows [kg]	4,7	4,7	4,7	4,7	4,7	4,7	4,7	4,7	
Required installation diameter [mm]		165	165	165	165	165	165	165	165	
Inlet thread "Female"										
DIN ISO 228-1	G	Inlet a	60,5	65,5	70	65,5	70,5	60,5	65,5	70,5
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75
Height [mm]		H max.	290,5	295,5	300,5	295,5	300,5	290,5	295,5	300,5
ISO 7-1/BS 21	Rc	Inlet a	60,5	70,5	70,5	70,5	70,5	60,5	70,5	70,5
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75
Height [mm]		H max.	290,5	300,5	300,5	300,5	300,5	290,5	300,5	300,5
ANSI/ASME B1.20.1	NPT	Inlet a	60,5	70,5	70,5	70,5	70,5	60,5	70,5	75,5
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75
Height [mm]		H max.	290,5	300,5	300,5	300,5	300,5	290,5	300,5	300,5
Inlet thread "Male"										
DIN ISO 228-1	G	Inlet a	55,5	55,5	55,5	55,5	55,5	–	55,5	55,5
		Center to face [mm]	Outlet b	75	75	75	75	75	–	75
ISO 7-1/BS 21	R	Inlet a	52,5	52,5	52,5	52,5	52,5	–	52,5	52,5
		Center to face [mm]	Outlet b	75	75	75	75	75	–	75
ANSI/ASME B1.20.1	NPT	Inlet a	52,5	52,5	52,5	52,5	52,5	–	52,5	52,5
		Center to face [mm]	Outlet b	75	75	75	75	75	–	75

Height inlet thread "Male"

		Conventional design			Balanced bellows		
Inlet thread		1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1	[mm] G H max.	300,5	301,5	303,5	345,5	346,5	348,5
ISO 7-1/BS 21	[mm] R H max.	301,5	302,5	305,5	346,5	347,5	350,5
ASME B1.20.1	[mm] NPT H max.	304,5	304,5	309,5	349,5	349,5	354,5

Length of screwed end "c" inlet thread "Male"

Inlet thread		1/2"	3/4"	1"
DIN ISO 228-1	[mm] G	15	16	18
ISO 7-1/BS 21	[mm] R	19	20	23
ASME B1.20.1	[mm] NPT	22	22	27



Conventional design – Female thread

Conventional design – Male thread

Balanced bellows

Dimensions and weights – Metric Units

Flanged connection

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [mm]	6	9	13	6	9	13
Actual Orifice area A_0 [mm ²]	28,3	63,6	133	28,3	63,6	133

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

Flange rating PN 40 – 400

Center to face [mm]	Inlet a	Conventional design			Balanced bellows		
		100	100	100	100	100	100
	Outlet b	100	100	100	100	100	
Height [H4] [mm]	H max.	330	330	330	330	330	

ASME B 16.5 (Available flange sizes refer to page 09/07)

Flange rating class 150 – 2500

Center to face [mm]	Inlet a	Conventional design			Balanced bellows		
		100	100	100	100	100	100
	Outlet b	100	100	100	100	100	
Height [H4] [mm]	H max.	330	330	330	375	375	

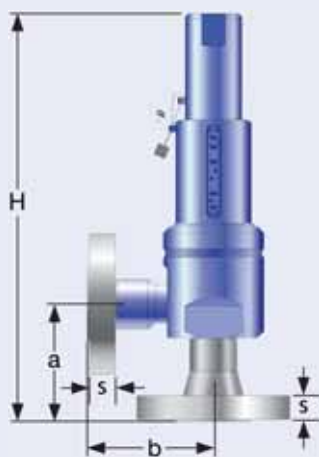
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

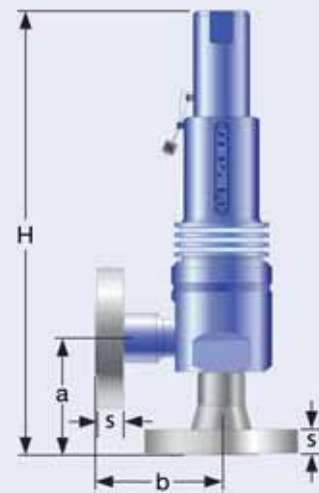
Weight net [kg]	W_N	Conventional design			Balanced bellows		
(without inlet and outlet flange)	2,6	2,6	2,6	3,8	3,8	3,8	

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class					
		40	160	250	320	400	Size	150	300	600	900	1500
DN 15		NPS 1/2"										
Flange thickness [mm]	s	18	22	26	26	30	14	18	26	30,2		
Weight slip on flange [kg]	W_F	0,8	1,2	2,5	2,5	3,6	0,6	0,9	2,1	3		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Available at Outlet		✓	✓	✓			✓	✓	✓		✓	
DN 20		NPS 3/4"										
Flange thickness [mm]	s	20	22				15	18	25,4	32		
Weight slip on flange [kg]	W_F	1,1	1,3				0,8	1,4	2,3	3,5		
Available at Inlet		✓	✓				✓	✓	✓	✓		✓
Available at Outlet		✓	✓				✓	✓	✓		✓	
DN 25		NPS 1"										
Flange thickness [mm]	s	22	26	30	36	40	17	21,5	32,5	40		
Weight slip on flange [kg]	W_F	1,3	2,6	3,5	5	7,5	1	2,1	4,1	5,1		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Available at Outlet		✓	✓	✓			✓	✓	✓		✓	
DN 40		NPS 1 1/2"										
Flange thickness [mm]	s	23	23	34			22	24	38			
Weight slip on flange [kg]	W_F	2,1	2,9	4,3			1,4	2,2	3,9			
Available at Inlet		✓	✓	✓			✓	✓	✓			
Available at Outlet		✓	✓	✓			✓	✓	✓			



Conventional design



Balanced bellows

Dimensions and weights - US Units

Threaded connections

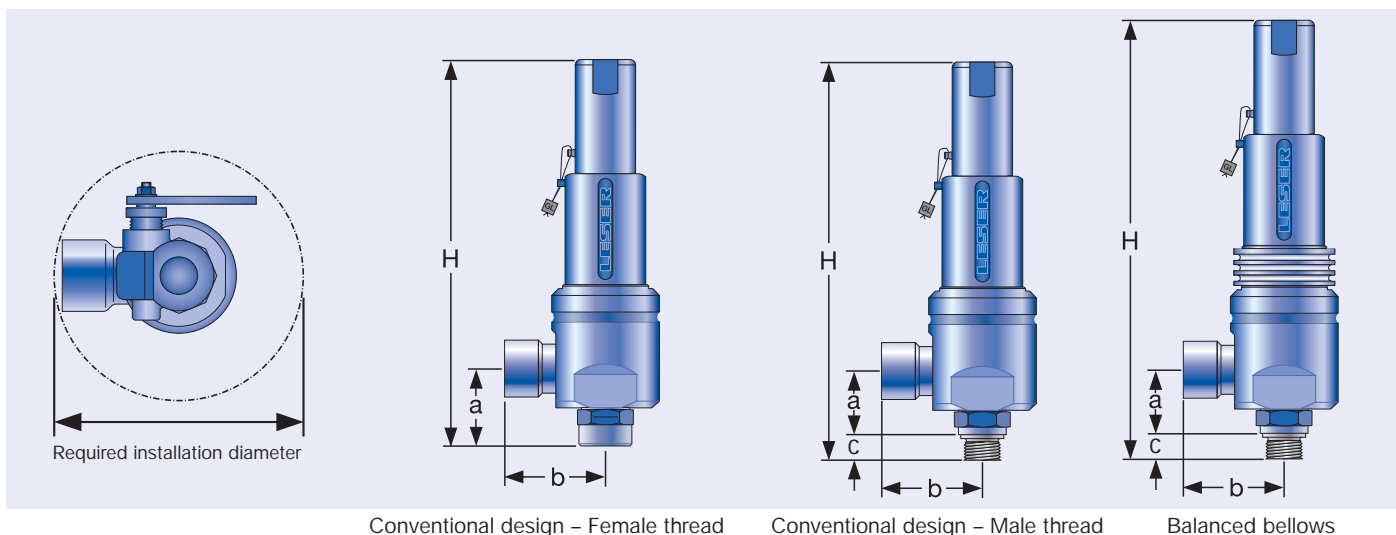
Size Outlet body		1"	1"	1"	1"	1"	1"	1"	1"	
Actual Orifice diameter d_0 [inch]		0,236	0,236	0,236	0,354	0,354	0,512	0,512	0,512	
Actual Orifice area A_0 [inch ²]		0,044	0,044	0,044	0,099	0,099	0,206	0,206	0,206	
Weight	Standard [lbs]	5,7	5,7	5,7	5,7	5,7	5,7	5,7	5,7	
	Balanced bellows	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	
Required installation diameter [inch]		6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	
Inlet thread "Female"										
DIN ISO 228-1	G	Inlet a	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ⁶ / ₁₆	2 ¹¹ / ₁₉	2 ²⁵ / ₃₂
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ¹ / ₂	11 ⁴⁷ / ₇₁	11 ⁵⁴ / ₆₅
ISO 7-1/BS 21	Rc	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²¹ / ₅₅	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ⁵⁴ / ₆₅	11 ⁵⁴ / ₆₅
ANSI/ASME B1.20.1	NPT	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²¹ / ₅₅	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ⁵⁴ / ₆₅	11 ⁵⁴ / ₆₅
Inlet thread "Male"										
DIN ISO 228-1	G	Inlet a	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	-	2 ¹⁵ / ₁₆
ISO 7-1/BS 21	R	Inlet a	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	-	2 ¹ / ₁₆	2 ¹ / ₁₆
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	-	2 ¹⁵ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	-	2 ¹ / ₁₆	2 ¹ / ₁₆
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	-	2 ¹⁵ / ₁₆

Height inlet thread "Male"

		Conventional design			Balanced bellows			
Inlet thread		Size	1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1	[inch] G	H max.	11 ¹³ / ₁₆	11 ⁷ / ₈	11 ¹⁵ / ₁₆	13 ¹⁹ / ₃₂	13 ⁵ / ₈	13 ²³ / ₃₂
ISO 7-1/BS 21	[inch] R	H max.	11 ⁷ / ₈	11 ²⁹ / ₃₂	12 ¹ / ₃₂	12 ³ / ₃₂	13 ¹¹ / ₁₆	13 ¹³ / ₁₆
ASME B1.20.1	[inch] NPT	H max.	12	12	12 ³ / ₁₆	13 ³ / ₄	13 ³ / ₄	13 ³¹ / ₃₂

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	1/2"	3/4"	1"
DIN ISO 228-1	[inch] G		1 ⁹ / ₃₂	5/8	2 ³ / ₃₂
ISO 7-1/BS 21	[inch] R		3/4	2 ⁵ / ₃₂	2 ⁹ / ₃₂
ASME B1.20.1	[inch] NPT		7/8	7/8	1 ¹ / ₁₆



Dimensions and weights – US Units

Flanged connection

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [inch]	0,236	0,354	0,512	0,236	0,345	0,512
Actual Orifice area A_0 [inch ²]	0,044	0,099	0,206	0,044	0,099	0,206

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

		Flange rating PN 40 – 400					
Center to face [inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
	Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height [H4] [inch]	H max.	13	13	13	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{3}/_{4}$

ASME B 16.5 (Available flange sizes refer to page 09/07)

		Flange rating class 150 – 2500					
Center to face [inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
	Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height [H4] [inch]	H max.	13	13	$13^{1}/_{8}$	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{3}/_{4}$

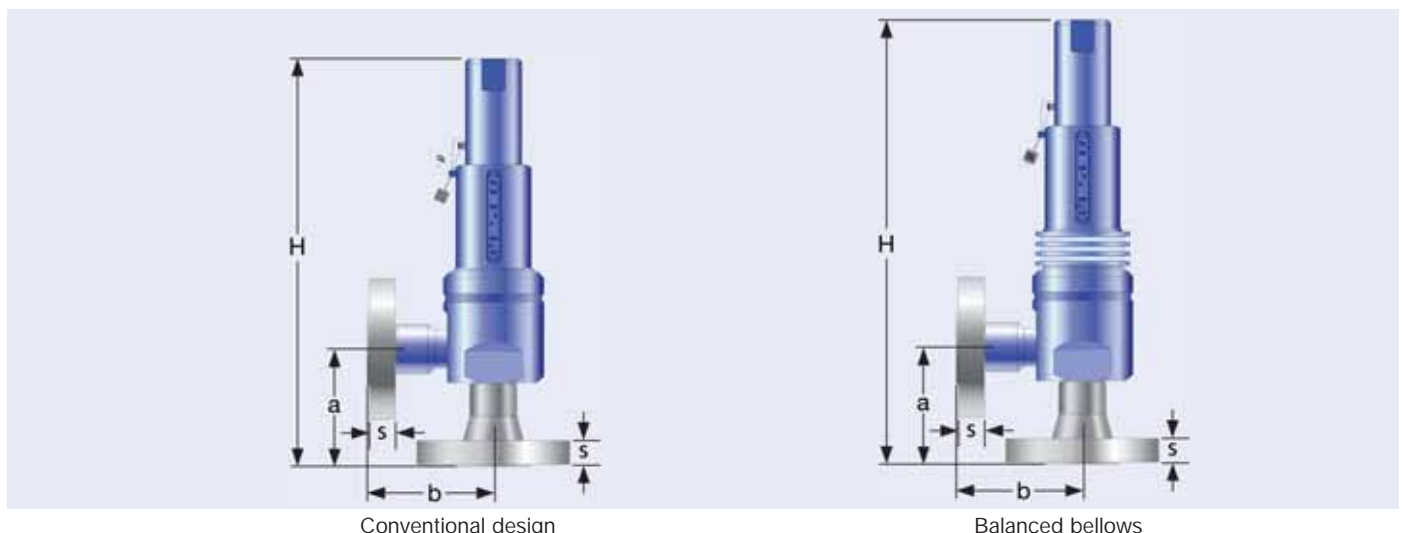
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

Weight net [lbs]		5,7	5,7	5,7	8,4	8,4	8,4
(without inlet and outlet flange) W_N							

Flange dimensions and availability

		DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
Size		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS $1/2$ "						
Flange thickness [inch]	s	$1^{1}/_{16}$	$7/8$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$		$9/_{16}$	$1^{1}/_{16}$		$1^{1}/_{32}$		$1^{3}/_{16}$
Weight slip on flange [lbs]	W_F	1,8	2,6	5,5	5,5	7,9		1,3	2		4,6		6,6
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓		✓
Available at Outlet		✓	✓	✓				✓	✓		✓		
DN 20							NPS $3/4$ "						
Flange thickness [inch]	s	$2^{5}/_{32}$	$7/8$					$1^{9}/_{32}$	$1^{1}/_{16}$		1		$1^{1}/_{4}$
Weight slip on flange [lbs]	W_F	2,4	2,9					1,8	3,1		5,1		7,7
Available at Inlet		✓	✓					✓	✓		✓		✓
Available at Outlet		✓	✓					✓	✓		✓		
DN 25							NPS 1"						
Flange thickness [inch]	s	$7/8$	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$		$1^{1}/_{16}$	$2^{7}/_{32}$		$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange [lbs]	W_F	2,9	5,7	7,7	11	16,5		2,2	4,6		9	9	11,2
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓	✓	✓
Available at Outlet		✓	✓	✓				✓	✓		✓		
DN 40							NPS $1^{1}/_{2}$ "						
Flange thickness [inch]	s	$2^{9}/_{32}$	$2^{9}/_{32}$	$1^{11}/_{32}$				$7/8$	$1^{5}/_{16}$		$1^{1}/_{2}$		
Weight slip on flange [lbs]	W_F	4,5	6,3	9,5				3,2	4,8		8,6		
Available at Inlet		✓	✓	✓				✓	✓		✓		
Available at Outlet		✓	✓	✓				✓	✓		✓		



Type 459 HDD

Pressure temperature ratings

Metric Units															
Actual Orifice diameter d_0 [mm]		6					9					13			
Actual Orifice Area A_0 [mm ²]		28,2					63,6					133			
Body material 1.4404 (316L) Type 4594															
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"		
	Pressure rating	PN 700			PN 850			PN 500			PN 250				
Outlet body	Pressure rating	PN 160			PN 160			PN 160			PN 160				
Minimum set pressure	p [bar _g] S/G/L	420			420			1,5			0,2				
Maximum set pressure	p [bar _g] S/G	700			-			420			200				
	p [bar _g] L	-			850										
Temperature acc. to DIN EN	min [°C]								-270						
	max [°C]								+550						
Temperature acc. to ASME	min [°C]								-268						
	max [°C]								+538						

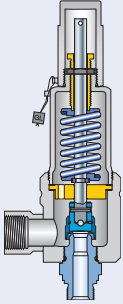
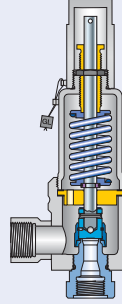
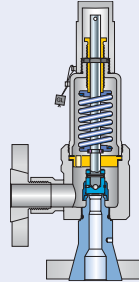
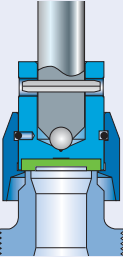
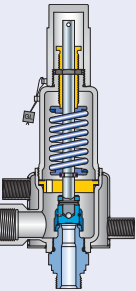
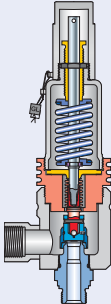
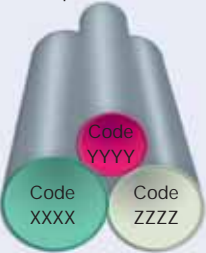
US Units															
Actual Orifice diameter d_0 [inch]		0,236					0,354					0,512			
Actual Orifice Area A_0 [inch ²]		0,044					0,099					0,206			
Body material 1.4404 (316L) Type 4594															
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"		
Minimum set pressure	p [psig] S/G/L	6091			10153			21,7			2,9				
Maximum set pressure	p [psig] S/G	10150			-			6091			2901				
	p [psig] L	-			12325										
Temperature acc. to DIN EN	min [°F]								-454						
	max [°F]								+1022						
Temperature acc. to ASME	min [°F]								-450						
	max [°F]								+1000						

Because there is no open bonnet for this type available, please use at a temperature of 300°C (572°F) a stainless steel bellows or a specific high temperature model without a bellows. For DIN EN applications at temperatures under -10°C please proceed according to AD-2000 Merkblatt W 10.

Order information – Spare Parts

Spare parts																	
Actual Orifice diameter d_0 [mm]	6			9			13										
Actual Orifice area A_0 [mm ²]	28,2			63,6			133										
Actual Orifice diameter d_0 [inch]	0,236			0,354			0,512										
Actual Orifice area A_0 [inch ²]	0,044			0,099			0,206										
Body (Item 1): Male thread				Material-No. / Art.-No.													
Connection Size		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	1/2"	1"							
DIN ISO 228-1	G	316L stellited	136.6969.9000	136.7069.9000	136.7169.9000	–	136.7569.9000	136.7669.9000	–	136.8069.9000 136.8169.9000							
ISO 7-1/BS 21	R	316L stellited	136.6969.9220	136.7069.9220	136.7169.9220	–	136.7569.9220	136.7669.9220	–	136.8069.9220 136.8169.9220							
ANSI/ASME B1.20.1	NPT	316L stellited	136.6969.9204	136.7069.9204	136.7169.9204	–	136.7569.9204	136.7669.9204	–	136.8069.9204 136.8169.9204							
Body (Item 1): Female thread				Material-No. / Art.-No.													
DIN ISO 228-1	G	316L stellited	136.6969.9210	136.7069.9210	136.7169.9210	136.7469.9210	136.7569.210	136.7669.9210	–	–							
ISO 7-1/BS 21	Rc	316L stellited	136.6969.9222	136.7069.9222	136.7169.9222	136.7469.9222	136.7569.9222	136.7669.9222	136.7969.9222	136.8069.9222 136.8169.9222							
ANSI/ASME B1.20.1	NPT	316L stellited	136.6969.9211	136.7069.9211	136.7169.9211	136.7469.9211	136.7569.9211	136.7669.9211	–	–							
Body (Item 1): Flange design				Material-No. / Art.-No.													
DN 15 / NPS 1/2"	PN 40 – PN 400	316L stellited	136.6969.9208			136.7469.9208			136.7969.9208								
	CL 300 – CL 2500	316L stellited															
DN 20 / NPS 3/4"	PN 40 – PN 400	316L stellited	136.7069.9208			136.3969.9208			136.5069.9208								
	CL 150 – CL 2500	316L stellited															
DN 25 / NPS 1"	PN 40 – PN 400	316L stellited	136.7169.9208			136.3469.9208			136.3569.9208								
	CL 150	316L stellited										136.7669.9202			136.8169.9202		
	CL 300 – CL 2500	316L stellited															
Disc (Item 7): Metal to metal				Material-No. / Art.-No.													
Disc	1.4404	316L stellited	200.3269.9118 (L) / 200.3969.9118 (S/G)			200.2069.9118			200.2169.9118								
Disc with sealing plate (Item 7)				Material-No. / Art.-No.													
Disc	1.4404	PCTFE "G"	–			200.2149.9006			200.2249.9006								
		SP "T"	–			200.2149.9007			200.2249.9007								
Sealing plate (Item 7.3)				Material-No. / Art.-No.													
Sealing plate	1.4404	PCTFE "G"	–			236.3569.0000			236.0869.0000								
		SP "T"	–			236.3579.0000			236.0879.0000								
Pin (Item 57)				Material-No. / Art.-No.													
Pin	1.4310		200.2039.9000			200.2039.9000			200.2139.9000								
Gasket – outlet body / bonnet (Item 60)				Material-No. / Art.-No.													
Gasket	Graphite + 1.4401		500.2407.0000			500.2407.0000			500.2407.0000								
Option code	L68 Gylon (Filled PTFE)		500.2405.0000			500.2407.0000			500.2407.0000								
Ball (Item 61)				Material-No. / Art.-No.													
Ball	Ball Ø [mm]		6			6			6								
	1.4401		510.0104.0000			510.0104.0000			510.0104.0000								
Bellows and bellows conversion kit (Item 15)				Material-No. / Art.-No.													
Stainless steel bellows	1.4571/316Ti		p ≤ 40 bar / 580 psig = 400.7949.0000														
			p > 40 bar / 580 psig = 400.6349.0000														
Conversion kit	≤ PN 40 / CL 600					5021.1050											
	> PN 40 / CL 600					5021.1051											

Available Options

<p>Male thread</p> 	<p>Female thread</p> 	<p>Flanged version</p> 	
<p>Disc with inserted sealing plate J48: PTFE-FDA "G" J49: VESPEL-SP "T"</p> 			
<p>Heating jacket H29</p> 	<p>Balanced bellows</p> 		
<p>Special material 2.4610 Hastelloy® C4 2.4360 Monel® 400 1.4462 Duplex</p> 			

Type 459 HDD

Approvals

Approvals				
Actual Orifice diameter d_0 [mm]		6	9	13
Actual Orifice area A_0 [mm ²]		28,2	63,6	133
Actual Orifice diameter d_0 [inch]		0,236	0,354	0,512
Actual Orifice area A_0 [inch ²]		0,044	0,099	0,206
Europe		Coefficient of discharge K_{dr}		
DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13		
	S/G	0,81	0,83	0,81
	L	0,70	0,61	0,53
Germany		Coefficient of discharge α_w		
AD 2000-Merkblatt A2	Approval No.	TÜV SV 909		
	S/G	0,81	0,83	0,81
	L	0,70	0,61	0,53
United States		Coefficient of discharge K		
ASME Sec. VIII	Approval No.	M 37112		
	S/G	0,811		
	Approval No.	M 37101		
	L	0,566		
Canada		Coefficient of discharge K		
CRN	Approval No.	OG0730.95		
	S/G	Refer to ASME Sec. VIII		
	L	Refer to ASME Sec. VIII		
China		Coefficient of discharge α_w		
CSBQTS	Approval No.			
	S/G	0,81	0,83	0,81
	L	0,70	0,61	0,53
Russia		Coefficient of discharge α_w		
GGTN/	Approval No.	PPC 00-18458		
GOSGOTECHNADZOR	S/G	0,81	0,83	0,81
GOST R	L	0,7	0,61	0,53
Classification societies		Homepage		
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every renewal. A sample certificate including the valid certification number can be taken from the homepage of the classification societies.	
Det Norske Veritas	DNV	www.dnv.com		
Germanischer Lloyd	GL	www.gl-group.com		
Lloyd' s Register EMEA	LREMEA	www.lr.org		
Registro Italiano Navale	RINA	www.rina.org		

