Compact Performance

Safety Relief Valves
Series 437
Series 459

CATALOG

LESER

The-Safety-Valve.com

Product Range

LESER

LESER Safety Valves for every industrial application

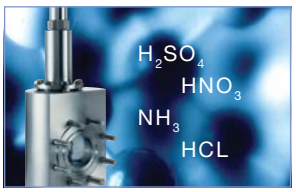
Compact Performance

High Performance

API

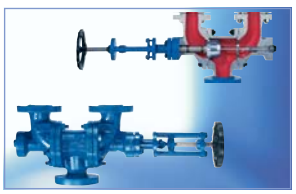
High Efficiency

Clean Service



Critical Service

Modulate Action



Best Availability

Series 437

Type 437

Type 438

Type 439

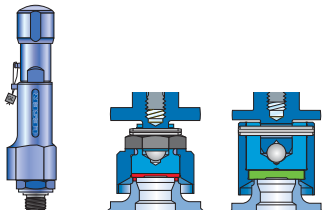
Series 459

Type 459

Type 459 HDD

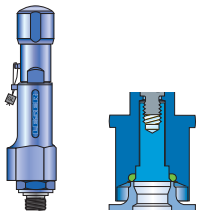
Type 462

Type 462 HDD



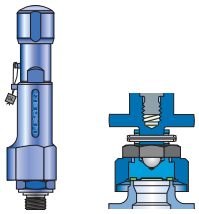
Type 437

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)



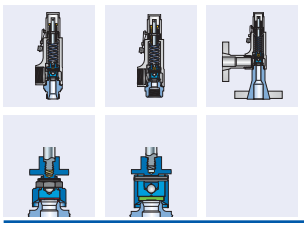
Type 438

Orifice diameter d_0 10 mm
Set pressure 5 – 180 bar, 72.5 – 2611 psig
O-ring soft seal

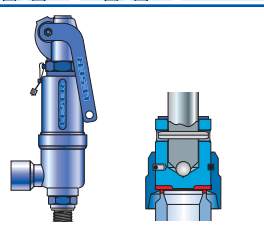


Type 439

Orifice diameter d_0 10 mm
Set pressure 0.1 – 16 bar, 1.5 – 232 psig
Vulcanized soft seal

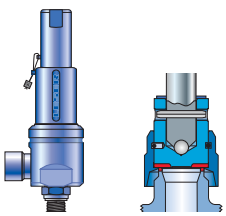


Options Series 437



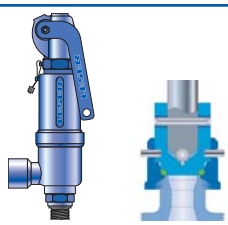
Type 459

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)



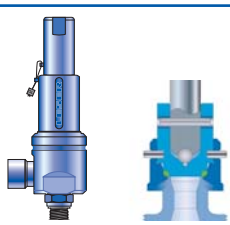
Type 459 HDD

Orifice diameter d_0 6, 9, 13 mm
Set pressure 0.2 – 850 bar, 2.9 – 12328 psig
Sealing stellited metal to metal



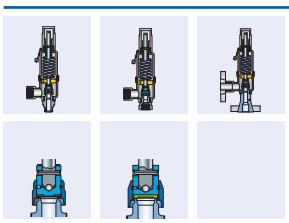
Type 462

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

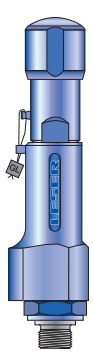


Options Series 459

Contents

Overview

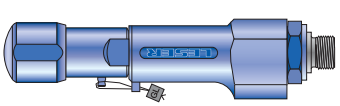
LESER Type



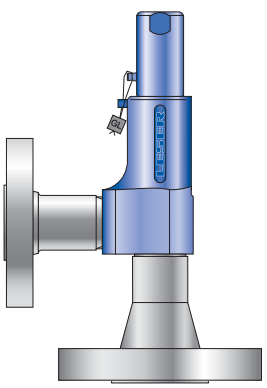
Type 437
Packed knob H4

Type 437
Packed knob H4
Long version

Type 437
Pull button H3

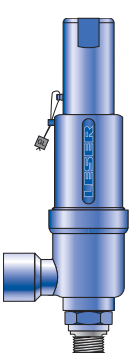


Type 437
Packed knob H4
Certified for horizontal fitting

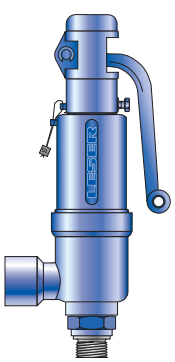


Type 437
Cap H2
Flange connection

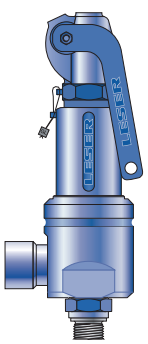
Contents



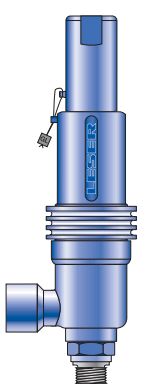
Type 459
Cap H2



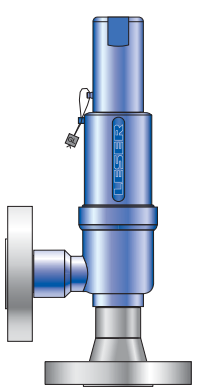
Type 459
Plain lever H3



Type 459 HDD
Packed lever H4



Type 459
Cap H2
Balanced bellows design



Type 459
Cap H2
Flange connection

General Information

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: AQSIQ 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, DIN 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

General Information

Applications

LESER – Compact Performance Safety Valves

offer ultimate protection against unallowable over-pressures 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 CO_2 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 $^3/_8$" to 1 $^1/_2$" 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 (acc. to DIN EN) 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
- Stellited 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

LESER

How to find the right Product Group

High operating to set pressure ratio, high backpressure or low total height?
Yes → **High Efficiency**


No

Clean Service application?
Yes → **Clean Service**


No

Critical Service / highly corrosive application?
Yes → **Critical Service**


No

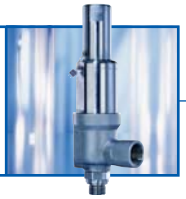
API specified application?
Yes → **API**


No

Steam, gas and liquid application with low capacity in relation to valve size?
Yes → **Modulate Action**


No

Required Orifice letter?
Orifice ≥ F → **High Performance**


Orifice ≤ F → **Compact Performance**


Additional components beyond safety valves
Yes → **Best Availability**


Medium-controlled

Spring loaded

Safety Valves

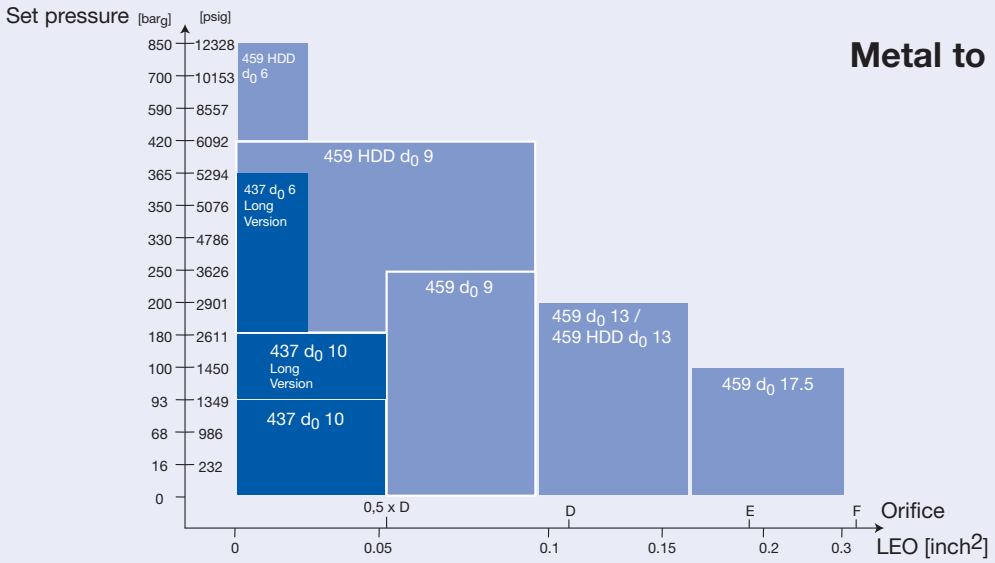
Change-over valve

Bursting disc

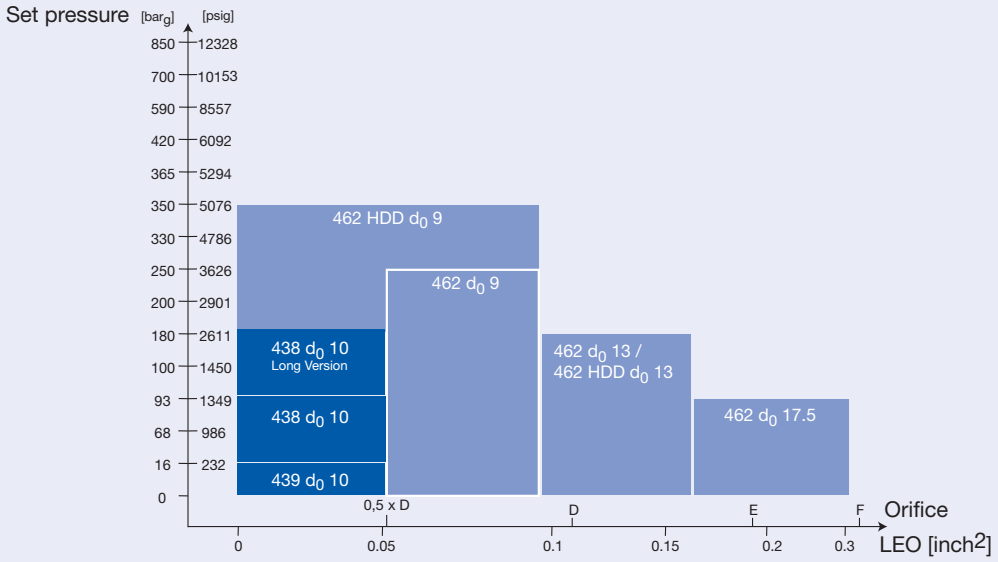
Valve finder

How to find the right Safety Valve

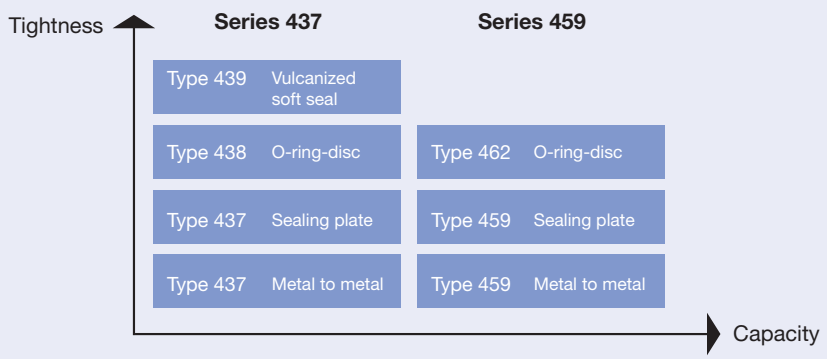
Metal to metal seat



Soft seal



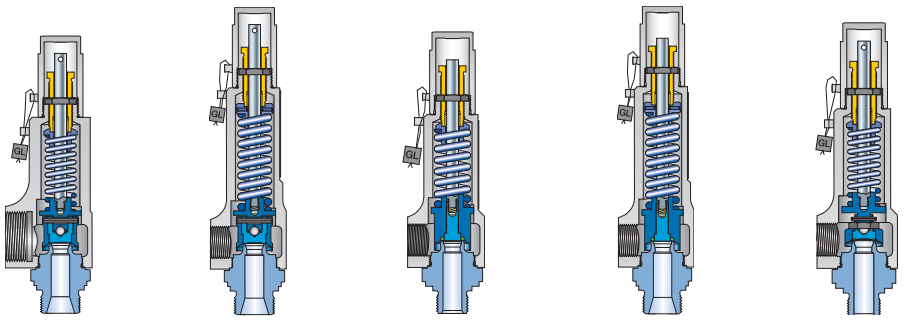
Tightness requirement



How to find
the right Compact Performance
Safety Valve

Valve selection

LESER



Valve size

Type	437	437 Long version	438	438 Long version	439
Actual Orifice diameter d_0 [mm]	–	6	–	–	–
Actual Orifice diameter d_0 [inch]	–	0.236	–	–	–
Actual Orifice diameter d_0 [mm]	10	10	10	10	10
Actual Orifice diameter d_0 [inch]	0.394	0.394	0.394	0.394	0.394

Sealing

Type	Metal seat	Metal seat	O-ring sealing	O-ring sealing	Vulcanized soft seal

Capacity

$LEO_{S/G}$	d_0 6 [mm]	–	0.021	–	–	–
$LEO_{S/G}$	d_0 10 [mm]	0.057	0.057	0.057	0.051	0.051
LEO_L	d_0 6 [mm]	–	0.022	–	–	–
LEO_L	d_0 10 [mm]	0.062	0.062	0.060	0.060	0.060

Materials

Type	4373	4374	4373 Long version	4374 Long version	4383	4384	4383 Long version	4384 Long version	4393	4394
1.4104 SA 479 430	✓	–	✓	–	✓	–	✓	–	✓	–
1.4404 SA 479 316L	–	✓	–	✓	–	✓	–	✓	–	✓

Set pressure

Metric units											
	min.	p [bar]	0.1	0.1	93	68	5	5	93	68	0.1	0.1
	max.	p [bar]	93	68	365	330	93	68	180	180	16	16
US units												
	min.	p [psig]	1.5	1.5	1349	986	72.5	72.5	1349	986	1.5	1.5
	max.	p [psig]	1348	986	5294	4786	1349	986	2611	2611	232	232

Temperature range

Acc. 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. ASME	min.	[°C]	-29	-268	-29	-268	-29	-45	-29	-45	-29	-45
	max.	[°C]	220	280	220	280	150	150	150	150	150	150
	min.	[°F]	-20	-450	-20	-450	-20	-49	-20	-49	-20	-49
	max.	[°F]	428	536	428	536	302	302	302	302	302	302

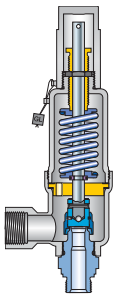
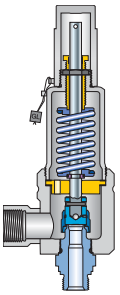
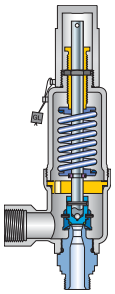
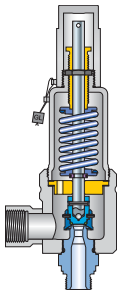
The temperature range for Type 438 and 439 are restricted by the material of the soft seal. The specified values are related to EPDM.

Approvals

Country	Code	Media
Europe	PED / DIN EN ISO 4126-1	S/G/L
Germany	PED / AD 2000-Merkblatt A2	S/G/L
USA	ASME Sec. VIII Div. 1	S/G/L
Canada	ASME Sec. VIII Div. 1	S/G/L
China	AQSIQ	S/G/L
Russia	TR / RTN	S/G/L
Kazakhstan	GOST-K	S/G/L
Belarus	GOSPROMNADZOR	S/G/L
Klassifikationsgesellschaften		
Bureau Veritas (BV)	Det Norske Veritas (DNV)	Germanischer Lloyd (GL)
Lloyd`s Register EMEA (LREMEA)	Registro Italiano Navale (RINA)	U.S. Coast Guard (U.S.C.G.)

Valve selection

LESER

Valve size

Type	4593	459 HDD	462	462 HDD
Actual Orifice diameter d_0 [mm]	9	6	9	9
Actual Orifice diameter d_0 [inch]	0.354	0.236	0.354	0.354
Actual Orifice diameter d_0 [mm]	13	9	13	13
Actual Orifice diameter d_0 [inch]	0.512	0.354	0.512	0.512
Actual Orifice diameter d_0 [mm]	17.5	13	17.5	–
Actual Orifice diameter d_0 [inch]	0.689	0.512	0.689	–

Sealing

Type	Metal seat	Metal seat	O-ring sealing	O-ring sealing

Capacity

$LEO_{S/G}$	d_0 6 [mm]	–	0.036	–	–
$LEO_{S/G}$	d_0 9 [mm]	0.082	0.082	0.082	0.082
$LEO_{S/G}$	d_0 13 [mm]	0.171	0.171	0.171	0.171
$LEO_{S/G}$	d_0 17,5 [mm]	0310	–	0.310	–
LEO_L	d_0 6 [mm]	–	0.038	–	–
LEO_L	d_0 9 [mm]	0.086	0.086	0.086	0.86
LEO_L	d_0 13 [mm]	0.179	0.179	0.179	0.179
LEO_L	d_0 17,5 [mm]	0.325	–	0.325	–

Orifice

$Orifice_{S/G}$	1.01 x F	1.5 x D	1.01 x F	1.5 x D
$Orifice_L$	1.05 x F	1.6 x D	1.05 x F	1.05 x F

Materials

	Type	4593	4592	4594	4594 HDD	4623	4622	4624	4624 HDD
1.4104 / 0.7043	430/ Duktil Gr. 60-40-18	✓	–	–	–	✓	–	–	–
1.0619	WCB	–	✓	–	–	–	✓	–	–
1.4404	SA 479 316L	–	–	✓	✓	–	–	✓	✓

Set pressure

Metric Units										
	min.	p [bar]	0.2	0.2	0.2	250	0.5	0.5	0.5	250
	max.	p [bar]	250	250	250	850	250	250	250	350
US Units										
	min.	p [psig]	2.9	2.9	2.9	3626	7.3	7.3	7.3	3626
	max.	p [psig]	3626	3626	3626	12325	3626	3626	3626	5076

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

Temperature range

Acc. to DIN EN	min.	[°C]	-10	-85	-200	-270	-10	-45	-45	-45
	max.	[°C]	300	400	400	550	150	150	150	150
	min.	[°F]	14	-121	-328	-454	14	-49	-49	-49
	max.	[°F]	572	752	752	1022	302	302	302	302
Acc. to ASME	min.	[°C]	-29	-29	-184	-268	-29	-45	-45	-45
	max.	[°C]	300	427	427	538	150	150	150	150
	min.	[°F]	-20	-20	-300	-450	-20	-49	-49	-49
	max.	[°F]	572	800	800	1000	302	302	302	302

Approvals

Country	Code	Media
Europe	PED / DIN EN ISO 4126-1	S/G/L
Germany	PED / AD 2000-Merkblatt A2	S/G/L
USA	ASME Sec. VIII Div. 1	S/G/L
Canada	ASME Sec. VIII Div. 1	S/G/L
China	AQSIQ	S/G/L
Russia	TR / RTN	S/G/L
Kazakhstan	GOST-K	S/G/L
Belarus	GOSPROMNADZOR	S/G/L
Klassifikationsgesellschaften		
Bureau Veritas (BV)	Det Norske Veritas (DNV)	Germanischer Lloyd (GL)
Lloyd`s Register EMEA (LREMEA)	Registro Italiano Navale (RINA)	U.S. Coast Guard (U.S.C.G.)

How to use

LESER

General signs and symbols	
*	Standard
✓	Available
–	Not possible

Signs and symbols for flange drillings and flange facings	
*	Standard design, no option code required
–	Flange drilling / facing is not possible
(*)	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”

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. L36	
L36	Flange facing as specified in flange standard (e.g. Flange facing inlet Type B2 “smooth finish”)

General information concerning flange drillings and flange facings	
Dimensions	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. 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: - 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	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!
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	
		DIN EN	ASME
xxx 2. xxxx	Stainless steel	1.4404	SA 479 316L
xxx 3. xxxx	Chrome steel	1.4104	SA 479 430
xxx 4. xxxx	Stainless steel	1.4404, 1.4571	SA 479 316L, 316Ti
xxx X. xxxx	Other materials on request	e. g. 2.4610	e. g. Hastelloy®

How to use

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

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_{ao} = Back pressure [bar_a]
p_0 = Set pressure [bar_a]
p_{ao}/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)

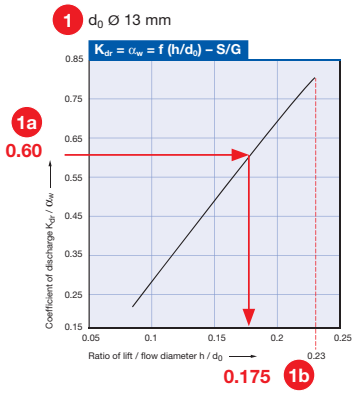
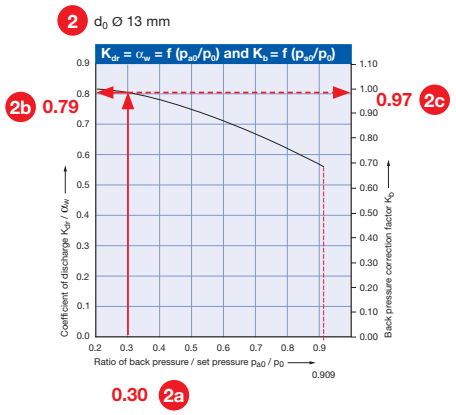


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure/set pressure (p_{a0}/p_0)



Explanation

Sample – Type 459, flow diameter d_0 = 13 mm, rated lift h = 3.0 mm, K_{dr}/α_w S/G = 0.81

1 Diagram 1
Determination of the restricted lift due to reduced K_{dr}/α_w

Step	Description	Sample
1	Calculate the required coefficent of discharge of the selected safety valve. Applicable formulas are stated in codes and standards.	1a K_{dr}/α_w = 0.60
2	Select the starting point (0.60) at the Y-axis of the diagram.	
3	Lay a horizontal line onto the ratio graph for 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
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 x 0,175 h = 2.3 mm

2 Diagram 2
Determination of reduced K_{dr}/α_w or K_b[1] due to back pressure

Step	Description	Sample
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 (0.30) at the X-axis of the diagram.	
3	Lay a vertical line onto the ratio graph to identify the intersection point.	
4	Lay a horizontal line to the Y-axis to identify the reduced K_{dr}/α_w or K_b.	2b K_{dr}/α_w = 0.79 2c K_b = 0.97
5	Calculate the sizing with the established K_{dr}/α_w or K_b.	

[1] Back pressure correction factor K_b acc. to API 520 topic 3.3. For further information refer to ENGINEERING at www.leser.com/engineering

How to use

LESER

Sample Capacity sheet – How to select capacities for steam: Type 459, d_0 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 (1)		
Actual Orifice diameter d_0 [mm]		9 (2)	
Actual Orifice area A_0 [mm²]		63.6 (3)	
LEO*) [inch²] (4)	S/G = 0.082 L = 0.086		
Set pressure (5)	Capacities		
[bar]	**Steam** saturated [kg/h]	**Air** 0° C and 1013 mbar [m_n^3/h]	**Water** 20° C [10^3kg/h]
0.2			
0.5			
1			
1.5	77	92	2.54
2	93 (6)	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 [inch²]	0.099		
LEO*) [inch²]	S/G = 0.082 L = 0.086		
Set pressure	Capacities		
[psig]	**Steam** saturated [lb/h]	**Air** 60° F and 14,5 psig [S.C.F.M.]	**Water** 70° F [US-G.P.M.]
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	[mm²]	[inch²]	63.6
4	LESER Effective Orifice	$LEO_{S/G}$	[inch²]	[inch²]	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 ENGINEERING at www.leser.com/engineering

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	$LEO_{S/G}$ [inch²]	% 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)

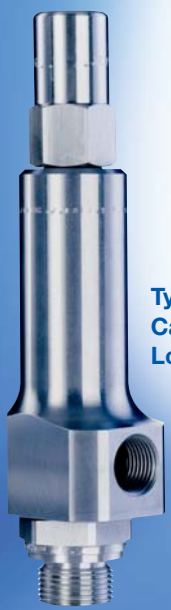
Orifice acc. API 526	LESER-Series	DN	Inlet size	d_0 [inch]	d_0 [mm]	K-value	LEO_{L} [inch²]	% of higher orifice	% of lower orifice
	437		1/2"	0.236	6.0	0.333	0.022	20.4%	
	459	10	1/2"	0.236	6.0	0.566	0.038	34.7%	
	438		1/2"	0.394	10.0	0.322	0.060	54.8%	
	439		1/2"	0.394	10.0	0.322	0.060	54.8%	
	437		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%

Type 437

Safety Relief Valves – spring loaded

Type 437
Packed knob H4
Conventional design

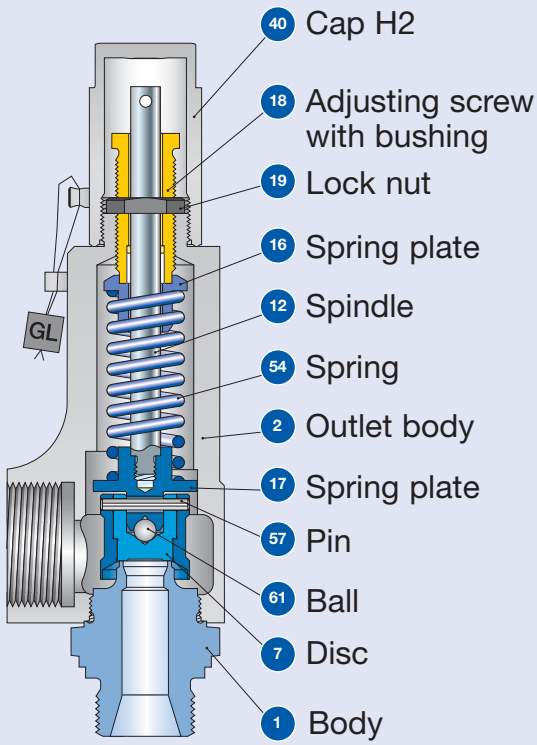
Type 437
Packed knob H4
Flanged connection



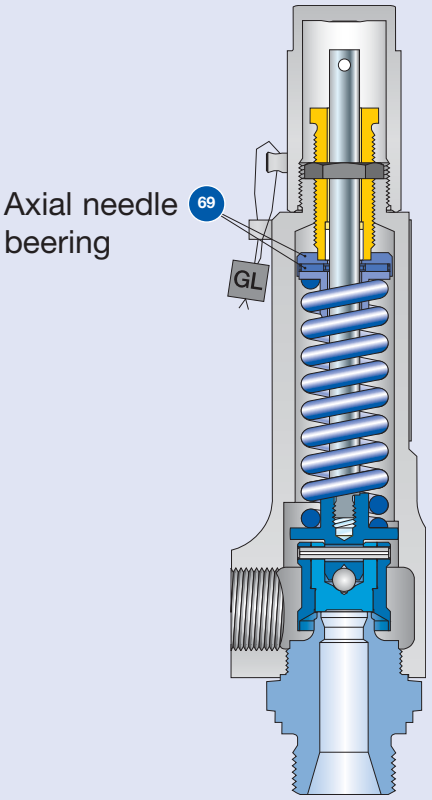
Type 437
Cap H2
Long version

Contents

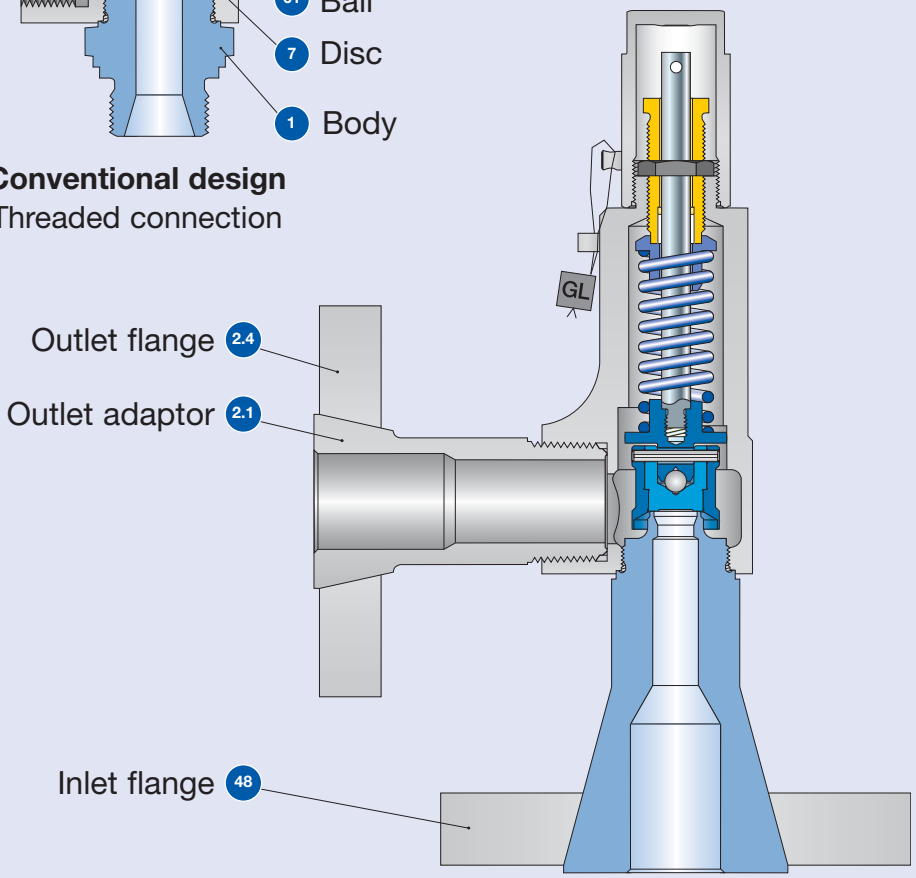
Available designs



Conventional design
Threaded connection



Long version
Threaded connection



Conventional design
Flange connection

Type 437

LESER

Available designs – materials

Materials

Item	Component	Remarks	Type 4373	Type 4374
1	Base / Inlet body	Threaded connection	1.4104[1], 1.4404 SA 479 430[1], SA 479 316L	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L
		Long version	1.4104[2], 1.4404 Stellited SA 479 430[2], SA 479 316L Stellited	1.4404 Stellited SA 479 316L Stellited
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	d_0 6: 1.4404 Stellited / d_0 10: 1.4122 d_0 6: 316L Stellited / d_0 10: HSS	d_0 6: 1.4404 Stellited / d_0 10: 1.4404 d_0 6: 316L Stellited / d_0 10: 316L
12	Spindle[3]		1.4021 420	1.4571 316Ti
		Long version	1.4571 316Ti	1.4571 316Ti
16/17	Spring plate[3]		1.4104 Chrome steel	1.4404 316L
		Long version	1.4404 316L	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 beering	Long version	1.4404 316L	1.4404 316L

[1] Only for male thread DIN ISO 228-1 $G^3/8$, $G^1/_2$, $G^3/_4$ (Option Codes V49, V54, V55).
[2] Only for d_0 10 with male thread DIN ISO 228-1 $G^3/_8$, $G^1/_2$, $G^3/_4$ (Option Codes V49, V54, V55).
[3] The items 12 and 17 are combined to one unit.

Please notice:

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

Type 437

LESER

How to order – Series 437 – Example for numbering system

1 Article Number	2 Set Pressure	3 Connections	
4374.3142	10 barg	V62	V71

1	2	3	4
437	4	314	2

1 Valve 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

Please state unit (in gauge)!

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

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

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

4 Options

J44 | | | |

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
• INCONEL X-750 spring		X08

5 Documentation

H01 | L30 | |

Please select requested documentation:

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

6 Code and Medium

2.0

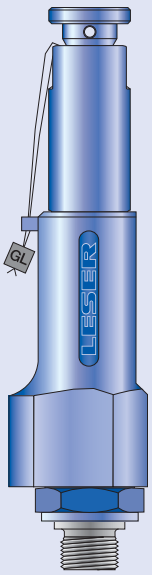
1	2
2	. 0

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

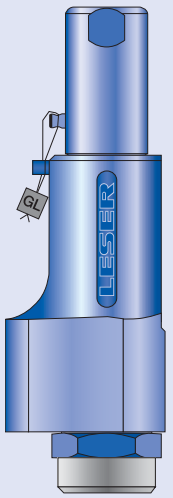
2 Medium
.1 Gases
.2 Liquids
.3 Steam
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)

Type 437

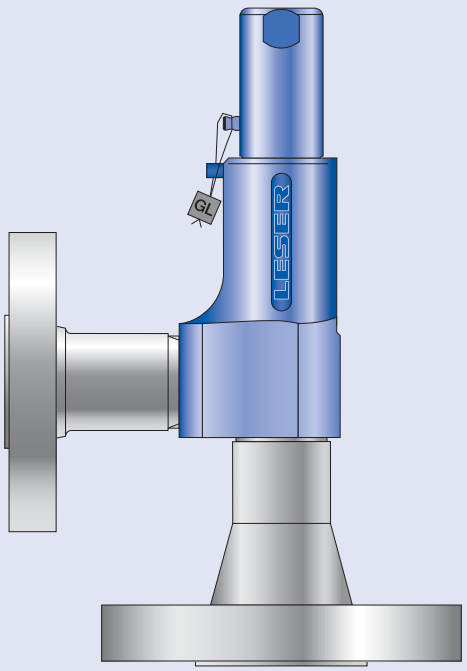
How to order – Article numbers



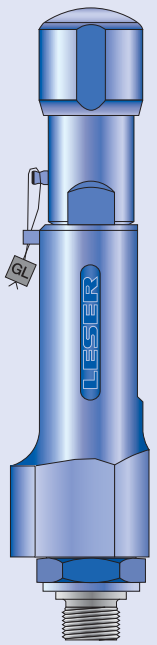
Type 437 Male
Outlet body $^1/_2$"
Pull button H3
Conventional design



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	Long version	
Actual Orifice diameter d_0 [mm]	10	6	10
Actual Orifice area A_0 [mm^2]	78.5	28.3	78.5
Actual Orifice diameter d_0 [inch]	0.394	0.236	0.394
Actual Orifice area A_0 [$inch^2$]	0.122	0.044	0.122
Base / Inlet body material: 1.4104 (430)			
H2 Art.-No. **4373.**	**2602**	**2622**	**2612**
H3 Art.-No. **4373.** $p_{max.}$ = 16 bar_g	**2603**	**–**	**–**
H4 Art.-No. **4373.**	**2604**	**2624**	**2614**
p [bar_g]	**S/G/L 0.1 – 93**	**S/G 180 – 365**	**S/G/L 93 –180**
p [psig]	**S/G/L 1.5 – 1349**	**S/G 2611 – 5294**	**S/G/L 1349 – 2611**
Base / Inlet body material: 1.4404 (316L)			
H2 Art.-No. **4374.**	**3142**	**3122**	**3152**
H4 Art.-No. **4374.**	**3144**	**3124**	**3154**
p [bar_g]	**S/G/L 0.1 – 68**	**S/G 180 – 330**	**S/G/L 68 –180**
p [psig]	**S/G/L 1.5 – 986**	**S/G 2611 – 4786**	**S/G/L 986 – 2611**

Type 437

LESER

Dimensions and weights – Metric Units

Threaded connections

Size Outlet body	Conventional design			Long version					
	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 [mm²]	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"

		Size outlet body	Conventional design			Long version					
			1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [mm]											
DIN ISO 228-1	**G**	Inlet 1/2" a	46	46	49	46	46	49	46	46	49
ISO 7-1/BS 21	**Rc**										
ASME B1.20.1	**NPT**	Inlet 3/4", 1" a	56	56	59	56	56	59	56	56	59
		Outlet b	30	37	37	30	37	37	30	37	37
Height [mm]											
		Inlet 1/2" H max.	209	209	212	230	230	233	230	230	233
		Inlet 3/4", 1" H max.	219	219	222	240	240	243	240	240	243

Inlet thread "Male"

		Size outlet body	Conventional design			Long version					
			1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [mm]											
DIN ISO 228-1	**G**	Inlet a	33	33	36	33	33	36	33	33	36
		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
ASME B1.20.1	**NPT**										
		Outlet b	30	37	37	30	37	37	30	37	37

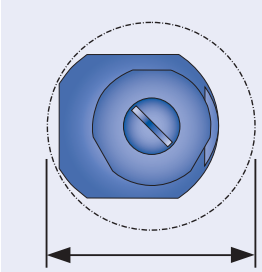
Height [mm]

		Size inlet thread	Conventional design				Long version			
			3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	208	210	212	217	229	231	233	238
ISO 7-1/BS 21	**R**	H max.	–	213	214	220	–	234	235	241
ASME B1.20.1	**NPT**	H max.	–	216	216	224	–	237	237	245

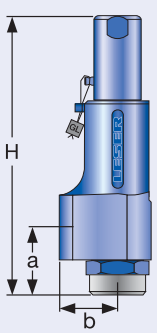
Length of screwed end "c" [mm]

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

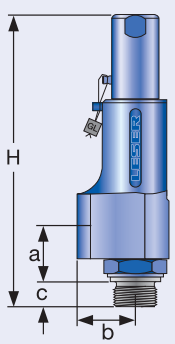
Available threaded connections refer to page 04/04.



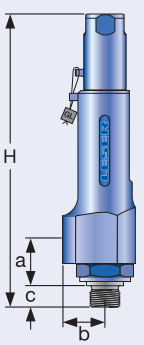
Required installation diameter



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	6	10
Actual Orifice area A_0 [mm²]			78.5	28.3	78.5
DIN EN 1092-1 (Available flange sizes refer to page 04/05)					
			Flange rating class PN 40		
Center to face	[mm]	Inlet a	100	100	100
		Outlet b	100	100	100
Height	[mm]	H max.	263	284	284
			Flange rating class ≥ PN 160		
Center to face	[mm]	Inlet a	103	103	103
		Outlet b	100	100	100
Height	[mm]	H max.	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
		Outlet b	100	100	100
Height	[mm]	H max.	263	284	284
			Flange rating class ≥ 300		
Center to face	[mm]	Inlet a	103	103	103
		Outlet b	100	100	100
Height	[mm]	H max.	266	287	287

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com

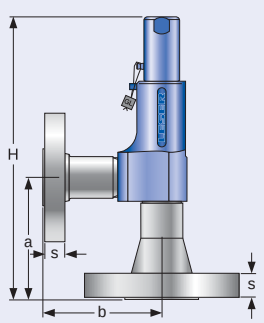
Weight

To calculate the total weight use the formula: $mT = m_N + m_F(\text{Inlet}) + m_F(\text{Outlet})$

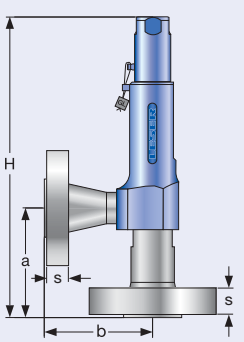
Weight net (without inlet and outlet flange)	[kg]	m_N	2.4	2.8	2.8

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	m_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	0.9	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	m_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Weight slip on flange	[kg]	m_F	1.3	–	2.6	3.5	5	7.5		1	2.1	21	4.1	4.1	5.1



Conventional design



Long version

Type 437

LESER

Dimensions and weights – US Units

Threaded connections

Size Outlet body	Conventional design			Long version					
	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 [inch²]	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"

		Size outlet body	Conventional design			Long version					
			1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [inch]											
DIN ISO 228-1	**G**	Inlet 1/2" a	1 13/16	1 13/16	1 15/16	1 13/16	1 13/16	1 15/16	1 13/16	1 13/16	1 15/16
ISO 7-1/BS 21	**Rc**										
ASME B1.20.1	**NPT**	Inlet 3/4", 1" a	2 7/32	2 7/32	2 5/16	2 7/32	2 7/32	2 5/16	2 7/32	2 7/32	2 5/16
		Outlet b	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32
Height [inch]											
		Inlet 1/2" H max.	8 7/32	8 7/32	8 11/32	8 7/32	8 7/32	8 11/32	8 7/32	8 7/32	8 11/32
		Inlet 3/4", 1" H max.	8 5/8	8 5/8	8 3/4	9 7/16	9 7/16	9 9/16	9 7/16	9 7/16	9 9/16

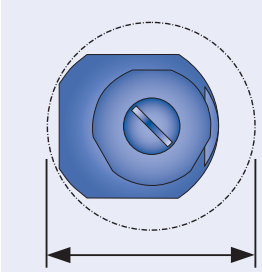
Inlet thread "Male"

		Size outlet body	Conventional design			Long version					
			1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [inch]											
DIN ISO 228-1	**G**	Inlet a	1 5/16	1 5/16	1 13/32	1 5/16	1 5/16	1 13/32	1 5/16	1 5/16	1 13/32
		Outlet b	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32
ISO 7-1/BS 21	**R**	Inlet a	1 7/32	1 7/32	1 11/32	1 7/32	1 7/32	1 11/32	1 7/32	1 7/32	1 11/32
ASME B1.20.1	**NPT**	Outlet b	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32
Height [inch]											

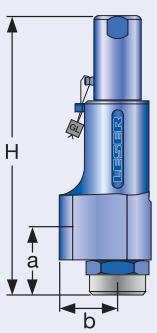
		Size inlet thread	Conventional design				Long version			
			3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	8 3/16	8 1/4	8 11/32	8 17/32	9	9 3/32	9 5/32	9 3/8
ISO 7-1/BS 21	**R**	H max.	–	8 3/8	8 13/32	8 21/32	–	9 7/32	9 1/4	9 15/32
ASME B1.20.1	**NPT**	H max.	–	8 1/2	8 1/2	8 13/16	–	9 5/16	9 5/16	9 21/32

Length of screwed end "c" [inch]		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**		15/32	9/16	5/8	23/32
ISO 7-1/BS 21	**R**		–	3/4	25/32	29/32
ASME B1.20.1	**NPT**		–	7/8	7/8	1 1/16

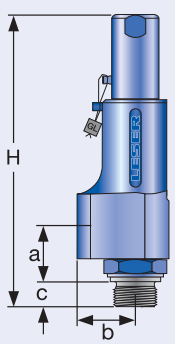
Available threaded connections refer to page 04/04.



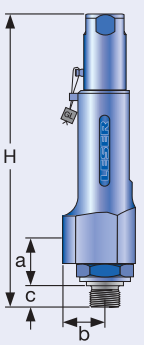
Required installation diameter



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	0.236	0.394
Actual Orifice area A_0 [inch²]			0.122	0.044	0.122
DIN EN 1092-1 (Available flange sizes refer to page 04/05)					
			Flange rating PN 40		
Center to face	[inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{11}/_{32}$	$11^{3}/_{16}$	$11^{3}/_{16}$
			Flange rating ≥ PN 160		
Center to face	[inch]	Inlet a	$4^{1}/_{16}$	$4^{1}/_{16}$	$4^{1}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{15}/_{32}$	$11^{5}/_{16}$	$11^{5}/_{16}$
ASME B 16.5 (Available flange sizes refer to page 04/05)					
			Flange rating class 150		
Center to face	[inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{11}/_{32}$	$11^{3}/_{16}$	$11^{3}/_{16}$
			Flange rating class ≤ 300		
Center to face	[inch]	Inlet a	$4^{1}/_{16}$	$4^{1}/_{16}$	$4^{1}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{15}/_{32}$	$11^{5}/_{16}$	$11^{5}/_{16}$

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com

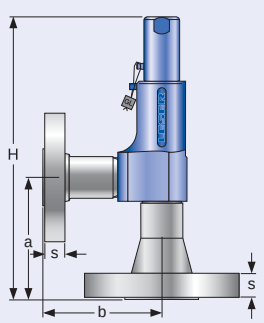
Weight

To calculate the total weight use the formula: $mT = m_N + m_F$ (Inlet) + m_F (Outlet)

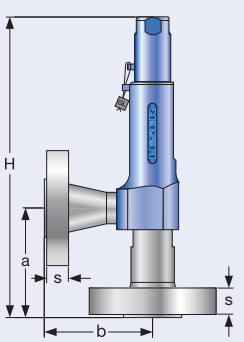
Weight net (without inlet and outlet flange)	[lbs]	m_N	5.3	6.2	6.2

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		Size	40	100	160	250	320	400	Größe	150	300	600	900	1500	2500
		DN 15							NPS $^1/_2$"						
Flange thickness	[inch]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$^{23}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$
Weight slip on flange	[lbs]	m_F	1.8	–	2.6	5.5	5.5	7.9		1.3	2.0	2.0	4.6	4.6	6.6
		DN 20							NPS $^3/_4$"						
Flange thickness	[inch]	s	$^{25}/_{32}$	$^{7}/_{8}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{1}/_{4}$
Weight slip on flange	[lbs]	m_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.0	5.0	7.7
		DN 25							NPS 1"						
Flange thickness	[inch]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange	[lbs]	m_F	2.9	–	5.7	7.7	11.0	16.5		2.2	4.6	4.6	9.0	9.0	11.2



Conventional design



Long version

Type 437

LESER

Pressure temperature ratings

Metric Units

Actual Orifice diameter d_0 [mm]		6				10			
Actual Orifice area A_0 [mm²]		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 320			
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]				16 [only H3] 180			
Temperature acc. to DIN EN	min [°C]	-10							
	max [°C]	+220							
Temperature acc. to ASME	min [°C]	-29							
	max [°C]	+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 320			
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]				180			
Temperature acc. to DIN EN	min [°C]	-270							
	max [°C]	+280							
Temperature acc. to ASME	min [°C]	-268							
	max [°C]	+280							

US Units

Actual Orifice diameter d_0 [inch]		0,236				0,394			
Actual Orifice area A_0 [inch²]		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 [psig] S/G/L	2611				1.5			
Maximum set pressure	p [psig] S/G/L	5294				145 [only H3] 2611			
Temperature acc. to DIN EN	min [°F]	+14							
	max [°F]	+428							
Temperature acc. to ASME	min [°F]	-20							
	max [°F]	+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 [psig] S/G/L	2611				1.5			
Maximum set pressure	p [psig] S/G/L	5294				2611			
Temperature acc. to DIN EN	min [°F]	-450							
	max [°F]	+536							
Temperature acc. to ASME	min [°F]	-450							
	max [°F]	+536							

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]			6				10		
Actual Orifice area A_0 [mm²]			28.3				78.5		
Actual Orifice diameter d_0 [inch]			0.236				0.394		
Actual Orifice area A_0 [inch²]			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	–	–	–	–
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	–	–	–	–

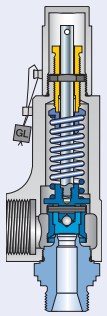
Body (Item 1): Female thread			**Material-No. / Art.-No.**						
		Connection Size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	316L	–	–	–	–	–	136.4449.9210	136.4549.9210	136.5849.9210
		316L stellited	–	136.4369.9210	136.5569.9210	136.6769.9210	–	–	–	–
ISO 7-1/BS 21	**Rc**	316L	–	–	–	–	–	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	136.5869.9222
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	
	CL150	316L	–	136.4449.9202	
	CL300 – 2500	316L	136.4369.9208	136.6349.9208	
DN 20 / NPS 3/4"	PN 40 – 160	316L	136.5569.9208	136.4549.9208	
	CL150 – 2500	316L	136.5569.9208	136.4549.9208	
DN 25 / NPS 1"	PN 40 – 400	316L	136.6769.9208	136.4449.9208	
	CL150 – 2500	316L	136.6769.9208	136.4449.9208	
Disc (Item 7): Metal to metal			**Material-No. / Art.-No.**		
Disc	1.4122	420 RM	–	205.3339.9000	
	1.4404	316L	–	205.3349.9000	
		316L stellited	205.3169.9000	–	
Disc with sealing plate (Item 7)			**Material-No. / Art.-No.**		
Disc		PTFE "A"	200.9249.9005	200.8449.9005	
	1.4404	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		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	480.2405.0000	480.2405.0000	
Ball (Item 61)			**Material-No. / Art.-No.**		
Ball		Ball Ø [mm]	6	6	
		1.4401	510.0104.0000	510.0104.0000	

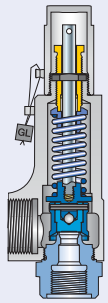
Type 437

Available Options

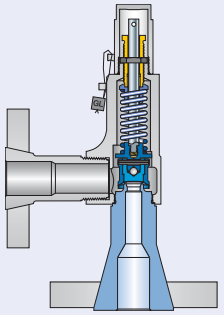
Male thread



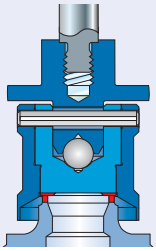
Female thread



Flanged version

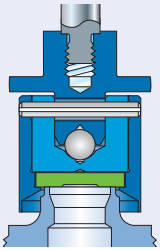


Stellited sealing surface
J25: Disc stellited
L20: Base/inlet body

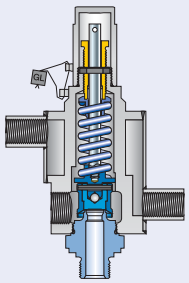


Disc with inserted sealing plate

J44: PTFE-FDA	“A”
J48: PCTFE	“G”
J49: VESPEL-SP1	“T”

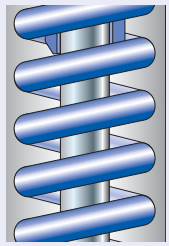


Heating jacket
H29



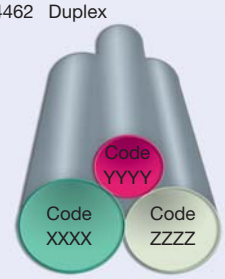
Test gag
J70: H2

INCONEL X-750 spring
X08



Special material

2.4610	Hastelloy® C4
2.4360	Monel® 400
1.4462	Duplex



Approvals

Approvals			
Actual Orifice diameter d_0 [mm]		6	10
Actual Orifice area A_0 [mm²]		28.3	78.5
Actual Orifice diameter d_0 [inch]		0.236	0.394
Actual Orifice area A_0 [inch²]		0.044	0.122
Europe		**Coefficient of discharge K_{dr}**	
PED / 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**	
PED / 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 Div. 1	Zulassungs-Nr.	–	M 37213
	D/G	–	0.458
	Zulassungs-Nr.	–	M 37189
	F	–	0.333
Canada		**Coefficient of discharge K**	
CRN	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	–	0.458
	L	–	0.333
China		**Coefficient of discharge α_w**	
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.72	0.50
	L	–	0.35
Russia		**Coefficient of discharge α_w**	
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.72	0.50
	L	–	0.37
Kazakhstan		**Coefficient of discharge α_w**	
GOST-K	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.72	0.50
	L	–	0.35
Belarus		**Coefficient of discharge α_w**	
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.72	0.50
	L	–	0.35

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
U.S. Coast Guard	U.S.C.G	www uscg.org

The valid certification number is changed with every reneval.

A sample certificate including the valid certification number can be found at www.leser.com

Rated slope
Within the capacity certification according to ASME Sec. VIII Div. 1 the coefficients of discharge for Series 437 are issued as "rated slope values" instead of K values. Rated slope values can be converted into K values. The table above shows the converted K values. The original rated slope values are listed in the table below.

Fluid	Rated slope Type 437
S	2.86 lb / hr / PSIA
G	1.02 SCFM / PSIA
L	1.54 GPM $\sqrt{PSID}$

Type 437

LESER

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 [mm²]	28.3	78.5
$LEO_{S/G}$*) [inch²]	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 [inch²]	0.044	0.122
$LEO_{S/G}$*) [inch²]	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.

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	

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.

US Units	**ASME Section VIII** [S.C.F.M.]	
Act. Orifice dia. d_0 [mm]	0.236	0.394
Act. Orifice area A_0 [mm^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		479
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

Type 437

LESER

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.

Metric Units	**AD 2000-Merkblatt A2** [10^3kg/h]	
Act. Orifice dia. d_0 [mm]	6	10
Act. Orifice area A_0 [mm²]	28.3	78.5
LEO_L*) [inch²]	0.021	0.062
Set pressure [bar]	**Capacities** [10^3kg/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

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.

US Units	**ASME Section VIII** [US-G.P.M.]	
Act. Orifice dia. d_0 [inch]	0.236	0.394
Act. Orifice area A_0 [inch²]	0.044	0.122
LEO_L*) [inch²]	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 coefficent 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

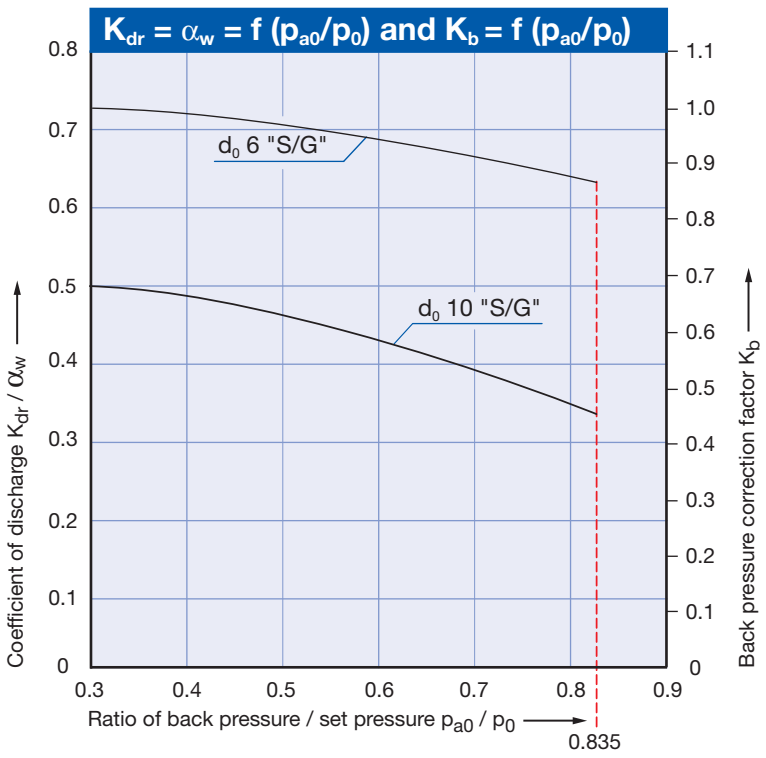
How to use please refer to page 00/08

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 ist not applicable because the actual design and the certified lift are ≤ 1.5 mm / $^1/_{16}$ 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)



Type 437

LESER

Application range of conventional design and long version

Application range

Type 4373

Conventional design

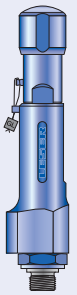
S/G/L

Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4104 SA 479 430
Disc	1.4122 Hardened stainless steel

Long version

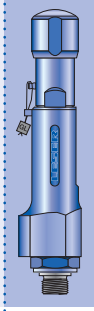
S/G/L



Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4104 SA 479 430
Disc	1.4122 Hardened stainless steel

S/G



Act. Orifice diameter	d_0 [mm]	6
	[inch]	0.236
Act. Orifice area	A_0 [mm²]	28.3
	[inch²]	0.044

Components	Materials
Base / Inlet Body	1.4404 Stellited SA 479 316L Stellited
Disc	1.4404 Stellited SA 479 316L Stellited

Set pressure p [psig]

0	986	1349	2611	4786	5294	5511
0	68	93	180	330	365	380

Set pressure p [bar]

Type 4374

Long version

S/G/L

S/G

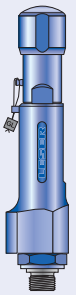
Also useable above 330 bar (4786 psig) but TÜV requirements will not be fulfilled

Conventional design

S/G/L

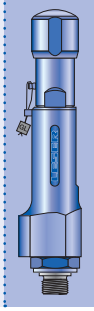
Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4404 SA 479 316L
Disc	1.4404 SA 479 316L



Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4404 SA 479 316L
Disc	1.4404 SA 479 316L



Act. Orifice diameter	d_0 [mm]	6
	[inch]	0.236
Act. Orifice area	A_0 [mm²]	28.3
	[inch²]	0.044

Components	Materials
Base / Inlet Body	1.4404 Stellited SA 479 316L Stellited
Disc	1.4404 Stellited SA 479 316L Stellited

Type 438

Safety Relief Valves – spring loaded

Type 438
Packed knob H4
Conventional design

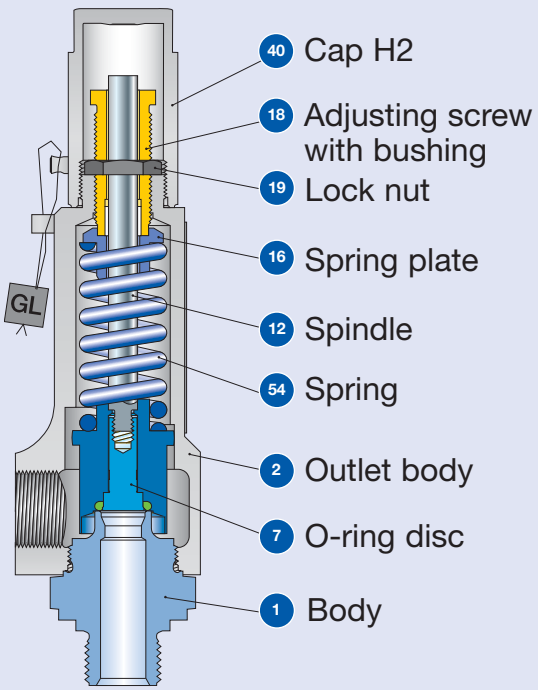
Type 438
Packed knob H4
Flanged connection

Type 438
Cap H2
Long version

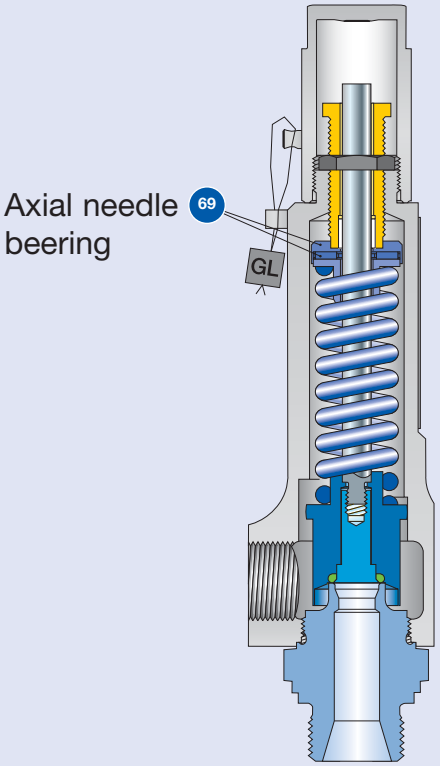
Contents — Chapter/Page

LESER

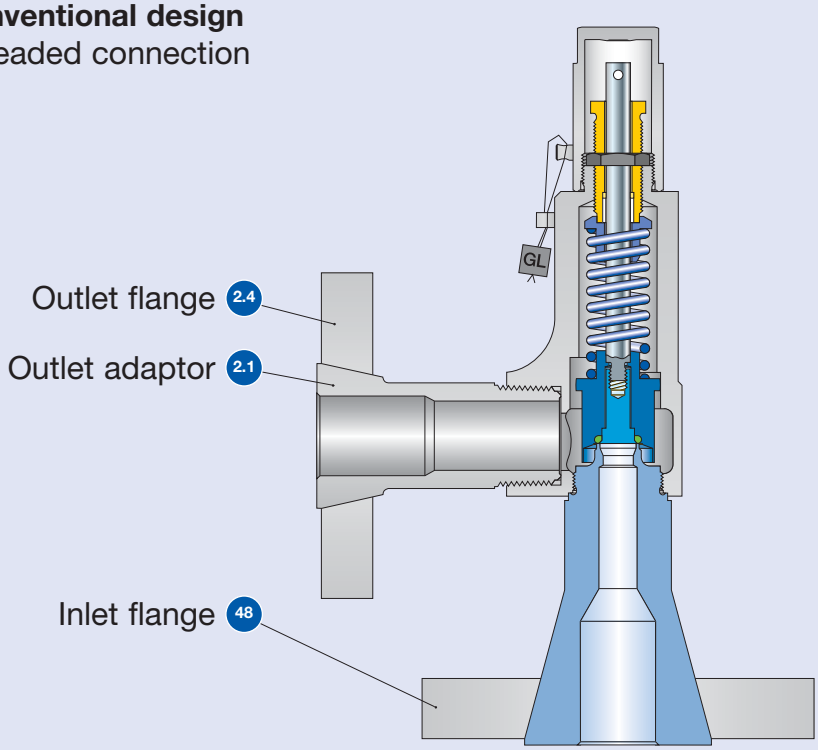
Available designs



Conventional design
Threaded connection



Long version
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials

Item	Component	Remarks	Type 4383	Type 4384
1	Base / Inlet body	Threaded connection	1.4104[1], 1.4404 SA 479 430[1], SA 479 316L	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L
		Long version	1.4104[1], 1.4404 SA 479 430[1], 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 Perfluor	FFKM Perfluor
12	Spindle		1.4021 420	1.4571 316Ti
		Long version	1.4571 316Ti	1.4571 316Ti
16	Spring plate		1.4104 Chrome steel	1.4404 316L
		Long version	1.4404 316L	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
69	Axial needle beering	Long version	1.4404 316L	1.4404 316L

[1] Only for male thread DIN ISO 228-1 $G^3/_8$, $G^1/_2$, $G^3/_4$ (Option codes V49, V54, V55).

Please notice:

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

Type 438

LESER

How to order – Series 438 – Example for numbering system

1 Article Number	2 Set Pressure	3 Connections	
4383.2862	12 bar_g	V55	V65

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

Please state unit (in gauge)!

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

Please refer to table “Availabe Connections” on pages 04/04 and 04/05.