Capacities – Metric Units

Capacities according to AD 2000-Merkblatt A2, based on set-pressure plus 10% overpressure.
 Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2								
Actual Orifice diameter d_0 [mm]		6			9			13		
Actual Orifice area A_0 [mm ²]		28,2			63,6			133,0		
LEO*) [inch ²]		S/G = 0,036 L = 0,038			S/G = 0,082 L = 0,086			S/G = 0,171 L = 0,179		
Set pressure		Capacities			Capacities			Capacities		
		Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]		[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]
0,2								53	61	1,96
1								120	143	3,75
1,5					77	92	2,54	156	188	4,6
2					93	113	2,93	190	229	5,31
3					127	155	3,59	258	316	6,5
4					158	195	4,14	322	396	7,51
5					189	234	4,63	386	477	8,39
6					220	274	5,07	449	557	9,19
7					251	313	5,48	511	638	9,93
8					282	353	5,86	573	718	10,6
9					312	392	6,21	636	799	11,3
10					343	432	6,55	699	879	11,9
12					405	511	7,17	824	1040	13
14					465	590	7,75	947	1201	14
16					527	669	8,28	1072	1363	15
18					588	748	8,78	1197	1524	15,9
20					650	827	9,26	1323	1685	16,8
25					802	1025	10,4	1633	2087	18,8
30					957	1223	11,3	1949	2490	20,6
35					1111	1421	12,2	2261	2893	22,2
40					1268	1618	13,1	2582	3295	23,7
45					1427	1816	13,9	2906	3698	25,2
50					1588	2014	14,6	3234	4101	26,5
60					1910	2409	16	3889	4906	29,1
70					2245	2805	17,3	4571	5711	31,4
80					2583	3201	18,5	5259	6517	33,6
90					2938	3596	19,6	5982	7322	35,6
100					3296	3992	20,7	6711	8127	37,5
120					4077	4783	22,7	8302	9738	41,1
140					4958	5574	24,5	10096	11349	44,4
160					5977	6365	26,2	12171	12959	47,5
180					7262	7156	27,8	14786	14570	50,3
200					8989	7947	29,3	18303	16181	53,1
220						8738	30,7			
240						9529	32,1			
260						10320	33,4			
280						11111	34,6			
300						11902	35,9			
320						12693	37			
340						13484	38,2			
360						14275	39,3			
380						15066	40,4			
400						15857	41,4			
420						16648	42,4			
440										
460						7221	21,6			
480						7564	22,1			
500						7907	22,6			
520						8250	23,1			
540						8593	23,6			
560						8936	24,1			
580						9280	24,5			
600						9623	25			
650						9966	25,4			
700						10309	25,9			
750						11167	26,9			
800						18024	27,9			
850						12882	28,9			
						13740	29,9			
						14598	30,8			

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11

How to use capacity-sheets refer to page 00/09

Capacities – US Units

Capacities according to ASME Section VIII (UV), based on set-pressure plus 10% overpressure.
 Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

US Units		ASME Section VIII								
Actual Orifice diameter d_0 [inch]		0,236			0,354			0,512		
Actual Orifice area A_0 [inch ²]		0,044			0,099			0,206		
LEO*) [inch ²]		S/G = 0,036 L = 0,038			S/G = 0,082 L = 0,086			S/G = 0,171 L = 0,179		
Set pressure		Capacities			Capacities			Capacities		
		Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]	Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]	Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]
[psig]		[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]
5								195	69	12,5
10								238	85	16
20					155	55	10,2	324	115	21,2
30					196	70	12,2	410	146	25,4
40					242	86	14,1	504	180	29,3
50					287	103	15,8	599	213	32,8
60					332	119	17,3	693	247	35,9
70					377	135	18,7	788	281	38,8
80					423	151	19,9	882	315	41,5
90					468	167	21,2	977	348	44
100					513	184	22,3	1071	382	46,4
150					740	265	27,3	1544	551	56,8
200					966	346	31,5	2016	719	65,6
250					1193	427	35,3	2489	888	73,4
300					1419	508	38,6	2962	1056	80,4
350					1646	589	41,7	3434	1225	86,8
400					1872	670	44,6	3907	1393	92,8
450					2099	751	47,3	4379	1562	98,4
500					2326	832	49,9	4852	1731	104
600					2779	994	54,6	5797	2068	114
700					3232	1156	59	6742	2405	123
800					3685	1318	63,1	7688	2742	131
900					4138	1480	66,9	8633	3079	139
1000					4591	1642	70,5	9578	3416	147
1100					5044	1804	74	10523	3753	154
1200					5497	1966	77,2	11469	4091	161
1300					5950	2128	80,4	12414	4428	167
1400					6394	2290	83,4	13340	4765	174
1500					6889	2452	86,4	14373	5102	180
1600					7393	2614	89,2	15424	5439	186
1700					7907	2776	91,9	16497	5776	191
1800					8433	2938	94,6	17594	6113	197
1900					8971	3100	97,2	18718	6451	202
2000					9525	3262	100	19872	6788	208
2250					10988	3667	106	22925	7631	220
2500					12604	4072	111	26298	8473	232
2750					14454	4477	117	30158	9316	243
3000						4882	122		10159	254
3250						5287	127			
3500						5692	132			
3750						6097	137			
4000						6502	141			
4250						6908	145			
4500						7313	150			
4750						7718	154			
5000						8123	158			
5250						8528	162			
5500						8933	165			
5750						9338	169			
6000						9743	173			
6250						10148	176			
6500			4330	76,8						
6750			4510	78,4						
7000			4690	79,9						
7250			4870	81,4						
7500			5050	82,9						
7750			5230	84,4						
8000			5410	85,8						
8250			5590	87,3						
8500			5770	88,6						
8750			5950	90						
9000			6130	91,4						
9250			6310	92,7						
9500			6490	94						
9750			6851	96,6						
10000			7211	99,1						
11000			7931	104,0						
12000			8651	109,0						

*) $LEO_{S/G/L}$ = LESER Effective Orifice steam / gas / liquids please refer to page 00/11

How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d₀) in reference to the coefficient of discharge (K_{dr}/α_w)

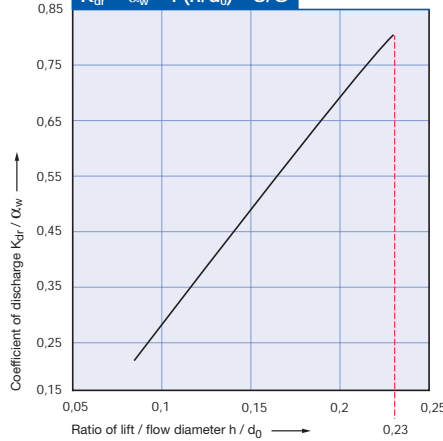
d₀ Ø 6 mm

$$K_{dr} = \alpha_w = f(h/d_0) - S/G$$

A lift restriction is not applicable because the actual design and the certified lift ≤ 1,5 mm / 1/16 inch.

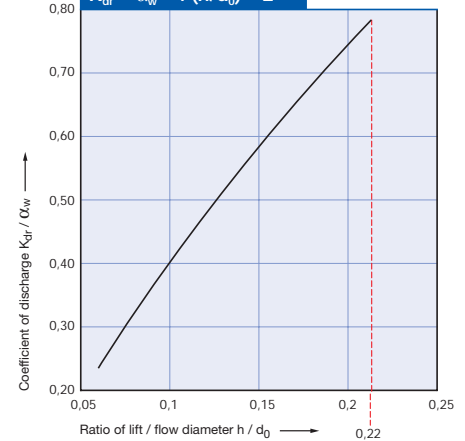
d₀ Ø 9 mm

$$K_{dr} = \alpha_w = f(h/d_0) - S/G$$



d₀ Ø 13 mm

$$K_{dr} = \alpha_w = f(h/d_0) - L$$



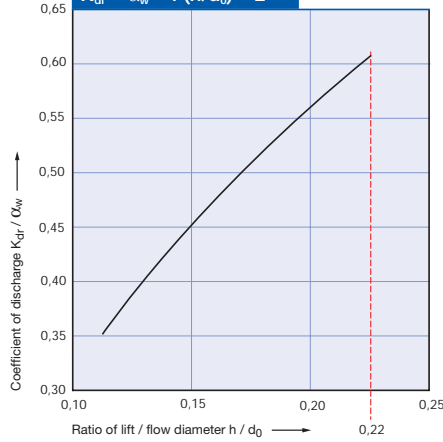
d₀ Ø 6 mm

$$K_{dr} = \alpha_w = f(h/d_0) - S/G$$

A lift restriction is not applicable because the actual design and the certified lift ≤ 1,5 mm / 1/16 inch.

d₀ Ø 9 mm

$$K_{dr} = \alpha_w = f(h/d_0) - L$$



d₀ Ø 13 mm

$$K_{dr} = \alpha_w = f(h/d_0) - L$$

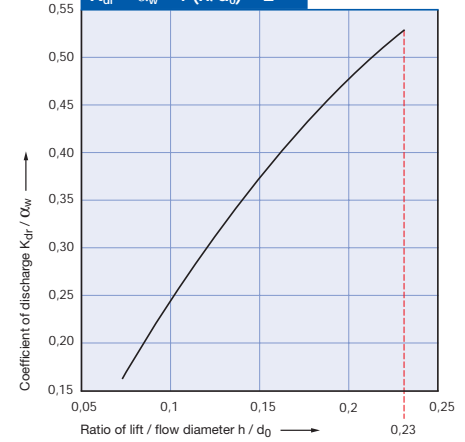


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)

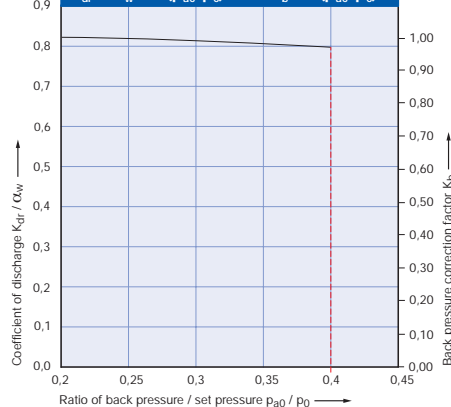
d₀ Ø 6 mm

$$K_{dr} = \alpha_w = f(p_{a0}/p_0) \text{ und } K_b = f(p_{a0}/p_0)$$

The certified coefficient of discharge K_{dr} / α_w
S/G = 0,81
L = 0,70
is constant in set pressure range.

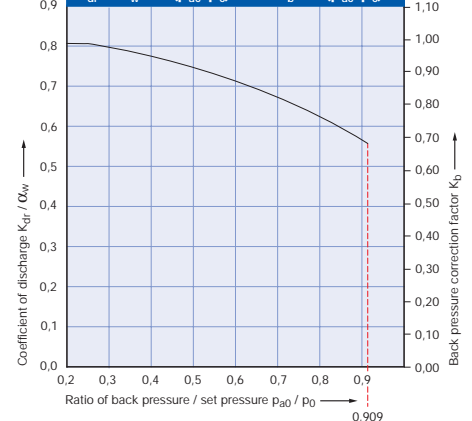
d₀ Ø 9 mm

$$K_{dr} = \alpha_w = f(p_{a0}/p_0) \text{ und } K_b = f(p_{a0}/p_0)$$



d₀ Ø 13 mm

$$K_{dr} = \alpha_w = f(p_{a0}/p_0) \text{ und } K_b = f(p_{a0}/p_0)$$



How to use please refer to page 00/08

Type 462

Type 462
Plain lever H3



Safety Relief Valves – spring loaded

Contents

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Dimensions and weights

- Metric Units [Threaded connection] 07/08
- [Flanged connection] 07/09
- US Units [Threaded connection] 07/10
- [Flanged connection] 07/11

Pressure temperature ratings

- Metric Units 07/12
- US Units 07/13

Order information – Spare parts 07/14

Available options 07/16

Approvals 07/17

Capacities

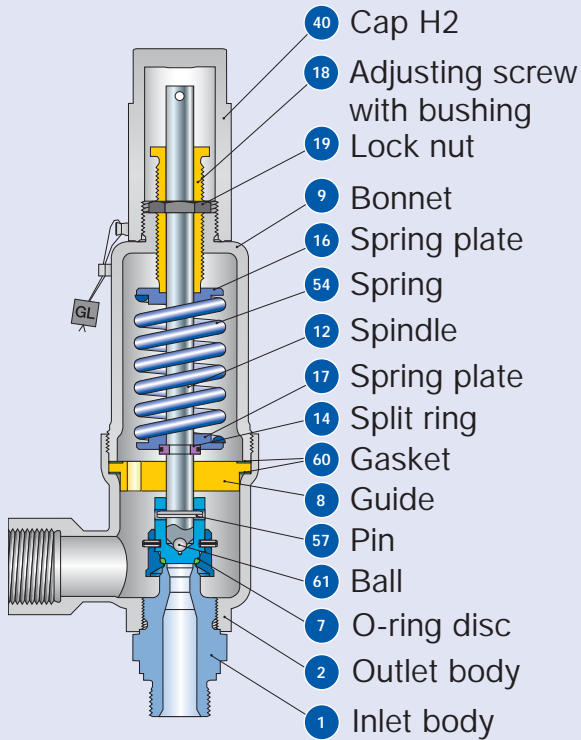
- Metric Units [Steam, Air, Water] 07/18
- US Units [Steam, Air, Water] 07/19

Determination of coefficient of discharge K_{dr}/α_w 07/20

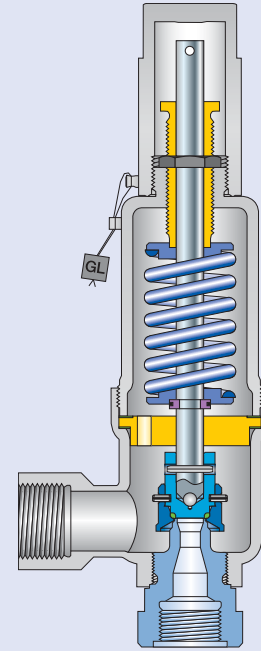
Type 462
Cap H2



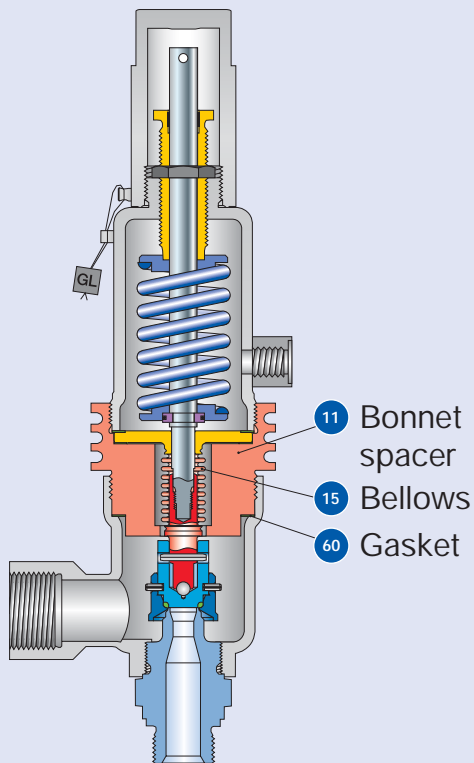
Available designs



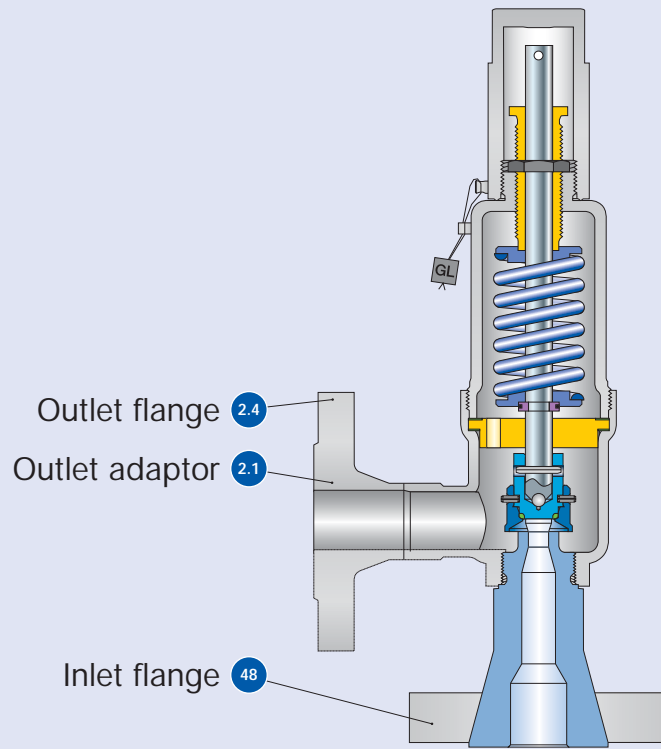
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials					
Item	Component	Remarks	Type 4623	Type 4622	Type 4624
1	Base / Inlet body	Threaded connection	1.4104	1.4404 SA 479 316L	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L	1.4404 SA 479 316L
2	Outlet body		0.7043 Ductile Gr. 60-40-18	1.4404 SA 479 316L	1.4404 SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
7	O-ring disc		1.4404 SA 479 316L	1.4404 SA 479 316L	1.4404 SA 479 316L
7.4	Soft seal O-ring	"N"	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene
		"K"	CR Chloroprene	CR Chloroprene	CR Chloroprene
		"D"	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene
		"L"	FPM Fluorocarbon	FPM Fluorocarbon	FPM Fluorocarbon
		"C"	FFKM Perflouro	FFKM Perflouro	FFKM Perflouro
8	Guide		1.4104 tenifer Chrome steel tenifer	1.4104 tenifer Chrome steel tenifer	1.4404 316L
		Balanced bellows design	1.4404 / SA 316L Upper connection of balanced bellows	1.4404 / SA 316L Upper connection of balanced bellows	1.4404 / SA 316L Upper connection of balanced bellows
9	Bonnet		0.7043 Ductile Gr. 60-40-18	1.0460 Carbon steel	1.4404 316L
		Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
11	Bonnet spacer	Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
12	Spindle		1.4021 420	1.4404 316L	1.4404 316L
		Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
14	Split ring		1.4104 Chrome steel	1.4104 Chrome steel	1.4404 316L
		Balanced bellows design	1.4571 316Ti	1.4571 316Ti	1.4571 316Ti
16/17	Spring plate		1.0718 Steel	1.0718 Steel	1.4404 316L
18	Adjusting screw with bushing		1.4104 / PTFE Chrome steel / PTFE	1.4104 / PTFE Chrome steel / PTFE	1.4104 / PTFE Chrome steel / PTFE
19	Lock nut		1.4104 430	1.4104 430	1.4404 316L
40	Cap H2		1.0718 Steel	1.0718 Steel	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
54	Spring	Standard	1.1200 / 1.8159 / 1.7107 Carbon steel	1.1200 / 1.8159 / 1.7107 Carbon steel	1.4310 Stainless steel
		Optional	1.4310 Stainless steel	1.4310 Stainless steel	- -
57	Pin		1.4310 Stainless steel	1.4310 Stainless steel	1.4310 Stainless steel
60	Gasket		Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316
61	Ball		1.3541 Hardened stainless steel	1.3541 Hardened stainless steel	1.4401 316

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

1

Article Number

1	2	3	4
462	4	295	2

1 Type 462

Types of sealing

Soft seal	Soft seal material
NBR	Buna-N®
EPDM	Buna-EP®
CR	Neoprene®
FKM	Viton®
FFKM	Kalrez® 6375

2 Material code

Code	Body material
2	Steel
3	SG iron
4	Stainless steel

3 Valve code

Identifies valve size and body material, refer to page 07/07.

4 Code for lifting device

Code	Lifting device	
2	Screwed cap	H2
3	Plain lever	H3
4	Packed knob	H4

4624.2952

Article No.

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

12 bar_g

Set Pressure

3

Connections

Please refer to table "Available Connections" on pages 09/06 and 09/07.

Please state one option code for each, inlet **and** outlet.

V62

V71

Connections

4 Options

Type 462	Option code
• Base / Inlet body material 316L (Type 4623, 4622 only)	L18
• Soft seal material	
NBR	"N" J30
CR	"K" J21
EPDM	"D" J22
FKM	"L" J23
FFKM	"C" J20
• Stainless steel bellows	
p ≤ 40 bar _g	J78
p > 40 bar _g	J55
• Elastomer bellows	J79
• Heating jacket	H29
• High temperature alloy spring	X01
• Stainless steel spring	X04

J78

Options

5 Documentation

Please select requested documentation:

Inspections, tests:	Option code
DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	M33
LESER Certificate for Global Application	H03
- Inspection certificate 3.1 acc. to DIN EN 10204	
- Declaration of conformity acc. to PED 97/23/EC	
Material test certificate:	
DIN EN 10204-3.1	
Part	Option code
Base / Inlet body	H01
Outlet body	L34
Cap / lever cover	L31
Disc	L23

H01 L23

Documentation

6 Code and Medium

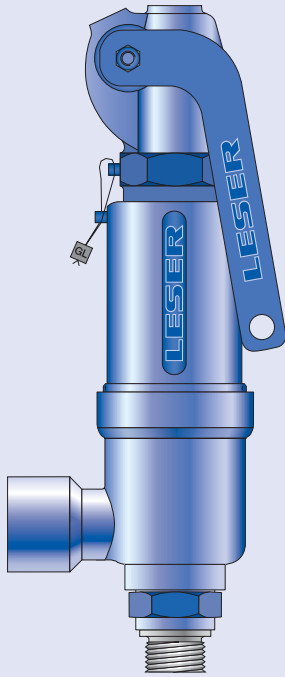
1	2
2	0
1	Code
	1. ASME Section VIII
	2. CE / VdTUEV
	3. ASME Section VIII + CE / VdTUEV
2	Medium
	.1 Gases
	.2 Liquids
	.3 Steam
	.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)

2.0

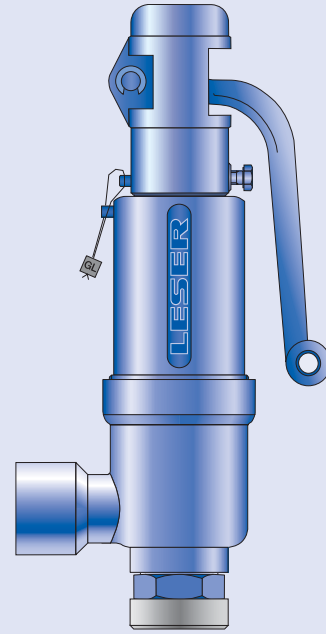
Code and Medium

Type 462

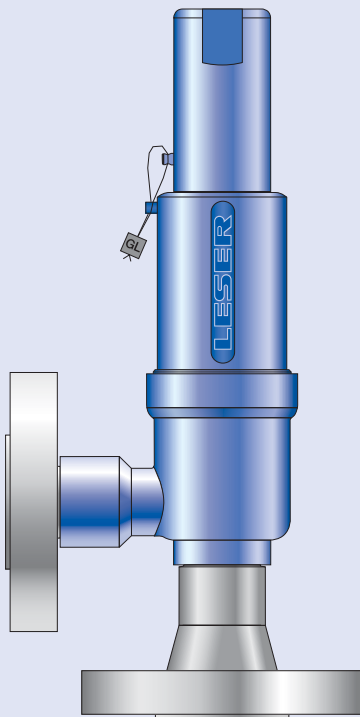
How to order – Article numbers



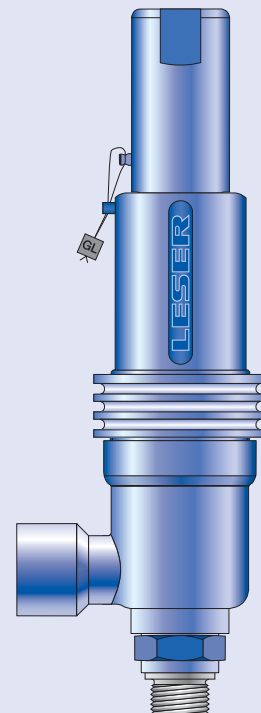
Type 462 Male
Packed lever H4
Conventional design



Type 462 Female
Cap H2
Conventional design



Type 462
Cap H2
Conventional design
Flanged connection



Type 462
Cap H2
Balanced bellows

How to order – Article numbers

Article numbers				
O-ring material				NBR "N" J30
				CR "K" J21
				EPDM "D" J22
				FKM "L" J23
				FFKM "C" J20
Actual Orifice diameter d_0 [mm]		9	13	17,5
Actual Orifice area A_0 [mm ²]		63,9	133	241
Actual Orifice diameter d_0 [inch]		0,354	0,512	0,689
Actual Orifice area A_0 [inch ²]		0,099	0,206	0,374
Outlet chamber casted				
Inlet body	1.4104	H2	Art.-No. 4623.	2902
				2912
Outlet body	0.7043	H3	Art.-No. 4623.	2903
				2913
Bonnet	0.7043	H4	Art.-No. 4623.	2904
				2914
	p [bar _g]		S/G/L	0,5 – 250
				0,5 – 180
	p [psig]			7,3 – 3626
				7,3 – 2911
				0,5 – 92,5
				7,3 – 1342
Outlet chamber deep-drawn				
Inlet body	1.4404	H2	Art.-No. 4622.	3772
				3782
Outlet body	1.4404	H3	Art.-No. 4622.	3773
				3783
Bonnet	1.0460	H4	Art.-No. 4622.	3774
				3784
	p [bar _g]		S/G/L	0,5 – 250
				0,5 – 180
	p [psig]			7,3 – 3626
				7,3 – 2611
				0,5 – 92,5
				7,3 – 1342
Outlet chamber deep-drawn				
All body and trim parts	1.4404	H2	Art.-No. 4624.	2952
		H4	Art.-No. 4624.	2954
				2962
				2964
	p [bar _g]		S/G/L	0,5 – 250
				0,5 – 180
	p [psig]			7,3 – 3626
				7,3 – 2611
				0,5 – 92,5
				7,3 – 1342

For selection of inlet and outlet connection please refer to page 09/06 – 09/07.