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

4 Options

J23 | | | |

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**
- INCONEL X-750 spring — **X08**

5 Documentation

H01 | L23 | |

Please select requested documentation:

Inspections, tests: — **Option code**

DIN EN 10204-3.2: TÜV-Nord
Certificate for test pressure — **M33**

LESER CGA (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**

6 Code and Medium

2.0

1 2
2 . 0

1 Code

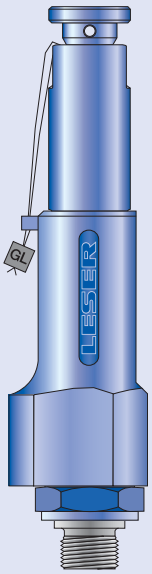
1. ASME Section VIII
2. CE / VdTUEV
3. ASME Section VIII + CE / VdTUEV

2 Medium

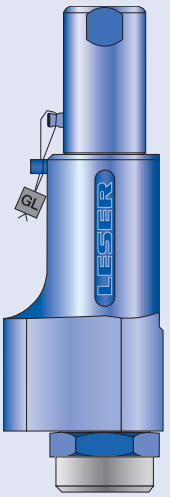
.1 Gases
.2 Liquids
.3 Steam
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)

Type 438

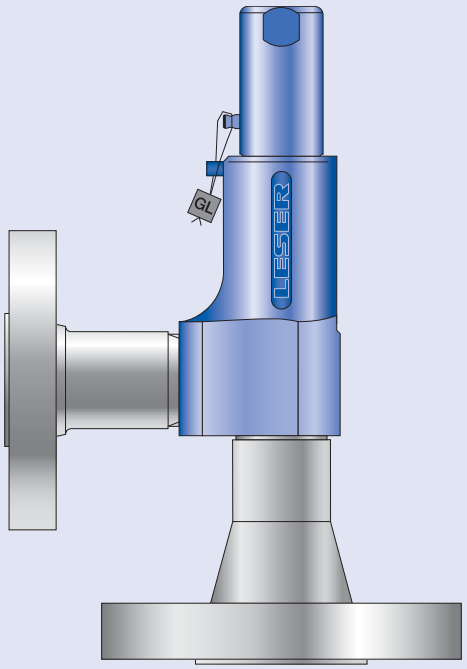
How to order – Article numbers



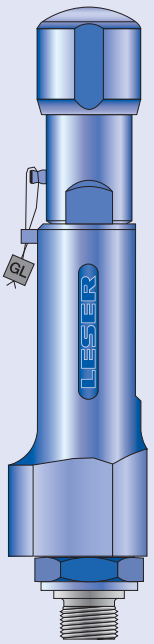
Type 438 Male
Outlet body $^1/_2$"
Pull button H3
Conventional design



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 [mm²]		78.5	78.5
Actual Orifice diameter d_0 [inch]		0.394	0.394
Actual Orifice area A_0 [inch²]		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 p_{max} **= 16 bar$_g$**	Art.-No. **4383.**	**2863**	**–**
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. **4384.**	**2982**	**2992**
H4	Art.-No. **4384.**	**2984**	**2994**
p [bar$_g$]	S/G/L	**5 – 68**	**68 – 180**
p [psig]	S/G/L	**72.5 – 986**	**986 – 2611**

Type 438

LESER

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 [mm²]	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"

		Size outlet body	Conventional design			Long version		
			1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [mm]								
DIN ISO 228-1	**G**	Inlet 1/2" a	46	46	49	46	46	49
ISO 7-1/BS 21	**Rc**							
ASME B1.20.1	**NPT**	Inlet 3/4", 1" a	56	56	59	56	56	59
		Outlet b	30	37	37	30	37	37
Height [mm]								
		Inlet 1/2" H max.	209	209	212	230	230	233
		Inlet 3/4", 1" H max.	219	219	222	240	240	243

Inlet thread "Male"

		Size outlet body	Conventional design			Long version		
			1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [mm]								
DIN ISO 228-1	**G**	Inlet a	33	33	36	33	33	36
		Outlet b	30	37	37	30	37	37
ISO 7-1/BS 21	**R**	Inlet a	31	31	34	31	31	34
ASME B1.20.1	**NPT**							
		Outlet b	30	37	37	30	37	37

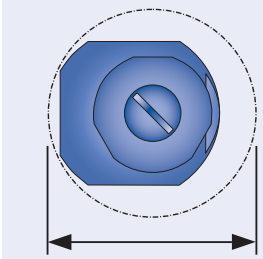
Height [mm]

		Size inlet thread	Conventional design				Long version			
			3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	208	210	212	217	229	231	233	238
ISO 7-1/BS 21	**R**	H max.	–	213	214	220	–	234	235	241
ASME B1.20.1	**NPT**	H max.	–	216	216	224	–	237	237	245

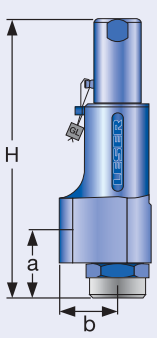
Length of screwed end "c" [mm]

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

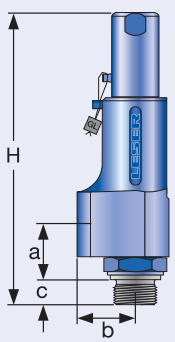
Available threaded connections refer to page 04/04.



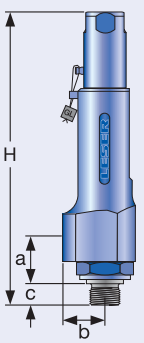
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Long version – male thread

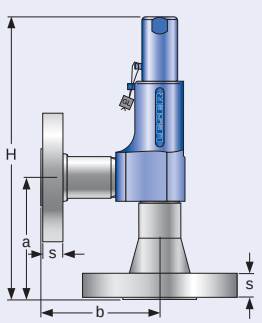
Dimensions and weights – Metric Units

Flanged connection

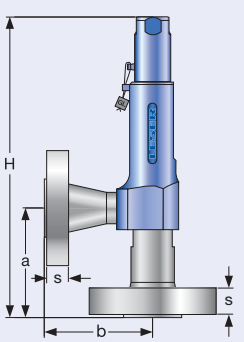
			Conventional design	Long version
Actual Orifice diameter d_0 [mm]			10	10
Actual Orifice area A_0 [mm²]			78.5	78.5
DIN EN 1092-1 (Available flange sizes refer to page 04/05)				
			Flange rating PN 40	
Center to face	[mm]	Inlet a	100	100
		Outlet b	100	100
Height	[mm]	H max.	263	284
			Flange rating ≥ PN 160	
Center to face	[mm]	Inlet a	103	103
		Outlet b	100	100
Height	[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	[mm]	H max.	263	284
			Flange rating class ≥ 300	
Center to face	[mm]	Inlet a	103	103
		Outlet b	100	100
Height	[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 (without inlet and outlet flange)	[kg]	W_N	2.4	2.8

Flange dimensions and availability

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	W_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	2.0	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	W_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Weight slip on flange	[kg]	W_F	1.3	–	2.6	3.5	5	7.5		1	2.1	2.1	4.1	4.1	5.1



Conventional design



Long version

Type 438

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Dimensions and weights – US 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 [inch]	0.394	0.394	0.394	0.394	0.394	0.394
Actual Orifice area A_0 [inch²]	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"

		Size outlet body	Conventional design			Long version		
			1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [inch]								
DIN ISO 228-1	**G**	Inlet 1/2" a	1 13/16	1 13/16	1 15/16	1 13/16	1 13/16	1 15/16
ISO 7-1/BS 21	**Rc**							
ASME B1.20.1	**NPT**	Inlet 3/4", 1" a	2 7/32	2 7/32	2 5/16	2 7/32	2 7/32	2 5/16
		Outlet b	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32
Height [inch]								
		Inlet 1/2" H max.	8 7/32	8 7/32	8 11/32	9 1/16	9 1/16	9 3/16
		Inlet 3/4", 1" H max.	8 5/8	8 5/8	8 3/4	9 7/16	9 7/16	9 9/16

Inlet thread "Male"

		Size outlet body	Conventional design			Long version		
			1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [inch]								
DIN ISO 228-1	**G**	Inlet a	1 5/16	1 5/16	1 13/32	1 5/16	1 5/16	1 13/32
		Outlet b	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32
ISO 7-1/BS 21	**R**	Inlet a	1 7/32	1 7/32	1 11/32	1 7/32	1 7/32	1 11/32
ASME B1.20.1	**NPT**							
		Outlet b	1 3/16	1 15/32	1 15/32	1 3/16	1 15/32	1 15/32

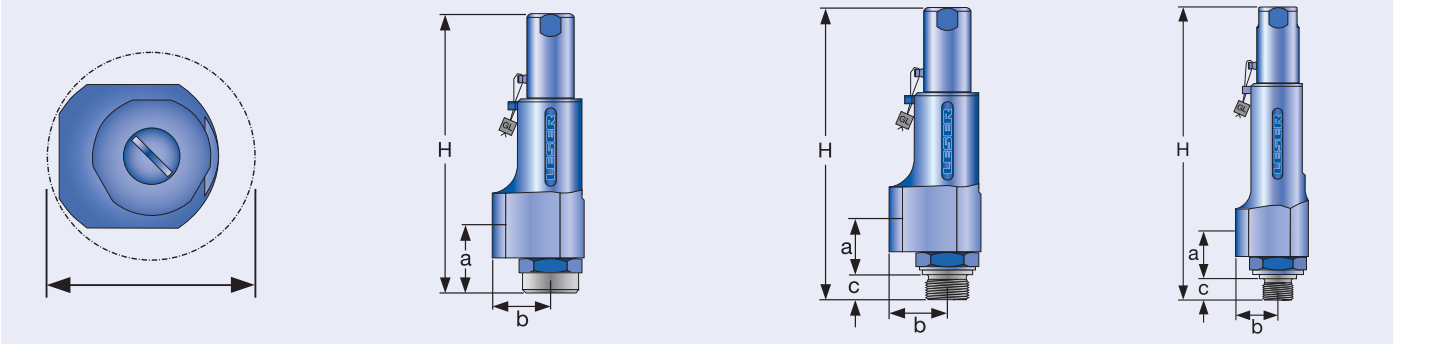
Height [inch]

		Size inlet thread	Conventional design				Long version			
			3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	8 3/16	8 1/4	8 11/32	8 17/32	9	9 3/32	9 5/32	9 3/8
ISO 7-1/BS 21	**R**	H max.	–	8 3/8	8 13/32	8 21/32	–	9 7/32	9 1/4	9 15/32
ASME B1.20.1	**NPT**	H max.	–	8 1/2	8 1/2	8 13/16	–	9 5/16	9 5/16	9 21/32

Length of screwed end "c" [inch]

		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**		15/32	9/16	5/8	23/32
ISO 7-1/BS 21	**R**		–	3/4	25/32	29/32
ASME B1.20.1	**NPT**		–	7/8	7/8	11/16

Available threaded connections refer to page 04/04.



Required installation diameter | Conventional design – Female thread | Conventional design – Male thread | Long version – male thread

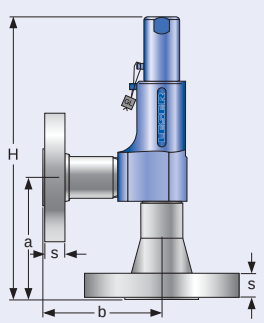
Dimensions and weights – US Units

Flanged connection

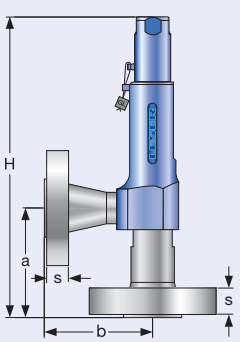
			Conventional design	Long version
Actual Orifice diameter d_0 [inch]			0.394	0.394
Actual Orifice area A_0 [inch²]			0.122	0.122
DIN EN 1092-1 (Available flange sizes refer to page 04/05)				
			Flange rating PN 40	
Center to face	[inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{11}/_{32}$	$10^{3}/_{16}$
			Flange rating ≥ PN 160	
Center to face	[inch]	Inlet a	$4^{1}/_{16}$	$4^{1}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{15}/_{32}$	$11^{5}/_{16}$
ASME B 16.5 (Available flange sizes refer to page 04/05)				
			Flange rating class 150	
Center to face	[inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{11}/_{32}$	$11^{3}/_{16}$
			Flange rating class ≥ 300	
Center to face	[inch]	Inlet a	$4^{1}/_{16}$	$4^{1}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{15}/_{32}$	$11^{5}/_{16}$
Weight				
For the calculation of the total weight please use the Formular: $W_T = W_N + W_F$ (Inlet) + W_F (Outlet)				
Weight net (without inlet and outlet flange)	[lbs]	W_N	5.3	6.2

Flange dimensions and availability

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS $^1/_2$"**						
Flange thickness	[inch]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{6}/_{32}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{6}/_{32}$
Weight slip on flange	[lbs]	W_F	1.8	–	2.6	5.5	5.5	7.9		1.3	2.0	2.0	4.6	4.6	6.6
DN 20									**NPS $^3/_4$"**						
Flange thickness	[inch]	s	$^{25}/_{32}$	$^{28}/_{32}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{8}/_{32}$
Weight slip on flange	[lbs]	W_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.0	5.0	7.7
DN 25									**NPS 1"**						
Flange thickness	[inch]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{6}/_{32}$	$1^{13}/_{32}$	$1^{18}/_{32}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{18}/_{32}$
Weight slip on flange	[lbs]	W_F	2.9	–	5.7	7.7	11.0	16.5		2.2	4.6	4.6	9.0	9.0	11.2



Conventional design



Long version

Type 438

LESER

Pressure temperature ratings

Metric Units

		Conventional design				Long version			
Actual Orifice diameter d_0 [mm]		10				10			
Actual Orifice Area A_0 [mm²]		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	16 [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	68				180			
Temperature acc. to DIN EN	min [°C]	-45				-45			
	max [°C]	+150				+150			
Temperature acc. to ASME	min [°C]	-45				-45			
	max [°C]	+150				+150			

US Units

		Standard				Long version			
Actual Orifice diameter d_0 [inch]		0.394				0.394			
Actual Orifice area A_0 [inch²]		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	232 [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	986				2611			
Temperature acc. to DIN EN	min [°F]	-49				-49			
	max [°F]	+302				+302			
Temperature acc. to ASME	min [°F]	-49				-49			
	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 [mm²]	78.5
Actual Orifice diameter d_0 [inch]	0.394
Actual Orifice area A_0 [inch²]	0.122

Body (Item 1): Male thread			Material-No. / Art.-No.			
		Connection Size	3/8"	1/2"	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
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	3/8"	1/2"	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
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 1/2"	PN 40 – 400	316L	136.4949.9208
	CL150	316L	136.4949.9202
	CL300 – 2500	316L	136.4949.9208
DN 20 / NPS 3/4"	PN 40 – 160	316L	136.5449.9208
	CL150 – 2500	316L	136.5449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.6449.9208
	CL150	316L	136.6849.9202
	CL150 – 2500	316L	136.6449.9208

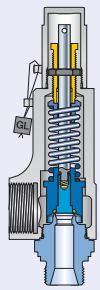
Disc with O-ring (Item 7)		Material-No. / Art.-No.
Disc	NBR "N"	200.8349.9781
	CR "K"	200.8349.9751
	EPDM "D"	200.8349.9741
	FKM "L"	200.8349.9771
	FFKM "C"	200.8349.9791

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

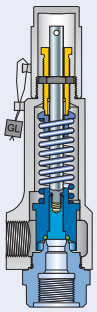
Type 438

Available Options

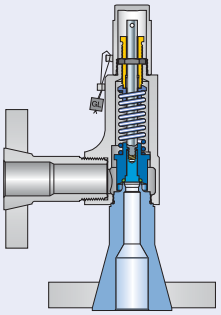
Male thread



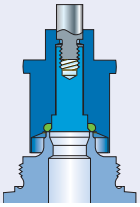
Female thread



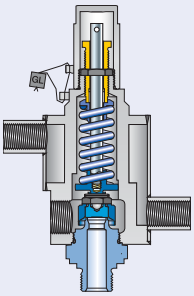
Flanged version



Soft seal o-ring disc
J30: NBR “N”
J21: CR “K”
J22: EPDM “D”
J23: FKM “L”
J20: FFKM “C”

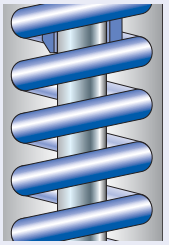


Heating jacket
H29

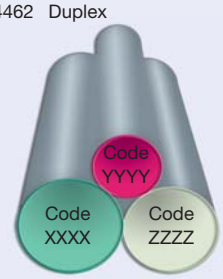


Test gag
J70: H2

INCONEL X-750 spring
X08



Special material
2.4610 Hastelloy® C4
2.4360 Monel® 400
1.4462 Duplex



Approvals

Approvals		
Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm²]		78.5
Actual Orifice diameter d_0 [inch]		0.394
Actual Orifice area A_0 [inch²]		0.122
Europe		**Coefficient of discharge K_{dr}**
PED / DIN EN ISO 4126-1	Approval No.	0720201110008/0/21-1
	S/G	0.40
	L	0.33
Germany		**Coefficient of discharge α_w**
PED / 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 Div. 1	Approval No.	M 37190
	S/G	0.406
	Approval No.	M 371202
	L	0.322
Canada		**Coefficient of discharge K**
CRN	Approval No.	The current approval no. can be found at www.leser.com.
	S/G	0.406
	L	0.322
China		**Coefficient of discharge α_w**
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com.
	S/G	0.40
	L	0.33
Russia		**Coefficient of discharge α_w**
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com.
	S/G	0.40
	L	0.33
Kazakhstan		**Coefficient of discharge α_w**
GOST-K	Approval No.	The current approval no. can be found at www.leser.com.
	S/G	0.40
	L	0.33
Belarus		**Coefficient of discharge α_w**
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com.
	S/G	0.40
	L	0.33

Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every reneval. A sample certificate including the valid certification number can be found at www.leser.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	
U.S. Coast Guard	U.S.C.G	www uscg.org	

Rated slope
Within the capacity certification according to ASME Sec. VIII Div. 1 the coefficients of discharge for Series 437 are issued as "rated slope values" instead of K values. Rated slope values can be converted into K values. The table above shows the converted K values. The original rated slope values are listed in the table below.

Fluid	Rated slope Type 438
S	2.55 lb / hr / PSIA
G	0.904 SCFM / PSIA
L	1.94 GPM $\sqrt{PSID}$

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 [mm²]	78.5		
LEO*) [inch²]	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]	[10^3kg/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 [inch²]	0.122		
LEO*) [inch²]	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 coefficent 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

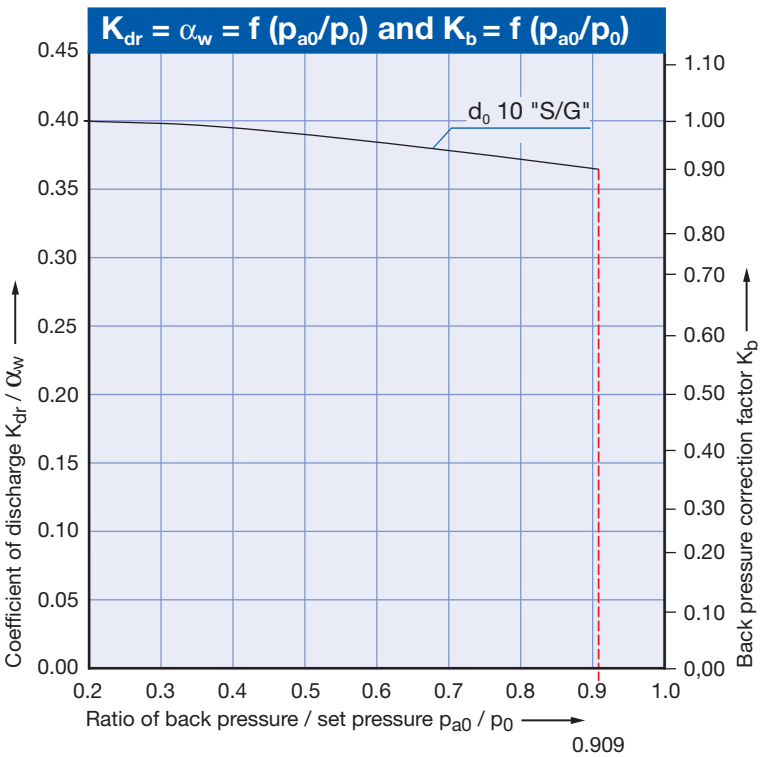
How to use please refer to page 00/08

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

$Kdr = \alpha_w = f\ (h/d_0)$

A lift restriction ist not applicable because the actual design and the certified lift are ≤ 1.5 mm / $^1/_{16}$ 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)



Type 438

Application range of conventional design and long version

Application range

Type 4383

Conventional design

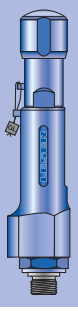
S/G/L

Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4104 SA 479 430
Disc	1.4404 SA 479 316L

Long version

S/G/L



Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

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

Set pressure p [bar]

Type 4384

Conventional design

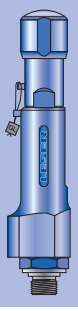
S/G/L

Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4404 SA 479 316L
O-ring disc	1.4404 SA 479 316L

Long version

S/G/L



Act. Orifice diameter	d_0 [mm]	10
	[inch]	0.394
Act. Orifice area	A_0 [mm²]	78.5
	[inch²]	0.122

Components	Materials
Base / Inlet Body	1.4404 SA 479 316L
O-ring disc	1.4404 SA 479 316L

Type 439

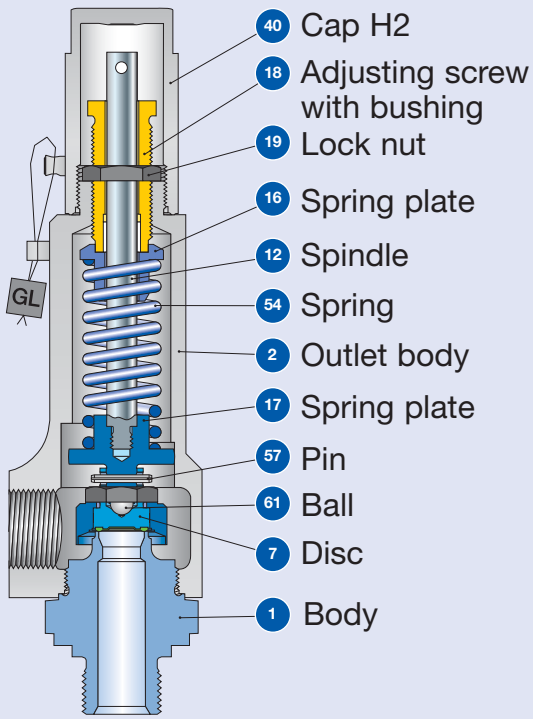
Type 439
Packed knob H4

Safety Relief Valves – spring loaded

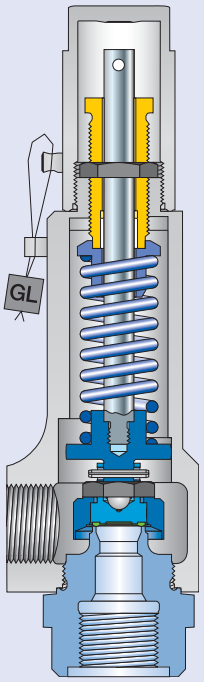
Type 439
Packed knob H4
Flanged connection

Contents — Chapter/Page

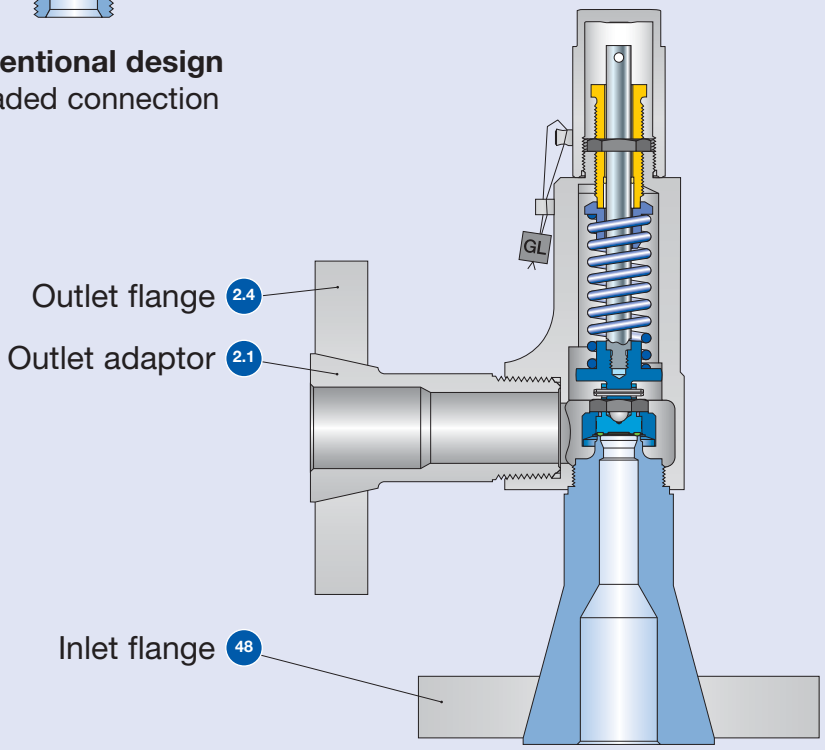
Available designs



Conventional design
Threaded connection



Conventional design
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials

Item	Component	Remarks	Type 4393	Type 4394
1	Base / Inlet body	Threaded connection	1.4104[1], 1.4404 SA 479 430[1], SA 479 316L	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 Perfluor	FFKM Perfluor
12	Spindle[2]		1.4021 420	1.4571 316Ti
16/17	Spring plate[2]		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

[1] Only for male thread DIN ISO 228-1 $G^3/_8$, $G^1/_2$, $G^3/_4$ (Option codes V49, V54, V55).

[2] The items 12 and 17 are combined to one unit.

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 – Series 439 – Example for numbering system

1 Article Number	2 Set Pressure	3 Connections	
4394.2894	12 bar_g	I31	I46

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

Please state unit (in gauge)!

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

Please refer to table “Availabe Connections” on pages 04/04 and 04/05.

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

4 Options

J23			

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
• INCONEL X-750 spring		X08

5 Documentation

H01	L23	

Please select requested documentation:

Inspections, tests:	Option code
DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	M33
LESER CGA (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	H01
Outlet body	L34
Cap / lever cover	L31
Disc	L23

6 Code and Medium

2.0

1	2
2	. 0

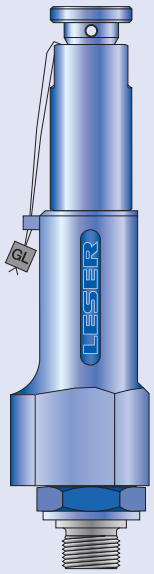
1 Code
1. ASME Section VIII
2. CE / VdTUEV
3. ASME Section VIII + CE / VdTUEV

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

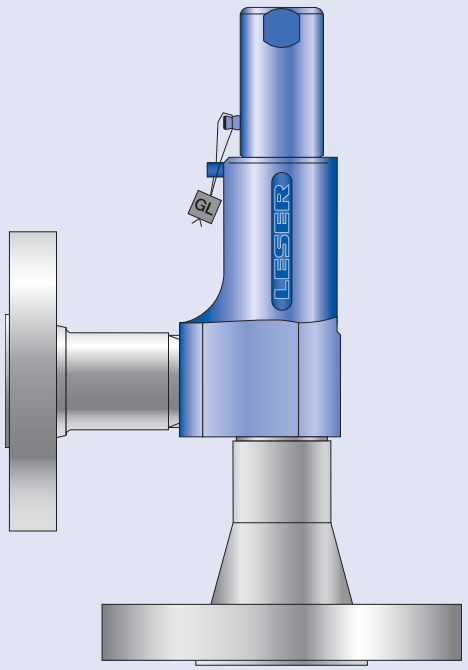
Type 439

How to order – Article numbers

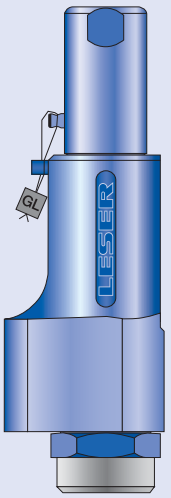
Article numbers			
Actual Orifice diameter d_0 [mm]		10	
Actual Orifice area A_0 [mm²]		78.5	
Actual Orifice diameter d_0 [inch]		0.394	
Actual Orifice area A_0 [inch²]		0.122	
Soft seal material		NBR “N” J30	
		CR “K” J21	
		EPDM “D” J22	
		FKM “L” J23	
		FFKM “C” J20	
Base / Inlet body material: 1.4104 (430)			
H2	Art.-No. **4393.**	**2882**	
H3 p_{max} = 10 bar_g	Art.-No. **4393.**	**2883**	
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 [mm²]		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	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	16			
Temperature acc. to DIN EN	min. [°C]	-45			
	max. [°C]	+150			
Temperature acc. to ASME	min. [°C]	-45			
	max. [°C]	+150			

US Units

Actual Orifice diameter d_0 [inch]		0.394			
Actual Orifice area A_0 [inch²]		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	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	1.5			
Maximum set pressure	p [psig] S/G/L	232			
Temperature acc. to DIN EN	min [°F]	-49			
	max [°F]	+302			
Temperature acc. to ASME	min [°F]	-49			
	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 [mm²]	78.5	78.5	78.5
Weight	[kg]	1.2	1.6	1.6
Required installation diameter	[mm]	65	80	80

Inlet thread "Female"

		Size outlet body	1/2"	3/4"	1"
Center to face [mm]					
DIN ISO 228-1 **ISO 7-1/BS 21** **ASME B1.20.1**	**G** **Rc** **NPT**	Inlet 1/2" a	46	46	49
		Inlet 3/4", 1" a	56	56	59
		Outlet b	30	37	37
Height [mm]					
		Inlet 1/2" H max.	209	209	212
		Inlet 3/4", 1" H max.	219	219	222

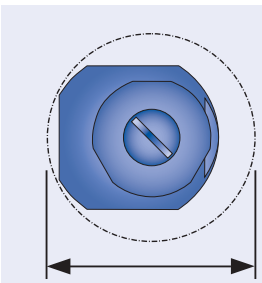
Inlet thread "Male"

		Size outlet body	1/2"	3/4"	1"
Center to face [mm]					
DIN ISO 228-1	**G**	Inlet a	33	33	36
		Outlet b	30	37	37
ISO 7-1/BS 21 **ASME B1.20.1**	**R** **NPT**	Inlet a	31	31	34
		Outlet b	30	37	37

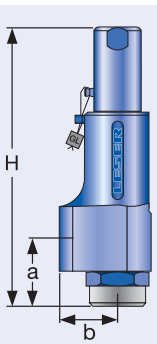
Height [mm]						
		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	208	210	212	217
ISO 7-1/BS 21	**R**	H max.	–	213	214	220
ASME B1.20.1	**NPT**	H max.	–	216	216	224

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

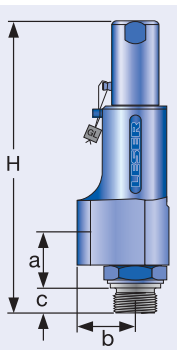
Available threaded connections refer to page 04/04.



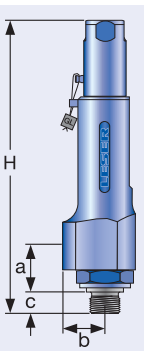
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Long version – male thread

Dimensions and weights – Metric Units

Flanged connection

Actual Orifice diameter d_0 [mm]			10
Actual Orifice area A_0 [mm²]			78.5
DIN EN 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	[mm]	H max.	263
			Flange rating ≥ PN 160
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height	[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	[mm]	H max.	263
			Flange rating class ≥ 300
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height	[mm]	H max.	266

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

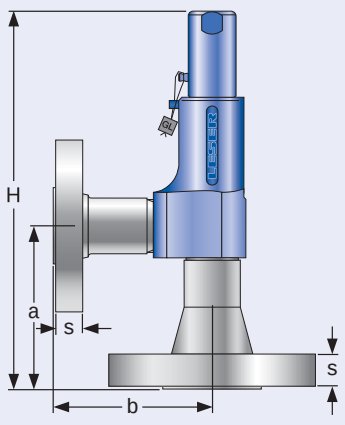
Weight

To calculate the total weight use the formula: $m_T = m_N + m_F$ (Inlet) + m_F (Outlet)

Weight net (without inlet and outlet flange)	[kg]	m_N	2.4

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		Size	40	100	160	250	320	400	**Size**	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	m_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	0.9	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	m_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Weight slip on flange	[kg]	m_F	1.3	–	2.6	3.5	5	7.5		1	2.1	2.1	4.1	4.1	5.1



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 [inch²]		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"

		Size outlet body	1/2"	3/4"	1"
Center to face [inch]					
DIN ISO 228-1	**G**	Inlet 1/2" a	1 13/16	1 13/16	1 15/16
ISO 7-1/BS 21	**Rc**				
ASME B1.20.1	**NPT**	Inlet 3/4", 1" a	2 7/32	2 7/32	2 5/16
		Outlet b	1 3/16	1 15/32	1 15/32
Height [inch]					
		Inlet 1/2" H max.	8 7/32	8 7/32	8 11/32
		Inlet 3/4", 1" H max.	8 5/8	8 5/8	8 3/4

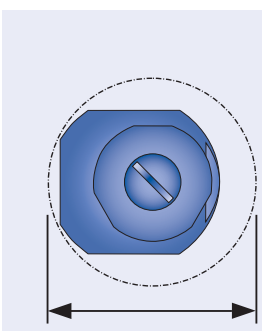
Inlet thread "Male"

		Size outlet body	1/2"	3/4"	1"
Center to face [inch]					
DIN ISO 228-1	**G**	Inlet a	1 5/16	1 5/16	1 13/32
		Outlet b	1 3/16	1 15/32	1 15/32
ISO 7-1/BS 21	**R**	Inlet a	1 7/32	1 7/32	1 11/32
ASME B1.20.1	**NPT**				
		Outlet b	1 3/16	1 15/32	1 15/32

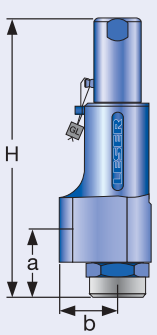
Height [inch]						
		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	8 3/16	8 1/4	8 11/32	8 17/32
ISO 7-1/BS 21	**R**	H max.	–	8 3/8	8 13/32	8 21/32
ASME B1.20.1	**NPT**	H max.	–	8 1/2	8 1/2	8 13/16

Length of screwed end "c" [inch]						
		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	**G**		15/32	9/16	5/8	23/32
ISO 7-1/BS 21	**R**		–	3/4	25/32	29/32
ASME B1.20.1	**NPT**		–	7/8	7/8	1 1/16

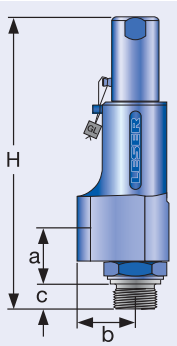
Available threaded connections refer to page 04/04.