Dimensions and weights – Metric Units

Threaded connections

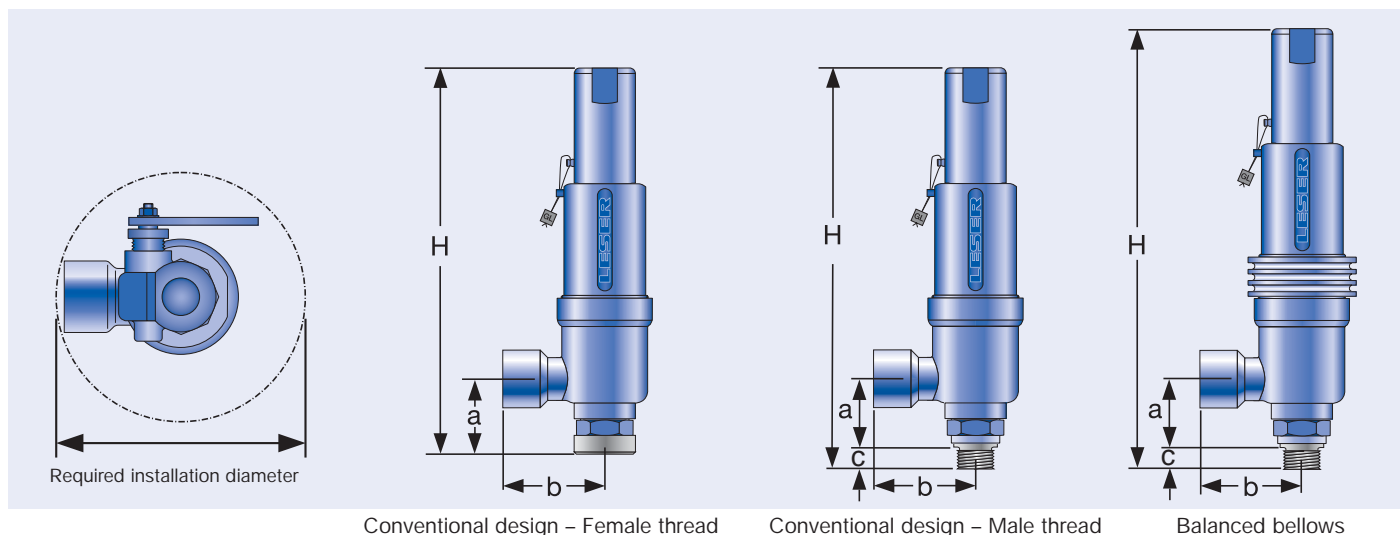
Size Outlet body		1"	1"	1"	1"	1"	1"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	
Actual Orifice diameter d_0 [mm]		9	9	9	13	13	13	17,5	17,5	17,5	17,5	17,5	
Actual Orifice area A_0 [mm ²]		63,6	63,6	63,6	133	133	133	241	241	241	241	241	
Weight	Standard	[kg]	2,6	2,6	2,6	2,6	2,6	2,6	3,0	3,0	3,0	3,0	
	Balanced bellows		3,4	3,4	3,4	3,4	3,4	3,4	3,8	3,8	3,8	3,8	
Required installation diameter		[mm]	165	165	165	165	165	165	165	165	165	165	
Inlet thread "Female"													
DIN ISO 228-1	G	Inlet a	60,5	65,5	70	60,5	65,5	70,5	65,5	70,5	75,5	80,5	-
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	75	75
Height	[mm]	H max.	290,5	295,5	300,5	290,5	295,5	300,5	292,5	297,5	302,5	307,5	-
ISO 7-1/BS 21	Rc	Inlet a	60,5	70,5	70,5	60,5	70,5	70,5	70,5	70,5	-	-	-
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	-	-
Height	[mm]	H max.	290,5	300,5	300,5	290,5	300,5	300,5	297,5	297,5	-	-	-
ANSI/ASME B1.20.1	NPT	Inlet a	60,5	70,5	70,5	60,5	70,5	70,5	70,5	70,5	75,5	80,5	-
		Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	75	75
Height	[mm]	H max.	290,5	300,5	300,5	290,5	300,5	300,5	297,5	297,5	302,5	307,5	-
Inlet thread "Male"													
DIN ISO 228-1	G	Inlet a	-	55,5	55,5	-	55,5	55,5	55,5	55,5	55,5	55,5	-
		Center to face [mm]	Outlet b	-	75	75	-	75	75	75	75	75	75
ISO 7-1/BS 21	R	Inlet a	-	52,5	52,5	-	52,5	52,5	-	52,5	-	52,5	-
		Center to face [mm]	Outlet b	-	75	75	-	75	75	-	75	-	75
ANSI/ASME B1.20.1	NPT	Inlet a	-	52,5	52,5	-	52,5	52,5	-	52,5	52,5	52,5	53
		Center to face [mm]	Outlet b	-	75	75	-	75	75	-	75	75	75

Height inlet thread "Male"

Inlet thread		Size	Conventional design						Balanced bellows						
			1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	
DIN ISO 228-1	[mm]	G	H max.	-	301,5	303,5	302,5	304,5	-	-	346,5	348,5	347,5	349,5	-
ISO 7-1/BS 21	[mm]	R	H max.	-	302,5	305,5	-	307,5	-	-	347,5	350,5	-	352,5	-
ASME B1.20.1	[mm]	NPT	H max.	-	304,5	309,5	307,5	307,5	308	-	349,5	354,5	352,5	352,5	353

Length of screwed end "c" inlet thread "Male"

Inlet thread		Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	[mm]	G	14	16	18	20	22	-
ISO 7-1/BS 21	[mm]	R	19	20	23	-	28	-
ASME B1.20.1	[mm]	NPT	22	22	27	28	28	28



Dimensions and weights – Metric Units

Flanged connection

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [mm]	9	13	17,5	9	13	17,5
Actual Orifice area A_0 [mm ²]	63,6	133	241	63,6	133	241

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

Flange rating PN 40 – 400

Center to face [mm]	Inlet a	Conventional design			Balanced bellows		
		100	100	105	100	100	105
	Outlet b	100	100	100	100	100	
Height [H4] [mm]	H max.	330	330	333	375	375	378

ASME B 16.5 (Available flange sizes refer to page 09/07)

Flange rating class 150 – 2500

Center to face [mm]	Inlet a	Conventional design			Balanced bellows		
		100	100	105	100	100	105
	Outlet b	100	100	100	100	100	
Height [H4] [mm]	H max.	330	330	333	375	375	378

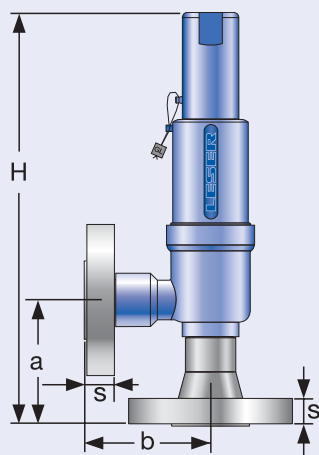
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

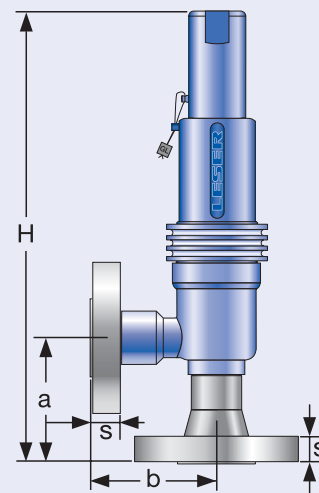
Weight net [kg]	Conventional design			Balanced bellows		
(without inlet and outlet flange) W_N	2,6	2,6	3	3,8	3,8	4,2

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class					
		40	160	250	320	400	Size	150	300	600	900	1500
DN 15							NPS 1/2"					
Flange thickness [mm]	s	18	22	26	26	30	14	18		26		30,2
Weight slip on flange [kg]	W_F	0,8	1,2	2,5	2,5	3,6	0,6	0,9		2,1		3
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓
Available at Outlet		✓	✓	✓			✓	✓		✓		
DN 20							NPS 3/4"					
Flange thickness [mm]	s	20	22				15	18		25,4		32
Weight slip on flange [kg]	W_F	1,1	1,3				0,8	1,4		2,3		3,5
Available at Inlet		✓	✓				✓	✓		✓		✓
Available at Outlet		✓	✓				✓	✓		✓		
DN 25							NPS 1"					
Flange thickness [mm]	s	22	26	30	36	40	17	21,5		32,5		40
Weight slip on flange [kg]	W_F	1,3	2,6	3,5	5	7,5	1	2,1		4,1		5,1
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓
Available at Outlet		✓	✓	✓			✓	✓		✓		
DN 40							NPS 1 1/2"					
Flange thickness [mm]	s	23	23	34			22	24		38		
Weight slip on flange [kg]	W_F	2,1	2,9	4,3			1,4	2,2		3,9		
Available at Inlet		✓	✓	✓			✓	✓		✓		
Available at Outlet		✓	✓	✓			✓	✓		✓		



Conventional design



Balanced bellows

Dimensions and weights – US Units

Threaded connections

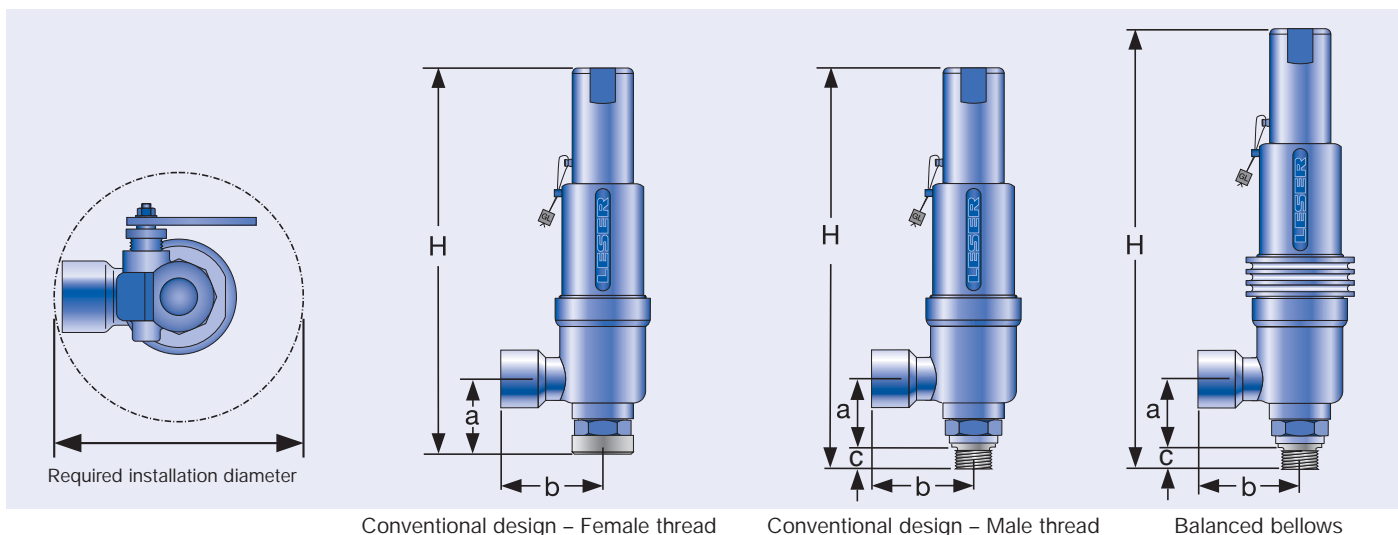
Size Outlet body		1"	1"	1"	1"	1"	1"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	
Actual Orifice diameter d ₀ [inch]		0,354	0,354	0,354	0,512	0,512	0,512	0,689	0,689	0,689	0,689	0,689	
Actual Orifice area A ₀ [inch ²]		0,099	0,099	0,099	0,206	0,206	0,206	0,374	0,374	0,374	0,374	0,374	
Weight	Standard [lbs]	5,7	5,7	5,7	5,7	5,7	5,7	6,6	6,6	6,6	6,6	6,6	
	Balanced bellows	7,5	7,5	7,5	7,5	7,5	7,5	8,4	8,4	8,4	8,4	8,4	
Required installation diameter	[inch]	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	
Inlet thread "Female"													
DIN ISO 228-1	G	Inlet a	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ³¹ / ₃₂	3 ³ / ₁₆	–
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height	[inch]	H max.	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ¹ / ₂	11 ²³ / ₃₂	11 ²⁹ / ₃₂	12 ³ / ₃₂	–
ISO 7-1/BS 21	Rc	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	–	–	–
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	–
Height	[inch]	H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ²³ / ₃₂	11 ²³ / ₃₂	–	–	–
ANSI/ASME B1.20.1	NPT	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³¹ / ₃₂	3 ³ / ₁₆	–
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height	[inch]	H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ²³ / ₃₂	11 ²³ / ₃₂	11 ²⁹ / ₃₂	12 ³ / ₃₂	–
Inlet thread "Male"													
DIN ISO 228-1	G	Inlet a	–	2 ³ / ₁₆	2 ³ / ₁₆	–	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	2 ³ / ₁₆	–
		Center to face [inch]	Outlet b	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
ISO 7-1/BS 21	R	Inlet a	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	–	2 ¹⁵ / ₁₆	–
		Center to face [inch]	Outlet b	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	2 ¹ / ₁₆	–	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆	2 ¹ / ₁₆
		Center to face [inch]	Outlet b	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	–	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆

Height inlet thread "Male"

		Conventional design						Balanced bellows					
Inlet thread	Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1 [inch]	G H max.	–	11 ⁷ / ₈	11 ¹⁵ / ₁₆	11 ²⁹ / ₃₂	12	–	–	13 ⁵ / ₈	13 ²³ / ₃₂	13 ¹¹ / ₁₆	13 ³ / ₄	–
ISO 7-1/BS 21 [inch]	R H max.	–	11 ²⁹ / ₃₂	12 ¹ / ₃₂	–	12 ³ / ₃₂	–	–	13 ¹¹ / ₁₆	13 ¹³ / ₁₆	–	13 ⁷ / ₈	–
ASME B1.20.1 [inch]	NPT H max.	–	12	12 ³ / ₁₆	12 ³ / ₃₂	12 ³ / ₃₂	12 ¹ / ₈	–	13 ³ / ₄	13 ³¹ / ₃₂	13 ⁷ / ₈	13 ⁷ / ₈	13 ²⁹ / ₃₂

Length of screwed end "c" inlet thread "Male"

Inlet thread	Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1 [inch]	G c	9 ¹ / ₁₆	5 ¹ / ₈	2 ³ / ₃₂	2 ⁵ / ₃₂	7 ¹ / ₈	–
ISO 7-1/BS 21 [inch]	R c	3 ³ / ₄	2 ⁵ / ₃₂	2 ⁹ / ₃₂	–	1 ³ / ₃₂	–
ASME B1.20.1 [inch]	NPT c	7 ¹ / ₈	7 ¹ / ₈	1 ¹ / ₁₆	1 ³ / ₃₂	1 ³ / ₃₂	1 ³ / ₃₂



Dimensions and weights – US Units

Flanged connection

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [inch]	0,354	0,512	0,689	0,354	0,512	0,689
Actual Orifice area A_0 [inch ²]	0,099	0,206	0,374	0,099	0,206	0,374

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

Flange rating PN 40 – 400

Center to face [inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$4^{1}/_{8}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$4^{1}/_{8}$
	Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height [H4] [inch]	H max.	13	13	$13^{1}/_{8}$	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{7}/_{8}$

ASME B 16.5 (Available flange sizes refer to page 09/07)

Flange rating class 150 – 2500

Center to face [inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$4^{1}/_{8}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$4^{1}/_{8}$
	Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height [H4] [inch]	H max.	13	13	$13^{1}/_{8}$	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{7}/_{8}$

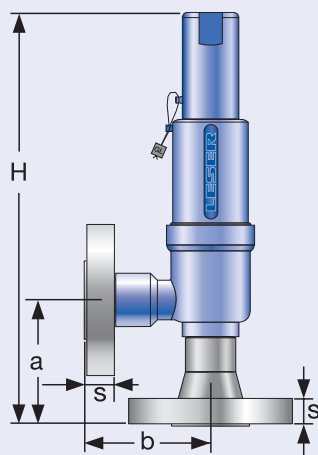
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

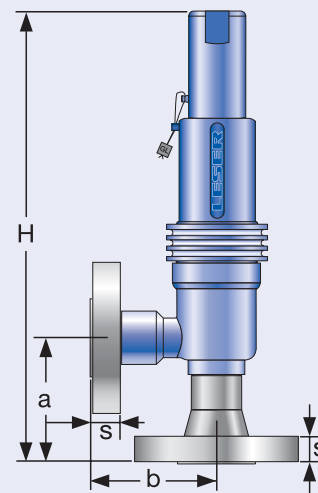
Weight net [lbs]	W_N						
(without inlet and outlet flange)	W_N	5,7	5,7	6,6	8,4	8,4	9,3

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class					
		40	160	250	320	400	Size	150	300	600	900	1500
DN 15							NPS 1/2"					
Flange thickness [inch]	s	$1^{1}/_{16}$	$7/8$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$		$9/_{16}$	$1^{1}/_{16}$		$1^{1}/_{32}$	$1^{3}/_{16}$
Weight slip on flange [lbs]	W_F	1,8	2,6	5,5	5,5	7,9		1,3	2		4,6	6,6
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓	✓
Available at Outlet		✓	✓	✓				✓	✓		✓	
DN 20							NPS 3/4"					
Flange thickness [inch]	s	$2^{5}/_{32}$	$7/8$					$1^{9}/_{32}$	$1^{1}/_{16}$		1	$1^{1}/_{4}$
Weight slip on flange [lbs]	W_F	2,4	2,9					1,8	3,1		5,1	7,7
Available at Inlet		✓	✓					✓	✓		✓	✓
Available at Outlet		✓	✓					✓	✓		✓	
DN 25							NPS 1"					
Flange thickness [inch]	s	$7/8$	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$		$1^{1}/_{16}$	$2^{7}/_{32}$		$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange [lbs]	W_F	2,9	5,7	7,7	11	16,5		2,2	4,6		9	11,2
Available at Inlet		✓	✓	✓	✓	✓		✓	✓		✓	✓
Available at Outlet		✓	✓	✓				✓	✓		✓	
DN 40							NPS 1 1/2"					
Flange thickness [inch]	s	$2^{9}/_{32}$	$2^{9}/_{32}$	$1^{11}/_{32}$				$7/8$	$1^{5}/_{16}$		$1^{1}/_{2}$	
Weight slip on flange [lbs]	W_F	4,5	6,3	9,5				3,2	4,8		8,6	
Available at Inlet		✓	✓	✓				✓	✓		✓	
Available at Outlet		✓	✓	✓				✓	✓		✓	



Conventional design



Balanced bellows

Pressure temperature ratings – Metric Units

Metric Units												
Actual Orifice diameter d_0 [mm]		9			13			17,5				
Actual Orifice Area A_0 [mm ²]		63,6			133			241				
Body material: 1.4104 (430F)						Type 4623						
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 400			PN 250			PN 160				
Outlet body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	0,5			0,5			0,5				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	40			40			40				
Min. set pressure low press. bellows	p [bar _g] S/G/L	3			3			3				
Maximum set pressure	p [bar _g] S/G/L	250			180			92,5				
Temperature acc. to DIN EN	min [°C]				-10							
	max [°C]				+350							
Temperature acc. to ASME	min [°C]				-29							
	max [°C]				+150							
Body material: 1.4404 (316L)						Type 4622						
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 250			PN 160			PN 160				
Outlet Body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	0,5			0,5			0,5				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	40			40			40				
Min. set pressure low press. bellows	p [bar _g] S/G/L	3			3			3				
Maximum set pressure	p [bar _g] S/G/L	250			180			92,5				
Temperature acc. to DIN EN	min [°C]				-45							
	max [°C]				+180							
Temperature acc. to ASME	min [°C]				-45							
	max [°C]				+180							
Body material: 1.4404 (316L)						Type 4624						
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 250			PN 160			PN 160				
Outlet Body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	0,5			0,5			0,5				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	40			40			40				
Min. set pressure ¹⁾ standard bellows	p [bar _g] S/G/L	3			3			3				
Maximum set pressure	p [bar _g] S/G/L	250			180			92,5				
Temperature acc. to DIN EN	min [°C]				-45							
	max [°C]				+150							
Temperature acc. to ASME	min [°C]				-268							
	max [°C]				+150							

¹⁾ Min. set pressure standard bellows = Max. pressure low pressure bellows.
The temperature is limited by soft seal material. The stated values are valid for EPDM.

Pressure temperature ratings – US Units

US Units												
Actual Orifice diameter d_0 [inch]		0,354			0,512			0,689				
Actual Orifice Area A_0 [inch ²]		0,099			0,206			0,374				
Body material: 1.4104 (430F)						Type 4623						
Base / Inlet body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	7,3			7,3			7,3				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	580			580			580				
Min. set pressure low press. bellows	p [psig] S/G/L	43,5			43,5			43,5				
Maximum set pressure	p [psig] S/G/L	3626			2911			1342				
Temperature acc. to DIN EN	min [°F]							+14				
	max [°F]							+302				
Temperature acc. to ASME	min [°F]							-20				
	max [°F]							+302				
Body material: 1.4404 (316L)						Type 4622						
Base / Inlet body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	7,3			7,3			7,3				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	580			580			580				
Min. set pressure low press. bellows	p [psig] S/G/L	43,5			43,5			43,5				
Maximum set pressure	p [psig] S/G/L	3626			2911			1342				
Temperature acc. to DIN EN	min [°F]							-49				
	max [°F]							+356				
Temperature acc. to ASME	min [°F]							-49				
	max [°F]							+365				
Body material: 1.4404 (316L)						Type 4624						
Base / Inlet body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	7,3			7,3			7,3				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	580			580			580				
Min. set pressure ¹⁾ standard bellows	p [psig] S/G/L	43,5			43,5			43,5				
Maximum set pressure	p [psig] S/G/L	3626			2911			1342				
Temperature acc. to DIN EN	min [°F]							-49				
	max [°F]							+302				
Temperature acc. to ASME	min [°F]							-268				
	max [°F]							+302				

¹⁾ Min. set pressure standard bellows = Max. pressure low pressure bellows.
The temperature is limited by soft seal material. The stated values are valid for EPDM.

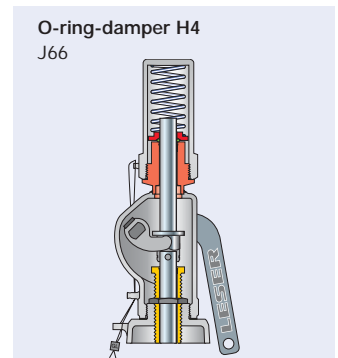
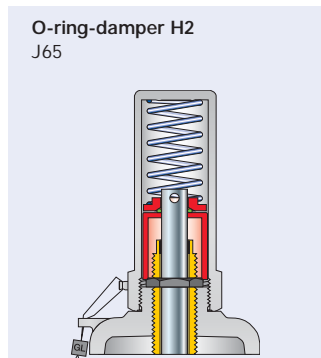
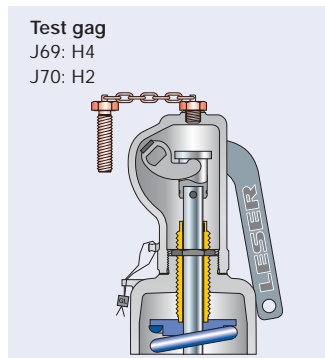
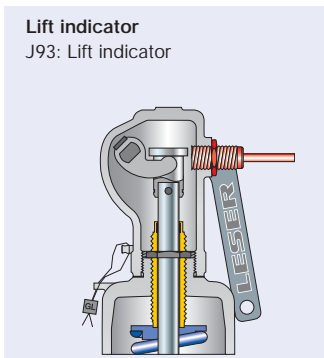
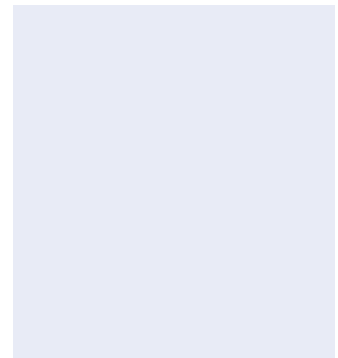
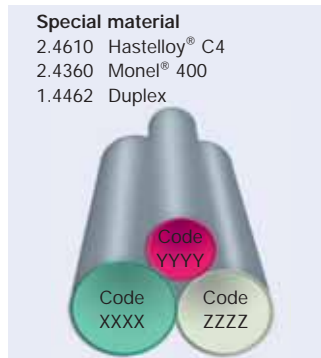
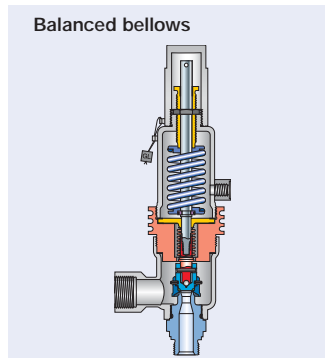
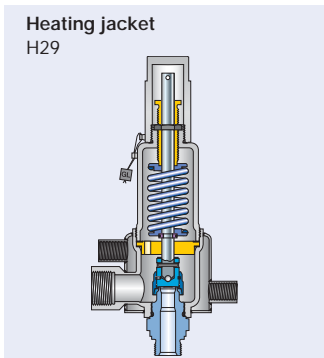
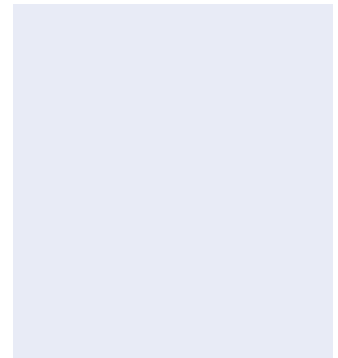
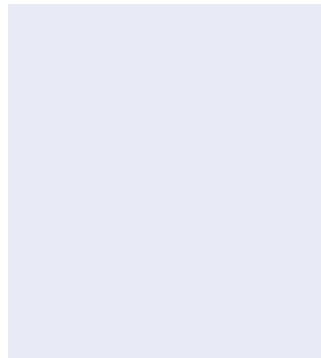
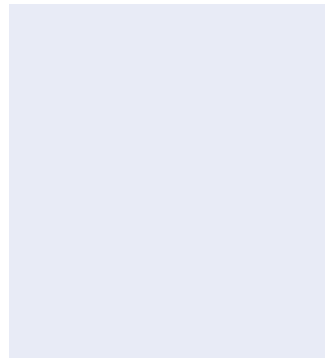
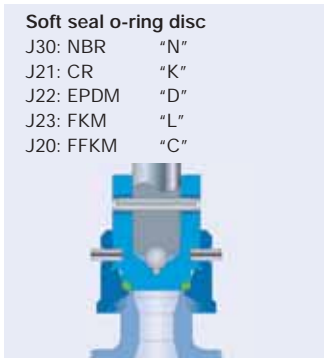
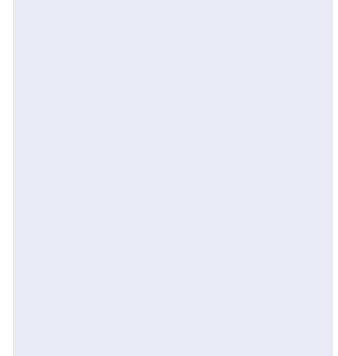
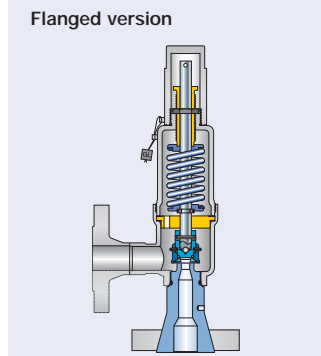
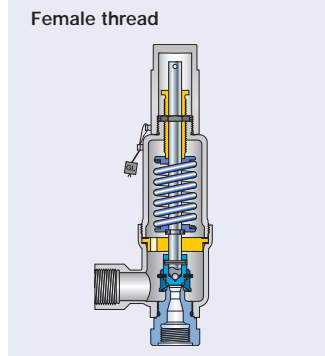
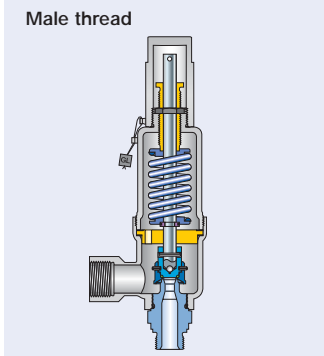
Order information – Spare parts

Spare parts		Material-No. / Art.-No.					
Connection size		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Actual Orifice diameter d ₀ [mm]		9					
Actual Orifice area A ₀ [mm ²]		63,6					
Actual Orifice diameter d ₀ [inch]		0,354					
Actual Orifice area A ₀ [inch ²]		0,099					
Body (Item 1): Male thread		Material-No. / Art.-No.					
Connection size		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	G	1.4104	–	136.7539.9000	136.7639.9000	–	–
		316L	–	136.7549.9000	136.7649.9000	–	–
		316L stellited	–	136.7569.9000	136.7669.9000	–	–
ISO 7-1/BS 21	R	316L	–	136.7549.9220	136.7649.9220	–	–
		316L stellited	–	136.7569.9220	136.7669.9220	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.7549.9204	136.7649.9204	–	–
		316L stellited	–	136.7569.9204	136.7669.9204	–	–
Body (Item 1): Female thread		Material-No. / Art.-No.					
DIN ISO 228-1	G	316L	136.7449.9210	136.7549.9210	136.7649.9210	–	–
		316L stellited	136.7469.9210	136.7569.210	136.7669.9210	–	–
ISO 7-1/BS 21	Rc	316L	136.7449.9222	136.7549.9222	136.7649.9222	–	–
		316L stellited	136.7469.9222	136.7569.9222	136.7669.9222	–	–
ANSI/ASME B1.20.1	NPT	316L	136.7449.9211	136.7549.9211	136.7649.9211	–	–
		316L stellited	136.7469.9211	136.7569.9211	136.7669.9211	–	–
Actual Orifice diameter d ₀ [mm]		13					
Actual Orifice area A ₀ [mm ²]		133					
Actual Orifice diameter d ₀ [inch]		0,512					
Actual Orifice area A ₀ [inch ²]		0,206					
Body (Item 1): Male thread		Material-No. / Art.-No.					
Connection size		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	G	1.4104	–	136.8039.9000	136.8139.9000	–	–
		316L	–	136.8049.9000	136.8149.9000	–	–
		316L stellited	–	136.8069.9000	136.8169.9000	–	–
ISO 7-1/BS 21	R	316L	–	136.8049.9220	136.8149.9220	–	–
		316L stellited	–	136.8069.9220	136.8169.9220	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.8049.9204	136.8149.9204	–	–
		316L stellited	–	136.8069.9204	136.8169.9204	–	–
Body (Item 1): Female thread		Material-No. / Art.-No.					
DIN ISO 228-1	G	316L	136.7949.9210	136.8049.9210	136.8149.9210	–	–
		316L stellited	–	–	–	–	–
ISO 7-1/BS 21	Rc	316L	136.7949.9222	136.8049.9222	136.8149.9222	–	–
		316L stellited	136.7969.9222	136.8069.9222	136.8169.9222	–	–
ANSI/ASME B1.20.1	NPT	316L	136.7949.9211	136.8049.9211	136.8149.9211	–	–
		316L stellited	–	136.7569.9211	136.7669.9211	–	–
Actual Orifice diameter d ₀ [mm]		17,5					
Actual Orifice area A ₀ [mm ²]		241					
Actual Orifice diameter d ₀ [inch]		0,689					
Actual Orifice area A ₀ [inch ²]		0,374					
Body (Item 1): Male thread		Material-No. / Art.-No.					
Connection size		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	G	1.4104	–	136.3639.9000	–	136.8639.9000	–
		316L	–	136.3649.9000	136.8549.9000	136.8649.9000	–
		316L stellited	–	–	–	–	–
ISO 7-1/BS 21	R	316L	–	136.3649.9220	–	136.8649.9220	–
		316L stellited	–	–	–	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.3649.9204	136.8549.9204	136.8649.9204	136.8749.9204
		316L stellited	–	–	–	–	–
Body (Item 1): Female thread		Material-No. / Art.-No.					
DIN ISO 228-1	G	316L	–	136.3649.9000	136.8549.9000	136.8649.9000	–
		316L stellited	–	–	–	–	–
ISO 7-1/BS 21	Rc	316L	–	136.8049.9222	136.3649.9222	136.8649.9222	–
		316L stellited	–	136.8069.9222	–	–	–
ANSI/ASME B1.20.1	NPT	316L	–	136.8449.9211	136.3649.9211	136.8549.9211	136.8649.9211
		316L stellited	–	–	–	–	–

Order information – Spare parts

Spare parts			
Actual Orifice diameter d_0 [mm]	9	13	17,5
Actual Orifice area A_0 [mm ²]	63,6	133	241
Actual Orifice diameter d_0 [inch]	0,354	0,512	0,689
Actual Orifice area A_0 [inch ²]	0,099	0,206	0,374
Body (Item 1): Flange design		Material-No. / Art.-No.	
DN 15 / NPS 1/2"	PN 40 – 400 CL 300 – 2500	316L	136.7449.9208
			136.7949.9208
			–
DN 20 / NPS 3/4"	PN 40 – 400 CL 150 – 2500	316L	136.3949.9208
			136.5049.9208
			136.8449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208
	CL 150		136.7649.9202
	CL 300 – 2500	316L	136.3449.9208
			136.8149.9202
			136.3549.9208
			136.3649.9208
			136.3649.9202
			136.3649.9208
Disc (Item 7): Soft seal with O-ring		Material-No. / Art.-No.	
Disc	NBR	"N"	200.9349.9081
	EPDM	"D"	200.9349.9041
	CR	"K"	200.9349.9051
	FKM	"L"	200.9349.9071
	FFKM	"C"	200.9349.9091
			220.4549.9081
			220.4549.9041
			220.4549.9051
			220.4549.9071
			220.4549.9091
			220.4649.9081
			220.4649.9041
			220.4649.9051
			220.4649.9071
			220.4649.9091
Disc (Item 7.4): O-ring		Material-No. / Art.-No.	
	NBR	"N"	502.0123.2681
	EPDM	"D"	502.0123.2641
	CR	"K"	502.0123.2651
	FKM	"L"	502.0123.2671
	FFKM	"C"	502.0123.2691
			502.0139.2681
			502.0139.2641
			502.0139.2651
			502.0139.2671
			502.0139.2691
			502.0202.2681
			502.0202.2641
			502.0202.2651
			502.0202.2671
			502.0202.2691
Pin (Item 57)		Material-No. / Art.-No.	
Pin	1.4310		480.0505.0000
			480.0505.0000
			480.0505.0000
Gasket – outlet body / bonnet (Item 60)		Material-No. / Art.-No.	
Gasket	Graphite + 1.4401		500.2407.0000
			500.2407.0000
			500.2407.0000
Option code L68	Gylon (Filled PTFE)		500.2405.0000
			500.2405.0000
			500.2405.0000
Ball (Item 61)		Material-No. / Art.-No.	
Ball	Ø [mm]	6	6
	1.4401	510.0104.0000	510.0104.0000
			510.0104.0000
Bellows and bellows conversion kit (Item 15)		Material-No. / Art.-No.	
Stainless steel bellows	1.4571 / 316Ti		$p \leq 40 \text{ bar} / 580 \text{ psig} = 400.7949.0000$
			$p > 40 \text{ bar} / 580 \text{ psig} = 400.6349.0000$
Conversion kit	$\leq \text{PN } 40 / \text{CL } 600$		5021.1050
	$> \text{PN } 40 / \text{CL } 600$		5021.1051

Available Options



Approvals

Approvals			
Actual Orifice diameter d_0 [mm]	9	13	17,5
Actual Orifice area A_0 [mm ²]	63,6	133	241
Actual Orifice diameter d_0 [inch]	0,354	0,512	0,689
Actual Orifice area A_0 [inch ²]	0,099	0,206	0,374
Europe		Coefficient of discharge K_{dr}	
DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/14	
	S/G	0,83	0,81
	L	0,61	0,52
Germany		Coefficient of discharge α_w	
AD 2000-Merkblatt A2	Approval No.	TÜV SV 909	
	S/G	0,83	0,81
	L	0,61	0,52
United States		Coefficient of discharge K	
ASME Sec. VIII	Approval No.	M 37112	
	S/G	0,811	
	Approval No.	M 37101	
	L	0,566	
Canada		Coefficient of discharge K	
CRN	Approval No.	OG0730.96	
	S/G	Refer to ASME Sec. VIII	
	L	Refer to ASME Sec. VIII	
China		Coefficient of discharge α_w	
CSBQTS	Approval No.		
	S/G	0,83	0,81
	L	0,61	0,52
Russia		Coefficient of discharge α_w	
GGTN/	Approval No.	PPC 00-18458	
GOSGOTECHNADZOR	S/G	0,83	0,81
GOST R	L	0,61	0,52
Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every renewal. A sample certificate including the valid certification number can be taken from the homepage of the classification societies.
Det Norske Veritas	DNV	www.dnv.com	
Germanischer Lloyd	GL	www.gl-group.com	
Lloyd' s Register EMEA	LREMEA	www.lr.org	
Registro Italiano Navale	RINA	www.rina.org	

Capacities – Metric Units

Capacities according to AD 2000-Merkblatt A2, based on set-pressure plus 10% overpressure.
 Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2								
Actual Orifice diameter d_0 [mm]		9			13			17,5		
Actual Orifice area A_0 [mm ²]		63,6			133,0			241,0		
LEO ^{*)} [inch ²]		S/G = 0,082 L = 0,086			S/G = 0,171 L = 0,179			S/G = 0,310 L = 0,325		
Set pressure		Capacities			Capacities			Capacities		
		Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]		[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]
0,5		40	47	1,53	87	102	3,19	134	157	4,93
1		58	69	2,07	125	149	4,32	200	238	6,67
2		93	113	2,93	195	235	6,11	331	400	9,44
3		127	155	3,59	258	316	7,48	456	558	11,6
4		158	195	4,14	322	396	8,64	569	700	13,3
5		189	234	4,63	386	477	9,66	681	842	14,9
6		220	274	5,07	449	557	10,6	793	985	16,3
7		251	313	5,48	511	638	11,4	902	1127	17,7
8		282	353	5,86	573	718	12,2	1013	1269	18,9
9		312	392	6,21	636	799	13	1124	1412	20
10		343	432	6,55	699	879	13,7	1235	1554	21,1
12		405	511	7,17	824	1040	15	1457	1839	23,1
14		465	590	7,75	947	1201	16,2	1674	2123	25
16		527	669	8,28	1072	1363	17,3	1895	2408	26,7
18		588	748	8,78	1197	1524	18,3	2116	2693	28,3
20		650	827	9,26	1323	1685	19,3	2338	2977	29,8
22		709	906	9,71	1444	1846	20,3	2553	3262	31,3
24		771	986	10,1	1570	2007	21,2	2775	3547	32,7
26		833	1065	10,6	1696	2168	22	2997	3831	34
28		895	1144	11	1822	2329	22,9	3221	4116	35,3
30		957	1223	11,3	1949	2490	23,7	3445	4401	36,5
32		1020	1302	11,7	2076	2651	24,4	3669	4685	37,7
34		1079	1381	12,1	2198	2812	25,2	3884	4970	38,9
36		1142	1460	12,4	2325	2973	25,9	4110	5255	40
38		1205	1539	12,8	2453	3134	26,6	4336	5539	41,1
40		1268	1618	13,1	2582	3295	27,3	4564	5824	42,2
42		1332	1698	13,4	2711	3456	28	4792	6109	43,2
44		1395	1777	13,7	2841	3617	28,7	5021	6393	44,3
46		1459	1856	14	2971	3779	29,3	5251	6678	45,3
48		1524	1935	14,3	3102	3940	29,9	5483	6963	46,2
50		1588	2014	14,6	3234	4101	30,5	5715	7247	47,2
60		1910	2409	16	3889	4906	33,5	6874	8671	51,7
70		2245	2805	17,3	4571	5711	36,1	8079	10094	55,8
80		2583	3201	18,5	5259	6517	38,6	9294	11518	59,7
90		2938	3596	19,6	5982	7322	41	10572	12941	63,3
100		3296	3992	20,7	6711	8127	43,2	11862	14364	66,7
120		4077	4783	22,7	8302	9738	47,3			
140		4958	5574	24,5	10096	11349	51,1			
160		5977	6365	26,2	12171	12959	54,6			
180		7262	7156	27,8	14786	14570	57,9			
200		8989	7947	29,3						
220		9426	8738	30,7						
240		9843	9529	32,1						
250		10046	9924	32,7						

^{*)} LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11
 How to use capacity-sheets refer to page 00/09

Capacities – US Units

Capacities according to ASME Section VIII (UV), based on set-pressure plus 10% overpressure.
 Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

US Units		ASME Section VIII								
Actual Orifice diameter d_0 [inch]		0,354			0,512			0,689		
Actual Orifice area A_0 [inch ²]		0,099			0,206			0,374		
LEO ^{*)} [inch ²]		S/G = 0,082 L = 0,086			S/G = 0,171 L = 0,179			S/G = 0,310 L = 0,325		
Set pressure	Capacities			Capacities			Capacities			
	Steam saturated	Air 60° F and 14,5 psig	Water 70°F	Steam saturated	Air 60° F and 14,5 psig	Water 70°F	Steam saturated	Air 60° F and 14,5 psig	Water 70°F	
[psig]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	
5	93	33	6,01	195	69	12,5	353	126	22,7	
10	114	41	7,67	238	85	16	431	153	28,9	
20	155	55	10,2	324	115	21,2	586	209	38,4	
30	196	70	12,2	410	146	25,4	742	264	46	
40	242	86	14,1	504	180	29,3	913	326	53,1	
50	287	103	15,8	599	213	32,8	1085	387	59,4	
60	332	119	17,3	693	247	35,9	1256	448	65,1	
70	377	135	18,7	788	281	38,8	1427	509	70,3	
80	423	151	19,9	882	315	41,5	1599	570	75,1	
90	468	167	21,2	977	348	44	1770	631	79,7	
100	513	184	22,3	1071	382	46,4	1941	692	84	
120	604	216	24,4	1260	449	50,8	2284	814	92	
140	695	248	26,4	1449	517	54,9	2626	936	99,4	
160	785	281	28,2	1638	584	58,7	2969	1058	106	
180	876	313	29,9	1827	652	62,3	3311	1180	113	
200	966	346	31,5	2016	719	65,6	3654	1302	119	
220	1057	378	33,1	2205	787	68,8	3996	1424	125	
240	1148	410	34,5	2394	854	71,9	4339	1546	130	
260	1238	443	36	2584	921	74,8	4682	1669	135	
280	1329	475	37,3	2773	989	77,6	5024	1791	141	
300	1419	508	38,6	2962	1056	80,4	5367	1913	146	
320	1510	540	39,9	3151	1124	83	5709	2035	150	
340	1601	572	41,1	3340	1191	85,6	6052	2157	155	
360	1691	605	42,3	3529	1259	88	6394	2279	159	
380	1782	637	43,5	3718	1326	90,5	6737	2401	164	
400	1872	670	44,6	3907	1393	92,8	7080	2523	168	
420	1963	702	45,7	4096	1461	95,1	7422	2645	172	
440	2054	734	46,8	4285	1528	97,3	7765	2767	176	
460	2144	767	47,8	4474	1596	99,5	8107	2889	180	
480	2235	799	48,9	4663	1663	102	8450	3011	184	
500	2326	832	49,9	4852	1731	104	8792	3134	188	
550	2552	913	52,3	5325	1899	109	9649	3439	197	
600	2779	994	54,6	5797	2068	114	10505	3744	206	
650	3005	1075	56,9	6270	2236	118	11362	4049	214	
700	3232	1156	59	6742	2405	123	12218	4354	222	
750	3458	1237	61,1	7215	2573	127	13075	4660	230	
800	3685	1318	63,1	7688	2742	131	13931	4965	238	
850	3911	1399	65	8160	2911	135	14787	5270	245	
900	4138	1480	66,9	8633	3079	139	15644	5575	252	
950	4364	1561	68,7	9105	3248	143	16500	5881	259	
1000	4591	1642	70,5	9578	3416	147	17357	6186	266	
1100	5044	1804	74	10523	3753	154	19070	6796	279	
1200	5497	1966	77,2	11469	4091	161	20782	7407	291	
1300	5950	2128	80,4	12414	4428	167	22495	8017	303	
1400	6394	2290	83,4	13340	4765	174	24174	8628	314	
1500	6889	2452	86,4	14373	5102	180				
1600	7393	2614	89,2	15424	5439	186				
1700	7907	2776	91,9	16497	5776	191				
1800	8433	2938	94,6	17594	6113	197				
1900	8971	3100	97,2	18718	6451	202				
2000	9525	3262	99,7	19872	6788	208				
2200	10684	3586	105	22292	7462	218				
2400	11935	3910	109	24901	8136	227				
2600	13310	4234	114	27770	8811	237				
2800	14864	4558	118	31012	9485	246				
3000	13651	4882	122							
3200	14557	5206	126							
3400	15463	5530	130							
3600	16369	5854	134							
3800	17276	6178	137							

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11

How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

- h = Lift [mm]
- d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d_0 = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p_0 = Set pressure [bar_a]
- p_{a0}/p_0 = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)