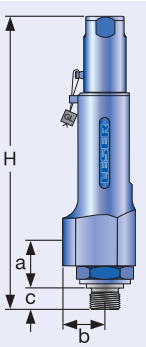
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Long version – male thread

Dimensions and weights – US Units

Flanged connection

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	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{11}/_{32}$
			Flange rating ≥ PN 160
Center to face	[inch]	Inlet a	$4^{1}/_{16}$
		Outlet b	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{15}/_{32}$

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

			Flange rating class 150
Center to face	[inch]	Inlet a	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{11}/_{32}$
			Flange rating class ≥ 300
Center to face	[inch]	Inlet a	$4^{1}/_{16}$
		Outlet b	$3^{15}/_{16}$
Height	[inch]	H max.	$10^{15}/_{32}$

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

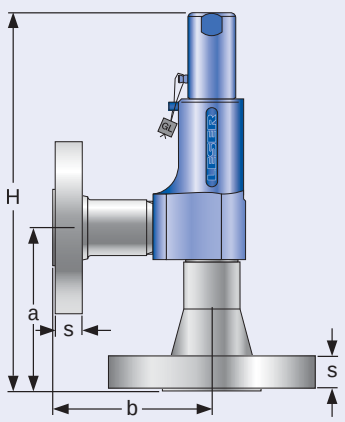
Weight

To calculate the total weight use the formula: $m_T = m_N + m_F$ (Inlet) + m_F (Outlet)

Weight net (without inlet and outlet flange)	[lbs]	m_N	5.3

Flange dimensions

			DIN ISO 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		Size	40	100	160	250	320	400	**Size**	150	300	600	900	1500	2500
DN 15									**NPS $^1/_2$"**						
Flange thickness	[inch]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
Weight slip on flange	[lbs]	m_F	1.8	–	2.6	5.5	5.5	8.0		1.3	2.0	2.0	4.6	4.6	6.6
DN 20									**NPS $^3/_4$"**						
Flange thickness	[inch]	s	$^{25}/_{32}$	$^{7}/_{8}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{1}/_{4}$
Weight slip on flange	[lbs]	m_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.0	5.0	7.7
DN 25									**NPS 1"**						
Flange thickness	[inch]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange	[lbs]	m_F	2.9	–	5.7	7.7	11.0	16.5		2.2	4.6	4.6	9.0	9.0	11.2



Conventional design

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]	10
Actual Orifice area A_0 [mm²]	78.5
Actual Orifice diameter d_0 [inch]	0.394
Actual Orifice area A_0 [inch²]	0.122

Body (Item 1): Male thread

			Connection Size	3/8"	1/2"	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
ASME B1.20.1	NPT	316L		–	136.4949.9204	136.5449.9204	136.6849.9204

Body (Item 1): Female thread

			Connection Size	3/8"	1/2"	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
ASME B1.20.1	NPT	316L		–	136.4949.9211	136.5449.9211	136.6849.9211

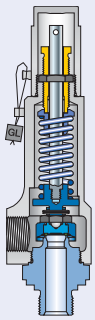
Body (Item 1): Flange design

DN 15 / NPS 1/2"	PN 40 – 400	316L	136.4949.9208
	CL150	316L	136.4949.9202
	CL300 – 2500	316L	136.4949.9208
DN 20 / NPS 3/4"	PN 40 – 160	316L	123.5449.9208
	CL150 – 2500	316L	123.5449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.6449.9208
	CL150	316L	136.6849.9202
	CL300 – 2500	316L	136.6449.9208

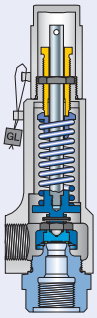
Vulcanized soft seal disc (Item 7)		Material-No. / Art.-No.
Disc	NBR "N"	200.9049.9081
	CR "K"	200.9049.9051
	EPDM "D"	200.9049.9041
	FKM "L"	200.9049.9071
	FFKM "C"	200.9049.9091
Disc (Item 7.1): With vulcanized soft seal		**Material-No. / Art.-No.**
Soft seal	NBR "N"	212.5249.9081
	CR "K"	212.5249.9051
	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
Ball (Item 61)		**Material-No. / Art.-No.**
Ball	Ball Ø [mm]	6
	1.4401	510.0104.0000

Available Options

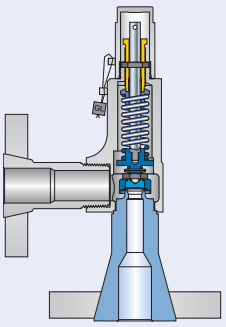
Male thread



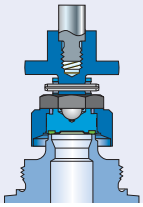
Female thread



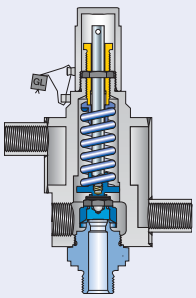
Flanged version



Vulcanized soft seal disc
J30: NBR “N”
J21: CR “K”
J22: EPDM “D”
J23: FKM “L”
J20: FFKM “C”

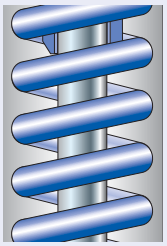


Heating jacket
H29

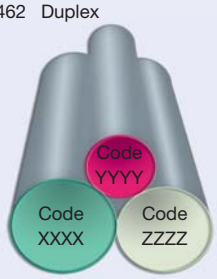


Test gag
J70: H2

INCONEL X-750 spring
X08



Special material
2.4610 Hastelloy® C4
2.4360 Monel® 400
1.4462 Duplex



Approvals

Approvals		
Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm²]		78.5
Actual Orifice diameter d_0 [inch]		0.394
Actual Orifice area A_0 [inch²]		0.122
Europa		**Coefficient of discharge K_{dr}**
PED / DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/21-2
	S/G	0.45
	L	0.37
Germany		**Coefficient of discharge α_w**
PED / 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 Div. 1	Approval No.	M 37190
	S/G	0.406
	Approval No.	M 37202
	L	0.322
Canada		**Coefficient of discharge K**
CRN	Approval No.	The current approval no. can be found at www.leser.com
	S/G	0.406
	L	0.322
China		**Coefficient of discharge α_w**
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com
	S/G	0.45
	L	0.37
Russia		**Coefficient of discharge α_w**
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com
	S/G	0.45
	L	0.37
Kazakhstan		**Coefficient of discharge α_w**
GOST-K	Approval No.	The current approval no. can be found at www.leser.com
	S/G	0.45
	L	0.37
Belarus		**Coefficient of discharge α_w**
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com
	S/G	0.45
	L	0.37

Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every reneval. A sample certificate including the valid certification number can be found at www.leser.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	
U.S. Coast Guard	U.S.C.G	www uscg.org	

Rated slope
Within the capacity certification according to ASME Sec. VIII Div. 1 the coefficients of discharge for Series 437 are issued as “rated slope values” instead of K values. Rated slope values can be converted into K values. The table above shows the converted K values. The original rated slope values are listed below.

Fluid	Rated slope Type 439
S	2.55 lb / hr / PSIA
G	0.904 SCFM / PSIA
L	1.94 GPM $\sqrt{PSID}$

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 [mm²]	78.5		
LEO*) [inch²]	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]	[10^3kg/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 [inch²]	0.122		
LEO*) [inch²]	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 coefficent 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

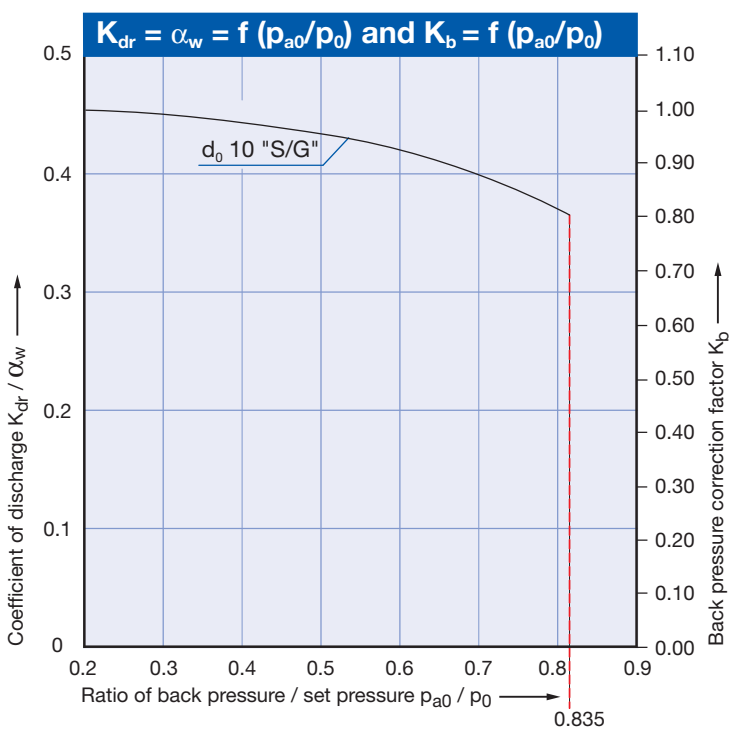
How to use please refer to page 00/08

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

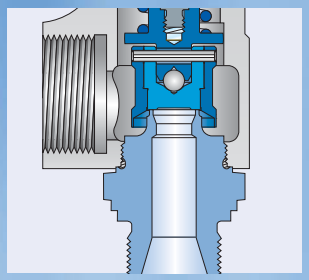
$Kdr = \alpha_w = f\ (h/d_0)$

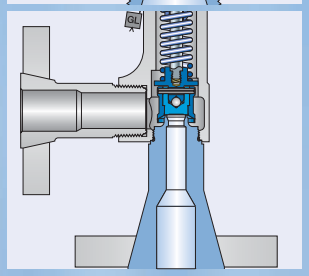
A lift restriction ist not applicable because the actual design and the certified lift are ≤ 1.5 mm / $^1/_{16}$ inch.

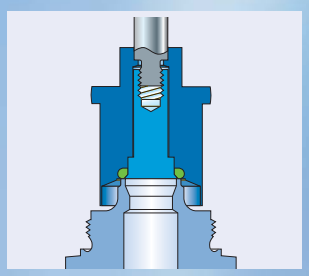
Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)

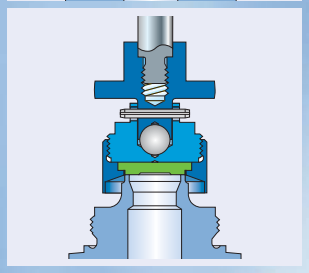


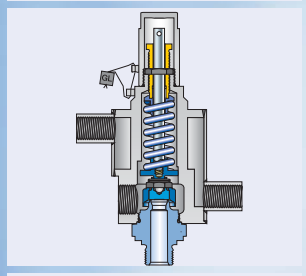
Accessories and Options

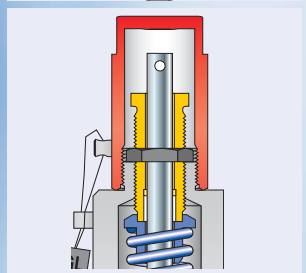


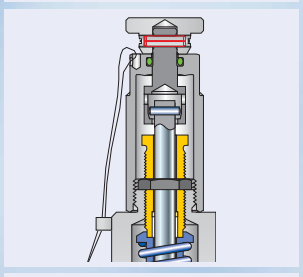


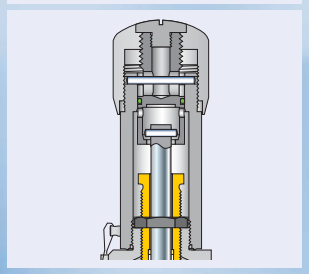












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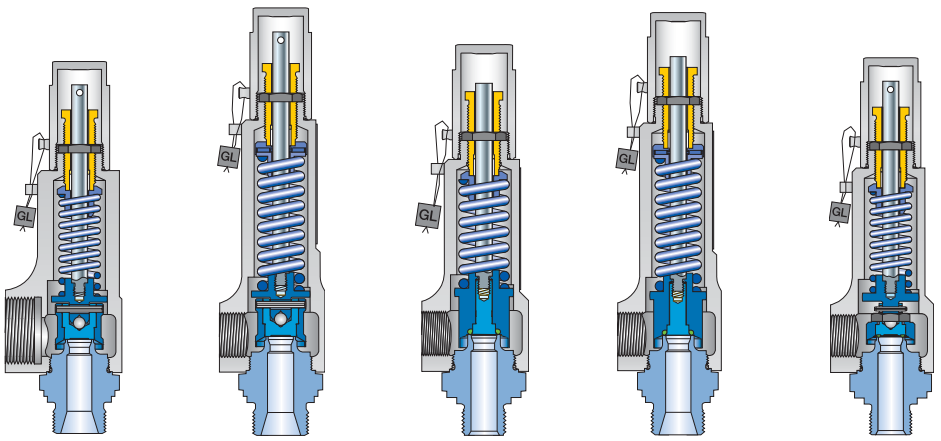
Accessories and Options

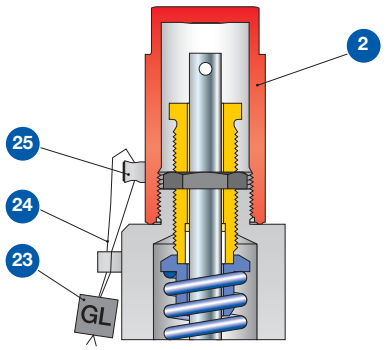
LESER

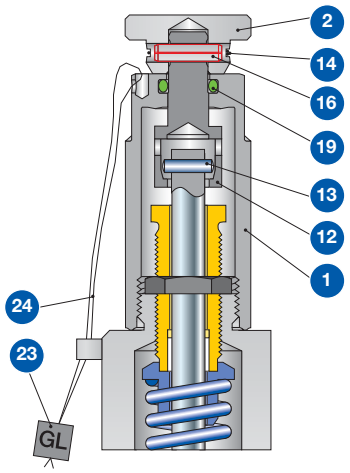
Overview

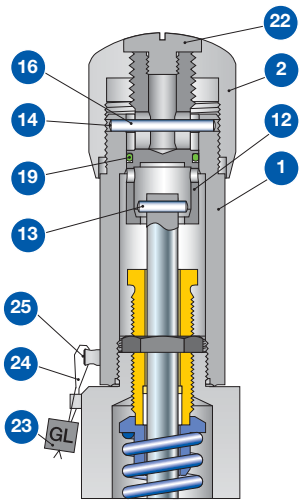


Options	Type	437	437 Long version	438	438 Long version	439
Base / Inlet body						
	Male thread	✓	✓	✓	✓	✓
	Female thread	✓	✓	✓	✓	✓
Flanged version – DIN EN 1092-1						
Size DN 15		✓	✓	✓	✓	✓
	Inlet	Flange rating PN 40 – 400				
	Outlet	Flange rating PN 40 – 250				
Size DN 20		✓	✓	✓	✓	✓
	Inlet	Flange 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 stellited	–	✓	–	–	–
Soft seal	Sealing plate	✓	✓	–	–	–
	O-ring	–	–	✓	✓	–
	Vulcanized soft seal	–	–	–	–	✓
Caps and levers						
	H2	✓	✓	✓	✓	✓
	H3	✓	✓	✓	✓	✓
	H4	✓	✓	✓	✓	✓
Heating jacket						
		✓	✓	✓	✓	✓
INCONEL X-750 spring						
	Option code: X08	✓	✓	✓	✓	✓

Caps and levers – Subassembly item 40







Materials

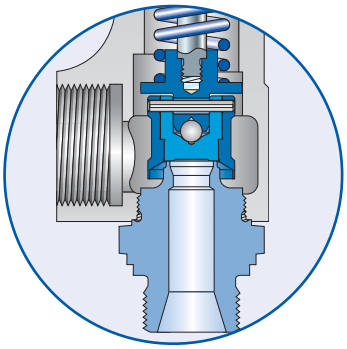
		Steel			Stainless steel	
Item	**Component**	**Cap H2**	**Pull button H3**	**Packed knob H4**	**Cap H2**	**Packed knob H4**
1	Lever cover	–	1.0718	1.4104	–	1.4404
		–	Steel	430	–	316L
2	Cap	1.0718	–	1.0718	1.4404	1.4404
		Steel	–	Steel	316L	316L
	Knob	–	1.0718	–	–	–
		–	Steel	–	–	–
12	Spindle cap	–	1.4021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

Accessories and Options

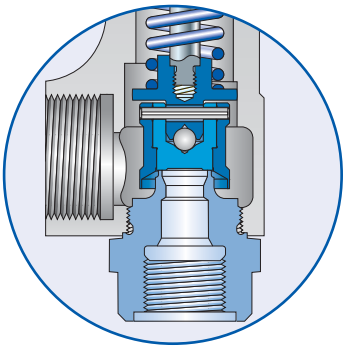
LESER

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

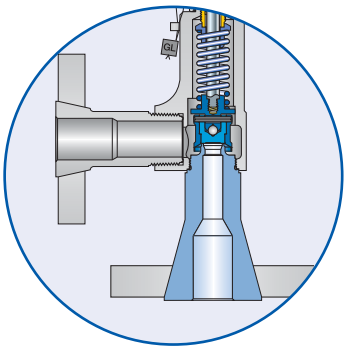
Threaded connections

	Valve size	d_0 6 mm		d_0 10 mm	
		Inlet	Outlet	Inlet	Outlet
		Option code	Option code	Option code	Option code
Male thread DIN ISO 228-1					
G	3/8"	V49	–	V49	–
	1/2 "	V54	–	V54	–
	3/4"	V55	–	V55	–
	1"	V56	–	V56	–
Female thread DIN ISO 228-1					
G	1/2"	V50	V65	V50	V65
	3/4"	V51	V76	V51	V76
	1"	V52	V66	V52	V66
Male thread DIN ISO 7- 1 / BS 21					
R/BSPT	1/2"	V30	–	V30	–
	3/4"	V31	–	V31	–
	1"	V32	–	V32	–
Female thread DIN ISO 7- 1 / BS 21					
Rc/BSPT	1/2"	V38	V34	V38	V34
	3/4"	V39	V35	V39	V35
	1"	V40	V36	V40	V36
Male thread ANSI / ASME B1.20.1					
NPT	1/2"	V61	–	V61	–
	3/4"	V62	–	V62	–
	1"	V63	–	V63	–
Female thread ANSI / ASME B1.20.1					
NPT	1/2"	V58	V70	V58	V70
	3/4"	V59	V77	V59	V77
	1"	V60	V71	V60	V71

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

Valve size	Pressure rating	d_0 6 mm		d_0 10 mm	
DIN EN 1092-1 (PN > 100: DIN 2501)					
		Option code		Option code	
DN	PN	Inlet	Outlet	Inlet	Outlet
15	40		I40	I21	I40
	160		I41	I22	I41
	250	I23	I42	I23	I42
	320	I24	–	I24	–
	400	I25	–	I25	–
20	40	I26	I43	I26	I43
	100	I27	I44	I27	I44
25	40		I46	I31	I46
	160		I47	I32	I47
	250	I33	I48	I33	I48
	320	I34	–	I34	–
	400	I35	–	I35	–
ANSI/ASME B16.5					
		Option code		Option code	
NPS	CL	Inlet	Outlet	Inlet	Outlet
1/2"	150		V24	V01	V24
	300		V13	V02	V13
	600		V13	V02	V13
	900	V03	V14	V03	V14
	1500	V03	–	V03	–
	2500	V04	–	V04	–
3/4"	150		V15	V05	V15
	300		V16	V06	V16
	600		V16	V06	V16
	900	V07	V17	V07	V17
	1500	V07	–	V07	–
	2500	V08	–	V08	–
1"	150		V18	V09	V18
	300		V19	V10	V19
	600		V19	V10	V19
	900	V11	V20	V11	V20
	1500	V11	–	V11	–
	2500	V12	–	V12	–

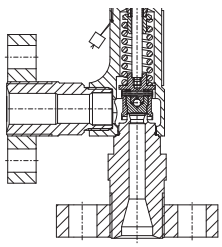
Flanged and threaded connections can be combined.
Threads according to other standards are available.
Please specify in writing (diameter, pressure rating, standard).

Flange facings, IG flange (high pressure technology)

Overview available flange facings for Compact Performance safety valves with flanged connection

Flange facings acc. to DIN EN 1092	Option code		Flange facings acc. to ASME B16.5	Option code		Other flange facings	Option code	
	Inlet	Outlet		Inlet	Outlet		Inlet	Outlet
Tongue face C	H94	I98	RTJ-Nut	H62	H63	Linde-V-Nut, Form V48	J07	J08
Groove face D	H93	I99				Linde-V-Nut, Form V48A	J05	J06
Male face E	H96	I94						
Female face F	H97	I95						
O-ring male face G	J01	I97						
O-ring female face H	J03	I96						
Lens seal form L	J11	J12						

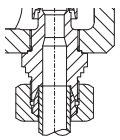
IG flange (BASF High pressure technology)



Pressure rating	Valve size	d_0 6 mm		d_0 10 mm	
PN	DN	Inlet	Outlet	Inlet	Outlet
325	10	W01	–	–	–
	16	W02	W17	W02	W17
	24	–	W18	–	–
	45	–	W20	–	–
500	16	–	–	W12	–
700	10	W26	–	–	–

Screwed fittings

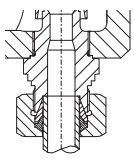
Progressive – cutting ring – screw fitting DIN 2353 / DIN EN ISO 8434-1 (e. g. ERMETO)



Pipe dimension		
Outer Ø x Wall thickness	d_0 6 mm	
mm	Inlet	Outlet
16 x 2,0	V25	–
22 x 1,5	–	V26

Screwed fittings

Two-ferrule bite type screw fitting (Original SWAGELOK)



Pipe dimension		
Outer Ø x Wall thickness	d_0 10 mm	
mm	Inlet	Outlet
18 x 1,5	V44	–

Weld-on end

Pipe dimension		
Outer Ø x Wall thickness	All d_0	
mm	Inlet	Outlet
≤ 25	W50	–
≥ 33	W51	–

LESER supplies components with weld-on end in 1.4404 / 316L, 1.4408 / CF8M

Note: To manufacture the requested weld-on end as specified, LESER requires the dimensions and the material on the form LWN 288.20-EN, which can be downloaded at www.leser.com

Further connections

Please state the required connections, dimensions and standards. LESER will verify the manufacturing of the connection.

Inconel X-750 spring

LESER offers the spring material INCONEL X-750 / 2.4669 as an Option of Series 437 for all valve sizes and the complete pressure range.

Applications

INCONEL X-750 is recommended in the following applications:

– **Sour gas applications acc. to NACE MR 0175 and NACE MR 0103:**
if NACE conditions are present at the outlet of the safety valve (NACE Level 2). INCONEL X-750 is a spring material which is recommended in the NACE standards.

– **High temperature applications:**
INCONEL X-750 allows higher operating temperatures than other standard spring materials which are often the restricting components. Thus, the full temperature range of the valve type can be utilized.

– **Highly corrosive applications:**
applications that require a spring material with a corrosion resistance superior to that of stainless steel, e.g. seawater applications.

Option Code

Option code X08: Spring material INCONEL X-750

Ordering

The option code for ordering is X08. Spring part numbers and pressure limits can be taken from the actual spring charts LGS 3618 (Type 437), LGS 3619 (Type 438) and LGS 3625 (Type 439).

Type of sealing

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 d_0 6 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 Harding 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.

Type of sealing

Types 437, 438, 439 – Soft seal

LESER soft seal solutions allow for superior tightness.

Features and bennefits

– 3 different designs for a wide variety application

– large selection of soft seal materials to best adapt to the application

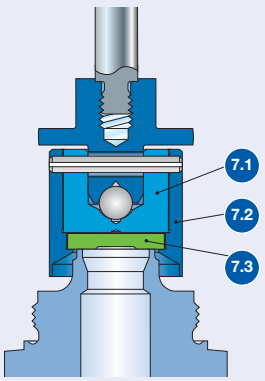
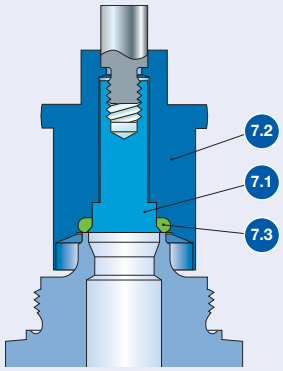
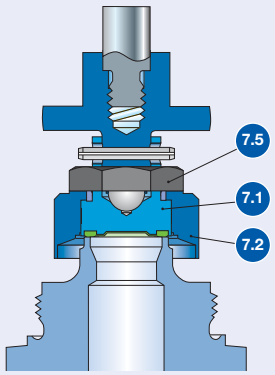
– increased service life of sealing surfaces compared to a metal to metal seat

– 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 then 5 bar / 75 psig.	Superior tightness is required and the set pressure is below 16 bar / 232 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 laboraties

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

Component

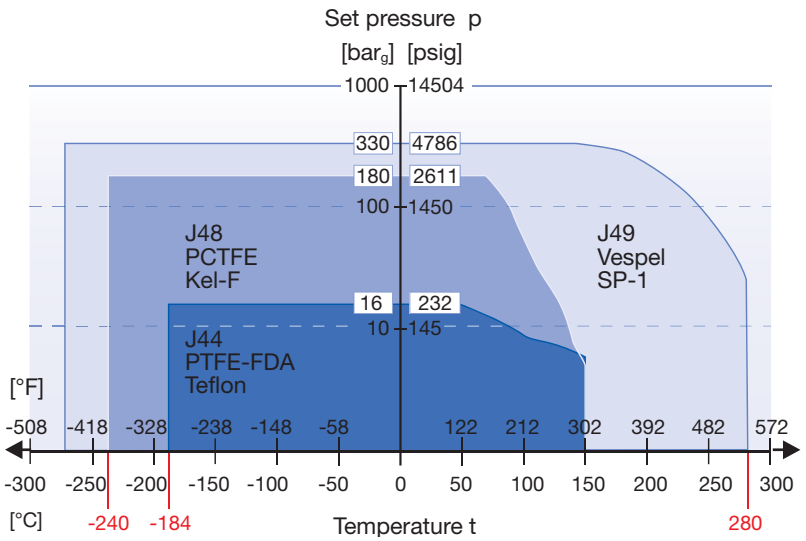
Disc	Item 7.1	1.4404 SA 479 316L	Item 7.1	1.4404 SA 479 316L	Item 7.1	1.4404 SA 479 316L
Soft seal Materials refer to next page	Item 7.3	sealing plate	Item 7.3	O-ring		vulcanized disc
Lifting aid	Item 7.2	1.4404 316L	Item 7.2	1.4404 316L	Item 7.2	1.4404 316L
Lock nut		– –		– –	Item 7.5	1.4404 316L

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

Material selection



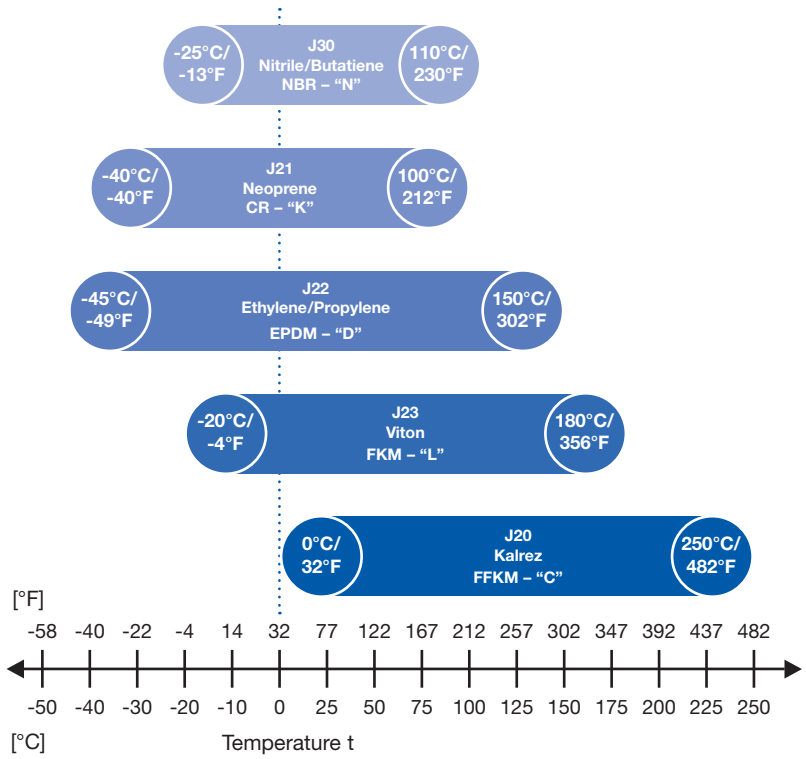
Option code

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.

Soft seal materials **Selection**



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.

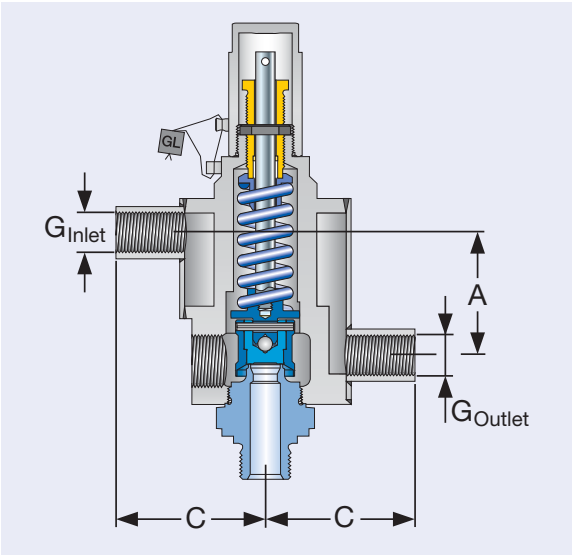
Heating jacket

Application and design

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 [mm²]		28.3	78.5
Actual Orifice diameter d_0 [inch]		0.236	0.394
Actual Orifice area A_0 [inch²]		0.044	0.122
Materials			
Outlet body	Series 437	1.4404	
		316L	
	Heating jacket	1.4541	
		321	
Connection			
Couplings	G 3/8" female	1.4571	
DIN 2986		316Ti	

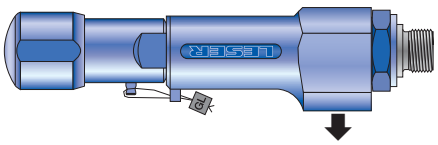
Metric Units				
	Size outlet body	1/2"	3/4"	1"
Dimensions				
	A [mm]	50	50	50
	C [mm]	61	71	71
	G ["]	3/8	3/8	3/8
Operating conditions		Operating pressure [bar]		
Temperature	20 [°C]	25		
	210 [°C]	18		

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		

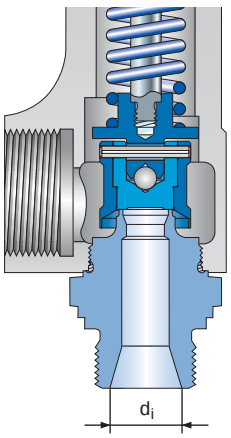
Installing note

Horizontal fitting

For horizontal fitting certified



Attention! Only with **outlet** in direction downwards.