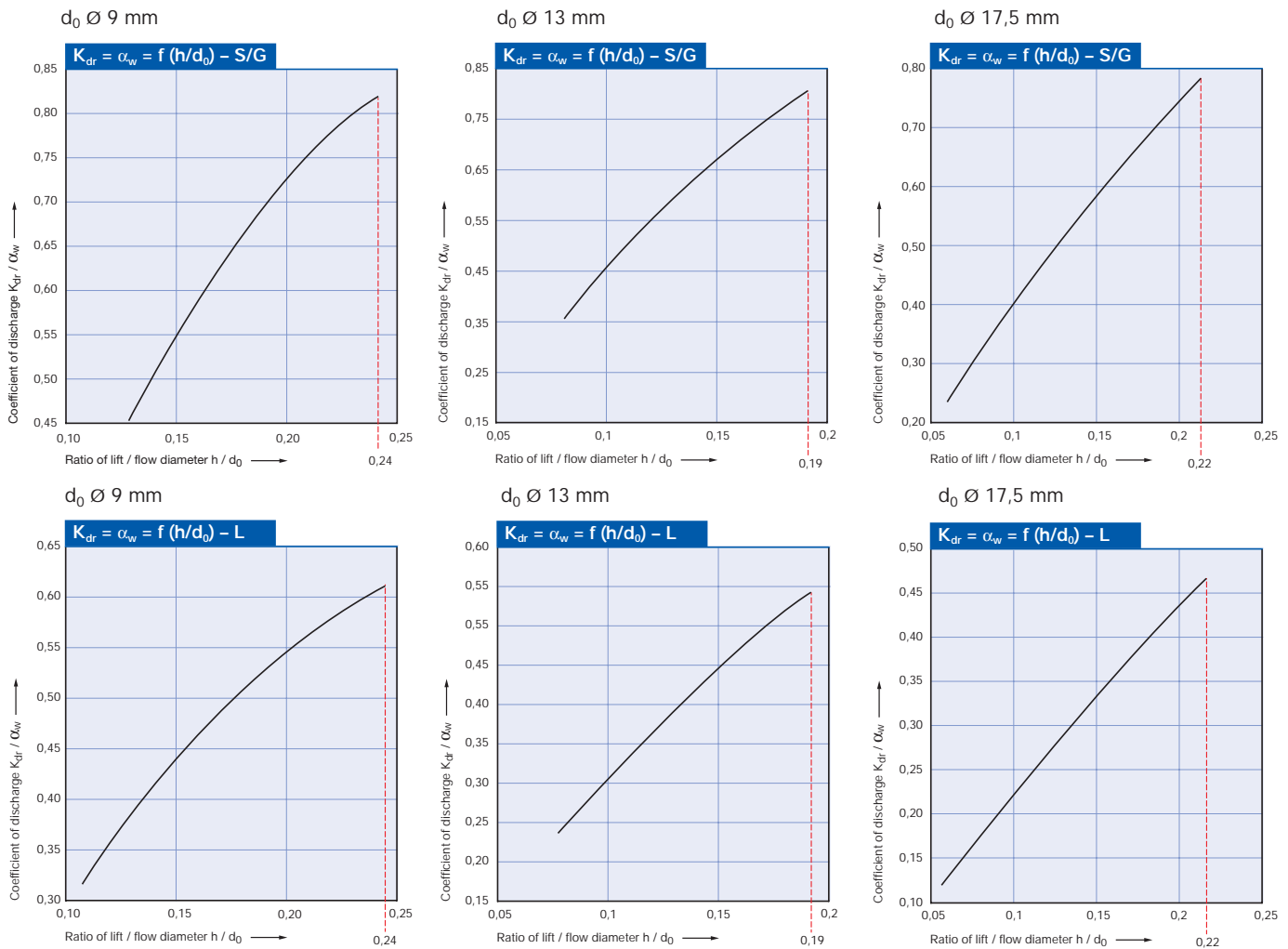
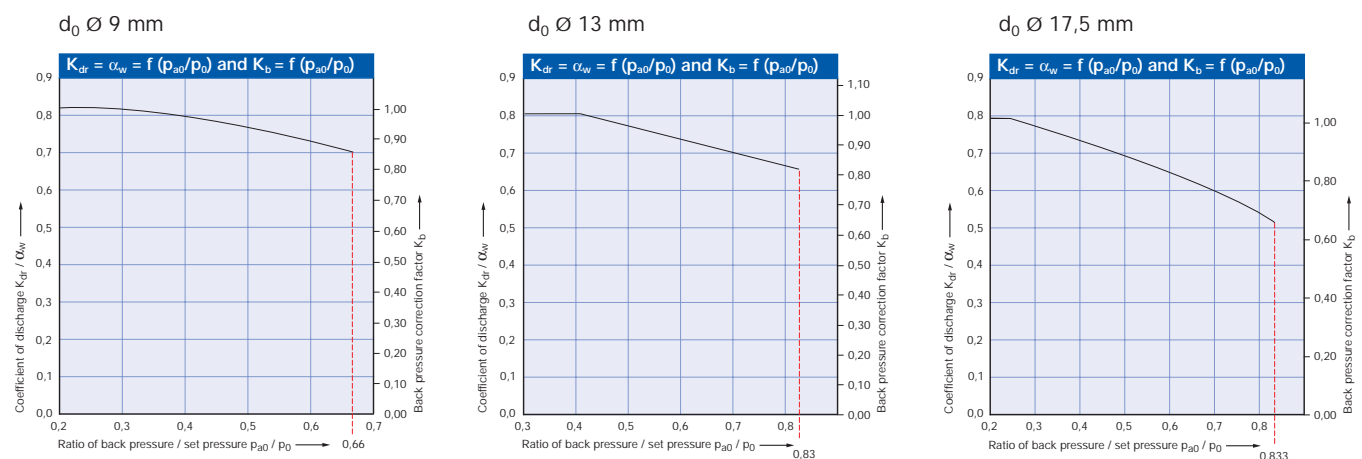


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)



How to use please refer to page 00/08

Type 462 HDD



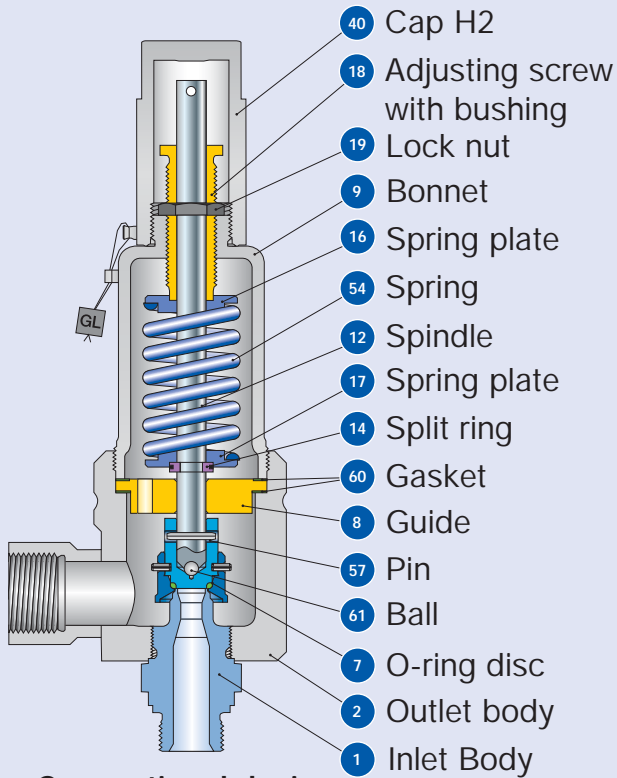
Type 462 HDD
Cap H2

Safety Relief Valves Heavy Duty Design – spring loaded

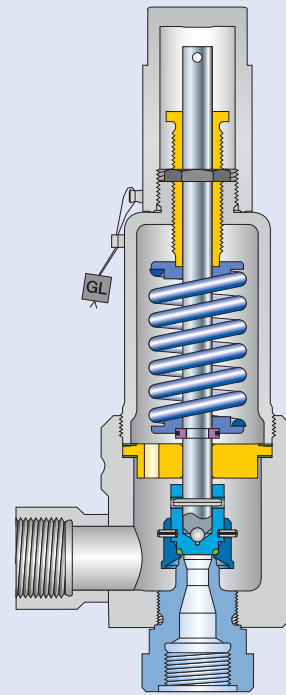
Contents	Chapter/Page
Materials	
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• Available designs – materials	08/03
How to order	
• Numbering system	08/04
• Article numbers	08/06
Dimensions and weights	
• Metric Units [Threaded connection]	08/08
	[Flanged connection] 08/09
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Pressure temperature ratings	
• Metric Units + US Units	08/12
Order information – Spare parts	08/13
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Capacities	
• Metric Units [Steam, Air, Water]	08/16
• US Units [Steam, Air, Water]	08/17
Determination of coefficient of discharge K_{dr}/α_w	08/18

Type 462 HDD

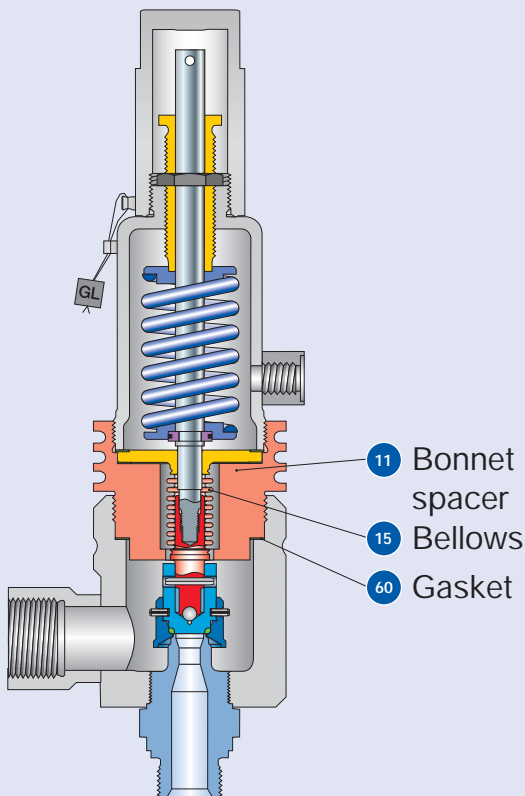
Available designs



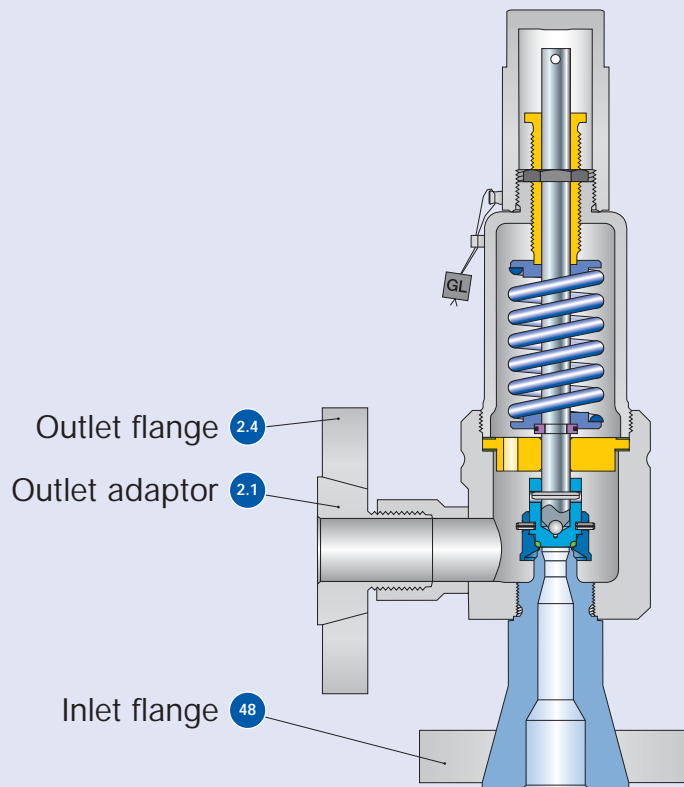
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials			
Item	Component	Remarks	Type 4624 HDD
1	Base / Inlet body	Threaded connection	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L
2	Outlet body		1.4404 SA 479 316L
			1.4404 316L
2.1	Outlet adaptor	Flange connection	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L
			1.4404 SA 479 316L
7.4	Soft seal O-ring	"N"	NBR Nitrile-Butadiene
		"K"	CR Chloroprene
		"D"	EPDM Ethylen-Propylene-Diene
		"L"	FPM Fluorocarbon
		"C"	FFKM Perflouro
8	Guide		1.4404 316L
		Balanced bellows design	1.4404 / SA 316L Upper conn. part of balanced bellows
9	Bonnet		1.4404 316L
		Balanced bellows design	1.4404 316L
11	Bonnet spacer	Balanced bellows design	1.4404 316L
			1.4404 316L
12	Spindle		1.4404 316L
		Balanced bellows design	1.4404 316L
14	Split ring		1.4404 316L
			1.4571 316Ti
15	Bellows	Balanced bellows design	1.4404 316L
			1.4404 316L
16/17	Spring plate		1.4404 / PTFE 316L / PTFE
			1.4404 316L
18	Adjusting screw with bushing		1.4404 / PTFE 316L / PTFE
			1.4404 316L
19	Lock nut		1.4404 316L
			1.4404 316L
40	Cap H2		1.4404 316L
			1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L
			1.4310 Stainless steel
54	Spring	Standard	1.4310 Stainless steel
			1.4310 Stainless steel
57	Pin		1.4310 Stainless steel
			Graphite / 1.4301 Graphite / 316L
60	Gasket		1.4401 316
			1.4401 316

Material Options

The Heavy Duty Design of Type 462 HDD offers the possibility to easily obtain special material versions. The fact that all product wetted parts are machined from bar stock materials makes it easier and faster to fulfill almost all material requirements according to the metal availability.

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

How to order – Numbering system

1

Article Number

1	2	3	4
462	4	225	2

1 Type 462 HDD

Types of sealing

Soft seal	Soft seal material
NBR	Buna-N®
EPDM	Buna-EP®
CR	Neoprene®
FKM	Viton®
FFKM	Kalrez® 6375

2 Material code

Code	Body material
4	Stainless steel

3 Valve code

Identifies valve size and body material, refer to page 08/07.

4 Code for lifting device

Code	Lifting device	
2	Screwed cap	H2
4	Packed lever	H4

2

Set Pressure

Please state unit (in gauge)!

Please do not exceed pressure range mentioned in the spring charts.

3

Connections

Please refer to pages 09/06 and 09/07.

Please state one option code for each, inlet **and** outlet.

4624.2252

Article No.

10 bar_g

Set Pressure

V62

V71

Connections

4 Options

Type 462 HDD	Option code
• Soft seal material	
NBR	"N" J30
CR	"K" J21
EPDM	"D" J22
FKM	"L" J23
FFKM	"C" J20
• Stainless steel bellows	p ≤ 40 bar _g J78 p > 40 bar _g J55
• Elastomer bellows	J79
• Heating jacket	H29

J30

Options

5 Documentation

Please select requested documentation:

Inspections, tests:	Option code
DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	M33
LESER Certificate for Global Application	H03
- Inspection certificate 3.1 acc. to DIN EN 10204	
- Declaration of conformity acc. to PED 97/23/EC	
Material test certificate:	
DIN EN 10204-3.1	
Part	Option code
Base / Inlet body	H01
Outlet body	L34
Bonnet	L30
Cap / lever cover	L31
Disc	L23

H01 L30

Documentation

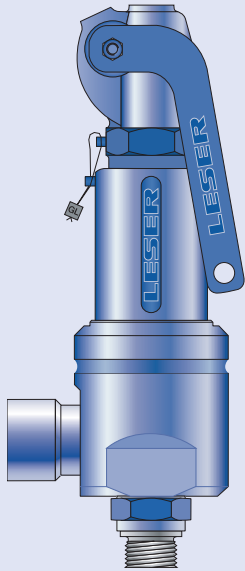
6 Code and Medium

1	2
2	0
1 Code	
1. ASME Section VIII	
2. CE / VdTUEV	
3. ASME Section VIII + CE / VdTUEV	
2 Medium	
.1 Gases	
.2 Liquids	
.3 Steam	
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)	

2.0

Code and Medium

How to order – Article numbers



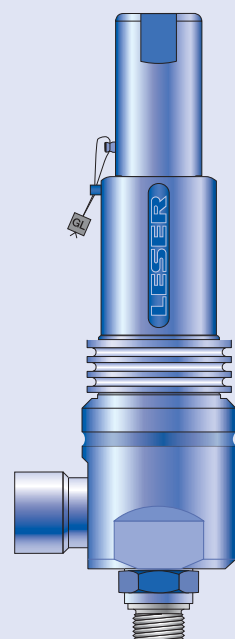
Type 462 HDD male
Packed lever H4
Conventional design



Type 462 HDD female
Packed lever H4
Conventional design



Type 462 HDD
Cap H2
Conventional design
Flanged connection



Type 462 HDD
Cap H2
Balanced bellows

How to order – Article numbers

Article numbers			
O-ring material			
		NBR	"N" J30
		CR	"K" J21
		EPDM	"D" J22
		FKM	"L" J23
		FFKM	"C" J20
Actual Orifice diameter d_0 [mm]		9	13
Actual Orifice area A_0 [mm ²]		63,9	133
Actual Orifice diameter d_0 [inch]		0,354	0,512
Actual Orifice area A_0 [inch ²]		0,099	0,206
Body material: 1.4404 (316L)			
All body and trim parts	1.4404	H2	Art.-No. 4624.
		H4	Art.-No. 4624.
		2252	2272
		2254	2274
	p [bar _g]	S/G/L	0,5 – 350
	p [psig]		7,3 – 5076
			0,5 – 180
			7,3 – 2611

For selection of inlet and outlet connection please refer to page 09/06 – 09/07.

Dimensions and weights – Metric Units

Threaded connections

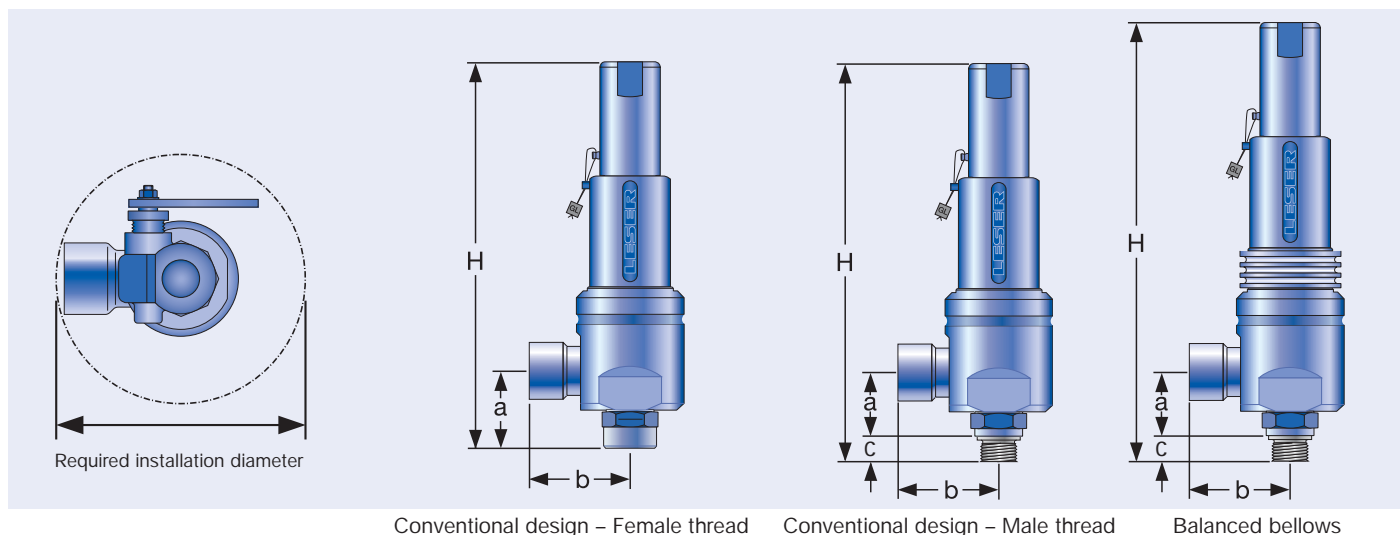
Size Outlet body		1"	1"	1"	1"	1"	1"	
Actual Orifice diameter d_0 [mm]		9	9	9	13	13	13	
Actual Orifice area A_0 [mm ²]		63,3	63,3	63,3	133	133	133	
Weight	Standard [kg]	3,9	3,9	3,9	3,9	3,9	3,9	
	Balanced bellows [kg]	4,7	4,7	4,7	4,7	4,7	4,7	
Required installation diameter [mm]		165	165	165	165	165	165	
Inlet thread "Female"								
DIN ISO 228-1	G	Inlet a	60,5	65,5	70	60,5	65,5	70,5
		Center to face [mm]	Outlet b	75	75	75	75	75
Height	[mm]	H max.	290,5	295,5	300,5	290,5	295,5	300,5
		ISO 7-1/BS 21	Rc	Inlet a	60,5	70,5	70,5	60,5
Center to face [mm]	Outlet b	75		75	75	75	75	75
Height	[mm]	H max.	290,5	300,5	300,5	290,5	300,5	300,5
		ANSI/ASME B1.20.1	NPT	Inlet a	60,5	70,5	70,5	60,5
Center to face [mm]	Outlet b	75		75	75	75	75	75
Height	[mm]	H max.	290,5	300,5	300,5	290,5	300,5	300,5
		Inlet thread "Male"						
DIN ISO 228-1	G	Inlet a	-	55,5	55,5	-	55,5	55,5
		Center to face [mm]	Outlet b	-	75	75	-	75
ISO 7-1/BS 21	R	Inlet a	-	52,5	52,5	-	52,5	52,5
		Center to face [mm]	Outlet b	-	75	75	-	75
ANSI/ASME B1.20.1	NPT	Inlet a	-	52,5	52,5	-	52,5	52,5
		Center to face [mm]	Outlet b	-	75	75	-	75

Height inlet thread "Male"

		Conventional design			Balanced bellows		
Inlet thread	Size	1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1 [mm]	G H max.	-	301,5	303,5	-	346,5	348,5
ISO 7-1/BS 21 [mm]	R H max.	-	302,5	305,5	-	347,5	350,5
ASME B1.20.1 [mm]	NPT H max.	-	304,5	309,5	-	349,5	354,5

Length of screwed end "c" inlet thread "Male"

Inlet thread	Size	1/2"	3/4"	1"
DIN ISO 228-1 [mm]	G	14	16	18
ISO 7-1/BS 21 [mm]	R	19	20	23
ASME B1.20.1 [mm]	NPT	22	22	27



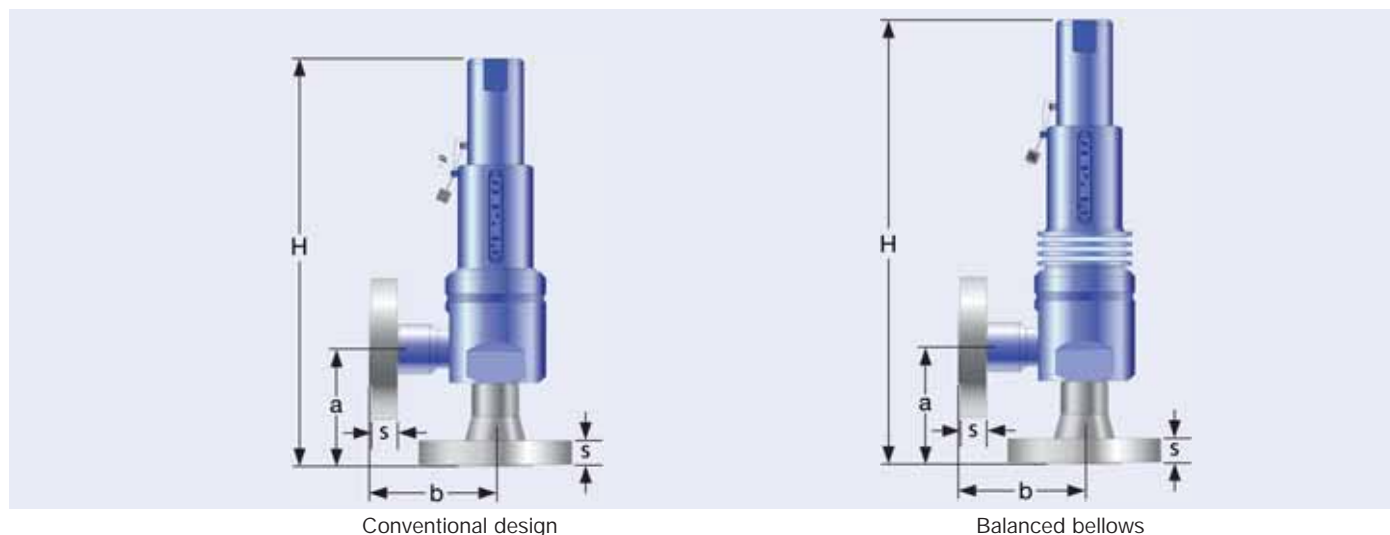
Dimensions and weights – Metric Units

Flanged connection

		Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [mm]		9	13	9	13		
Actual Orifice area A_0 [mm ²]		63,6	133	63,6	133		
DIN ISO 1092-1 (Available flange sizes refer to page 09/07)							
Flange rating PN 40 – 400							
Center to face [mm]	Inlet a	100	100	100	100		
	Outlet b	100	100	100	100		
Height [H4] [mm]	H max.	330	330	375	375		
ASME B 16.5 (Available flange sizes refer to page 09/07)							
Flange rating class 150 – 2500							
Center to face [mm]	Inlet a	100	100	100	100		
	Outlet b	100	100	100	100		
Height [H4] [mm]	H max.	330	330	375	375		
Weight							
For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)							
Weight net [kg]	W_N	2,6	2,6	3,8	3,8		
(without inlet and outlet flange)							

Flange dimensions and availability

		DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
Size		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS 1/2"						
Flange thickness [mm]	s	18	22	26	26	30	14	18		26		30,2	
Weight slip on flange [kg]	W_F	0,8	1,2	2,5	2,5	3,6	0,6	0,9		2,1		3	
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Available at Outlet		✓	✓	✓			✓	✓		✓			
DN 20							NPS 3/4"						
Flange thickness [mm]	s	20	22				15	18		25,4		32	
Weight slip on flange [kg]	W_F	1,1	1,3				0,8	1,4		2,3		3,5	
Available at Inlet		✓	✓				✓	✓		✓		✓	✓
Available at Outlet		✓	✓				✓	✓		✓			
DN 25							NPS 1"						
Flange thickness [mm]	s	22	26	30	36	40	17	21,5		32,5		40	
Weight slip on flange [kg]	W_F	1,3	2,6	3,5	5	7,5	1	2,1		4,1		5,1	
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Available at Outlet		✓	✓	✓			✓	✓		✓			
DN 40							NPS 1 1/2"						
Flange thickness [mm]	s	23	23	34			22	24		38			
Weight slip on flange [kg]	W_F	2,1	2,9	4,3			1,4	2,2		3,9			
Available at Inlet		✓	✓	✓			✓	✓		✓			
Available at Outlet		✓	✓	✓			✓	✓		✓			



Dimensions and weights – US Units

Threaded connections

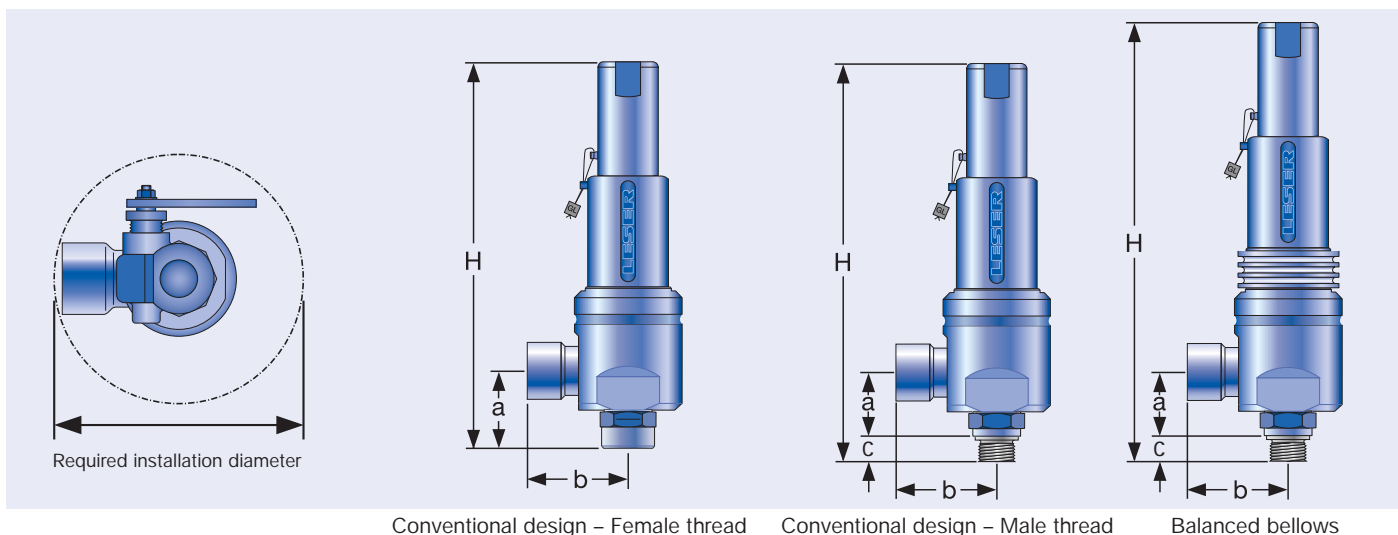
Size Outlet body		1"	1"	1"	1"	1"	1"	
Actual Orifice diameter d_0 [inch]		0,354	0,354	0,354	0,512	0,512	0,512	
Actual Orifice area A_0 [inch ²]		0,099	0,099	0,099	0,206	0,206	0,206	
Weight	Standard [lbs]	5,7	5,7	5,7	5,7	5,7	5,7	
	Balanced bellows	7,5	7,5	7,5	7,5	7,5	7,5	
Required installation diameter [inch]		6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	6 ¹ / ₂	
Inlet thread "Female"								
DIN ISO 228-1	G	Inlet a	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂	2 ³ / ₈	2 ⁹ / ₁₆	2 ²⁵ / ₃₂
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ⁵ / ₈	11 ¹³ / ₁₆
ISO 7-1/BS 21	Rc	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂	2 ³ / ₈	2 ²⁵ / ₃₂	2 ²⁵ / ₃₂
		Center to face [inch]	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Height [inch]		H max.	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆	11 ⁷ / ₁₆	11 ¹³ / ₁₆	11 ¹³ / ₁₆
Inlet thread "Male"								
DIN ISO 228-1	G	Inlet a	-	2 ³ / ₁₆	2 ³ / ₁₆	-	2 ³ / ₁₆	2 ³ / ₁₆
		Center to face [inch]	Outlet b	-	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	-	2 ¹⁵ / ₁₆
ISO 7-1/BS 21	R	Inlet a	-	2 ¹ / ₁₆	2 ¹ / ₁₆	-	2 ¹ / ₁₆	2 ¹ / ₁₆
		Center to face [inch]	Outlet b	-	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	-	2 ¹⁵ / ₁₆
ANSI/ASME B1.20.1	NPT	Inlet a	-	2 ¹ / ₁₆	2 ¹ / ₁₆	-	2 ¹ / ₁₆	2 ¹ / ₁₆
		Center to face [inch]	Outlet b	-	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	-	2 ¹⁵ / ₁₆

Height inlet thread "Male"

		Conventional design			Balanced bellows		
Inlet thread	Size	1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1 [inch]	G H max.	-	11 ⁷ / ₈	11 ¹⁵ / ₁₆	-	13 ¹⁰ / ₁₆	13 ²³ / ₃₂
ISO 7-1/BS 21 [inch]	R H max.	-	11 ²⁹ / ₃₂	12 ¹ / ₃₂	-	13 ²¹ / ₃₂	13 ¹³ / ₁₆
ASME B1.20.1 [inch]	NPT H max.	-	12	12 ³ / ₁₆	-	13 ¹² / ₁₆	13 ³¹ / ₃₂

Length of screwed end "c" inlet thread "Male"

Inlet thread	Size	1/2"	3/4"	1"
DIN ISO 228-1 [inch]	G	9/16	5/8	23/32
ISO 7-1/BS 21 [inch]	R	3/4	25/32	29/32
ASME B1.20.1 [inch]	NPT	7/8	7/8	1 ¹ / ₁₆



Dimensions and weights – US Units

Flanged connection

	Conventional design		Balanced bellows	
Actual Orifice diameter d_0 [inch]	0,354	0,512	0,345	0,512
Actual Orifice area A_0 [inch ²]	0,099	0,206	0,099	0,206

DIN ISO 1092-1 (Available flange sizes refer to page 09/07)

Flange rating PN 40 – 400

Center to face [inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
	Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height [H4] [inch]	H max.	13	13	$14^{3}/_{4}$	$14^{3}/_{4}$

ASME B 16.5 (Available flange sizes refer to page 09/07)

Flange rating class 150 – 2500

Center to face [inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
	Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height [H4] [inch]	H max.	13	13	$14^{3}/_{4}$	$14^{3}/_{4}$

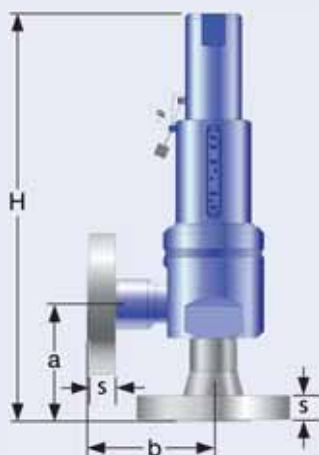
Weight

For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)

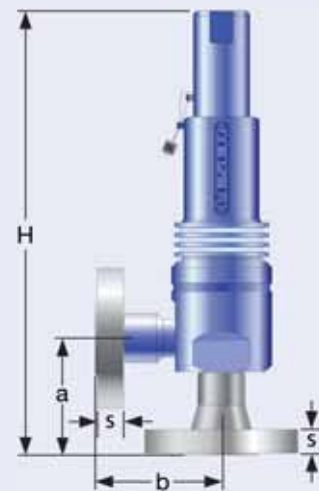
Weight net [lbs]					
(without inlet and outlet flange) W_N	5,7	5,7	8,4	8,4	

Flange dimensions and availability

	Size	DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating class						
		40	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15							NPS 1/2"						
Flange thickness [inch]	s	$1^{1}/_{16}$	$7/8$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$	$9/_{16}$	$1^{1}/_{16}$		$1^{1}/_{32}$	$1^{3}/_{16}$		
Weight slip on flange [lbs]	W_F	1,8	2,6	5,5	5,5	7,9	1,3	2		4,6	6,6		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
Available at Outlet		✓	✓	✓			✓	✓		✓			
DN 20							NPS 3/4"						
Flange thickness [inch]	s	$2^{5}/_{32}$	$7/8$				$1^{9}/_{32}$	$1^{1}/_{16}$		1	$1^{1}/_{4}$		
Weight slip on flange [lbs]	W_F	2,4	2,9				1,8	3,1		5,1	7,7		
Available at Inlet		✓	✓				✓	✓		✓	✓		✓
Available at Outlet		✓	✓				✓	✓		✓			
DN 25							NPS 1"						
Flange thickness [inch]	s	$7/8$	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$	$1^{1}/_{16}$	$2^{7}/_{32}$		$1^{9}/_{32}$	$1^{9}/_{16}$		
Weight slip on flange [lbs]	W_F	2,9	5,7	7,7	11	16,5	2,2	4,6		9	11,2		
Available at Inlet		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
Available at Outlet		✓	✓	✓			✓	✓		✓			
DN 40							NPS 1 1/2"						
Flange thickness [inch]	s	$2^{9}/_{32}$	$2^{9}/_{32}$	$1^{11}/_{32}$			$7/8$	$1^{5}/_{16}$		$1^{1}/_{2}$			
Weight slip on flange [lbs]	W_F	4,5	6,3	9,5			3,2	4,8		8,6			
Available at Inlet		✓	✓	✓			✓	✓		✓			
Available at Outlet		✓	✓	✓			✓	✓		✓			



Conventional design



Balanced bellows

Pressure temperature ratings

Metric Units							
Actual Orifice diameter d_0 [mm]		9			13		
Actual Orifice Area A_0 [mm ²]		63,6			133		
Body material 1.4404 (316L)		Type 4624					
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"
	Pressure rating	PN 500			PN 250		
Outlet body	Pressure rating	p ≤ 250 bar _g = PN 40, p > 250 bar _g = PN 160					
Minimum set pressure	p [bar _g] S/G/L	0,5			0,5		
Maximum set pressure	p [bar _g] S/G/L	350			180		
Temperature acc. to DIN EN	min [°C]	-45					
	max [°C]	+150					
Temperature acc. to ASME	min [°C]	-268					
	max [°C]	+150					

US Units							
Actual Orifice diameter d_0 [inch]		0,354			0,512		
Actual Orifice Area A_0 [inch ²]		0,099			0,206		
Body material 1.4404 (316L)		Type 4624					
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"
	Minimum set pressure	p [psig] S/G/L	7,3			7,3	
Maximum set pressure	p [psig] S/G/L	5076			2611		
Temperature acc. to DIN EN	min [°F]	-49					
	max [°F]	+302					
Temperature acc. to ASME	min [°F]	-268					
	max [°F]	+302					

The temperature is limited by soft seal material. The stated values are valid for EPDM.

Order information – Spare Parts

Spare parts								
Actual Orifice diameter d_0 [mm]		9			13			
Actual Orifice area A_0 [mm ²]		63,6			133			
Actual Orifice diameter d_0 [inch]		0,354			0,512			
Actual Orifice area A_0 [inch ²]		0,099			0,206			
Body (Item 1): Male thread								
Connection size		1/2"	3/4"	1"	1/2"	1/2"	1"	
DIN ISO 228-1	G	316L	–	136.7549.9000	136.7649.9000	–	136.8049.9000	136.8149.9000
ISO 7-1/BS 21	R	316L	–	136.7549.9220	136.7649.9220	–	136.8049.9220	136.8149.9220
ANSI/ASME B1.20.1	NPT	316L	–	136.7549.9204	136.7649.9204	–	136.8049.9204	136.8149.9204
Body (Item 1): Female thread								
DIN ISO 228-1	G	316L	136.7449.9210	136.7549.9210	136.7649.9210	136.7949.9210	136.8049.9210	136.8149.9210
ISO 7-1/BS 21	R	316L	136.7449.9222	136.7549.9222	136.7649.9222	136.7949.9222	136.8049.9222	136.8149.9222
ANSI/ASME B1.20.1	NPT	316L	136.7449.9211	136.7549.9211	136.7649.9211	136.7949.9211	136.8049.9211	136.8149.9211
Body (Item 1): Flange design			Material-No. / Art.-No.					
DN 15 / NPS 1/2"	PN 40 – 400 CL 300 – 2500	316L		136.7449.9208			136.7949.9208	
DN 20 / NPS 3/4"	PN 40 – 400 CL 150 – 2500	316L		136.3949.9208			136.5049.9208	
DN 25 / NPS 1"	PN 40 – 400	316L		136.3449.9208			136.3549.9208	
	CL 150			136.7649.9202			136.8149.9202	
	CL 300 – 2500			136.3449.9208			136.3549.9208	
Disc with O-ring (Item 7)			Material-No. / Art.-No.					
Disc	NBR	"N"		200.9349.9081			220.4549.9081	
	CR	"K"		200.9349.9051			220.4549.9041	
	EPDM	"D"		200.9349.9041			220.4549.9051	
	FKM	"L"		200.9349.9071			220.4549.9071	
	FFKM	"C"		200.9349.9091			220.4549.9091	
O-ring (Item 7.4)			Material-No. / Art.-No.					
O-ring	NBR	"N"		502.0123.2681			502.0139.2681	
	CR	"K"		502.0123.2651			502.0139.2641	
	EPDM	"D"		502.0123.2641			502.0139.2651	
	FKM	"L"		502.0123.2671			502.0139.2671	
	FFKM	"C"		502.0123.2691			502.0139.2691	
Pin (Item 57)			Material-No. / Art.-No.					
Pin		1.4310		480.0505.0000			480.0505.0000	
Gasket – outlet body / bonnet (Item 60)			Material-No. / Art.-No.					
Gasket	Graphite + 1.4401			500.2407.0000			500.2407.0000	
Option code L68	Gylon (Filled PTFE)			500.2405.0000			500.2405.0000	
Ball (Item 61)			Material-No. / Art.-No.					
Ball	Ø [mm]			6			6	
	1.4401			510.0105.0000			510.0105.0000	
Bellows and bellows conversion kit (Item 15)			Material-No. / Art.-No.					
Stainless steel bellows	1.4571 / 316Ti			p ≤ 40 bar / 580 psig = 400.7949.0000				
				p > 40 bar / 580 psig = 400.6349.0000				
Conversion kit	≤ PN 40/CL 600			5021.1050				
	> PN 40/CL 600			5021.1051				

Available Options

<p>Male thread</p>	<p>Female thread</p>	<p>Flanged version</p>	
<p>Soft seal o-ring disc</p> <p>J30: NBR "N" J21: CR "K" J22: EPDM "D" J23: FKM "L" J20: FFKM "C"</p>			
<p>Heating jacket H29</p>	<p>Balanced bellows</p>	<p>Special material</p> <p>2.4610 Hastelloy® C4 2.4360 Monel® 400 1.4462 Duplex</p>	
<p>Lift indicator J93: Lift indicator</p>	<p>Test gag J69: H4 J70: H2</p>	<p>O-ring-damper H2 J65</p>	<p>O-ring-damper H4 J66</p>

Approvals

Approvals			
Actual Orifice diameter d_0 [mm]		9	13
Actual Orifice area A_0 [mm ²]		63,3	133
Actual Orifice diameter d_0 [inch]		0,354	0,512
Actual Orifice area A_0 [inch ²]		0,099	0,206
Europe		Coefficient of discharge K_{dr}	
DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13	
	S/G	0,83	0,81
	L	0,61	0,61
Germany		Coefficient of discharge α_w	
AD 2000-Merkblatt A2	Approval No.	TÜV SV 909	
	S/G	0,83	0,81
	L	0,61	0,61
United States		Coefficient of discharge K	
ASME Sec. VIII	Approval No.	M 37112	
	S/G	0,811	
	Approval No.	M 37101	
	L	0,566	
Canada		Coefficient of discharge K	
CRN	Approval No.	OG0730.95	
	S/G	Refer to ASME Sec. VIII	
	L	Refer to ASME Sec. VIII	
China		Coefficient of discharge α_w	
CSBQTS	Approval No.		
	S/G	0,83	0,81
	L	0,61	0,61
Russia		Coefficient of discharge α_w	
GGTN /	Approval No.	PPC 00-18458	
GOSGOTECHNADZOR	S/G	0,83	0,81
GOST R	L	0,61	0,61
Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every renewal. A sample certificate including the valid certification number can be taken from the homepage of the classification societies.
Det Norske Veritas	DNV	www.dnv.com	
Germanischer Lloyd	GL	www.gl-group.com	
Lloyd' s Register EMEA	LREMEA	www.lr.org	
Registro Italiano Navale	RINA	www.rina.org	

Capacities – Metric Units

Capacities according to AD 2000-Merkblatt A2, based on set-pressure plus 10% overpressure.
 Capacities at 1 bar (14,5 psig) and below are based on 0,1 bar (1,45 psig) overpressure.

Metric Units		AD 2000-Merkblatt A2					
Actual Orifice diameter d_0 [mm]		9			13		
Actual Orifice area A_0 [mm ²]		63,6			133,0		
LEO*) [inch ²]		S/G = 0,082 L = 0,086			S/G = 0,171 L = 0,179		
Set pressure		Capacities			Capacities		
		Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]		[kg/h]	[m ³ /h]	[10 ³ kg/h]	[kg/h]	[m ³ /h]	[10 ³ kg/h]
0,5	40	47	1,53	87	102	3,19	
1	58	69	2,07	125	149	4,32	
2	93	113	2,93	195	235	6,11	
3	127	155	3,59	258	316	7,48	
4	158	195	4,14	322	396	8,64	
5	189	234	4,63	386	477	9,66	
6	220	274	5,07	449	557	10,6	
7	251	313	5,48	511	638	11,4	
8	282	353	5,86	573	718	12,2	
9	312	392	6,21	636	799	13	
10	343	432	6,55	699	879	13,7	
12	405	511	7,17	824	1040	15	
14	465	590	7,75	947	1201	16,2	
16	527	669	8,28	1072	1363	17,3	
18	588	748	8,78	1197	1524	18,3	
20	650	827	9,26	1323	1685	19,3	
22	709	906	9,71	1444	1846	20,3	
24	771	986	10,1	1570	2007	21,2	
26	833	1065	10,6	1696	2168	22	
28	895	1144	11	1822	2329	22,9	
30	957	1223	11,3	1949	2490	23,7	
32	1020	1302	11,7	2076	2651	24,4	
34	1079	1381	12,1	2198	2812	25,2	
36	1142	1460	12,4	2325	2973	25,9	
38	1205	1539	12,8	2453	3134	26,6	
40	1268	1618	13,1	2582	3295	27,3	
42	1332	1698	13,4	2711	3456	28	
44	1395	1777	13,7	2841	3617	28,7	
46	1459	1856	14	2971	3779	29,3	
48	1524	1935	14,3	3102	3940	29,9	
50	1588	2014	14,6	3234	4101	30,5	
60	1910	2409	16	3889	4906	33,5	
70	2245	2805	17,3	4571	5711	36,1	
80	2583	3201	18,5	5259	6517	38,6	
90	2938	3596	19,6	5982	7322	41	
100	3296	3992	20,7	6711	8127	43,2	
120	4077	4783	22,7	8302	9738	47,3	
140	4958	5574	24,5	10096	11349	51,1	
160	5977	6365	26,2	12171	12959	54,6	
180	7267	7156	27,8	14786	14570	57,9	
200	8989	7947	29,3				
220	9426	8738	30,7				
240	9843	9529	32,1				
260	10244	10320	33,4				
280	10629	11111	34,6				
300	11001	11902	35,9				
320	11361	12693	37				
340	11709	13484	38,2				
360	12048	14275	39,3				

*) LEO_{S/G/L} = LESER Effective Orifice steam / gas / liquids please refer to page 00/11
 How to use capacity-sheets refer to page 00/09

Capacities – US Units

Capacities according to ASME Section VIII (UV), based on set-pressure plus 10% overpressure.
 Capacities at 30 psig (2,07 bar) and below are based on 3 psig (0,207 bar) overpressure.

US Units		ASME Section VIII					
Actual Orifice diameter d_0 [inch]		0,354			0,512		
Actual Orifice area A_0 [inch ²]		0,099			0,206		
LEO*) [inch ²]		S/G = 0,082 L = 0,086			S/G = 0,171 L = 0,179		
Set pressure		Capacities			Capacities		
	Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]	Steam saturated	Air 60° F and 14,5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]	
[psig]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]	
5	93	33	6,01	195	69	12,5	
10	114	41	7,67	238	85	16	
20	155	55	10,2	324	115	21,2	
30	196	70	12,2	410	146	25,4	
40	242	86	14,1	504	180	29,3	
50	287	103	15,8	599	213	32,8	
60	332	119	17,3	693	247	35,9	
70	377	135	18,7	788	281	38,8	
80	423	151	19,9	882	315	41,5	
90	468	167	21,2	977	348	44	
100	513	184	22,3	1071	382	46,4	
120	604	216	24,4	1260	449	50,8	
140	695	248	26,4	1449	517	54,9	
160	785	281	28,2	1638	584	58,7	
180	876	313	29,9	1827	652	62,3	
200	966	346	31,5	2016	719	65,6	
220	1057	378	33,1	2205	787	68,8	
240	1148	410	34,5	2394	854	71,9	
260	1238	443	36	2584	921	74,8	
280	1329	475	37,3	2773	989	77,6	
300	1419	508	38,6	2962	1056	80,4	
320	1510	540	39,9	3151	1124	83	
340	1601	572	41,1	3340	1191	85,6	
360	1691	605	42,3	3529	1259	88	
380	1782	637	43,5	3718	1326	90,5	
400	1872	670	44,6	3907	1393	92,8	
420	1963	702	45,7	4096	1461	95,1	
440	2054	734	46,8	4285	1528	97,3	
460	2144	767	47,8	4474	1596	99,5	
480	2235	799	48,9	4663	1663	102	
500	2326	832	49,9	4852	1731	104	
550	2552	913	52,3	5325	1899	109	
600	2779	994	54,6	5797	2068	114	
650	3005	1075	56,9	6270	2236	118	
700	3232	1156	59	6742	2405	123	
750	3458	1237	61,1	7215	2573	127	
800	3685	1318	63,1	7688	2742	131	
850	3911	1399	65	8160	2911	135	
900	4138	1480	66,9	8633	3079	139	
950	4364	1561	68,7	9105	3248	143	
1000	4591	1642	70,5	9578	3416	147	
1100	5044	1804	74	10523	3753	154	
1200	5497	1966	77,2	11469	4091	161	
1300	5950	2128	80,4	12414	4428	167	
1400	6394	2290	83,4	13340	4765	174	
1500	6889	2452	86,4	14373	5102	180	
1600	7393	2614	89,2	15424	5439	186	
1700	7907	2776	91,9	16497	5776	191	
1800	8433	2938	94,6	17594	6113	197	
1900	8971	3100	97,2	18718	6451	202	
2000	9525	3262	99,7	19872	6788	208	
2500	12604	4072	111	26298	8473	232	
3000	13651	4882	122	28482	10159	254	
3500	15916	5692	132				
4000	18182	6502	141				
4500	20447	7313	150				
5000	22712	8123	158				
5500	24977	8933	165				

*) $LEO_{S/G/L}$ = LESER Effective Orifice steam / gas / liquids please refer to page 00/11

How to use capacity-sheets refer to page 00/09

Determination of coefficient of discharge in case of lift restriction or back pressure

- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 3.3

Diagram for evaluation of ratio of lift / flow diameter (h/d₀) in reference to the coefficient of discharge (K_{dr}/α_w)