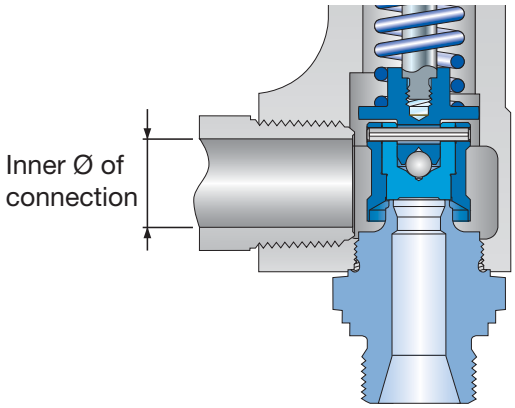
Inlet pipe dimension

Actual orifice diameter d_0	[mm]	6	10
	[inch²]	0.236	0.394
Actual orifice area A_0	[mm²]	28.3	78.5
	[inch²]	0.044	0.122
Inner Ø of pipe d_i	[mm]	10	12.5
	[inch]	$^3/_8$"	$^1/_2$"

Outlet connection

Caution!

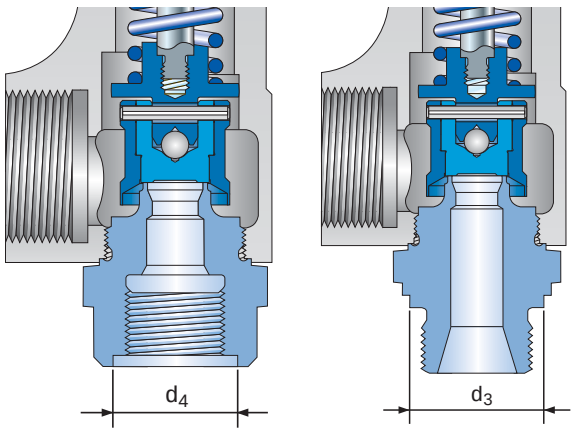
To achieve the certified function and capacity it is important to use an outlet pipe or an outlet connection with an inner diameter ≥ than 16 mm / $^5/_8$" inch.



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.



LESER

Type 459

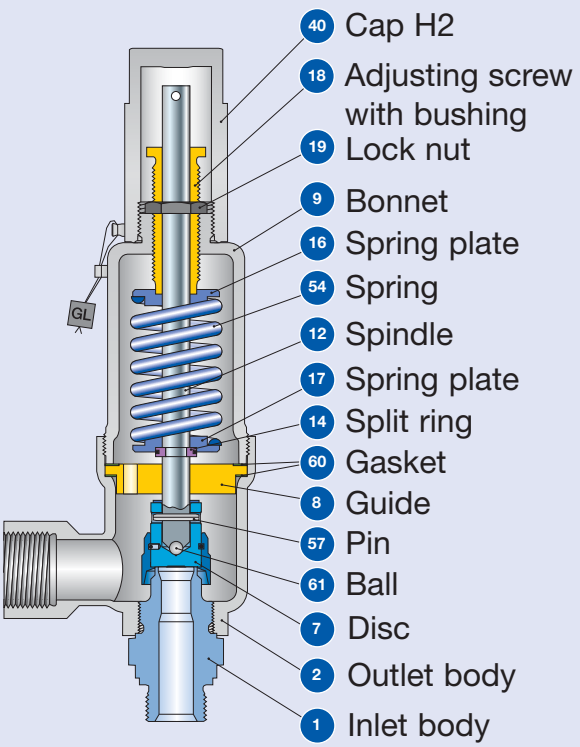
Safety Relief Valves – spring loaded

Type 459
Plain lever H3

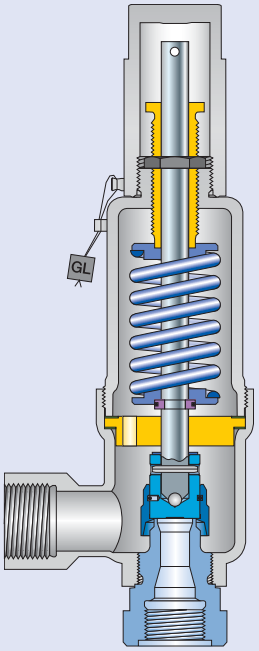
Type 459
Cap H2

Contents Chapter/Page

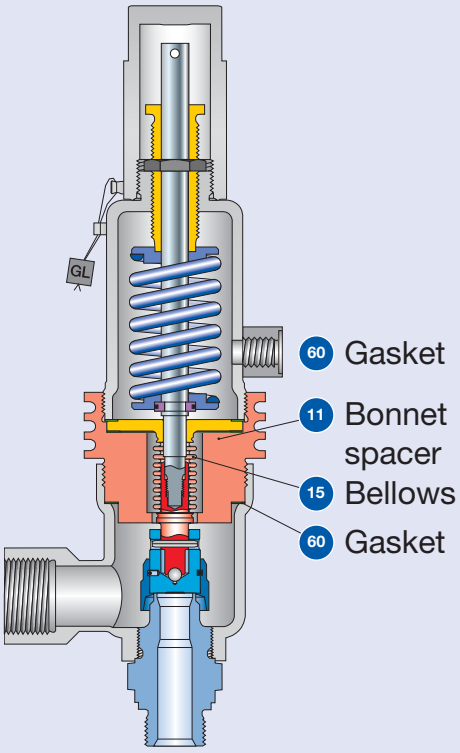
Available designs



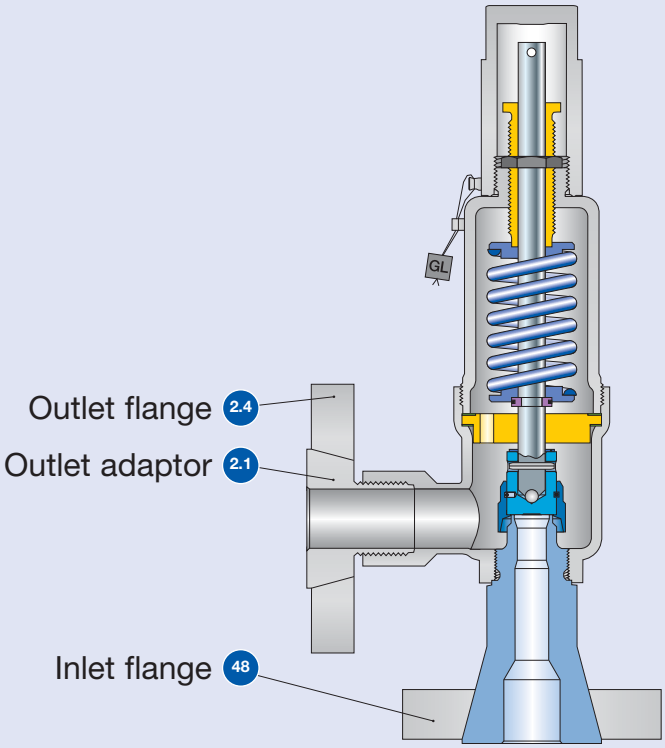
Conventional design
Threaded connection



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[2], 1.4404 SA 479 430[2], SA 479 316L	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	1.0619 WCB	1.4408[1] CF8M[1]
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.

[1] Type 4594 with outlet body deep-drawn: outlet body material 1.4404 / 316L

[2] only valid for male thread DIN ISO 228-1 G¾, G1, G1½ (Option codes V55, V56, V57) (please note availability regarding d_0)

LESER

How to order – Numbering system

1 Article Number	2 Set Pressure	3 Connections	
4594.2552	12 bar_g	V62	V71

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	Outlet body material
2	1.0619 investment casting
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

Please state unit (in gauge)!

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

Please refer to table “Availabe Connections” on pages 09/06 and 09/07.

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

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4 Options

J78			

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	$p \leq 40$ bar$_g$	J78
	$p > 40$ bar$_g$	J55
• Elastomer bellows		J79
• Heating jacket		H29
• High temperature alloy spring		X01
• Stainless steel spring		X04
• INCONEL X-750 spring		X08

5 Documentation

H01	L23	

Please select requested documentation:

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

6 Code and Medium

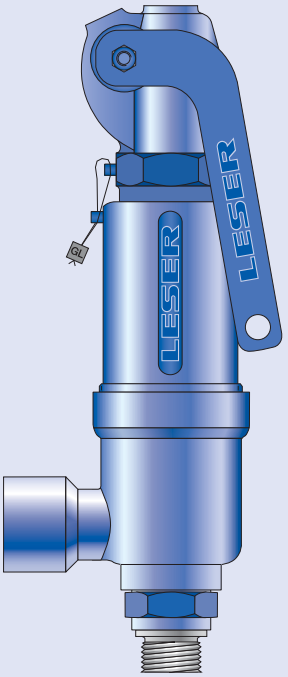
2.0

1	2
2	. 0

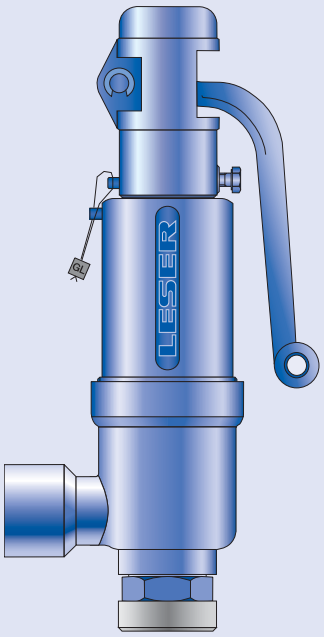
1 Code
1. ASME Section VIII
2. CE / VdTUEV
3. ASME Section VIII + CE / VdTUEV

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

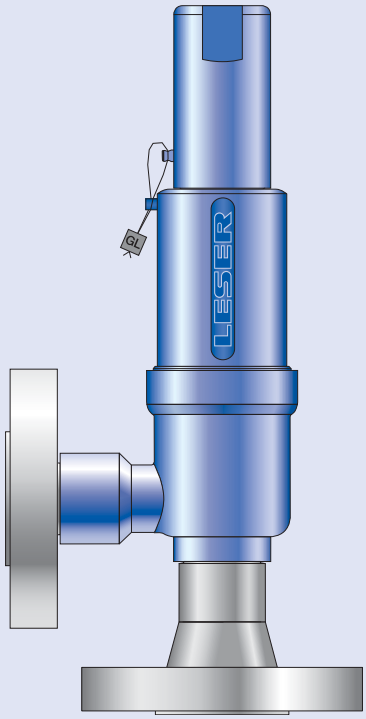
How to order – Article numbers



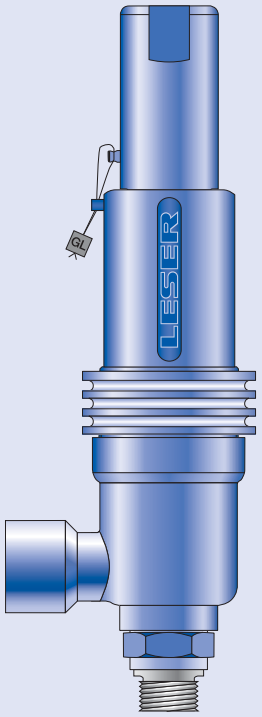
Type 459 Male
Packed lever H4
Conventional design



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 [mm²]	63.6	133	241
			Actual Orifice diameter d_0 [inch]	0.354	0.512	0.689
			Actual Orifice area A_0 [inch²]	0.099	0.206	0.374
Outlet body 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 body investment casted						
Inlet body	**1.4404**	**H2**	Art.-No. **4592.**	**2472**	**2482**	**2492**
Outlet body	**1.0619 (WCB)**	**H3**	Art.-No. **4592.**	**2473**	**2483**	**2493**
Bonnet	**1.0460**	**H4**	Art.-No. **4592.**	**2474**	**2484**	**2494**
	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 body investment casted						
Inlet body	**1.4404**	**H2**	Art.-No. **4594.**	**2162**	**2172**	**2182**
Outlet body	**1.4408 (CF8M)**	**H4**	Art.-No. **4594.**	**2164**	**2174**	**2184**
Bonnet	**1.4404**					
	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 body 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		½" x 1"	¾" x 1"	1" x 1"	½" x 1"	¾" x 1"	1" x 1"	¾" x 1½"	1" x 1½"	1¼" x 1½"	1½" x 1½"
Actual Orifice diameter d_0 [mm]		9	9	9	13	13	13	17.5	17.5	17.5	17.5
Actual Orifice area A_0 [mm²]		63.6	63.6	63.6	133	133	133	241	241	241	241
Weight	[kg]	2.6	2.6	2.6	2.6	2.6	2.6	3.0	3.0	3.0	3.0
Balanced bellows	[kg]	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"

Size outlet body		½" x 1"	¾" x 1"	1" x 1"	½" x 1"	¾" x 1"	1" x 1"	¾" x 1½"	1" x 1½"	1¼" x 1½"	1½" x 1½"
Actual Orifice diameter d_0 [mm]		9	9	9	13	13	13	17.5	17.5	17.5	17.5
Center to face / Height											
DIN ISO 228-1 **G** / **ASME B1.20.1** **NPT**	Inlet a	53	56	62	53	56	62	60	66	67	73
Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	75	75
Height [mm]	H max	283	286	292	283	286	292	287	293	294	300
Balanced bellows	H max	315	318	324	315	318	324	319	325	326	332
ISO 7-1/BS 21 **Rc**	Inlet a	53	56	64	53	56	64	60	68	–	77
Center to face [mm]	Outlet b	75	75	75	75	75	75	75	75	–	75
Height [mm]	H max	283	286	294	283	286	294	287	295	–	304
Balanced bellows	H max	315	318	326	315	318	326	319	327	–	336

Inlet thread "Male"

Size outlet body		1"	1"	1½"	2"
Actual Orifice diameter d_0 [mm]		9	13	17.5	17,5
Center to face [mm]					
DIN ISO 228-1 **G**	Inlet ½" – 1" a	52	–	–	–
	Inlet 1"– 2" a	–	–	56	–
	Outlet b	75	75	75	–
ISO 7-1/BS 21 **R**	Inlet ½" – 1" a	49	49	–	–
ASME B1.20.1 **NPT**	Inlet 1" – 2" a[1)]	–	–	53	53
	Outlet b	75	75	75	100

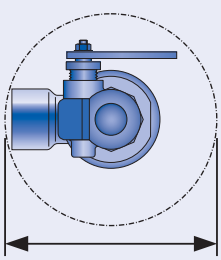
Height [mm]

			Conventional design						Balanced bellows					
		Size inlet thread	½"	¾"	1"	1¼"	1½"	2"	½"	¾"	1"	1¼"	1½"	2"
DIN ISO 228-1	**G**	H max.	296	298	301	303	305	–	328	330	333	335	337	–
ISO 7-1/BS 21	**R**	H max.	298	299	303	–	305	–	330	331	335	–	337	–
ASME B1.20.1	**NPT**	H max.	301	301	307	308	308	309	333	333	339	340	340	341

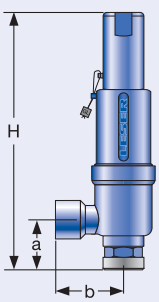
Length of screwed end "c" [mm]

		Size inlet thread	½"	¾"	1"	1¼"	1½"	2"
DIN ISO 228-1	**G**		14	16	18	20	22	–
ISO 7-1/BS 21	**R**		19	20	23	–	25	–
ASME B1.20.1	**NPT**		22	22	27	28	28	29

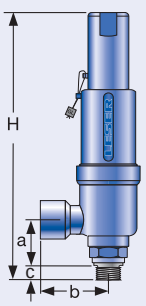
Available treaded connections refer to page 09/06. [1)] Inlet thread R only up to 1½".



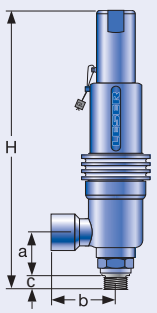
Required installation diameter



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]			9	13	17.5	9	13	17.5
Actual Orifice area A_0 [mm²]			63.6	133	241	63.6	133	241
DIN EN 1092-1 (Available flange sizes refer to page 09/07)								
			Flange rating PN 40 – PN 400					
Center to face	[mm]	Inlet a	100	100	105	100	100	105
		Outlet b	100	100	100	100	100	100
Height	[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	100	100	105	100	100	105
		Outlet b	100	100	100	100	100	100
Height	[mm]	H max.	330	330	333	375	375	378

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

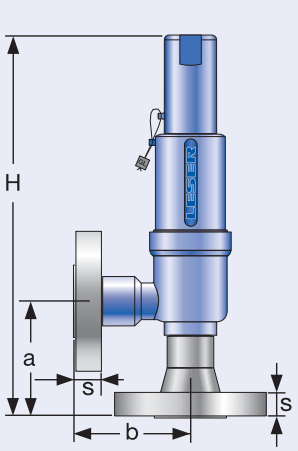
Weight

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

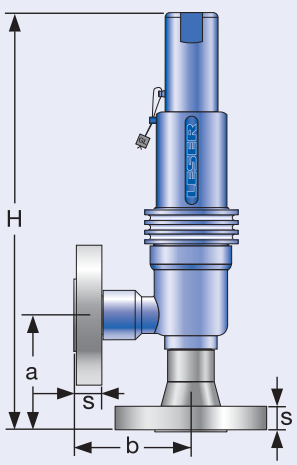
Weight net (without inlet and outlet flange)	[kg]	m_N	2.6	2.3	3	3.8	3.8	4.2

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	m_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	0.9	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	m_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Weight slip on flange	[kg]	m_F	1.3	–	2.6	3.5	5	7.5		1	2.1	2.1	4.1	4.1	5.1
DN 40									**NPS 1 1/2"**						
Flange thickness	[mm]	s	21	–	23	32	–	–		22	24	24	32	–	–
Weight slip on flange	[kg]	m_F	2.1	–	2.9	4.3	–	–		1.4	2.2	2.2	3.9	–	–



Conventional design



Balanced bellows

Dimensions and weights – US Units

Threaded connections

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 1 1/2"	1 1/2" x 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
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
Weight		[lbs]	5.7	5.7	5.7	5.7	5.7	5.7	6.6	6.6	6.6	6.6
	Balanced bellows	[lbs]	7.5	7.5	7.5	7.5	7.5	7.5	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

Inlet thread "Female"

Size outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 1 1/2"	1 1/2" x 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
Center to face / Height												
DIN ISO 228-1	**G**	Inlet a	2 3/32	2 7/32	2 7/16	2 3/32	2 7/32	2 7/16	2 3/8	2 19/32	2 5/8	2 7/8
ASME B1.20.1	**NPT**											
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 5/32	11 1/14	11 1/2	11 5/32	11 1/14	11 1/2	11 5/16	11 17/32	11 9/16	11 13/16
	Balanced bellows	H max.	12 13/32	12 17/32	12 3/4	12 13/32	12 17/32	12 3/4	12 9/16	12 25/32	12 27/32	13 1/16
ISO 7-1/BS 21	**Rc**	Inlet a	2 3/32	2 7/32	2 17/32	2 3/32	2 7/32	2 17/32	2 3/8	2 11/16	–	3 1/32
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	–	2 15/16
Height [inch]		H max.	11 5/32	11 1/14	11 9/16	11 5/32	11 1/14	11 9/16	11 5/16	11 5/8	–	11 31/32
	Balanced bellows	H max.	12 13/32	12 17/32	12 27/32	12 13/32	12 17/32	12 27/32	12 9/16	12 7/8	–	13 7/32

Inlet thread "Male"

Size outlet body			1"	1"	1 1/2"
Actual Orifice diameter d_0 [inch]			0.354	0.512	0.689
Center to face [inch]					
DIN ISO 228-1	**G**	Inlet 1/2" – 1" a	2 1/16	–	–
		Inlet 1"– 2" a	–	–	2 7/32
		Outlet b	2 15/16	2 15/16	2 15/16
ISO 7-1/BS 21	**R**	Inlet 1/2" – 1" a	1 15/16	1 15/16	–
ASME B1.20.1	**NPT**	Inlet 1" – 2" a[1)]	–	–	2 3/32
		Outlet b	2 15/16	2 15/16	2 15/16

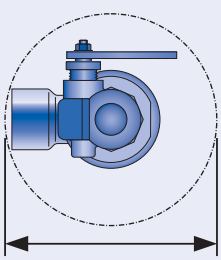
Height [inch]

			Conventional design						Balanced bellows					
		Size inlet thread	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	**G**	H max.	11 21/32	11 23/32	11 27/32	11 15/16	12	–	12 29/32	13	13 1/8	13 3/16	13 9/32	–
ISO 7-1/BS 21	**R**	H max.	11 23/32	11 25/32	11 15/16	–	12	–	13	13 1/32	13 3/16	–	13 9/32	–
ASME B1.20.1	**NPT**	H max.	11 27/32	11 27/32	12 3/32	12 1/8	12 1/8	12 5/32	13 1/8	13 1/8	13 11/32	13 3/8	13 3/8	13 7/16

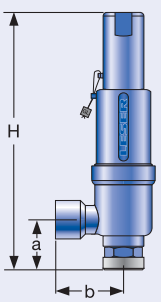
Length of screwed end "c" [inch]

		Size inlet thread	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**		9/16	5/8	23/32	25/32	7/8	–
ISO 7-1/BS 21	**R**		3/4	25/32	29/32	–	31/32	–
ASME B1.20.1	**NPT**		7/8	7/8	1 1/16	1 3/32	1 3/32	1 5/32

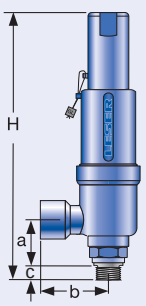
Available treaded connections refer to page 09/06. [1)] Inlet thread R only to 1 1/2".



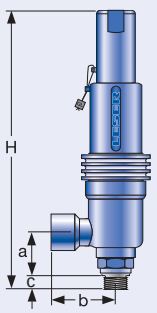
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Balanced bellows

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 [inch²]			0.099	0.206	0.374	0.099	0.206	0.374
DIN EN 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	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
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	[inch]	H max.	13	13	$13^{1}/_{8}$	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{7}/_{8}$

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

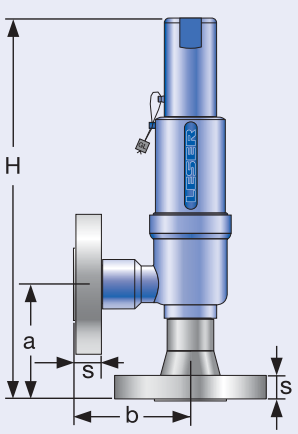
Weight

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

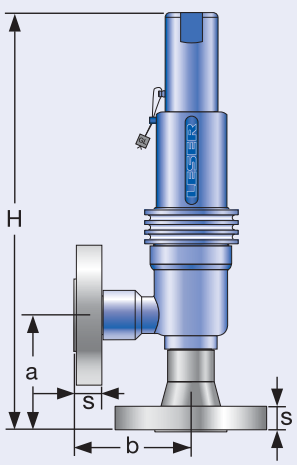
Weight net (without inlet and outlet flange)	[lbs]	m_N	5.7	5.7	6.6	8.4	8.4	9.3

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
		DN 15							**NPS $^{1}/_{2}$"**						
Flange thickness	[inch]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
Weight slip on flange	[lbs]	m_F	1.8	–	2.6	5.5	5.5	7.9		1.3	2.0	2.0	4.6	4.6	6.6
		DN 20							**NPS $^{3}/_{4}$"**						
Flange thickness	[inch]	s	$^{25}/_{32}$	$^{7}/_{8}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{1}/_{4}$
Weight slip on flange	[lbs]	m_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.1	5.1	7.7
		DN 25							**NPS 1"**						
Flange thickness	[inch]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange	[lbs]	m_F	2.9	–	5.7	7.7	11.0	16.5		2.2	4.6	4.6	9.0	9.0	11.2
		DN 40							**NPS $1^{1}/_{2}$"**						
Flange thickness	[inch]	s	$^{13}/_{16}$	–	$^{29}/_{32}$	$1^{1}/_{4}$	–	–		$^{7}/_{8}$	$^{15}/_{16}$	$^{15}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange	[lbs]	m_F	4.5	–	6.3	9.5	–	–		3.2	4.8	4.8	8.6	–	–



Conventional design



Balanced bellows

LESER

Pressure temperature ratings – Metric Units

Metric Units

Actual Orifice diameter d_0 [mm]		9			13			17.5				
Actual Orifice Area A_0 [mm²]		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 standard bellows	p [bar_g] S/G/L	3			3			3				
Min. set pressure[1] high press. bellows	p [bar_g] S/G/L	40			40			40				
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]	+427										
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 250 (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 standard bellows	p [bar_g] S/G/L	3			3			3				
Min. set pressure[1] high press. bellows	p [bar_g] S/G/L	40			40			40				
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]	+427										
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 250 (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 standard bellows	p [bar_g] S/G/L	3			3			3				
Min. set pressure[1] high press. bellows	p [bar_g] S/G/L	40			40			40				
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 high pressure bellows = Max. pressure standard 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 W10.

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	43.5			43.5			43.5				
Min. set pressure high press. bellows	p [psig] S/G/L	580			580			580				
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	43.5			43.5			43.5				
Min. set pressure high press. bellows	p [psig] S/G/L	580			580			580				
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]	+572										

Body material: 1.4404 (316L)					**Type 4594**							
Base / Inlet Body	Connection size	1 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	43.5			43.5			43.5				
Min. set pressure high press. bellows	p [psig] S/G/L	580			580			580				
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 ASME	min. [°F]	-300										
	max. [°F]	+800										

[1] Min. set pressure high pressure bellows = Max. pressure standard 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 W10.

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]			9					
Actual Orifice area A_0 [mm²]			63,6					
Actual Orifice diameter d_0 [inch]			0,354					
Actual Orifice area A_0 [inch²]			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	–	–	–
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	–	–	–
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 [mm²]			133					
Actual Orifice diameter d_0 [inch]			0,512					
Actual Orifice area A_0 [inch²]			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	–	–	–
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	–	–	–
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 [mm²]			241					
Actual Orifice diameter d_0 [inch]			0,689					
Actual Orifice area A_0 [inch²]			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	–	–	–	–	-	–
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	–	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.8449.9211	136.3649.9211	136.8549.9211	136.8649.9211	–
		316L stellited	–	–	–	–	–	–

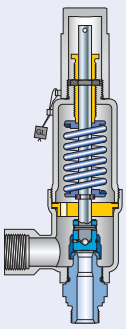
Order information – Spare parts

Spare parts

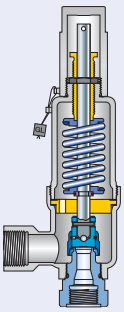
	Actual Orifice diameter d_0 [mm]		9	13	17.5
	Actual Orifice area A_0 [mm²]		63.6	133	241
	Actual Orifice diameter d_0 [inch]		0.354	0.512	0.689
	Actual Orifice area A_0 [inch²]		0.099	0.206	0.374
Body (Item 1): Flange design				**Material-No. / Art.-No.**	
DN 15 / NPS 1/2"	PN 40 – 400	316L	136.7449.9208	136.7949.9208	–
	CL300 – 2500				
DN 20 / NPS 3/4"	PN 40 – 400	316L	136.3949.9208	136.5049.9208	136.8449.9208
	CL150 – 2500				
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208	136.3549.9208	136.3649.9208
	CL150	316L	136.7649.9202	136.8149.9202	136.3649.9202
	CL300 – 2500		136.3449.9208	136.3549.9208	136.3649.9208
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	200.2249.9000
		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		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	
		1.4571 / 316Ti		p > 40 bar / 580 psig = 400.6349.0000	
Conversion kit		≤ PN 40/CL600		5021.1050	
		> PN 40/CL600		5021.1051	

Available Options

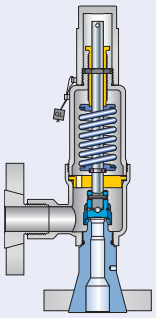
Male thread



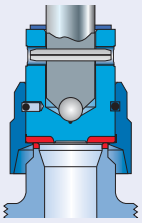
Female thread



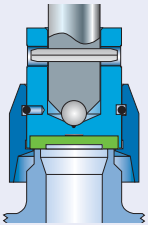
Flanged version



Stellited sealing surface
J25: Disc stellited
L20: Base/inlet body



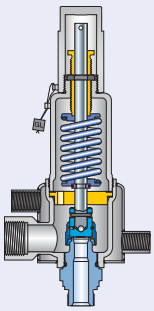
Disc with inserted sealing plate
J44: PTFE-FDA “A”
J48: PCTFE “G”
J49: VESPEL-SP “T”



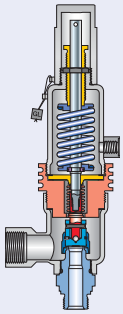
Solar valve
N80

4592.2482
4592.2484

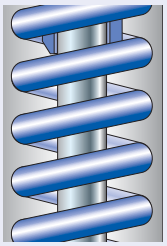
Heating jacket
H29



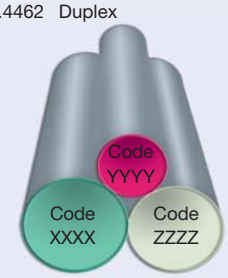
Balanced bellows



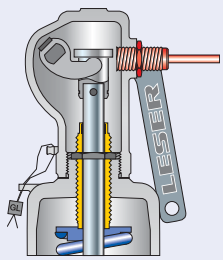
INCONEL X-750 spring
X08



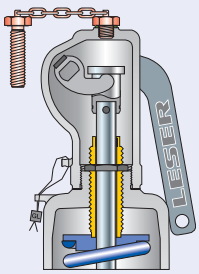
Special material
2.4610 Hastelloy® C4
2.4360 Monel® 400
1.4462 Duplex



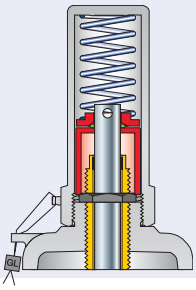
Lift indicator
J93: Lift indicator



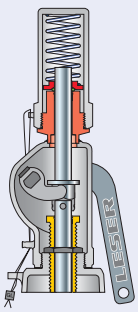
Test gag
J69: H4
J70: H2



O-ring-damper H2
J65



O-ring-damper H4
J66



Approvals

Approvals				
Actual Orifice diameter d_0 [mm]		9	13	17.5
Actual Orifice area A_0 [mm²]		63.6	133	241
Actual Orifice diameter d_0 [inch]		0.354	0.512	0.689
Actual Orifice area A_0 [inch²]		0.099	0.206	0.374
Europe		**Coefficient of discharge K_{dr}**		
PED / DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13 Rev. 2		
	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
Germany		**Coefficient of discharge α_w**		
PED / AD 2000-Merkblatt A2	Approval No.	TÜV SV 909		
	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
United States		**Coefficient of discharge K**		
ASME Sec. VIII Div. 1	Approval No.	M 37112		
	S/G	0.811		
	Approval No.	M 37101		
	L	0.566		
Canada		**Coefficient of discharge K**		
CRN	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.811		
	L	0.566		
China		**Coefficient of discharge α_w**		
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
Russia		**Coefficient of discharge α_w**		
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
Kazakhstan		**Coefficient of discharge α_w**		
GOST-K	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
Belarus		**Coefficient of discharge α_w**		
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52

Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every reneval. A sample certificate including the valid certification number can be found at www.leser.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	
U.S. Coast Guard	U.S.C.G	www uscg.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 [mm²]	63.6			133.0			241.0		
LEO*) [inch²]	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_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/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 [inch²]	0.099			0.206			0.374		
LEO*) [inch²]	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.]
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	7 422	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

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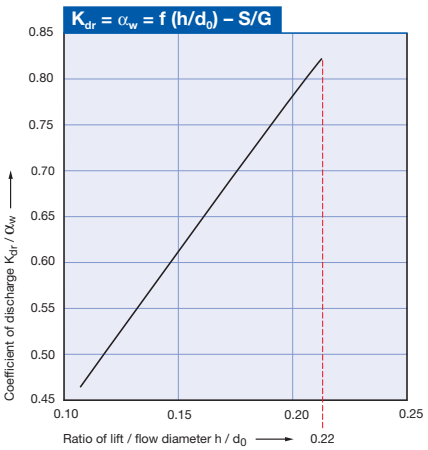
Determination of coefficent of discharge in case of lift restriction or back pressure

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

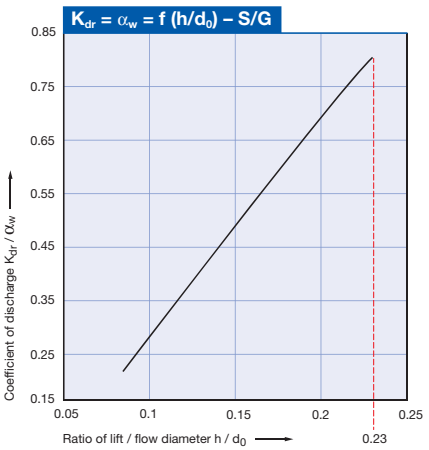
How to use please refer to page 00/08

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

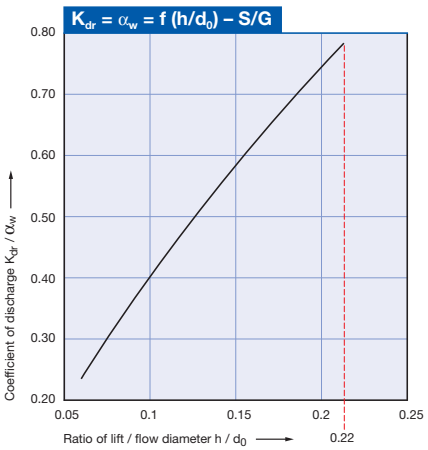
d_0 Ø 9 mm



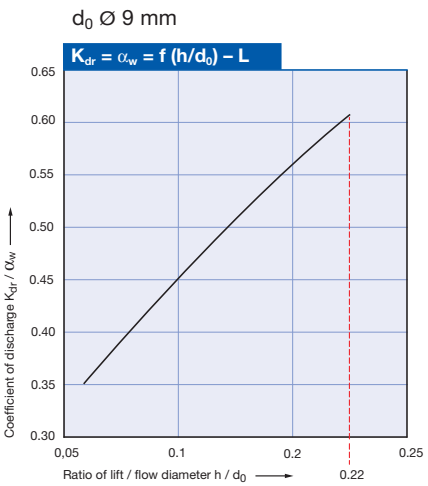
d_0 Ø 13 mm



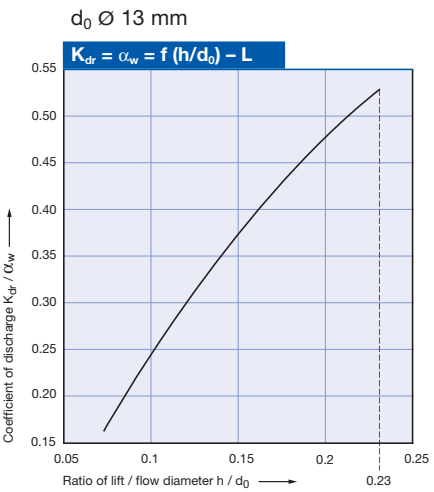
d_0 Ø 17.5 mm



d_0 Ø 9 mm



d_0 Ø 13 mm



d_0 Ø 17.5 mm

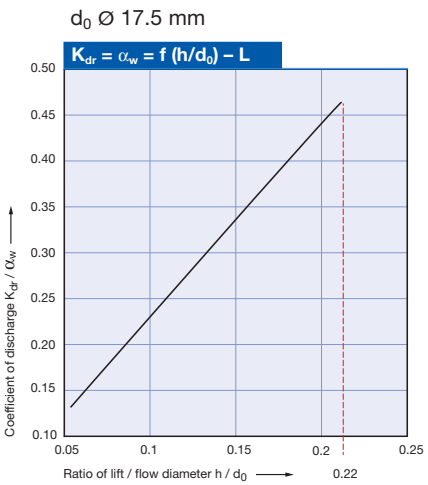
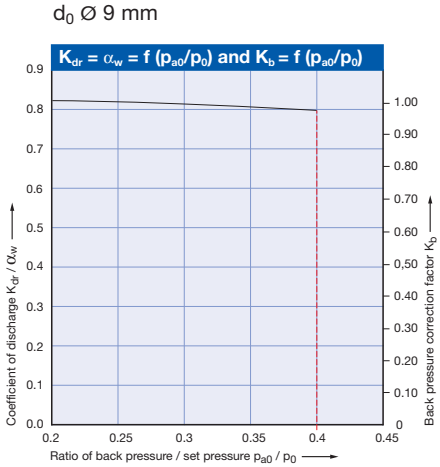
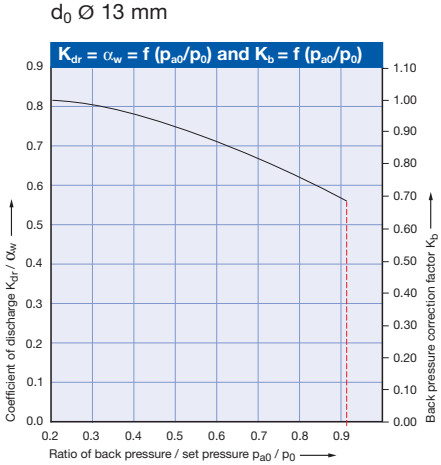


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)

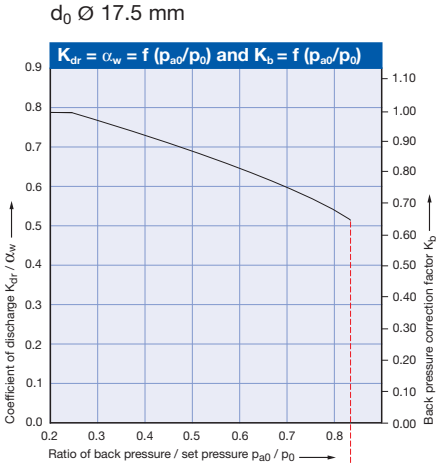
d_0 Ø 9 mm



d_0 Ø 13 mm



d_0 Ø 17.5 mm



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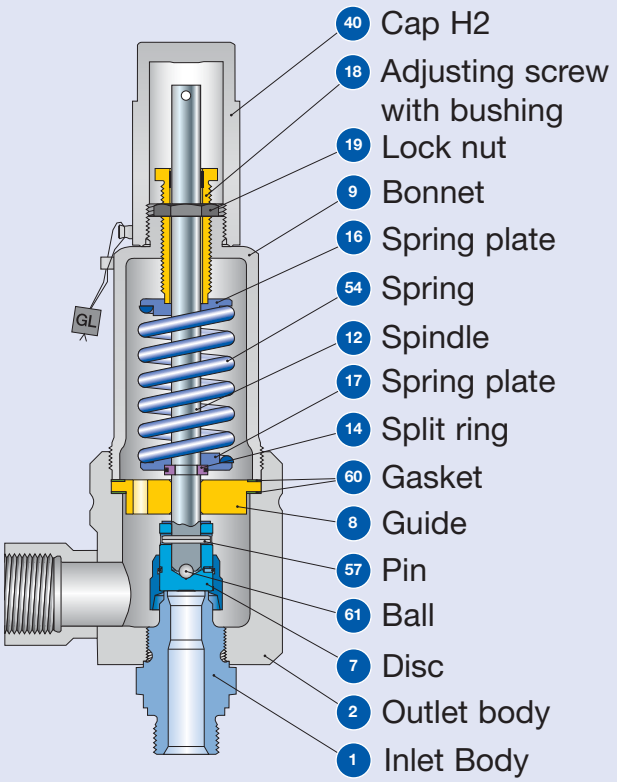
Type 459 HDD

Safety Relief Valves Heavy Duty Design – spring loaded

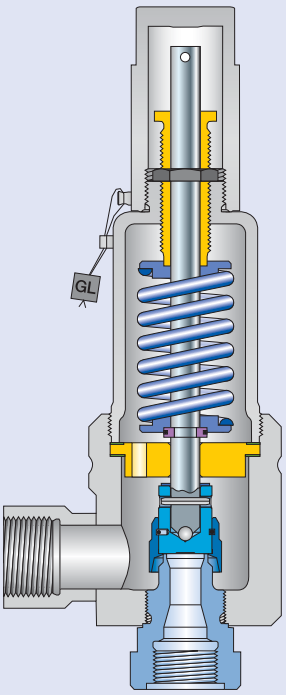
Type 459 HDD
Cap H2

Contents **Chapter/Page**

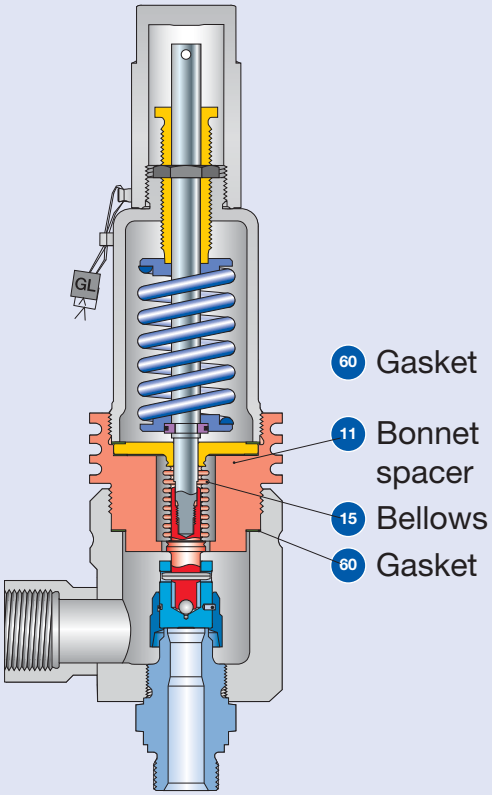
Available designs



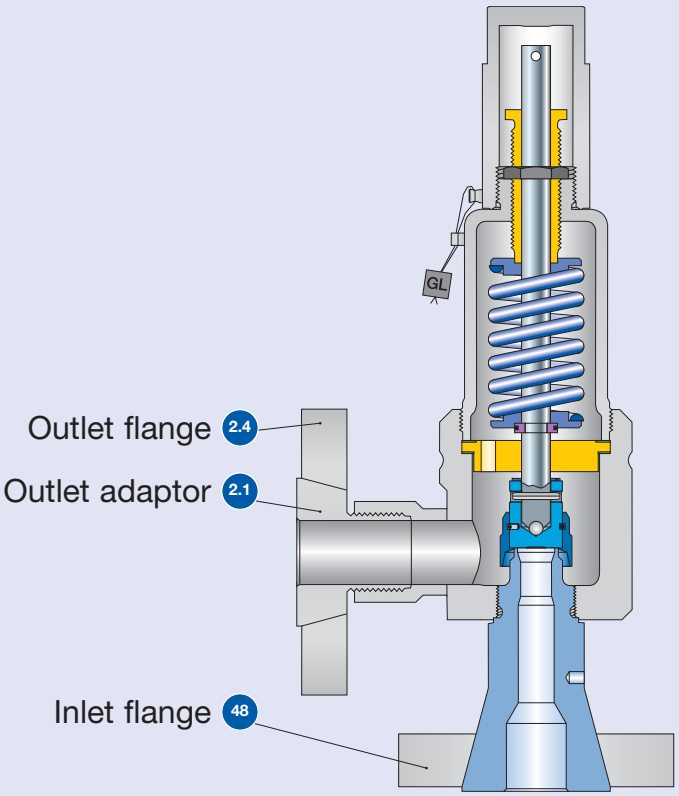
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Available designs – materials

Materials

Item	Component	Remarks	Type 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 stellited SA 479 316L stellited
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.

Type 459 HDD

How to order – Series 459 HDD – Example for numbering system

1 Article Number	2 Set Pressure	3 Connections	
4594.2582	10 bar_g	V62	V71

1	2	3	4
459	4	258	2

1 Type 459 HDD

Types of sealing

Metal seat	
Metal-to-metal stellited	
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

Please state unit (in gauge)!

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

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

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

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4 Options

J48 | | | |

Type 459 HDD		Option code
• Plastic seal material (only d_0 9 & d_0 13)		
PCTFE	"G"	J48
Vespel SP	"T"	J49
• Stainless steel bellows	p ≤ 40 barg	J78
	p > 40 barg	J55
• Elastomer bellows		J79
• Heating jacket		H29
• INCONEL X-750 spring		X08

5 Documentation

H01 | L23 | |

Please select requested documentation:

Inspections, tests:	Option code
DIN EN 10204-3.2: TÜV-Nord Certificate for test pressure	M33
LESER CGA (Certificate for Global Application) - Inspection certificate 3.1 acc. to DIN EN 10204 - Declaration of conformity acc. to PED 97/23/EC	H03

Part	Option code
Inlet body	H01
Outlet body	L34
Bonnet	L30
Cap / lever cover	L31
Disc	L23

6 Code and Medium

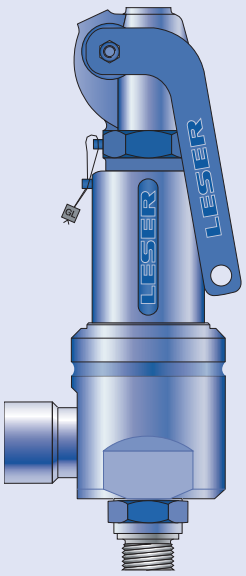
2.0

1 2
2 . 0

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

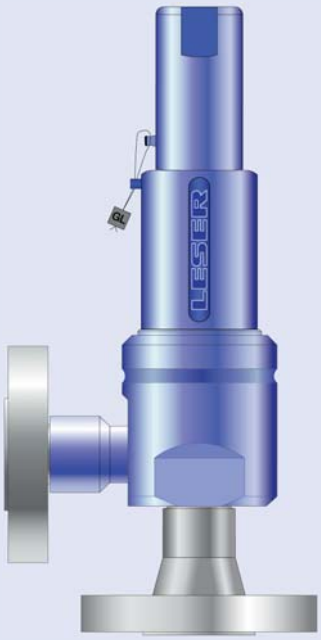
2 Medium
.1 Gases
.2 Liquids
.3 Steam
.0 Steam / Gases / Liquids (valid only for CE / VdTUEV)

How to order – Article numbers

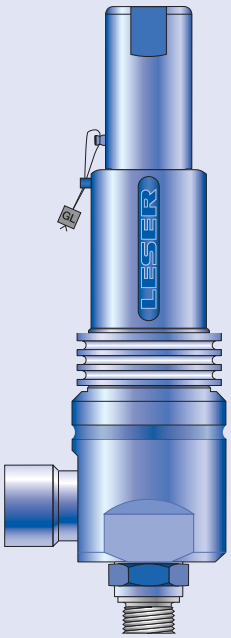


Type 459 HDD male
Packed lever H4
Conventional design

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[1)]	9	13
			Actual Orifice area A_0 [mm²]	28.3	63.9	133
			Actual Orifice diameter d_0 [inch]	0.236	0.354	0.512
			Actual Orifice area A_0 [inch²]	0.044	0.099	0.206
Body material: 14404 (316L)						
All body and trim parts	**1.4404**	**H2**	Art.-No. **4594.**	**2532**	**2582**	**2592**
		H4	Art.-No. **4594.**	**2534**	**2584**	**2594**
	p [bar_g]		S/G/L	**420.01 – 850**	**1.5 – 420**	**0.2 – 200**
	p [psig]			**6091 – 12328**	**21.7 – 6091**	**2.9 – 2901**

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

[1)] The specification of the medium is necessary at liquid applications (Option Code M09).

Type 459 HDD

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Dimensions and weights – Metric Units

Threaded connections

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d_0 [mm]			6	6	6	9	9	9	13	13	13
Actual Orifice area A_0 [mm²]			28.3	28.3	28.3	63.6	63.6	63.6	133	133	133
Weight		[kg]	3.9	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	4.7
Required installation diameter		[mm]	165	165	165	165	165	165	165	165	165

Inlet thread "Female"

Size outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d_0 [mm]			6	6	6	9	9	9	13	13	13
Center to face / Height											
DIN ISO 228-1 / **ASME B1.20.1**	**G** / **NPT**	Inlet a	53	53	62*)	53	56	62	53	56	62
Center to face [mm]		Outlet b	75	75	75*)	75	75	75	75	75	75
Height [mm]		H max.	283	286	292*)	283	286	292	283	286	292
	Balanced bellows	H max.	315	318	342*)	315	318	324	315	318	324
ISO 7-1/BS 21	**Rc**	Inlet a	53	56	64	53	56	64	53	56	64
Center to face [mm]		Outlet b	75	75	75	75	75	75	75	75	75
Height [mm]		H max.	283	286	294	283	286	294	283	286	294
	Balanced bellows	H max.	315	318	326	315	318	326	315	318	326

Inlet thread "Male"

Size outlet body			1"	1"	1"
Actual Orifice diameter d_0 [mm]			6	9	13
Center to face [mm]					
DIN ISO 228-1	**G**	Inlet a	52	52	–
		Outlet b	75	75	56
ISO 7-1/BS 21	**R**	Inlet a	49	49	49
ASME B1.20.1	**NPT**	Outlet b	75	75	75

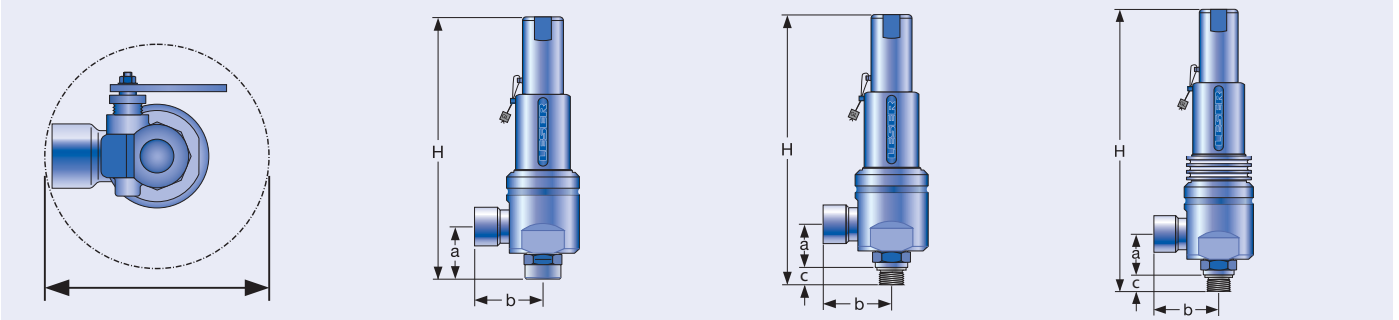
Height [mm]

			Conventional design			Balanced bellows		
		Size inlet thread	1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	296	298	301	328	330	333
ISO 7-1/BS 21	**R**	H max.	298	299	303	330	331	335
ASME B1.20.1	**NPT**	H max.	301	301	307	333	333	339

Length of screwed end "c" [mm]

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

Available treaded connections refer to page 09/06. *) DIN ISO 228-1 G not possible.



Required installation diameter

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 [mm²]			28.3	63.6	133	28.3	63.6	133
DIN EN 1092-1 (Available flange sizes refer to page 09/07)								
			Flange rating PN 40 – PN 400					
Center to face	[mm]	Inleta	100	100	100	100	100	100
		Outlet b	100	100	100	100	100	100
Height	[mm]	H max.	330	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	100	100	100	100	100	100
		Outlet b	100	100	100	100	100	100
Height	[mm]	H max.	330	330	330	375	375	375

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

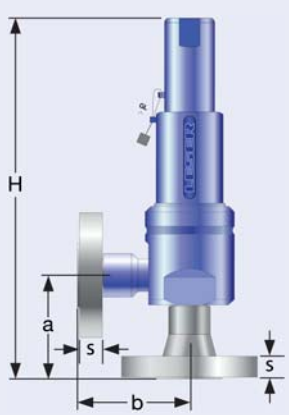
Weight

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

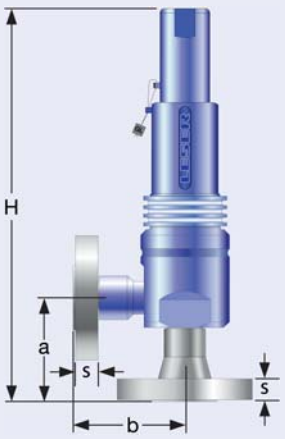
Weight net (without inlet and outlet flange)	[kg]	m_N	2.6	2.6	2.6	3.8	3.8	3.8

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						DIN ISO 1092-1 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	m_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	0.9	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	m_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Weight slip on flange	[kg]	m_F	1.3	–	2.6	3.5	5	7.5		1	2.1	2.1	4.1	4.1	5.1
DN 40									**NPS 1 1/2"**						
Flange thickness	[mm]	s	21	–	23	32	–	–		22	24	24	32	–	–
Weight slip on flange	[kg]	m_F	2.1	–	2.9	4.3	–	–		1.4	2.2	2.2	3.9	–	–



Conventional design



Balanced bellows

Type 459 HDD

Dimensions and weights – US Units

Threaded connections

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d_0 [inch]			0.236	0.236	0.236	0.354	0.354	0.354	0.512	0.512	0.512
Actual Orifice area A_0 [inch²]			0.044	0.044	0.044	0.099	0.099	0.099	0.206	0.206	0.206
Weight		[lbs]	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6
	Balanced bellows	[lbs]	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
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

Inlet thread "Female"

Size outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d_0 [inch]			0.236	0.236	0.236	0.354	0.354	0.354	0.512	0.512	0.512
Center to face / Height											
DIN ISO 228-1 / **ASME B1.20.1**	**G** / **NPT**	Inlet a	2 3/32	2 7/32	2 7/16*)	2 3/32	2 7/32	2 7/16	2 3/32	2 7/32	2 7/16
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
Height [inch]		H max.	11 5/32	11 1/14	11 1/2*)	11 5/32	11 1/14	11 1/2	11 5/32	11 1/4	11 1/2
	Balanced bellows	H max.	12 13/32	12 17/32	12 3/4*)	12 13/32	12 17/32	12 3/4	12 13/32	12 17/32	12 3/4
ISO 7-1/BS 21	**Rc**	Inlet a	2 3/32	2 7/32	2 17/32	2 3/32	2 7/32	2 17/32	2 3/32	2 7/32	2 17/32
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	2 15/16
Height [inch]		H max.	11 5/32	11 1/14	11 9/16	11 5/32	11 1/14	11 9/16	11 5/32	11 1/4	11 9/16
	Balanced bellows	H max.	12 13/32	12 17/32	12 27/32	12 13/32	12 17/32	12 27/32	12 13/32	12 17/32	12 27/32

Inlet thread "Male"

Size outlet body		1"	1"	1"
Actual Orifice diameter d_0 [inch]		1/4	11/32	1/2
Center to face [inch]				
DIN ISO 228-1	**G** Inlet a	2 1/16	2 1/16	–
	Outlet b	2 15/16	2 15/16	2 15/16
ISO 7-1/BS 21	**R** Inlet a	1 15/16	1 15/16	1 15/16
ASME B1.20.1	**NPT** Outlet b	2 15/16	2 15/16	2 15/16

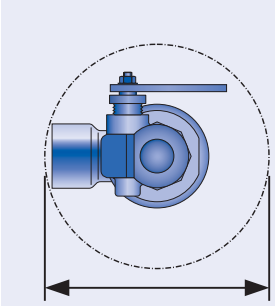
Height [inch]

			Conventional design			Balanced bellows		
		Size inlet thread	1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	11 21/32	11 23/32	11 27/32	12 29/32	13	13 1/8
ISO 7-1/BS 21	**R**	H max.	11 23/32	11 25/32	11 15/16	13	13 1/32	13 3/16
ASME B1.20.1	**NPT**	H max.	11 27/32	11 27/32	12 3/32	13 1/8	13 1/8	13 11/32

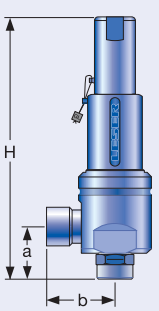
Length of screwed end "c" [inch]

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

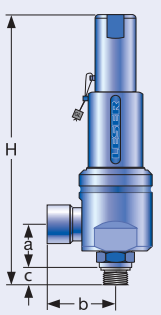
Available treaded connections refer to page 09/06. *) DIN ISO 228-1 G not possible.



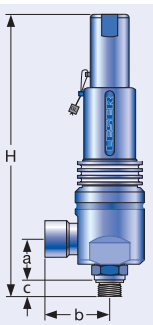
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Balanced bellows

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	0.354	0.512
Actual Orifice area A_0 [inch²]			0.044	0.099	0.206	0.044	0.099	0.206
DIN EN 1092-1 (Available flange sizes refer to page 09/07)								
			Flange rating PN 40 – PN 400					
Center to face	[inch]	Inlet a	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
		Outlet b	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$	$3^{15}/_{16}$
Height	[inch]	H max.	13	13	13	13	13	13
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	[inch]	H max.	13	13	13	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{3}/_{4}$

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

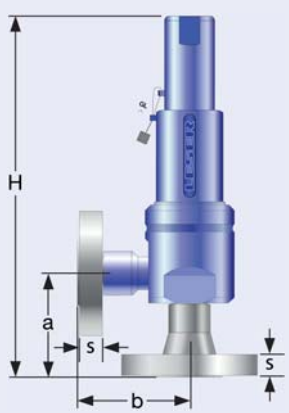
Weight

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

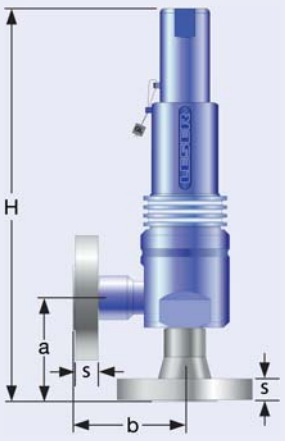
Weight net (without inlet and outlet flange)	[lbs]	m_N	5.7	5.7	5.7	8.4	8.4	8.4

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						DIN ISO 1092-1 / Flange rating PN						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
		DN 15							**NPS $^1/_2$"**						
Flange thickness	[mm]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
Weight slip on flange	[kg]	m_F	1.8	–	2.6	5.5	5.5	7.9		1.3	2	2	4.6	4.6	6.6
		DN 20							**NPS $^3/_4$"**						
Flange thickness	[mm]	s	$^{25}/_{32}$	$^{7}/_{8}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{1}/_{4}$
Weight slip on flange	[kg]	m_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.1	5.1	7.7
		DN 25							**NPS 1"**						
Flange thickness	[mm]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{3}/_{32}$	$1^{9}/_{16}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange	[kg]	m_F	2.9	–	5.7	7.7	11	16.5		2.2	4.6	4.6	9	9	11.2
		DN 40							**NPS $1^1/_2$"**						
Flange thickness	[mm]	s	$^{13}/_{16}$	–	$^{29}/_{32}$	$1^{1}/_{4}$	–	–		$^{7}/_{8}$	$^{15}/_{16}$	$^{15}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange	[kg]	m_F	4.5	–	6.3	9.5	–	–		3.2	4.8	4.8	8.6	–	–



Conventional design



Balanced bellows

Pressure temperature ratings

Metric Units

Actual Orifice diameter d_0 [mm]		6			9			13		
Actual Orifice Area A_0 [mm²]		28.3			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"	3/4"	1"	1 1/4"
	Pressure rating	PN 700			PN 500			PN 250		
Outlet body	Pressure rating	PN 160			PN 160			PN 160		
Minimum set pressure	p [bar_g] S/G/L	420			1.5			0,2		
Maximum set pressure	p [bar_g] S/G	700			420			200		
	p [bar_g] L	–								
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 [inch²]		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"	3/4"	1"	1 1/4"
Minimum set pressure	p [psig] S/G/L	6091			21.7			2.9		
Maximum set pressure	p [psig] S/G	10150			6091			2901		
	p [psig] L	–								
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 [mm²]			28.3			63.6			133	
Actual Orifice diameter d_0 [inch]			0.236			0.354			0.512	
Actual Orifice area A_0 [inch²]			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
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
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
	CL300 – CL2500	316L stellited			
DN 20 / NPS 3/4"	PN 40 – PN 400	316L stellited	136.7069.9208	136.3969.9208	136.5069.9208
	CL150 – CL2500	316L stellited			
DN 25 / NPS 1"	PN 40 – PN 400	316L stellited	136.7169.9208	136.3469.9208	136.3569.9208
	CL150	316L stellited		136.7669.9202	136.8169.9202
	CL300 – CL2500	316L stellited		136.3469.9208	136.3569.9208

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	PTFE "A"	–	200.2149.9005	200.2249.9005
		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	PTFE "A"	–	236.3559.0000	236. 0859.0000
	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

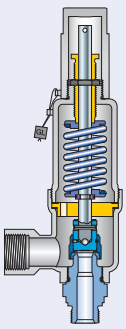
Gasket – outlet body / bonnet (Item 60)		**Material-No. / Art.-No.**		
Gasket	Graphite + 1.4401	500.2407.0000	500.2407.0000	500.2407.0000
Option code L68	Gylon (Filled PTFE)	500.2405.0000	500.2407.0000	500.2407.0000

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

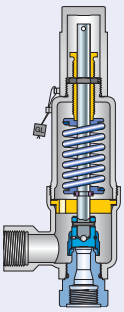
Bellows and belows conversion kit (Item 15)		
Stainless steel bellows	1.4571/316Ti	p ≤ 40 bar / 580 psig = 400.7949.0000
		p > 40 bar / 580 psig = 400.6349.0000
Conversion kit	≤ PN 40 / CL600	5021.1050
	> PN 40 / CL600	5021.1051

Available Options

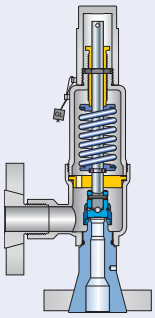
Male thread



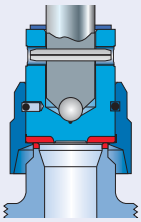
Female thread



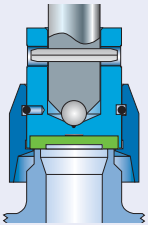
Flanged version



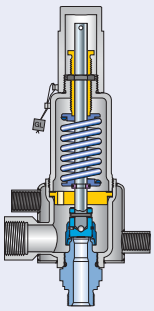
Stellited sealing surface
J25: Disc stellited
L20: Base/inlet body



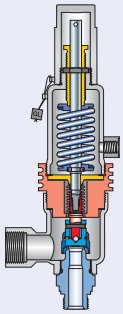
Disc with inserted sealing plate
J44: PTFE-FDA “A”
J48: PCTFE “G”
J49: VESPEL-SP “T”



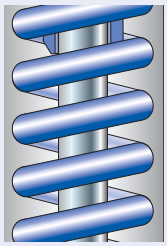
Heating jacket
H29



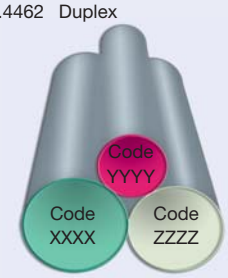
Balanced bellows



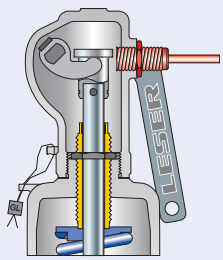
INCONEL X-750 spring
X08



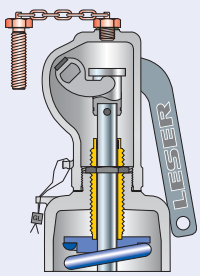
Special material
2.4610 Hastelloy® C4
2.4360 Monel® 400
1.4462 Duplex