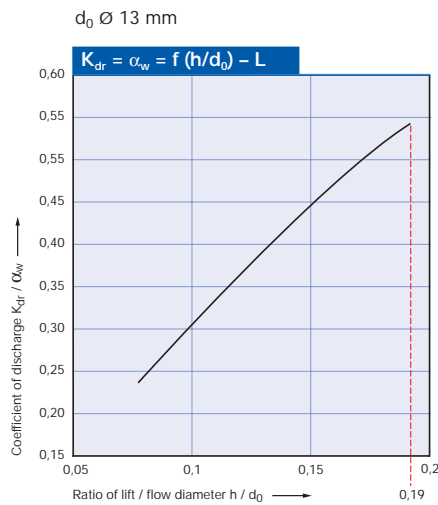
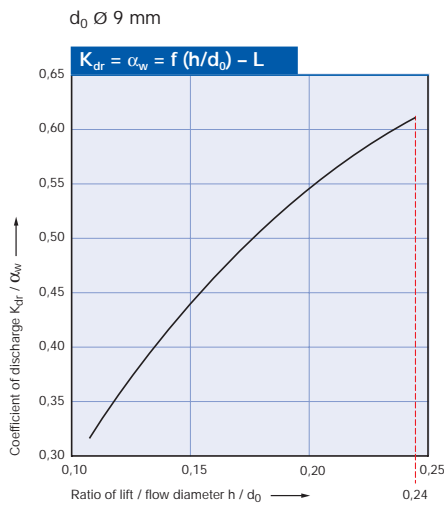
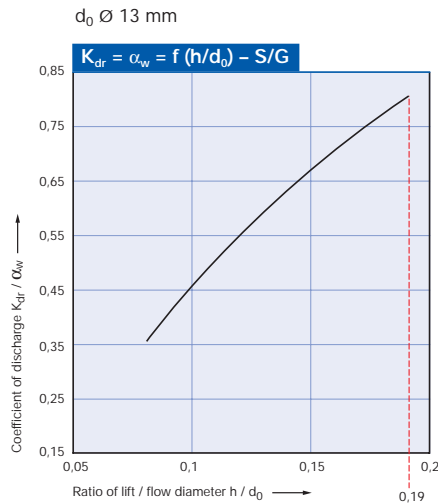
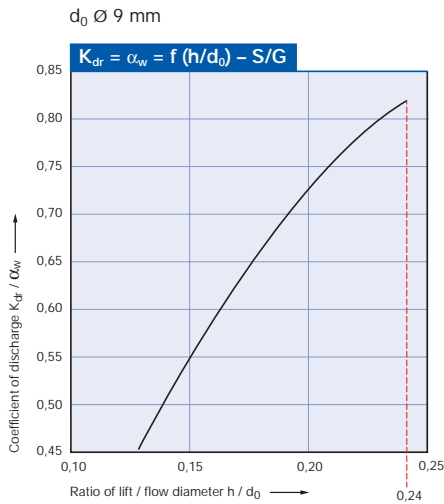
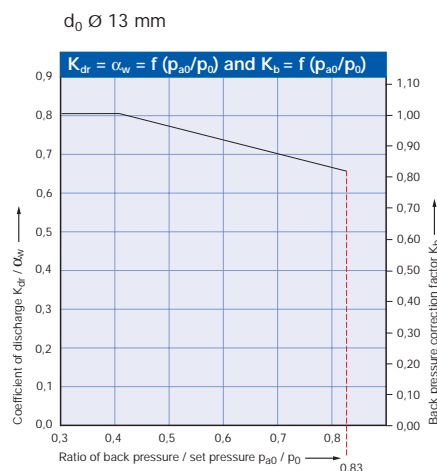
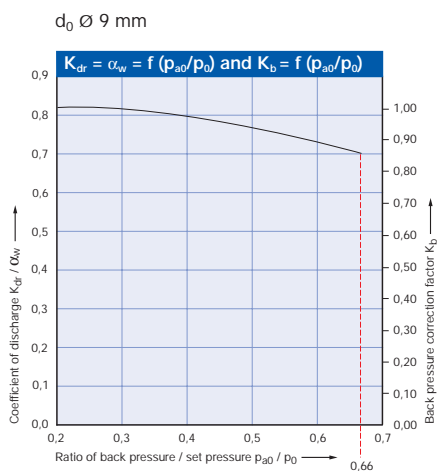
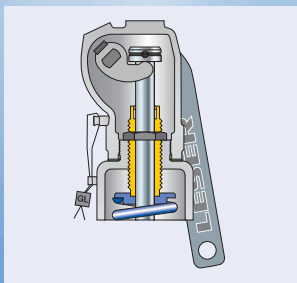
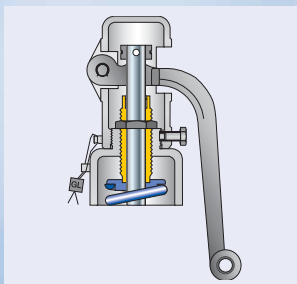
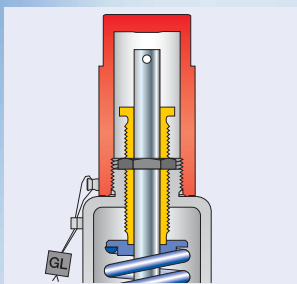
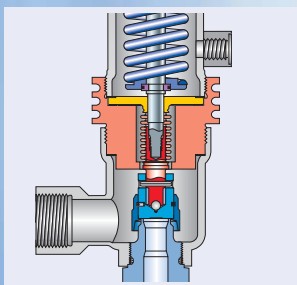
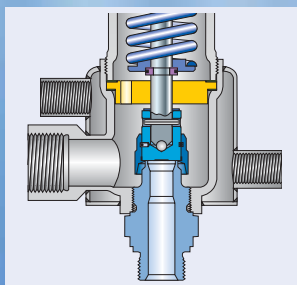
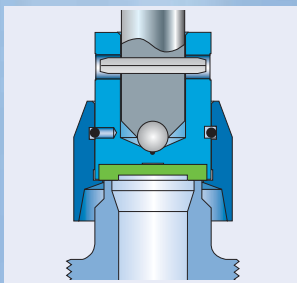
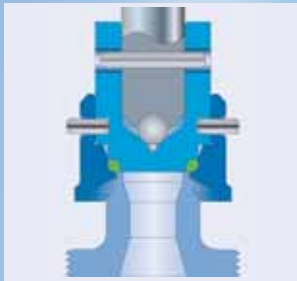
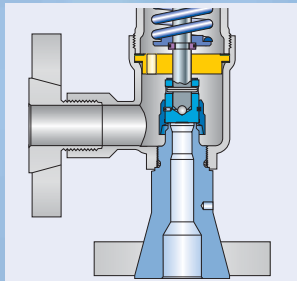
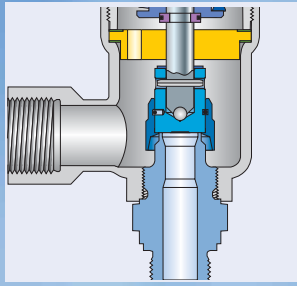


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)



How to use please refer to page 00/08

Accessories and Options

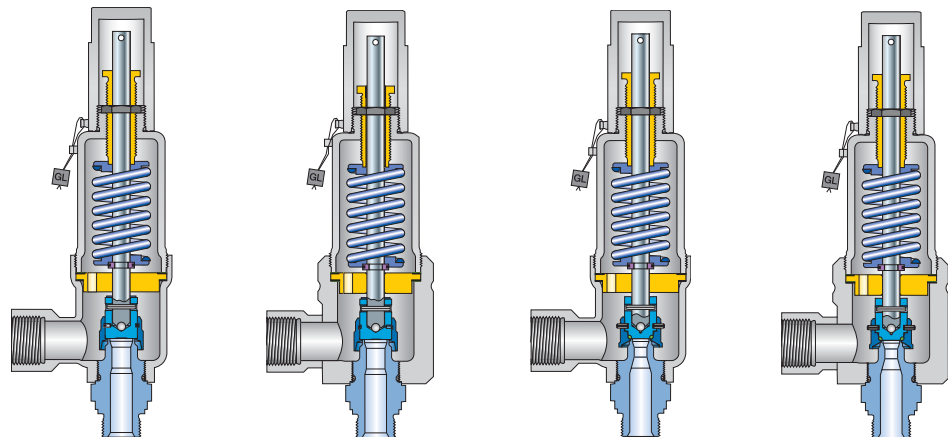


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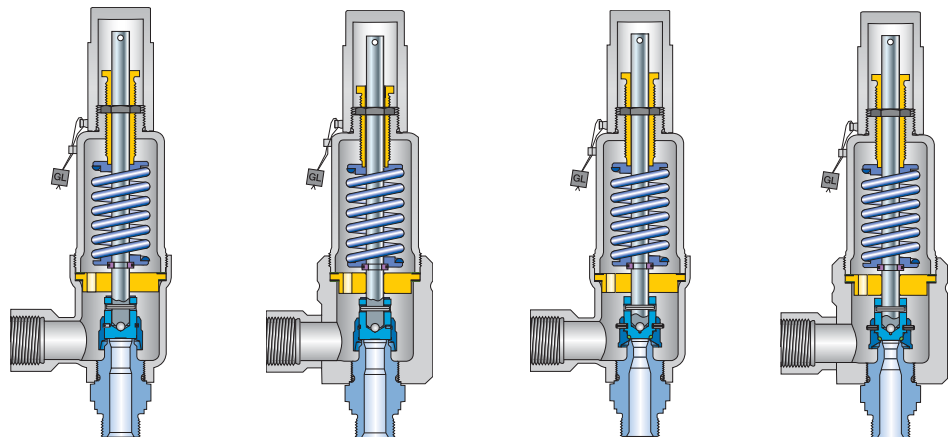
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Caps and Levers	09/04
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Soft seal material selection	09/10
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O-ring damper	09/14
Lift indicator	09/16
Lift restriction	09/17

Overview



Options		459	459 HDD	462	462 HDD
Base / Inlet body					
	Male thread	✓	✓	✓	✓
	Female thread	✓	✓	✓	✓
Flanged version – DIN ISO 1092-1					
Size DN 15		✓	✓	✓	✓
	Inlet		Flange rating PN 40 – 400		
	Outlet		–		
Size DN 20		✓	✓	✓	✓
	Inlet		Flange rating PN 40 + PN 160		
	Outlet		–		
Size DN 25		✓	✓	✓	✓
	Inlet		Flange rating PN 40 – 400		
	Outlet		Flange rating PN 40 – PN 400		
Size DN 40		✓	✓	✓	✓
	Inlet		–		
	Outlet		Flange rating PN 40 – 400		
Flanged version – ASME B16.5					
Size NPS 1/2"		✓	✓	✓	✓
	Inlet		Flange rating class 150 – 2500		
	Outlet		–		
Size NPS 3/4"		✓	✓	✓	✓
	Inlet		Flange rating class 150 – 2500		
	Outlet		–		
Size NPS 1"		✓	✓	✓	✓
	Inlet		Flange rating class 150 – 2500		
	Outlet		Flange rating class 150 – 900		
Size NPS 1 1/2"		✓	✓	✓	✓
	Inlet		Flange rating class 150 – 2500		
	Outlet		Flange rating class 150 – 900		
Disc					
	Disc stellited L25	✓	*	–	–
Type of sealing					
Metal seat	Metal to metal	✓	✓	–	–
	Metal to metal stellited	✓	*	✓	*
Plastic seat	Sealing plate	✓	✓	–	–
	O-ring	–	–	✓	✓

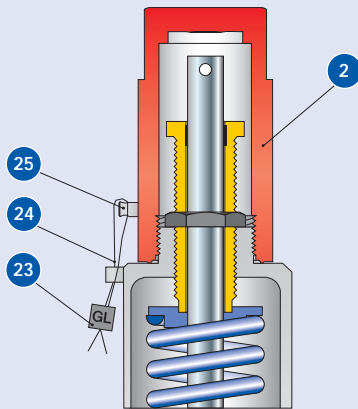
Overview



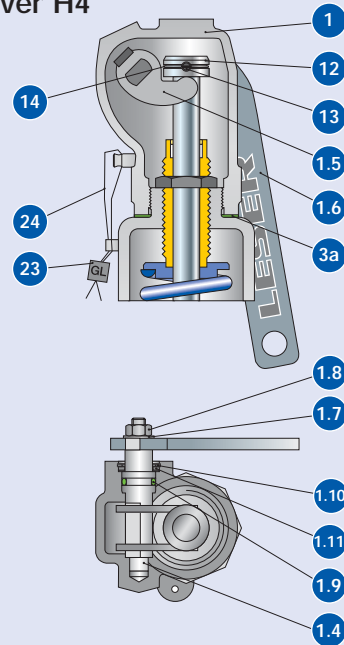
Options		459	459 HDD	462	462 HDD
Caps and levers					
	Type				
	H2	✓	✓	✓	✓
	H3	✓	-	✓	-
	H4	✓	✓	✓	✓
Heating jacket					
	Outlet body	✓	✓	✓	✓
	Bonnet spacer	✓	✓	✓	✓
Test gag					
	H2	✓	✓	✓	✓
	H4	-	-	-	-
Bellows					
	Stainless steel	✓	✓	✓	✓
	low pressure	✓	✓	✓	✓
	Hasteloy or spec. mat.	✓	✓	✓	✓
	High temp. equipment	-	✓	-	✓
	Elastomer	✓	-	✓	-
Lift indicator					
	Lifting device H4	✓	✓	✓	✓
Lift stopper					
	Bush	✓	✓ except d ₀ 6 mm	✓	✓
	Gag	✓	✓	✓	✓
O-ring damper					
	H2	✓	-	✓	-
	H4	✓	-	✓	-

Caps and levers – Subassembly item 40

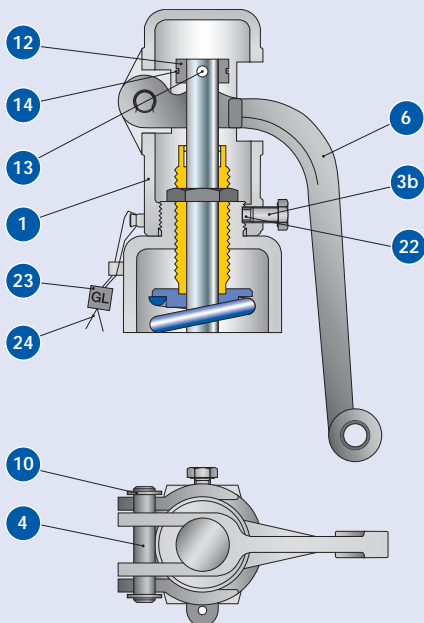
Cap H2



Packed lever H4

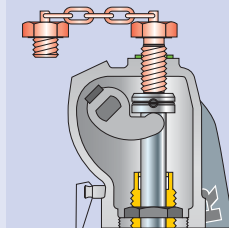
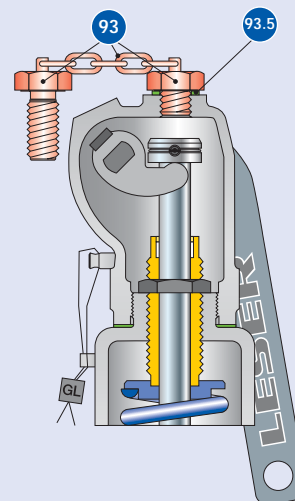


Plain lever H3



Test gag

Cap H2: J70
Packed lever H4: J69



BLOCKED
Remove
after testing

Test gag

The test gag blockades the spindle and keeps the safety valve tight while the system pressure exceeds the set pressure.

The test gag is used for:

- to perform pressure tests in a system without dismantling of the safety valve
- the individual adjustment of safety valves installed in the same system

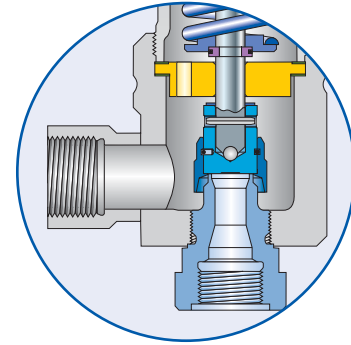
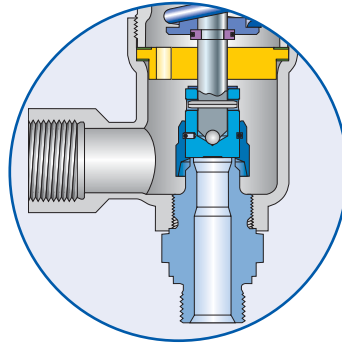
After testing the test gag must be removed because otherwise the safety valve cannot protect the system against unallowable overpressure!

Caps and levers – Subassembly item 40

Materials		Steel			Stainless steel	
Item	Component	Cap H2	Plain lever H3	Packed lever H4	Cap H2	Packed lever H4
1	Lever cover	–	0.7040	0.7040	–	1.4408
		–	Gr. 60-40-18	Gr. 60-40-18	–	CF8M
2	Cap	1.0718	–	–	1.4404	–
		Steel	–	–	316L	–
3a	Spacer	–	–	1.4571	–	1.4571
		–	–	316Ti	–	316Ti
3b	Hex screw	–	1.4401	–	–	–
		–	B7	–	–	–
4 / 1.4	Shaft / bolt	–	1.4021	1.0718	–	1.4404
		–	420	Steel	–	316L
1.5	Lifting fork	–	–	1.0531	–	1.4571
		–	–	Steel	–	316Ti
6 / 1.6	Lever	–	0.7040	1.0036	–	1.4301
		–	Gr. 60-40-18	Steel	–	316SS
1.7	Washer	–	–	1.4401	–	1.4301
		–	–	316	–	316SS
1.8	Nut	–	–	A2/Poly	–	1.4401
		–	–	2H	–	8M
1.9	O-ring	–	–	FKM	–	–
		–	–	---	–	–
	Packing ring precast	–	–	–	–	Graphite
10 / 1.10	Retaining clip	–	Carbon steel	Carbon steel	–	–
		–	---	---	–	–
1.11	Support ring	–	–	Carbon steel	–	–
		–	–	---	–	–
12	Spindle cap	–	1.0718	1.0718	–	1.4404
		–	Carbon steel	Carbon steel	–	316L
13	Pin	–	Steel	Steel	–	A4
		–	---	---	–	8M
14	Retaining clip	–	1.4571	1.4571	–	1.4571
		–	316Ti	316Ti	–	316Ti
22	Plug	–	Plastic	–	–	–
		–	---	–	–	–
23	Seal	Plastic	Plastic	Plastic	Plastic	Plastic
		---	---	---	---	---
24	Seal wire	1.4541	1.4541	1.4541	1.4541	1.4541
		321	321	321	321	321
25	Sealing nose	1.4435	–	–	1.4435	–
		316L	–	–	316L	–
93	Test gag	1.4401	–	1.4401	1.4401	1.4401
		B8M	–	B8M	B8M	B8M
93.5	Washer	Fiber	–	Fiber	Fiber	Fiber
		---	–	---	---	---

Available connections

For dimensions and weights refer to:
 Type 459 – page 05/08 + 05/10
 Type 459 HDD – page 06/08 + 06/10
 Type 462 – page 07/08 + 07/10
 Type 462 HDD – page 08/08 + 08/10



Male thread

Female thread

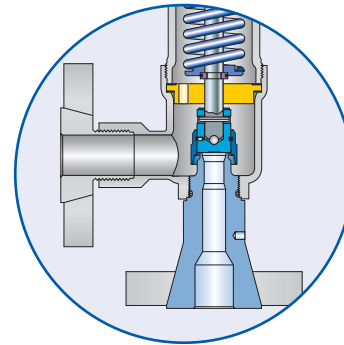
Threaded connections

Actual Orifice diameter d_0 [mm]	6	9 / 13		17,5		
Actual Orifice area A_0 [mm ²]	28,3	63,9 / 133		241		
Actual Orifice diameter d_0 [inch]	0,236	0,345 / 0,512		0,689		
Actual Orifice area A_0 [inch ²]	0,044	0,099 / 0,206		0,374		
Valve size	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Male thread DIN ISO 228-1						
G	1/2"	V54	-	-	-	-
	3/4"	V55	-	V55	-	-
	1"	V56	V68	V56	V68	V65
	1 1/4"	-	V79	-	V79	V83
	1 1/2"	-	V69	-	V69	V57
Female thread DIN ISO 228-1						
G	1/2"	V50	-	V50	-	-
	3/4"	V51	-	V51	-	V51
	1"	V52	V66	V52	V66	V52
	1 1/4"	-	V81	-	V81	V84
	1 1/2"	-	V67	-	V67	V53
Male thread DIN ISO 7-1/BS 21						
R/BSPT	1/2"	V30	-	-	-	-
	3/4"	V31	-	V31	-	-
	1"	V32	V42	V32	V42	V32
	1 1/2"	-	V43	-	V43	V33
Female thread DIN ISO 7-1/BS 21						
Rc/BSPT	1/2"	V38	-	V38	-	-
	3/4"	V39	-	V39	-	V39
	1"	V40	V36	V40	V36	V40
	1 1/2"	-	V37	-	V37	V41
Male thread ANSI/ASME B1.20.1						
NPT	1/2"	V61	-	-	-	-
	3/4"	V62	-	V62	-	-
	1"	V63	V73	V63	V73	V63
	1 1/4"	-	V82	-	V82	V85
	1 1/2"	-	V74	-	V74	V64
	2"	-	-	-	-	V86
Female thread ANSI/ASME B1.20.1						
NPT	1/2"	V58	-	V58	-	-
	3/4"	V59	-	V59	-	V59
	1"	V60	V71	V60	V71	V60
	1 1/4"	-	V80	-	V80	V87
	1 1/2"	-	V72	-	V72	V75
	2"	-	-	-	-	-

Flanged and threaded connections can be combined.
 Threads according to other standards are available.
 Please specify in writing (diameter, pressure rating, standard).

Available connections

For dimensions and weights refer to:
 Type 459 – page 05/09 + 05/11
 Type 459 HDD – page 06/09 + 06/11
 Type 462 – page 07/09 + 07/11
 Type 462 HDD – page 08/09 + 08/11



Flanged connections

Flanged version

Actual Orifice diameter d_0 [mm]	6	9 / 13	17,5
Actual Orifice area A_0 [mm ²]	28,3	63,9 / 133	241
Actual Orifice diameter d_0 [inch]	0,236	0,345 / 0,512	0,689
Actual Orifice area A_0 [inch ²]	0,044	0,099 / 0,206	0,374

DIN ISO 1092-1 (PN > 100: DIN 2501)

	PN	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
DN 15	40	I21	–	I21	–	–	–
	160	I22	–	I22	–	–	–
	250	I23	–	I23	–	–	–
	320	I24	–	I24	–	–	–
	400	I25	–	I25	–	–	–
DN 20	40	I26	–	I26	–	I26	–
	160	I27	–	I27	–	I27	–
	250	–	–	–	–	–	–
	320	–	–	–	–	–	–
	400	–	–	–	–	–	–
DN 25	40	I31	I46	I31	I46	I31	–
	160	I32	I47	I32	I47	I32	–
	250	I33	I48	I33	I48	I33	–
	320	I34	–	I34	–	I34	–
	400	I35	–	I35	–	I35	–
DN 40	40	–	–	–	I49	–	I49
	320	–	–	–	I50	–	I50
	400	–	–	–	I51	–	I51

ANSI/ASME B 16.5

	Class	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
NPS 1/2"	150	V01	–	V01	–	–	–
	300	V02	–	V02	–	–	–
	600	V02	–	V02	–	–	–
	900	V03	–	V03	–	–	–
	1500	V03	–	V03	–	–	–
	2500	V04	–	V04	–	–	–
NPS 3/4"	150	V05	–	V05	–	V05	–
	300	V06	–	V06	–	V06	–
	600	V06	–	V06	–	V06	–
	900	V07	–	V07	–	V07	–
	1500	V07	–	V07	–	V07	–
	2500	V08	–	V08	–	V08	–
NPS 1"	150	V09	V18	V09	V18	V09	–
	300	V10	V19	V10	V19	V09	–
	600	V10	V19	V10	V19	V10	–
	900	V11	V20	V11	V20	V10	–
	1500	V11	–	V11	–	V11	–
	2500	V12	–	V12	–	V12	–
NPS 1 1/2"	150	–	–	–	V21	–	V21
	300	–	–	–	V22	–	V22
	600	–	–	–	V22	–	V22
	900	–	–	–	V23	–	V23

Flanged and threaded connections can be combined. Threads according to other standards are available. Please specify in writing (diameter, pressure rating, standard).

Sealing surface

Type 459 – Metal seat

LESER metal seats (disc and nozzle) are lapped to optical flatness to ensure a tight seal. LESER safety relief valves are supplied with standard leak tightness according to API 527. Improved tightness is available on request.

Stellited sealing surface – Option code L20 (base / inlet body) and J25 (disc)

The sealing surfaces of the stainless steel disc and nozzle can be stellited by build-up welding. Stellite is a cobalt-chromium based, non-ferrous alloy with increased hardness, corrosion resistance and wear resistance at high temperatures.

LESER recommends stellited sealing surfaces for type 4374 (seat and disc 1.4404/316L) in the following cases:

- high pressure applications, due to the high stress of the sealing surfaces
- high temperature applications to avoid a permanent deformation of the sealing surfaces, due to the material properties of the seat and disc
- applications with abrasive fluids to increase the wear resistance of the sealing surfaces.

The stellited sealing surfaces of the disc and base / inlet body are standard for type 459 HDD and 462 HDD.

Hardness metal seat								
Item	Component	Type	Option code	Material		Hardness of sealing surface		
				EN	ASME	Values from standards or manufacturers specification		Average value LESER stock
1	Base / Inlet body	4593	*	EN 10088-3, 1.4104	SA 479 430	≤ 220HBW	EN 10088-3 Table 8	17 – 20 HRC ¹⁾
		4592 / 4594	*	EN 10272, 1.4404	SA 479 316L	≤ 215HBW	EN 10272 Table 7	16 – 19 HRC ¹⁾
		4592/4594	L20	EN 10272, 1.4404 stellited	SA 479 316L stellited	≥ 35 HRC	Manufacturers specification	40 HRC
7.1	Disc	4593	*	EN 10088-3, 1.4122 hardened	Hardened stainless steel	≥ 40 HRC	LWN 325.01 Harding procedure	42 – 46 HRC
		4592 / 4594	*	EN 10272, 1.4404	SA 479 316L	≤ 215HBW	EN 10272 Table 7	16 – 19 HRC ¹⁾
		4592 / 4594	J25	EN 10272, 1.4404 stellited	SA 479 316L stellited	≥ 35 HRC	Manufacturers specification	40 HRC

Standard material of LESER balanced bellows is stainless steel 1.4571 / 316Ti.