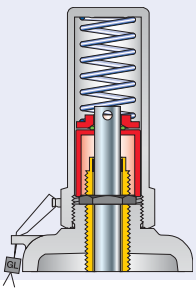
Lift indicator
J93: Lift indicator



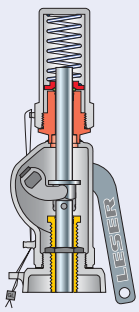
Test gag
J69: H4
J70: H2



O-ring-damper H2
J65



O-ring-damper H4
J66



Approvals

Approvals				
Actual Orifice diameter d_0 [mm]		6	9	13
Actual Orifice area A_0 [mm²]		28.3	63.6	133
Actual Orifice diameter d_0 [inch]		0.236	0.354	0.512
Actual Orifice area A_0 [inch²]		0.044	0.099	0.206
Europe		**Coefficient of discharge K_{dr}**		
PED / DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13 Rev. 2		
	S/G	0.81	0.83	0.81
	L	0.70	0.61	0.53
Germany		**Coefficient of discharge α_w**		
PED / 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 Div. 1	Approval No.	M 37112		
	S/G	0.811		
	Approval No.	M 37101		
	L	0.566		
Canada		**Coefficient of discharge K**		
CRN	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.811		
	L	0.566		
China		**Coefficient of discharge α_w**		
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.81	0.83	0.81
	L	0.70	0.61	0.53
Russia		**Coefficient of discharge α_w**		
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.81	0.83	0.81
	L	0.70	0.61	0.53
Kazakhstan		**Coefficient of discharge α_w**		
GOST-K	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.81	0.83	0.81
	L	0.70	0.61	0.53
Belarus		**Coefficient of discharge α_w**		
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.81	0.83	0.81
	L	0.70	0.61	0.53

Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every reneval. A sample certificate including the valid certification number can be found at www.leser.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	
U.S. Coast Guard	U.S.C.G	www uscg.org	

LESER

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 [mm²]	28.3			63.6			133.0		
LEO*) [inch²]	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_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/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		7221	21.6		16648	42.4			
440		7564	22.1						
460		7907	22.6						
480		8250	23.1						
500		8593	23.6						
520		8936	24.1						
540		9280	24.5						
560		9623	25						
580		9966	25.4						
600		10309	25.9						
650		11167	26.9						
700		18024	27.9						
750		12882	28.9						
800		13740	29.9						
850		14598	30.8						

No saturated steam application in set pressure range

*) $LEO_{S/G/L}$ = 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 plus10% 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 [inch²]	0.044			0.099			0.206		
LEO*) [inch²]	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	**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							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	No saturated steam application in set pressure range	4330	76.8		9743	173			
6250		4510	78.4		10148	176			
6500		4690	79.9						
6750		4870	81.4						
7000		5050	82.9						
7250		5230	84.4						
7500		5410	85.8						
7750		5590	87.3						
8000		5770	88.6						
8250		5950	90						
8500		6130	91.4						
8750		6310	92.7						
9000		6490	94						
9500		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 coefficent 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

How to use please refer to page 00/08

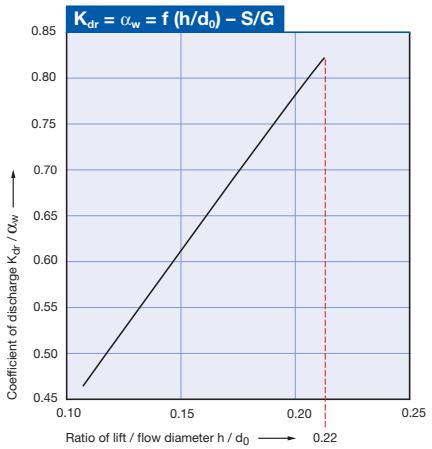
Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)

d_0 Ø 6 mm

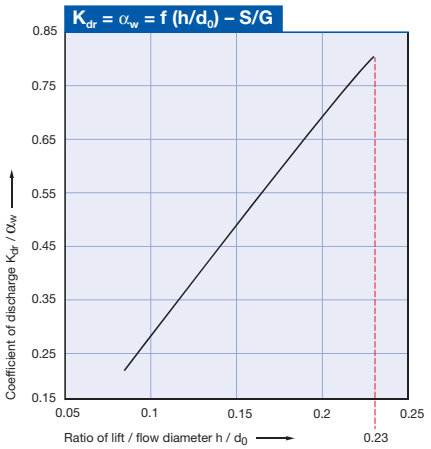
$K_{dr} = \alpha_w = f\ (h/d_0)$ – S/G

A lift restriction ist not applicable because the actual design and the certified lift ≤ 1.5 mm / $^1/_{16}$ inch.

d_0 Ø 9 mm



d_0 Ø 13 mm

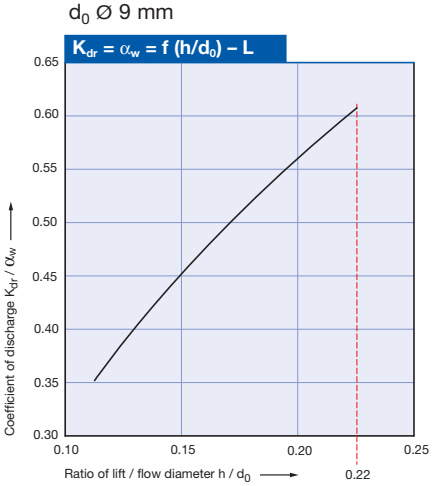


d_0 Ø 6 mm

$K_{dr} = \alpha_w = f\ (h/d_0)$ – L

A lift restriction ist not applicable because the actual design and the certified lift ≤ 1.5 mm / $^1/_{16}$ inch.

d_0 Ø 9 mm



d_0 Ø 13 mm

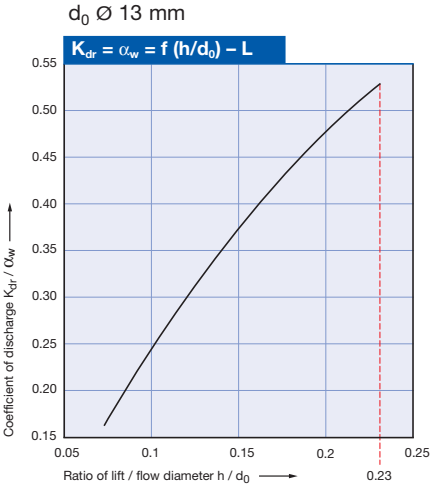


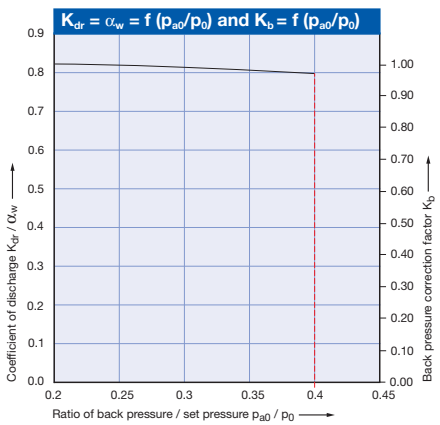
Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)

d_0 Ø 6 mm

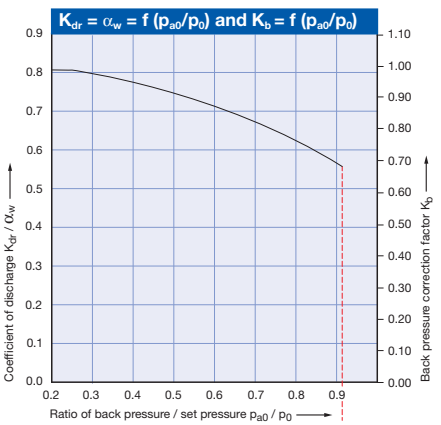
$K_{dr} = \alpha_w = f\ (p_{a0}/p_0)$ and $K_b = f\ (p_{a0}/p_0)$

The certified coefficent of discharge K_{dr} / α_w
S/G = 0.81
L = 0.70
is constant in set pressure range.

d_0 Ø 9 mm



d_0 Ø 13 mm



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Type 462

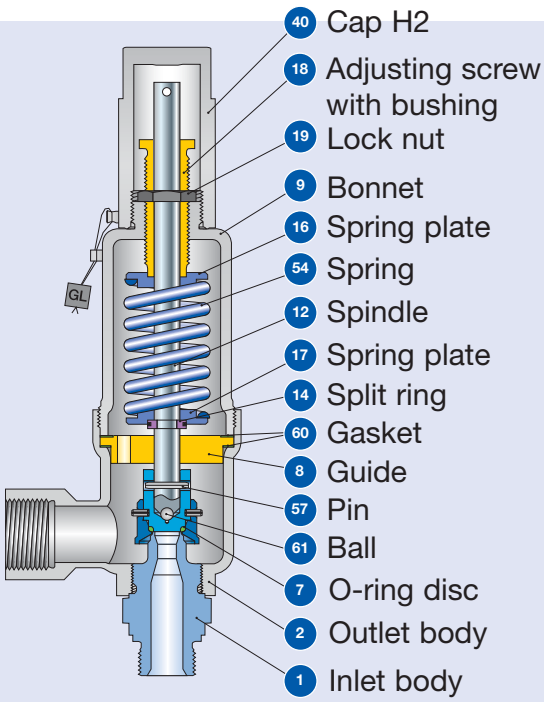
Type 462
Plain lever H3

Safety Relief Valves – spring loaded

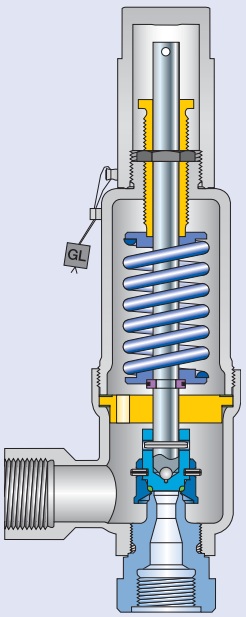
Type 462
Cap H2

Contents **Chapter/Page**

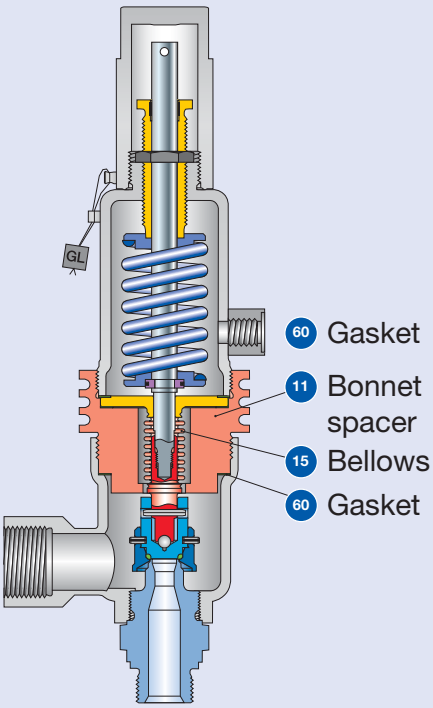
Available designs



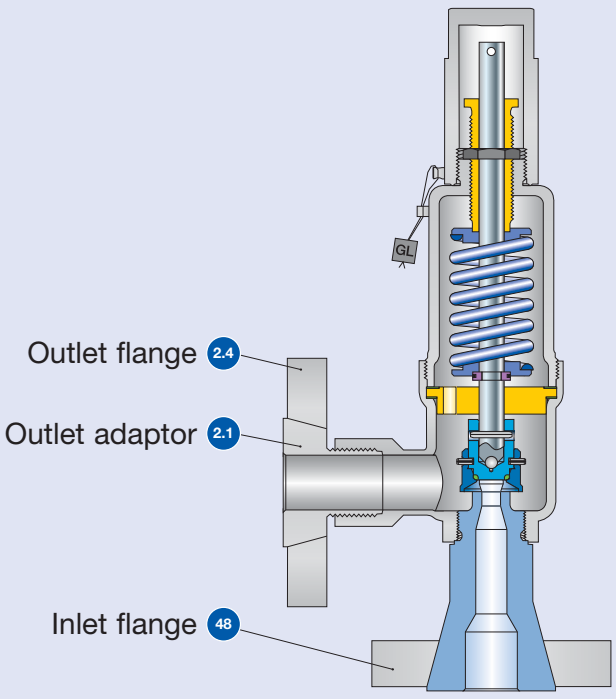
Conventional design
Threaded connection



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[2], 1.4404 SA 479 430[2], SA 479 316L	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	1.0619 WCB	1.4408 [1] CF8M [1]
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 Perfluor	FFKM Perfluor	FFKM Perfluor
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 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
15	Bellows	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.
- If several materials are specified LESER defines the material.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.

[1] Type 4624 with outlet body deep-drawn: outlet body material 1.4404 / 316L

[2] only valid for male thread DIN ISO 228-1 G¾ G1, G1½ (Option codes V55, V56, V57) (please note availability regarding d_0)

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How to order – Series 462 – Example for numbering system

1 Article Number	2 Set Pressure	3 Connections	
4624.2952	12 bar_g	V62	V71

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	1.0619 investment casting
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

Please state unit (in gauge)!

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

Please refer to table “Availabe Connections” on pages 09/06 and 09/07.

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

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4 Options

J78			

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	$p \leq 40$ bar$_g$	J78
	$p > 40$ bar$_g$	J55
• Elastomer bellows		J79
• Heating jacket		H29
• High temperature alloy spring		X01
• Stainless steel spring		X04
• INCONEL X-750 spring		X08

5 Documentation

H01	L23	

Please select requested documentation:

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

6 Code and Medium

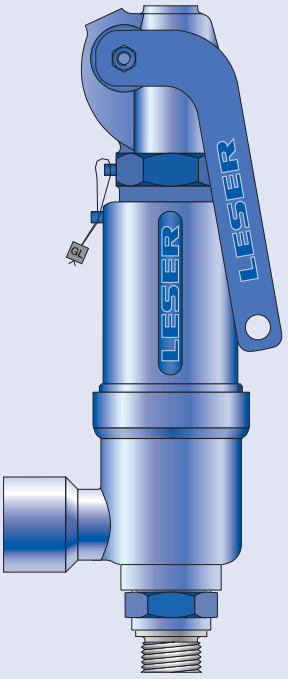
2.0

1	2
2	. 0

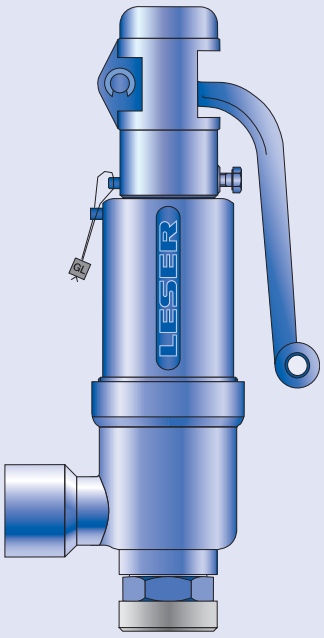
1 Code
1. ASME Section VIII
2. CE / VdTUEV
3. ASME Section VIII + CE / VdTUEV

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

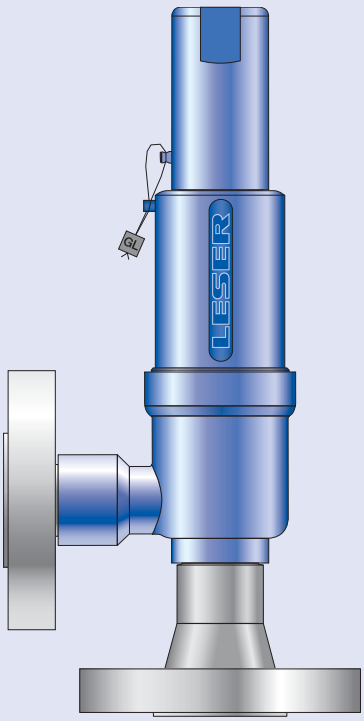
How to order – Article numbers



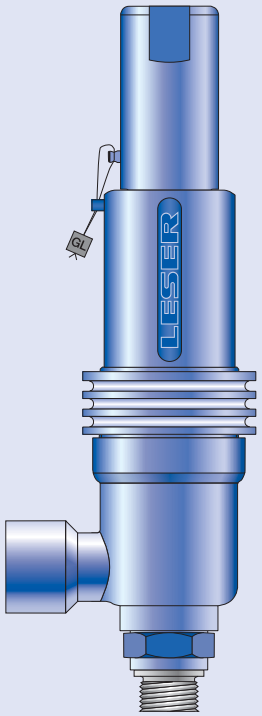
Type 462 Male
Packed lever H4
Conventional design



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						
			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
O-ring material					NBR "N" J30	
					CR "K" J21	
					EPDM "D" J22	
					FKM "L" J23	
					FFKM "C" J20	
Outlet body casted						
Inlet body	**1.4104**	**H2**	Art.-No. **4623.**	**2902**	**2912**	**2922**
Outlet body	**0.7043**	**H3**	Art.-No. **4623.**	**2903**	**2913**	**2923**
Bonnet	**0.7043**	**H4**	Art.-No. **4623.**	**2904**	**2914**	**2924**
	p [bar_g]		S/G/L	**0.5 – 250**	**0.5 – 180**	**0.5 – 92.5**
	p [psig]			**7.3 – 3626**	**7.3 – 2611**	**7.3 – 1342**
Outlet body investment casted						
Inlet body	**1.4404**	**H2**	Art.-No. **4622.**	**3772**	**3782**	**3792**
Outlet body Bonnet	**1.0619 (WCB)**	**H3**	Art.-No. **4622.**	**3773**	**3783**	**3793**
	1.0460	**H4**	Art.-No. **4622.**	**3774**	**3784**	**3794**
	p [bar_g]		S/G/L	**0.5 – 250**	**0.5 – 180**	**0.5 – 92.5**
	p [psig]			**7.3 – 3626**	**7.3 – 2611**	**7.3 – 1342**
Outlet body investment casted						
Inlet body **Outlet body**	**1.4404 1.4408 (CF8M)**	**H2**	Art.-No. **4624.**	**2192**	**2202**	**2212**
Bonnet	**1.4404**	**H4**	Art.-No. **4624.**	**2194**	**2204**	**2214**
	p [bar_g]		S/G/L	**0.5 – 250**	**0.5 – 180**	**0.5 – 92.5**
	p [psig]			**7.3 – 3626**	**7.3 – 2611**	**7.3 – 1342**
Outlet body deep-drawn						
All body and trim parts		**H2**	Art.-No. **4624.**	**2952**	**2962**	**2972**
	1.4404	**H4**	Art.-No. **4624.**	**2954**	**2964**	**2974**
	p [bar_g]		S/G/L	**0.5 – 250**	**0.5 – 180**	**0.5 – 92.5**
	p [psig]			**7.3 – 3626**	**7.3 – 2611**	**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			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 1 1/2"	1 1/2" x 1 1/2"
Actual Orifice diameter d_0 [mm]			9	9	9	13	13	13	17.5	17.5	17.5	17.5
Actual Orifice area A_0 [mm²]			63.6	63.6	63.6	133	133	133	241	241	241	241
Weight		[kg]	2.6	2.6	2.6	2.6	2.6	2.6	3.0	3.0	3.0	3.0
	Balanced bellows	[kg]	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"

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 1 1/2"	1 1/2" x 1 1/2"
Actual Orifice diameter d_0 [mm]			9	9	9	13	13	13	17.5	17.5	17.5	17.5
Center to face / Height												
DIN ISO 228-1 / **ASME B1.20.1**	**G** / **NPT**	Inlet a	53	56	62	53	56	62	60	66	67	73
Center to face [mm]		Outlet b	75	75	75	75	75	75	75	75	75	75
Height [mm]		H max.	283	286	292	283	286	292	287	293	294	300
	Balanced bellows	H max.	315	318	324	315	318	324	319	325	326	332
ISO 7-1/BS 21	**Rc**	Inlet a	53	56	64	53	56	64	60	68	–	77
Center to face [mm]		Outlet b	75	75	75	75	75	75	75	75	–	75
Height [mm]		H max.	283	286	294	283	286	294	287	295	–	304
	Balanced bellows	H max.	315	318	326	315	318	326	319	327	–	336

Inlet thread "Male"

Size outlet body			1"	1"	1 1/2"
Actual Orifice diameter d_0 [mm]			9	13	17.5
Center to face [mm]					
DIN ISO 228-1	**G**	Inlet 1/2" – 1" a	52	–	–
		Inlet 1"– 2" a	–	–	56
		Outlet b	75	75	75
ISO 7-1/BS 21	**R**	Inlet 1/2" – 1" a	49	49	–
ASME B1.20.1	**NPT**	Inlet 1" – 2" a[1)]	–	–	53
		Outlet b	75	75	75

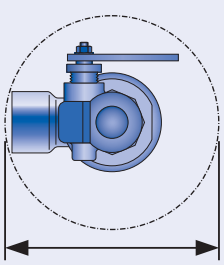
Height [mm]

			Conventional design						Balanced bellows					
Size inlet thread			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	**G**	H max.	296	298	301	303	305	–	328	330	333	335	337	–
ISO 7-1/BS 21	**R**	H max.	298	299	303	–	305	–	330	331	335	–	337	–
ASME B1.20.1	**NPT**	H max.	301	301	307	307	308	309	333	333	339	340	340	341

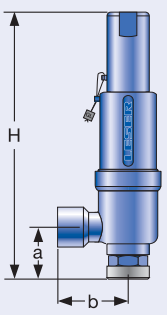
Length of screwed end "c" [mm]

Size inlet thread		1/2"	3/"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**	14	16	18	20	22	24
ISO 7-1/BS 21	**R**	19	20	23	25	25	–
ASME B1.20.1	**NPT**	22	22	27	28	28	29

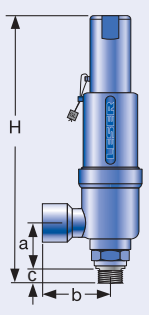
Available threaded connections refer to page 09/06. [1)] Inlet thread R only up to 1 1/2".



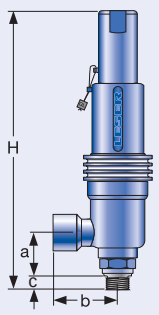
Required installation diameter



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]			9	13	17.5	9	13	17.5
Actual Orifice area A_0 [mm²]			63.6	133	241	63.6	133	241
DIN EN 1092-1 (Available flange sizes refer to page 09/07)								
			Flange rating PN 40 – 400					
Center to face	[mm]	Inlet a	100	100	105	100	100	105
		Outlet b	100	100	100	100	100	100
Height	[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	100	100	105	100	100	105
		Outlet b	100	100	100	100	100	100
Height	[mm]	H max.	330	330	333	375	375	378

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

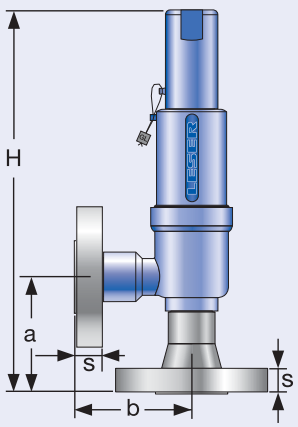
Weight

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

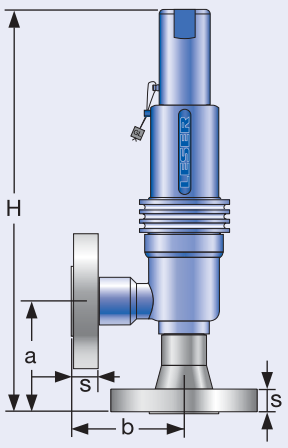
Weight net (without inlet and outlet flange)	[kg]	m_N	2.6	2.6	3	3.8	3.8	4.2

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	m_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	0.9	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	m_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Weight slip on flange	[kg]	m_F	1.3	–	2.6	3.5	5	7.5		1	2.1	2.1	4.1	4.1	5.1
DN 40									**NPS 1 1/2"**						
Flange thickness	[mm]	s	21	–	23	32	–	–		22	24	24	32	–	–
Weight slip on flange	[kg]	m_F	2.1	–	2.9	4.3	–	–		1.4	2.2	2.2	3.9	–	–



Conventional design



Balanced bellows

Dimensions and weights – US Units

Threaded connections

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 1 1/2"	1 1/2" x 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
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
Weight		[lbs]	5.7	5.7	5.7	5.7	5.7	5.7	6.6	6.6	6.6	6.6
	Balanced bellows	[lbs]	7.5	7.5	7.5	7.5	7.5	7.5	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

Inlet thread "Female"

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 1 1/2"	1 1/2" x 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
Center to face / Height												
DIN ISO 228-1	**G**	Inlet a	2 3/32	2 7/32	2 7/16	2 3/32	2 7/32	2 7/16	2 3/8	2 19/32	2 5/8	2 7/8
ASME B1.20.1	**NPT**											
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 5/32	11 1/14	11 1/2	11 5/32	11 1/4	11 1/2	11 5/16	11 17/32	11 9/16	11 13/16
	Balanced bellows	H max.	12 13/32	12 17/32	12 3/4	12 13/32	12 17/32	12 3/4	12 9/16	12 25/32	12 27/32	13 1/16
ISO 7-1/BS 21	**Rc**	Inlet a	2 3/32	2 7/32	2 17/32	2 3/32	2 7/32	2 17/32	2 3/8	2 11/16	–	3 1/32
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	–	2 15/16
Height [inch]		H max.	11 5/32	11 1/14	11 9/16	11 5/32	11 1/14	11 9/16	11 5/16	11 5/8	–	11 31/32
	Balanced bellows	H max.	12 13/32	12 17/32	12 27/32	12 13/32	12 17/32	12 27/32	12 9/16	12 7/8	–	13 7/32

Inlet thread "Male"

Size outlet body			1"	1"	1 1/2"
Actual Orifice diameter d_0 [mm]			9	13	17.5
Center to face [inch]					
DIN ISO 228-1	**G**	Inlet 1/2" – 1" a	2 1/16	–	–
		Inlet 1"– 2" a	–	–	2 7/32
		Outlet b	2 15/16	2 15/16	2 15/16
ISO 7-1/BS 21	**R**	Inlet 1/2" – 1" a	1 15/16	1 15/16	–
ASME B1.20.1	**NPT**	Inlet 1" – 2" a[1)]	–	–	2 3/32
		Outlet b	2 15/16	2 15/16	2 15/16

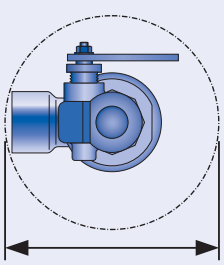
Height [inch]

			Conventional design						Balanced bellows					
		Size inlet thread	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	**G**	H max.	11 21/32	11 23/32	11 27/32	11 15/16	12	–	12 29/32	13	13 1/8	13 3/16	13 9/32	–
ISO 7-1/BS 21	**R**	H max.	11 23/32	11 25/32	11 15/16	–	12	–	13	13 1/32	13 3/16	–	13 9/32	–
ASME B1.20.1	**NPT**	H max.	11 27/32	11 27/32	12 3/32	12 1/8	12 1/8	12 5/32	13 1/8	13 1/8	13 11/32	13 3/8	13 3/8	13 7/16

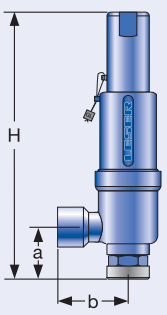
Length of screwed end "c" [inch]

		Size inlet thread	1/2"	3/"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1	**G**		9/16	5/8	23/32	25/32	7/8	15/16
ISO 7-1/BS 21	**R**		3/4	25/32	29/32	31/32	31/32	–
ASME B1.20.1	**NPT**		7/8	7/8	1 1/16	1 3/32	1 3/32	1 5/32

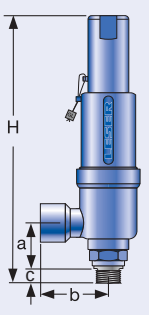
Available treaded connections refer to page 09/06. [1)] Inlet thread R only up to 1 1/2".



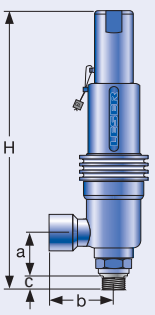
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Balanced bellows

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 [inch²]			0.099	0.206	0.374	0.099	0.206	0.374
DIN EN 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	[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	[inch]	H max.	13	13	$13^{1}/_{8}$	$14^{3}/_{4}$	$14^{3}/_{4}$	$14^{7}/_{8}$

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

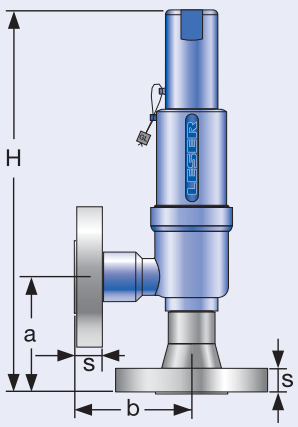
Weight

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

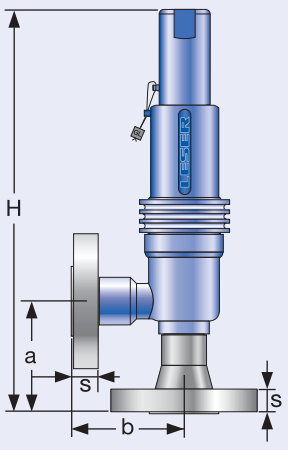
Weight net (without inlet and outlet flange)	[lbs]	m_N	5.7	5.7	6.6	8.4	8.4	9.3

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
		DN 15							**NPS $^{1}/_{2}$"**						
Flange thickness	[mm]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
Weight slip on flange	[lbs]	m_F	1.8	–	2.6	5.5	5.5	7.9		1.3	2.0	2.0	4.6	4.6	6.6
		DN 20							**NPS $^{3}/_{4}$"**						
Flange thickness	[mm]	s	$^{25}/_{32}$	$^{7}/_{8}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{1}/_{4}$
Weight slip on flange	[lbs]	m_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.1	5.1	7.7
		DN 25							**NPS 1"**						
Flange thickness	[mm]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{3}/_{32}$	$1^{9}/_{16}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Weight slip on flange	[lbs]	m_F	2.9	–	5.7	7.7	11.0	16.5		2.2	4.6	4.6	9.0	9.0	11.2
		DN 40							**NPS $1^{1}/_{2}$"**						
Flange thickness	[mm]	s	$^{13}/_{16}$	–	$^{29}/_{32}$	$1^{1}/_{4}$	–	–		$^{7}/_{8}$	$^{15}/_{16}$	$^{15}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange	[lbs]	m_F	4.5	–	6.3	9.5	–	–		3.2	4.8	4.8	8.6	–	–



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 [mm²]		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 standard bellows	p [bar_g] S/G/L	3			3			3				
Min. set pressure[1] high press. bellows	p [bar_g] S/G/L	40			40			40				
Maximum set pressure	p [bar_g] S/G/L	250			180			92.5				
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)						**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 standard bellows	p [bar_g] S/G/L	3			3			3				
Min. set pressure[1] high press. bellows	p [bar_g] S/G/L	40			40			40				
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]	-29										
	max. [°C]	+150										
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 standard bellows	p [bar_g] S/G/L	3			3			3				
Min. set pressure[1] high press. bellows	p [bar_g] S/G/L	40			40			40				
Maximum set pressure	p [bar_g] S/G/L	250			180			92.5				
Temperature acc. to DIN EN[2]	min. [°C]	-45										
	max. [°C]	+150										
Temperature acc. to ASME[2]	min. [°C]	-45										
	max. [°C]	+150										

[1] Min. set pressure high pressure bellows = Max. pressure standard bellows.
For DIN EN applications at temperatures under -10°C please proceed according to AD 2000-Merkblatt W10.
[2] The temperature is limited by the 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 standard bellows	p [psig] S/G/L	43.5			43.5			43.5				
Min. set pressure[1] high press. bellows	p [psig] S/G/L	580			580			580				
Maximum set pressure	p [psig] S/G/L	3626			2611			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 standard bellows	p [psig] S/G/L	43.5			43.5			43.5				
Min. set pressure[1] high press. bellows	p [psig] S/G/L	580			580			580				
Maximum set pressure	p [psig] S/G/L	3626			2611			1342				
Temperature acc. to DIN EN	min. [°F]	-49										
	max. [°F]	+302										
Temperature acc. to ASME	min. [°F]	-20										
	max. [°F]	+302										
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 standard bellows	p [psig] S/G/L	43.5			43.5			43.5				
Min. set pressure[1] high press. bellows	p [psig] S/G/L	580			580			580				
Maximum set pressure	p [psig] S/G/L	3626			2611			1342				
Temperature acc. to DIN EN	min. [°F]	-49										
	max. [°F]	+302										
Temperature acc. to ASME	min. [°F]	-49										
	max. [°F]	+302										

[1] Min. set pressure high pressure bellows = Max. pressure standard bellows.
For DIN EN applications at temperatures under -10°C please proceed according to AD 2000-Merkblatt W10.
[2] The temperature is limited by the soft seal material. The stated values are valid for EPDM.