HBW: BRINELL hardness acc. DIN EN ISO 6506-1

HRC: ROCKWELL hardness acc. DIN EN ISO 6508-1

¹⁾ Rockwell hardness values below 20 HRC are not allowed according to DIN EN ISO 6508-1. Lower, fictitious values were created for better comparison.

Sealing surface

Types 459 and 462 – Soft seal

LESER soft seal solutions allow for superior tightness.

Features and benefits

- two different designs for a wide variety application
- large selection of soft seal materials to best adapt to the application
- increased service life of sealing surfaces compared to a metal to metal seat
- simple replacement of the soft seal reduces maintenance costs
- standard ARP O-ring sizes for easy worldwide procurement
- one standard durometer per O-ring material for all set pressures to reduce stocking expenses

Soft seal solutions	Series 459	
	Type 459, 459 HDD	Type 462, 462 HDD
	Disc with inserted sealing plate, optional	O-ring disc
Design		
Requirements	increased tightness at temperatures lower than - 20°C / - 4°F	superior tightness maintained tightness close to the set pressure Pressure range: 5 – 180 bar, 75 – 2600 psig
Example application	Liquefied gases	Gas storage tanks

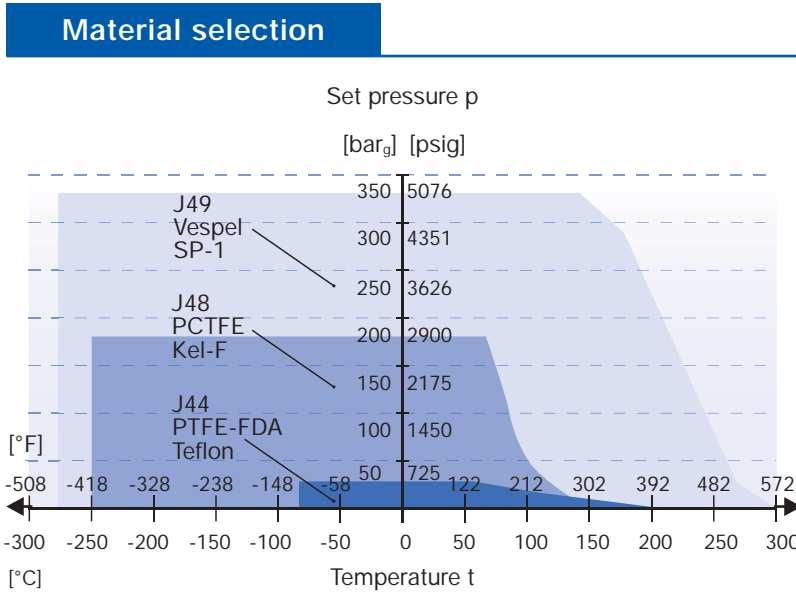
Subassembly of the disc (item 7), bill of materials

Component	Type 459		Type 462	
Disc	Item 7.1	1.4404 SA 479 316L	Item 7.1	1.4404 SA 479 316L
Soft seal Materials refer to next page	Item 7.3	sealing plate	Item 7.4	O-ring
Lifting aid	Item 7.2	1.4404 316L	Item 7.2	1.4404 316L
Retaining clip	Item 7.5	1.4571 316Ti	–	–
Pin	–	–	Item 7.5	1.4310 Stainless steel

For temperature limits and medium resistance please refer to the soft seal material selection, page 09/10.

Soft seal material selection

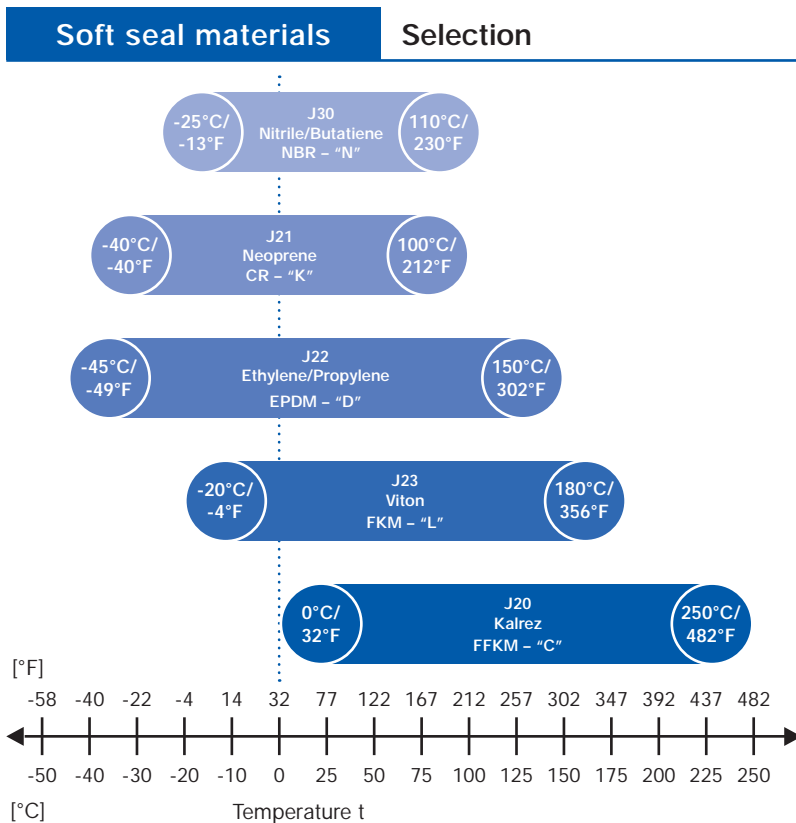
Type 459/459 HDD – Sealing plate



Option code		
Option code	Code letter ¹⁾	Application ²⁾
J44	PTFE-FDA "A"	Nearly all chemicals
J48	PCTFE "G"	Cryogenic and refrigeration applications, flammable media applications (e.g. gaseous oxygen) up to 50 bar, 725 psig at 60°C, 140°F
J49	VESPEL-SP1 "A"	High temperature and high pressure applications (no steam), for chemical resistance see www.DuPont.com
Other then listed	"X"	For other materials contact: your local representative or sales@leser.com

Standard material of LESER balanced bellows is stainless steel 1.4571 / 316Ti.

Type 462/462 HDD – O-ring disc



Option code		
Option code	Code letter ¹⁾	Application ²⁾
J30	NBR "N"	Hydraulic oil, vegetable and animal grease and oil
J21	CR "K"	Parafin oil, silicone oil and grease, water and water based solvents, refrigerants, ozone
J22	EPDM "D"	Hot water and superheated steam up to 150 °C, 302 °F, some organic and inorganic acids, silicone oil and grease, FDA compliant
J23	FKM "L"	High temperature service (no superheated steam), mineral oil and grease, silicone oil and grease, vegetable and animal grease and oil, ozone, FDA compliant compound available on request
J20	FFKM "C"	Nearly all chemicals, standard O-ring compound for Type 438 is Kalrez® 6375 with steam resistance, FDA compliant compound available on request
Other then listed	"X"	For other materials contact: your local representative or sales@leser.com

¹⁾ The code letters will be stamped on the disc (Item 7).

²⁾ Pressure and temperature service must be considered in any case. Chemical resistance information is supplied by the O-ring manufacturer.

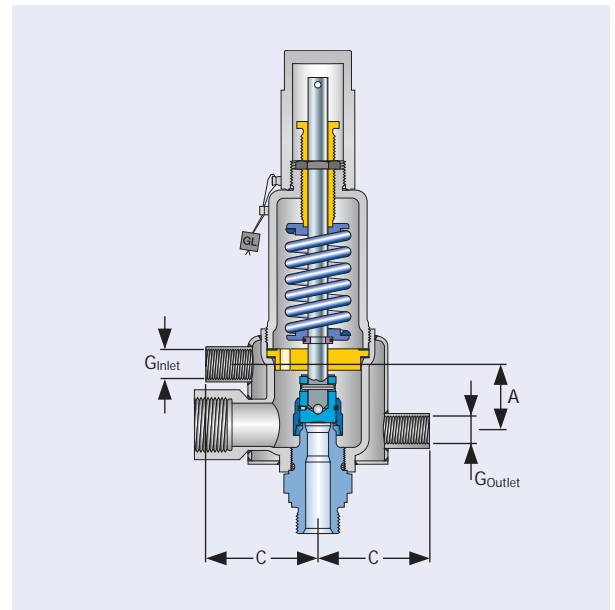
Heating jacket

Safety valves in systems which need to be protected from media that are viscous, sticky, or have the tendency to crystallize out of solution can be fitted with a heating jacket.

The heating jacket is constructed with a welded design and covers the outlet body (Item 2), allowing heating medias (e. g. steam, heat transfer oil, etc.) to pass through the space created.

For the balanced bellows design a separate heating of the bonnet spacer (Item 11) is not necessary. Sufficient heat will transfer to the spacer by convection, due to the compact design of the Series 459.

If there is no risk of solidification of the media at the outlet a safety valve without balanced bellows can be used as well.



Heating jacket

		Type 459, Type 462				Type 459 HDD, Type 462 HDD		
Actual Orifice diameter d_0 [mm]		6	9	13	17,5	6	9	13
Actual Orifice area A_0 [mm ²]		28,3	63,9	133	241	28,3	63,9	133
Actual Orifice diameter d_0 [inch]		0,236	0,345	0,512	0,689	0,236	0,345	0,512
Actual Orifice area A_0 [inch ²]		0,044	0,099	0,206	0,374	0,044	0,099	0,206
Option code		H29				H29		
Materials								
Outlet body		1.4404				1.4404		
Standard material of LESER balanced bellows is stainless steel 1.4571 / 316Ti.		316L				316L		
Heating jacket		1.4541				1.4541		
		321				321		
Couplings		1.4571				1.4571		
		316Ti				316Ti		
Dimensions								
Metric units		A [mm]	40			40		
		C [mm]	67			77		
US units		A [inch]	1 ⁹ / ₁₆			1 ⁹ / ₁₆		
		C [inch]	2 ⁵ / ₈			3 ¹ / ₁₆		
Connections								
G_{inlet}	Female thread DIN ISO 228-1	G 3/8"				G 3/8"		
	Female thread ASME B1.20.1	NPT 3/8"				NPT 3/8"		
G_{outlet}	Female thread DIN ISO 228-1	3/8"				3/8"		
	Female thread ASME B1.20.1	NPT 3/8"				NPT 3/8"		
Operating conditions								
max. operating pressure at 20°C [bar]		25				25		
max. operating pressure at 210°C [bar]		18				18		
max. operating pressure at 68°F [psig]		360				360		
max. operating pressure at 410°F [psig]		260				260		

For article no. and spare parts refer to spare part page of each type, please.

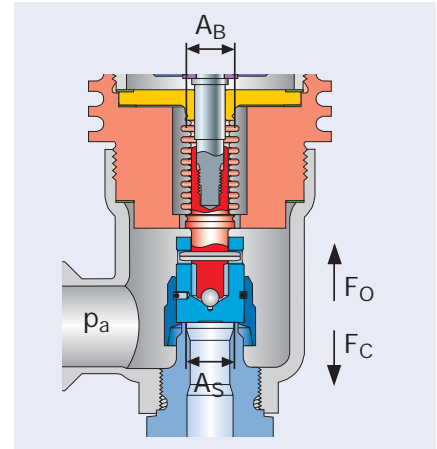
Balanced bellows – Subassembly item 15

LESER is able to provide a balanced bellows design through the use of stainless steel bellows. Balanced bellows are generally used for 2 applications:

- to compensate for back pressure
- to seal off the bonnet from the outlet chamber

Compensation for back pressure

The back pressure acts on the reverse side of the disc, creating a force in the closing direction (F_C) of the safety valve. The magnitude of this force depends on the seat area and the level of back pressure. The balanced bellows constitute an opposed area with the same area like the seat. The back pressure acts on both areas, thereby reducing or eliminating the closing force. This reduction of the force in the closing direction can be viewed as a compensating force acting in the opening direction (F_O). A quantitative representation is shown in the table below.



Actual area	Back pressure	Actual force	Direction of force	Compensation criteria
Seat area = A_S	p_a	$F_C = p_a \times A_S$	closing	$A_S = A_B$
Bellows area = A_B	p_a	$F_O = p_a \times A_B$	opening	$F_C = F_O$

LESER Series 459 is the first safety valve line in the world to offer stainless steel bellows in sizes less than an API D orifice. The stainless steel bellows was designed to compensate for back pressure in the valve size $A_0 = 133 \text{ mm}^2 / 0,206 \text{ inch}^2$, but the same design is also used in the smaller $A_0 = 63,9 \text{ mm}^2 / 0,099 \text{ inch}^2$ and $A_0 = 241 \text{ mm}^2 / 0,689 \text{ inch}^2$ sizes. For this reason, the bellows do not completely balance the smaller orifice size.

Sealing the bonnet from the outlet chamber

LESER's balanced bellows reliably seal the bonnet from the outlet chamber; protecting the guide, moving parts and the spring from problems associated with the media, such as dirt, corrosion, impurities of temperature.

Material and design

LESER Series 459 with balanced bellows is constructed with a bonnet spacer incorporated. The spacer helps to cool the bellows as well as shield it from turbulences during discharge, which reduces bellows vibration and guarantees a longer service life. Standard material of LESER balanced bellows is stainless steel 1.4571 / 316Ti. Other bellows materials like Hastelloy® or Inconel® are available as well.

A control thread DIN ISO 228-1 size $G^{1/4}$ " is fitted into the bonnet to monitor the condition of the bellows. A discharge pipe can be fitted to the $G^{1/4}$ " control thread to allow safe discharge of aggressive or toxic fluids.

Option code	Standard	High pressure
Bellows design	Standard	High pressure
Set pressure range	$p \leq 40 \text{ bar} / 580 \text{ psig}$	$p > 40 \text{ bar} / 580 \text{ psig}$
Option code	J78	J78 + J55

The dimensions and weights of a safety valve with balanced bellows are displayed in the tables "Dimensions and weights" for each type. The set pressure range as well as the temperature range are displayed in the tables "Pressure temperature ratings" for each type.

Balanced bellows – Subassembly item 15

Materials		
Item	Component	Series 459
8	Upper adaptor	1.4404 316L
11	Bonnet spacer	1.4404 316L
15.1	Lower adaptor	1.4404 316L
15.3	Bellows	1.4571 316Ti
60	Gaskets	Graphite / 1.4401 Graphite / 316

Hastelloy bellows or special materials are available on request.

Balanced bellows conversion kits

LESER balanced bellows conversion kits are available for convenient from conventional design into a balanced bellows design. The conversion kits contain all the necessary parts for conversion as well as instructions.

Conversion kits				
Item	Component	Quantity	Material	Remarks
11	Bonnet spacer	1	1.4404 316L	
12	Spindle	1	1.4404 316L	
15	Bellows	1	1.4571 316Ti	
60	Gasket	3	Graphite / 1.4401 Graphite / 316	
-	Installation instruction	1		LWN 037.06

For article no. and spare parts please refer to spare part page for each type.

O-ring damper – Subassembly item 40

The O-ring damper effectively suppresses or reduces oscillations of the movable parts of a safety valve.

Background:

In every spring-loaded safety valve the movable parts disc, spindle, lower spring plate and the spring form a so-called spring-mass system. As with all spring-mass systems, these parts can become excited by unfavorable operating conditions (e.g. inlet pressure drop) or by vibrations transferred from other equipment. Vibrations occurring at resonance frequency can cause the safety valve to undergo rapid, uncontrolled opening and closing, which will cause the valve to function improperly and not allow it to relieve the certified capacity.

In general two kinds of uncontrolled oscillations exist (definitions according to ASME PTC 25-2001, chapter 2.7):

chatter: “Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disc contacts the seat.” Causes for chattering are, among other things, high pressure losses in the inlet piping, excessive built-up back pressure and operation of the valve in the partial load range.

flutter: “Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disc does not contact the seat.” Causes for fluttering are vibrations with small or hardly measurable amplitude, where high frequency vibrations accumulate from external influences. The vibrations are usually induced by separate units (e.g. motors, pumps) and transmitted via a mechanical connection or the medium to the safety valve.

LESER developed the O-ring damper at LESER’s certified test labs based on long experience in the operation of safety valves. The O-ring damper is able to completely stabilize function or reduce oscillations to slow, uncritical movements. Also, the safety valve will still operate within the required ranges of the applicable codes and standards. Due to its design, the O-ring damper is able to be used for any type of oscillation.

LESER offers the O-ring damper incorporated in the gastight cap H2 or in a modified lifting device H4 with packed lever.

For applications with lubricating fluids, e.g. oil, the balanced bellows design must be selected to protect the O-ring damper from the fluid.

Available design

	Cap H2	Packed lever H4
Design		
Option code		
Conventional design	J65	J66
Balanced bellows design p ≤ 40 bar / 580 psig	J65, J78	J66, J78
Balanced bellows design p > 40 bar / 580 psig	J65, J78, J55	J66, J78, J55
Temperature range O-ring	-20 °C – +180 °C -4 °F – +356 °F	

O-ring damper – Subassembly item 40

Materials			
Item	Component	Cap H2	Packed lever H4
1	Lever cover	–	1.4408
		–	CF8M
2	Cap H2	1.4404	1.4404
		316L	316L
13	Parallel Pin	–	A4
		–	Steel
14	Securing ring	–	1.4571
		–	316Ti
15	Spindle	–	1.4404
		–	316L
22	Opposite ring	1.4404	1.4404
		316L	316L
27	Support bush	1.4404	–
		316L	–
27	Bush	–	PTFE 15% glas
		–	–
82	Spring	1.4310	1.4310
		Stainless steel	Stainless steel
83	O-ring	FKM	FKM
		–	–

Availability					
Type		459, 459 HDD		462, 462 HDD	
Actual Orifice diameter d_0 [mm]		9	13	9	13
Actual Orifice area A_0 [mm ²]		63,9	133	63,9	133
Actual Orifice diameter d_0 [inch]		0,345	0,512	0,345	0,512
Actual Orifice area A_0 [inch ²]		0,099	0,206	0,099	0,206
Option code					
Cap H2		✓	✓	✓	✓
Packed lever H4		✓	✓	✓	✓
Set pressure range					
Metric units	[bar _g]	8,7 – 27,5	8,7 – 120	17,0 – 125	6 – 110
US units	[psig]	261 – 400	126 – 1740	247 – 1810	98 – 1595

LESER has ensured proper performance of the O-ring damper through extensive tests at its certified test labs. If an O-ring damper is required for a set pressure not listed in the table above further testing must be performed, which will require a longer lead time; please contact sales@leser.com.

Lift indicator

Lift indicators are useful devices for process automation. The lift indicator is a useful device that can be used in process control to monitor the operating status of a safety valve.

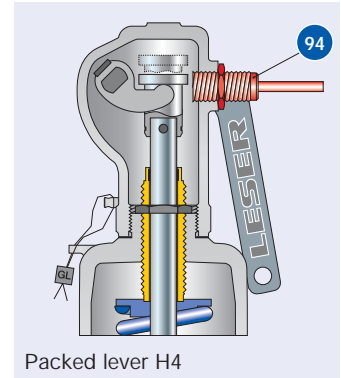
To detect lifting, LESER provides a special lifting device H4 incorporating a proximity switch (see drawing right).

The lift indicator will detect a safety valve lift equal to or more than 1 mm / 0.04 in, which may be the result of overpressure or of operation of the lifting device.

LESER provides inductive DC proximity switches, type DIN EN 60947-5-6 (NAMUR) using two-wire technology. These intrinsically safe proximity switches can be used in explosion hazard area zone 0 (Ex II 1 D Ex iaD 20 T6). Other types of proximity switch may be used. If a technical specification is supplied along with the type of connection thread LESER can verify compatibility.

For technical details of proximity switch refer to manufacturers homepage: www.pepperl-fuchs.com

For assembly and adjustment refer to LESER works standard LWN 323.03-E.



Packed lever H4

Availability

Item	Component	Option code
40	Lifting device H4 with adaptor for proximity switch M18 x 1 [mm]	J39
94	Lift indicator M18 x 1, used type = PEPPERL+FUCHS NJ5-18GK-N	J93

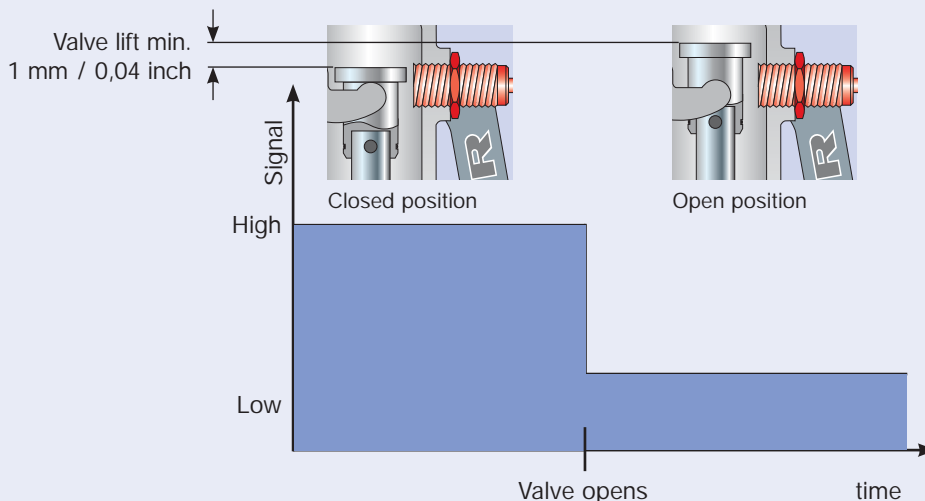
Operating chart

A, closed position

The lift indicator is positioned in front of the coupling or control sleeve when the safety valve is closed.

B, open position

When the safety valve opens or is lifted (in both cases at least 1 mm / 0,04 inch), lift indicator changes its signal. The signal also changes if the lift indicator accidentally becomes loosened or unscrewed (fail safe).



Lift restriction (lift restraining device)

A lift restriction may be needed to reduce the certified discharge capacity of a safety valve to the required discharge capacity. The lift restriction does not interfere with the operation of the valve.

If a lift restriction is used the following requirements of codes and standards must be considered.

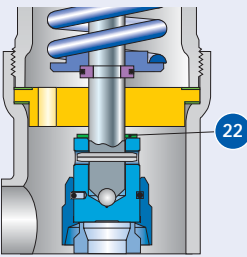
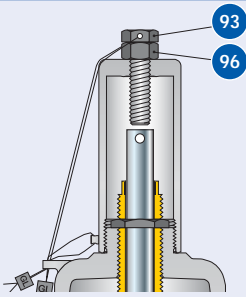
Requirements			
Code / standard	EN ISO 4126-1, section 5.1.3	ASME Code case 1945-4	AD 2000-Merkblatt A2, section 10.3
Lift	≥ 30% full rated lift not less than 1,0 mm / 1/16 inch	≥ 30% full rated lift not less than 0,08 inch / 2,0 mm	not less than 1,0 mm / 1/16 inch
Coefficient of discharge	-	-	$\alpha_w [S/G] \geq 0,08$
	-	-	$\alpha_w [L] \geq 0,05$
Name plate marking	Marking of reduced coefficient of discharge	- Capacity replaced with "Restricted capacity" - Restricted lift = ____ inch / mm	Marking of reduced coefficient of discharge
Design according to ASME code case 1945-4	The restriction of valve capacity shall be permitted only by the use of a lift restraining device, which shall limit valve lift and shall not otherwise interfere with flow throughout of the valve. The lift restricting device shall be designed so that the adjustable feature can be mechanically locked and have access sealed.		

Determining the restricted lift

Determining the restricted lift can be done by using:

- the "Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge".
 - LESER sizing program "VALVESTAR®"
 - LESER sizing web page www.valvestar.com
- An explanation on how to use this diagram may be found on page 00/08.

Lift restrictions

	Lift restriction by bush	Lift restriction by gag
Design		
Option code	J51	Cap H2: J52 Packed lever H4: J50
Materials		
Item	Component	
22	Bush	1.4404
		316L
93	Stud	-
		1.4401
96	Hex nut	-
		1.4401
		8M

Compact Performance Catalog
Edition September 2006

LWN 481.01-E / 09.2006 / 3000

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