Order information – Spare parts

Spare parts

Actual Orifice diameter d_0 [mm]			9					
Actual Orifice area A_0 [mm²]			63.6					
Actual Orifice diameter d_0 [inch]			0.354					
Actual Orifice area A_0 [inch²]			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	–	–	–
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	–	–	–
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 [mm²]			133					
Actual Orifice diameter d_0 [inch]			0.512					
Actual Orifice area A_0 [inch²]			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	–	–	–
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	–	–	–
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 [mm²]			241					
Actual Orifice diameter d_0 [inch]			0.689					
Actual Orifice area A_0 [inch²]			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	–	–	–	–	-	–
ASME B1.20.1	**NPT**	316L	–	–	136.3649.9204	136.8549.9204	136.8649.9204	136.8749.9204
		316L stellited	–	–	–	–	–	–
Body (Item 1): Female th read			**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	–	–	–	–
ASME B1.20.1	**NPT**	316L	–	136.8449.9211	136.3649.9211	136.8549.9211	136.8649.9211	–
		316L stellited	–	–	–	–	–	–

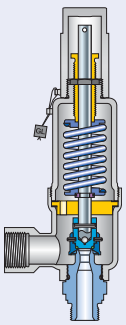
Order information – Spare parts

Spare parts

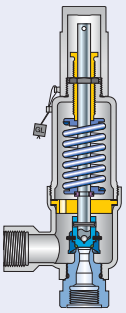
Actual Orifice diameter d_0 [mm]			9	13	17.5
Actual Orifice area A_0 [mm²]			63.6	133	241
Actual Orifice diameter d_0 [inch]			0.354	0.512	0.689
Actual Orifice area A_0 [inch²]			0.099	0.206	0.374
Body (Item 1): Flange design				**Material-No. / Art.-No.**	
DN 15 / NPS 1/2"	PN 40 – 400 / CL300 – 2500	316L	136.7449.9208	136.7949.9208	–
DN 20 / NPS 3/4"	PN 40 – 400 / CL150 – 2500	316L	136.3949.9208	136.5049.9208	136.8449.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208	136.3549.9208	136.3649.9208
	CL150	316L	136.7649.9202	136.8149.9202	136.3649.9202
	CL300 – 2500	316L	136.3449.9208	136.3549.9208	136.3649.9208
Disc (Item 7): Soft seal with O-ring				**Material-No. / Art.-No.**	
Disc	NBR	"N"	200.9349.9081	220.4549.9081	220.4649.9081
	EPDM	"D"	200.9349.9041	220.4549.9041	220.4649.9041
	CR	"K"	200.9349.9051	220.4549.9051	220.4649.9051
	FKM	"L"	200.9349.9071	220.4549.9071	220.4649.9071
	FFKM	"C"	200.9349.9091	220.4549.9091	220.4649.9091
Disc (Item 7.4): O-ring				**Material-No. / Art.-No.**	
	NBR	"N"	502.0123.2681	502.0139.2681	502.0202.2681
	EPDM	"D"	502.0123.2641	502.0139.2641	502.0202.2641
	CR	"K"	502.0123.2651	502.0139.2651	502.0202.2651
	FKM	"L"	502.0123.2671	502.0139.2671	502.0202.2671
	FFKM	"C"	502.0123.2691	502.0139.2691	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	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/CL600		5021.1050		
	> PN 40/CL600		5021.1051		

Available Options

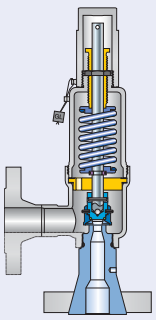
Male thread



Female thread



Flanged version

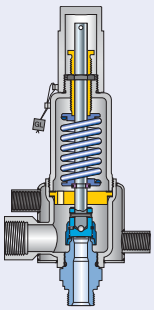


Soft seal o-ring disc

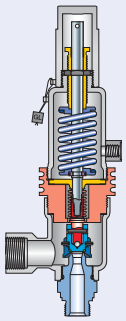
J30: NBR	“N”
J21: CR	“K”
J22: EPDM	“D”
J23: FKM	“L”
J20: FFKM	“C”

Heating jacket

H29

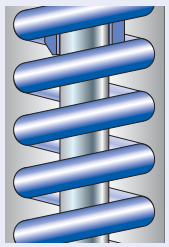


Balanced bellows



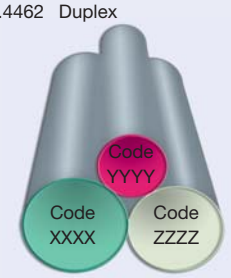
INCONEL X-750 spring

X08



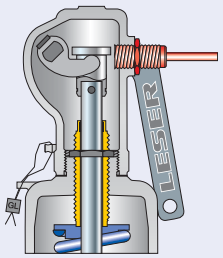
Special material

2.4610	Hastelloy® C4
2.4360	Monel® 400
1.4462	Duplex



Lift indicator

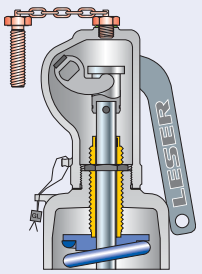
J93: Lift indicator



Test gag

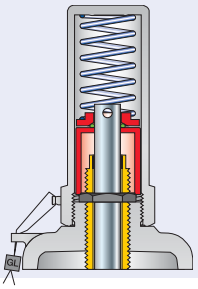
J69: H4

J70: H2



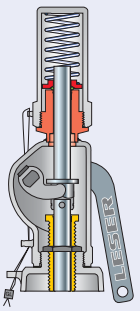
O-ring-damper H2

J65



O-ring-damper H4

J66



Approvals

Approvals				
Actual Orifice diameter d_0 [mm]		9	13	17.5
Actual Orifice area A_0 [mm²]		63.6	133	241
Actual Orifice diameter d_0 [inch]		0.354	0.512	0.689
Actual Orifice area A_0 [inch²]		0.099	0.206	0.374
Europe		**Coefficient of discharge K_{dr}**		
PED / DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13 Rev. 2		
	S/G	0.83	0.81	0.79
	L	0.61	0.61	0.52
Germany		**Coefficient of discharge α_w**		
PED / AD 2000-Merkblatt A2	Approval No.	TÜV SV 909		
	S/G	0.83	0.81	0.79
	L	0.61	0.61	0.52
United States		**Coefficient of discharge K**		
ASME Sec. VIII Div. 1	Approval No.	M 37112		
	S/G	0.811		
	Approval No.	M 37101		
	L	0.566		
Canada		**Coefficient of discharge K**		
CRN	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.811		
	L	0.566		
China		**Coefficient of discharge α_w**		
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.61	0.52
Russia		**Coefficient of discharge α_w**		
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.61	0.52
Kazakhstan		**Coefficient of discharge α_w**		
GOST-K	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.61	0.52
Belarus		**Coefficient of discharge α_w**		
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com		
	S/G	0.83	0.81	0.79
	L	0.61	0.61	0.52

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
U.S. Coast Guard	U.S.C.G	www uscg.org

The valid certification number is changed with every reneval.

A sample certificate including the valid certification number can be found at www.leser.com

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 [mm²]	63.6			133.0			241.0		
LEO*) [inch²]	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_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/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		511	7.17		1040	15		1839	23.1
14		590	7.75		1201	16.2		2123	25
16		669	8.28		1363	17.3		2408	26.7
18		748	8.78		1524	18.3		2693	28.3
20		827	9.26		1685	19.3		2977	29.8
22		906	9.71		1846	20.3		3262	31.3
24		986	10.1		2007	21.2		3547	32.7
26		1065	10.6		2168	22		3831	34
28		1144	11		2329	22.9		4116	35.3
30		1223	11.3		2490	23.7		4401	36.5
32		1302	11.7		2651	24.4		4685	37.7
34		1381	12.1		2812	25.2		4970	38.9
36		1460	12.4		2973	25.9		5255	40
38		1539	12.8		3134	26.6		5539	41.1
40		1618	13.1		3295	27.3		5824	42.2
42		1698	13.4		3456	28		6109	43.2
44		1777	13.7		3617	28.7		6393	44.3
46		1856	14		3779	29.3		6678	45.3
48		1935	14.3		3940	29.9		6963	46.2
50		2014	14.6		4101	30.5		7247	47.2
60		2409	16		4906	33.5		8671	51.7
70		2805	17.3		5711	36.1		10094	55.8
80		3201	18.5		6517	38.6		11518	59.7
90		3596	19.6		7322	41		12941	63.3
100		3992	20.7		8127	43.2		14364	66.7
120		4783	22.7		9738	47.3			
140		5574	24.5		11349	51.1			
160		6365	26.2		12959	54.6			
180		7156	27.8		14570	57.9			
200		7947	29.3						
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	**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		281	28.2		584	58.7		1058	106
180		313	29.9		652	62.3		1180	113
200		346	31.5		719	65.6		1302	119
220		378	33.1		787	68.8		1424	125
240		410	34.5		854	71.9		1546	130
260		443	36		921	74.8		1669	135
280		475	37.3		989	77.6		1791	141
300		508	38.6		1056	80.4		1913	146
320		540	39.9		1124	83		2035	150
340		572	41.1		1191	85.6		2157	155
360		605	42.3		1259	88		2279	159
380		637	43.5		1326	90.5		2401	164
400		670	44.6		1393	92.8		2523	168
420		702	45.7		1461	95.1		2645	172
440		734	46.8		1528	97.3		2767	176
460		767	47.8		1596	99.5		2889	180
480		799	48.9		1663	102		3011	184
500		832	49.9		1731	104		3134	188
550		913	52.3		1899	109		3439	197
600		994	54.6		2068	114		3744	206
650		1075	56.9		2236	118		4049	214
700		1156	59		2405	123		4354	222
750		1237	61.1		2573	127		4660	230
800		1318	63.1		2742	131		4965	238
850		1399	65		2911	135		5270	245
900		1480	66.9		3079	139		5575	252
950		1561	68.7		3248	143		5881	259
1000		1642	70.5		3416	147		6186	266
1100		1804	74		3753	154		6796	279
1200		1966	77.2		4091	161		7407	291
1300		2128	80.4		4428	167		8017	303
1400		2290	83.4		4765	174		8628	314
1500		2452	86.4		5102	180			
1600		2614	89.2		5439	186			
1700		2776	91.9		5776	191			
1800		2938	94.6		6113	197			
1900		3100	97.2		6451	202			
2000		3262	99.7		6788	208			
2200		3586	105		7462	218			
2400		3910	109		8136	227			
2600		4234	114		8811	237			
2800		4558	118		9485	246			
3000		4882	122						
3200		5206	126						
3400		5530	130						
3600		5854	134						
3800		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

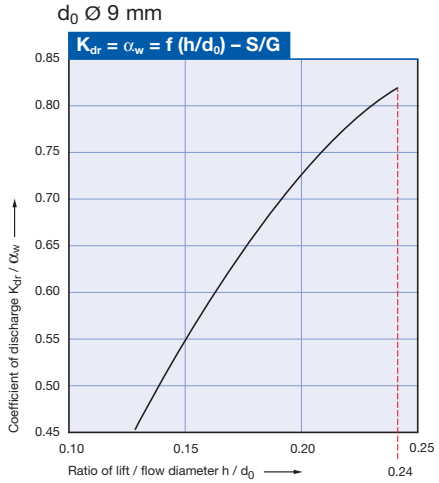
Determination of coefficent of discharge in case of lift restriction or back pressure

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

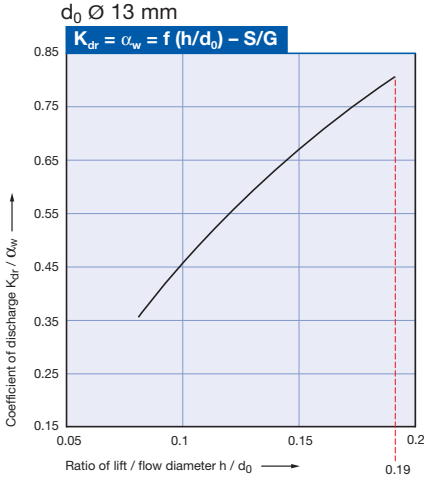
How to use please refer to page 00/08

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

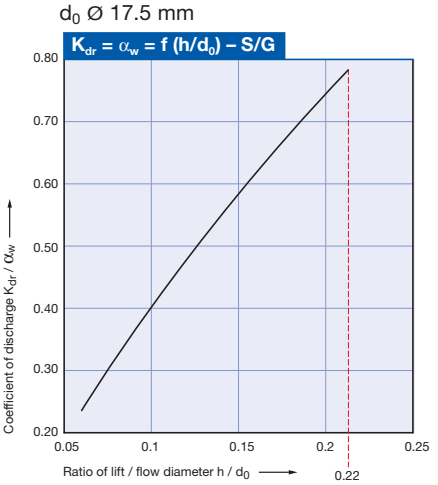
d_0 Ø 9 mm



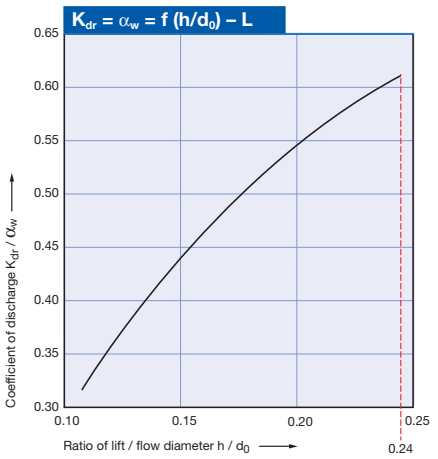
d_0 Ø 13 mm



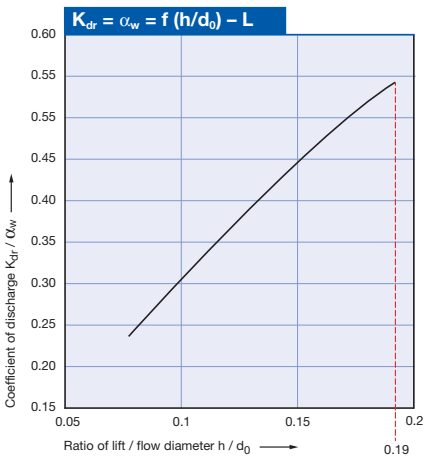
d_0 Ø 17.5 mm



d_0 Ø 9 mm



d_0 Ø 13 mm



d_0 Ø 17.5 mm

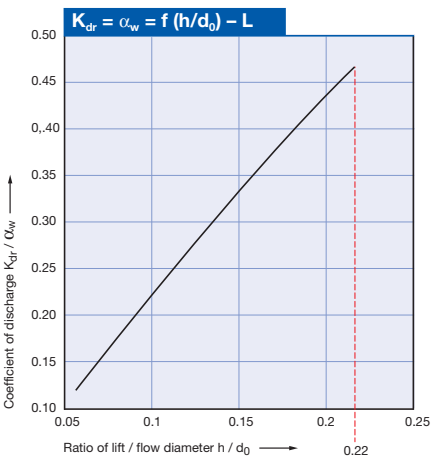
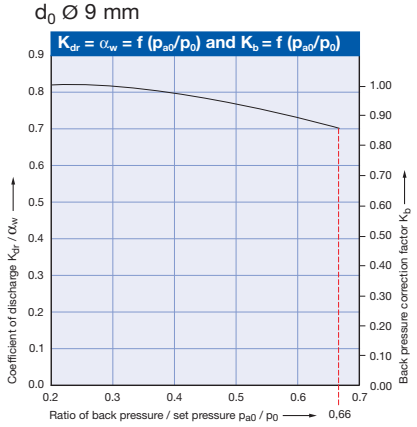
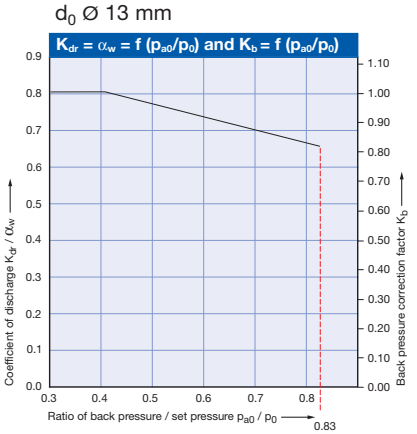


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)

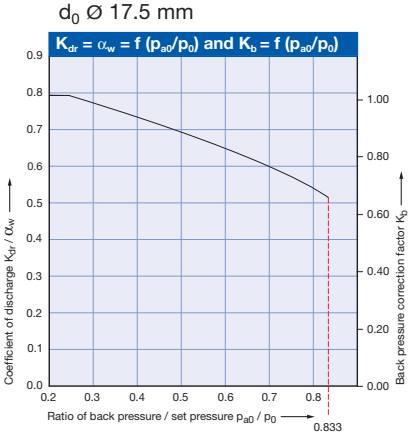
d_0 Ø 9 mm



d_0 Ø 13 mm



d_0 Ø 17.5 mm



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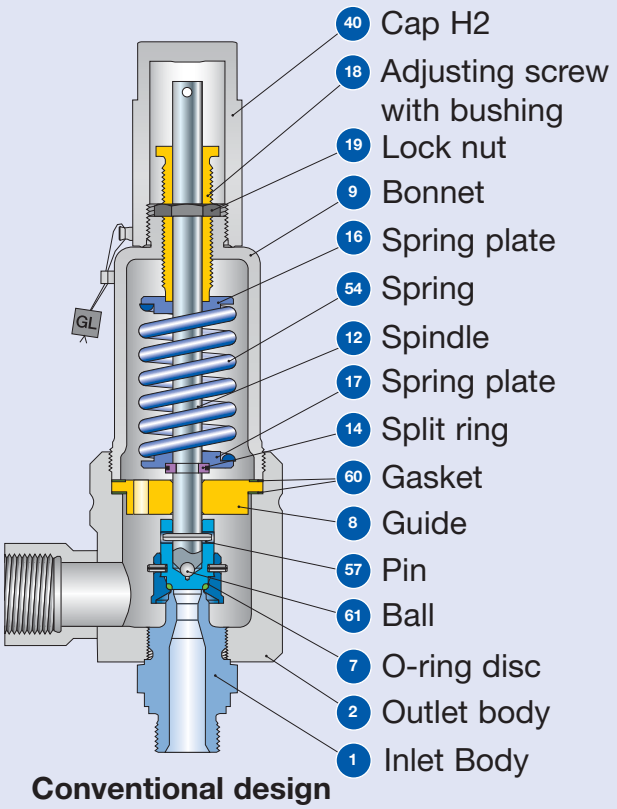
Type 462 HDD

Safety Relief Valves Heavy Duty Design – spring loaded

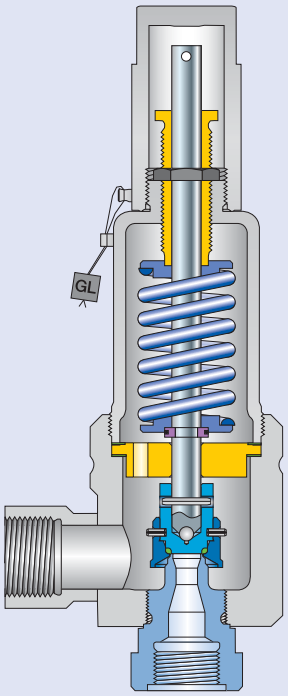
Type 462 HDD
Cap H2

Contents **Chapter/Page**

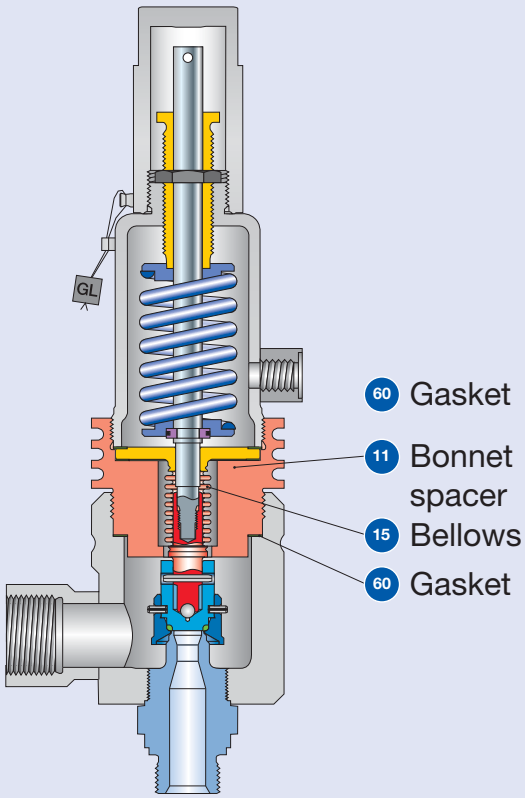
Available designs



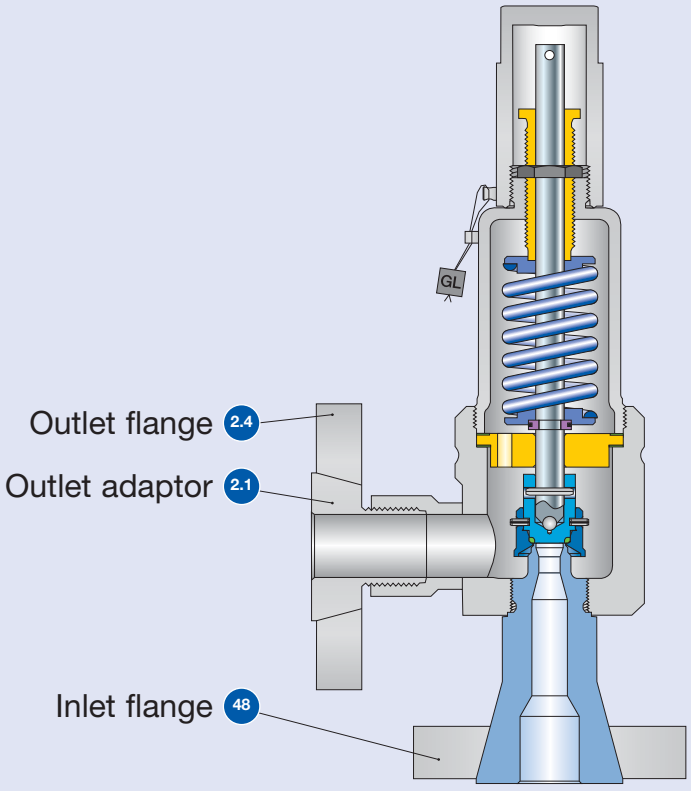
Conventional design
Threaded connection



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
2.1	Outlet adaptor	Flange connection	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L
7	O-ring disc		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 Perfluor
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
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 bushing		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 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.

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How to order – Series 462 HDD – Example for numbering system

1 Article Number	2 Set Pressure	3 Connections	
4624.2252	10 bar_g	V62	V71

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

Please state unit (in gauge)!

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

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

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

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4 Options

J30 | | | |

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 $p \leq 40$ bar$_g$ **J78**; $p > 40$ bar$_g$ **J55**
- Elastomer bellows **J79**
- Heating jacket **H29**
- INCONEL X-750 spring **X08**

5 Documentation

H01 | L30 | |

Please select requested documentation:

Inspections, tests: — **Option code**

DIN EN 10204-3.2: TÜV-Nord
Certificate for test pressure **M33**

LESER CGA (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**

6 Code and Medium

2.0

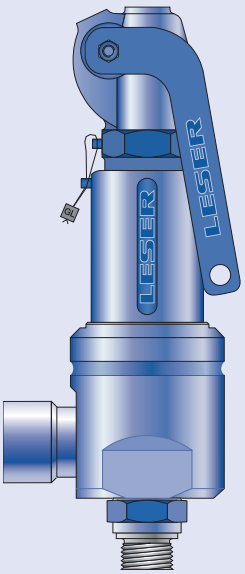
1 2
2 . 0

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)

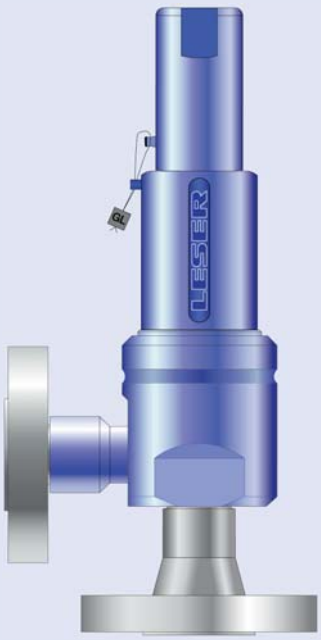
Type 462 HDD

How to order – Article numbers

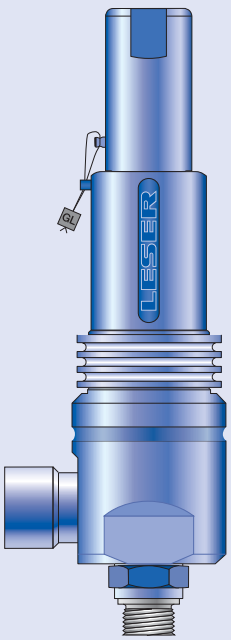


Type 462 HDD male
Packed lever H4
Conventional design

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						
	Actual Orifice diameter d_0 [mm]			9		13
	Actual Orifice area A_0 [mm²]			63,9		133
	Actual Orifice diameter d_0 [inch]			0.354		0.512
	Actual Orifice area A_0 [inch²]			0.099		0.206
O-ring material				NBR	“N”	J30
				CR	“K”	J21
				EPDM	“D”	J22
				FKM	“L”	J23
				FFKM	“C”	J20
Body material: 1.4404 (316L)						
All body and trim parts	**1.4404**	**H2**	Art.-No. **4624.**	**2252**		**2272**
		H4	Art.-No. **4624.**	**2254**		**2274**
	p [bar_g]	S/G/L		**0.5 – 350**		**0.5 – 180**
	p [psig]	S/G/L		**7.3 – 5076**		**7.3 – 2611**

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

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Dimensions and weights – Metric Units

Threaded connections

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d_0 [mm]			9	9	9	13	13	13
Actual Orifice area A_0 [mm²]			63.6	63.6	63.6	133	133	133
Weight		[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"

Size Outlet body			1/2" x 1"	3/4" x 1"	1" x 1"	1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d_0 [mm]			9	9	9	13	13	13
Center to face / Height								
DIN ISO 228-1 / **ASME B1.20.1**	**G** / **NPT**	Inlet a	53	56	62	53	56	62
Center to face [mm]		Outlet b	75	75	75	75	75	75
Height [mm]		H max.	283	286	292	283	286	292
	Balanced bellows	H max.	315	318	324	315	318	324
ISO 7-1/BS 21	**Rc**	Inlet a	53	56	64	53	56	64
Center to face [mm]		Outlet b	75	75	75	75	75	75
Height [mm]		H max.	283	286	294	283	286	294
	Balanced bellows	H max.	315	318	326	315	318	326

Inlet thread "Male"

Size outlet body			1"	1"
Actual Orifice diameter d_0 [mm]			9	13
Center to face [mm]				
DIN ISO 228-1	**G**	Inlet a	52	–
		Outlet b	75	75
ISO 7-1/BS 21 / **ASME B1.20.1**	**R** / **NPT**	Inlet a	49	49
		Outlet b	75	75

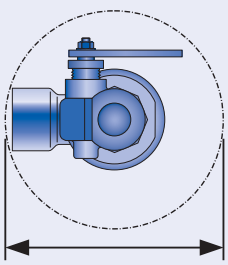
Height [mm]

		Size inlet thread	Conventional design			Balanced bellows		
			1/2"	3/4"	1"	1/2"	3/4"	1"
DIN ISO 228-1	**G**	H max.	296	298	301	328	330	333
ISO 7-1/BS 21	**R**	H max.	298	299	303	330	331	335
ASME B1.20.1	**NPT**	H max.	301	301	307	333	333	339

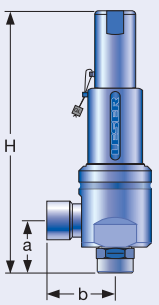
Length of screwed end "c" [mm]

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

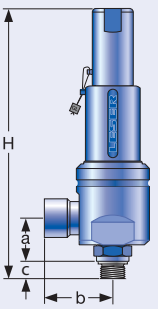
Available threaded connections refer to page 09/06.



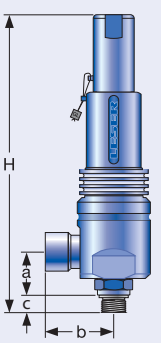
Required installation diameter



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]			9	13	9	13
Actual Orifice area A_0 [mm²]			63.6	133	63.6	133
DIN EN 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	[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	[mm]	H max.	330	330	375	375

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

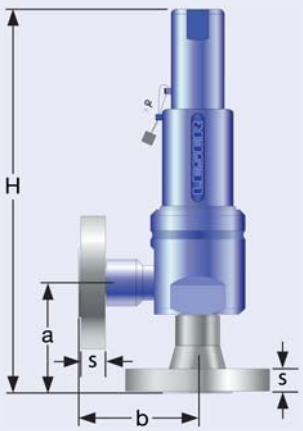
Weight

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

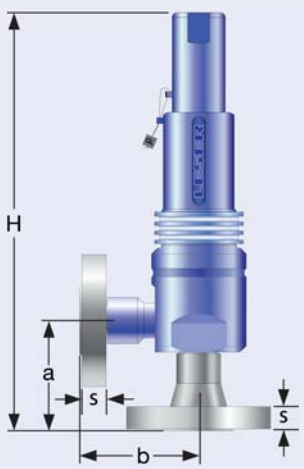
Weight net (without inlet and outlet flange)	[kg]	m_N	2.6	2.6	3	3.8

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS 1/2"**						
Flange thickness	[mm]	s	18	–	22	28	28	30		14	18	18	26	26	30.2
Weight slip on flange	[kg]	m_F	0.8	–	1.2	2.5	2.5	3.6		0.6	0.9	0.9	2.1	2.1	3
DN 20									**NPS 3/4"**						
Flange thickness	[mm]	s	20	22	–	–	–	–		15	18	18	25.4	25.4	32
Weight slip on flange	[kg]	m_F	1.1	1.3	–	–	–	–		0.8	1.4	1.4	2.3	2.3	3.5
DN 25									**NPS 1"**						
Flange thickness	[mm]	s	22	–	26	30	36	40		17	21.5	21.5	32.5	32.5	40
Flange thickness	[kg]	m_F	1.3	–	2.6	3.5	5	7.5		1	2.1	2.1	4.1	4.1	5.1
DN 40									**NPS 1 1/2"**						
Flanschblattdicke	[mm]	s	21	–	23	32	–	–		22	24	24	32	–	–
Weight slip on flange	[kg]	m_F	2.1	–	2.9	4.3	–	–		1.4	2.2	2.2	3.9	–	–



Conventional design



Balanced bellows

LESER

Dimensions and weights – US Units

Threaded connections

Size Outlet body			$^1/_2$" x 1"	$^3/_4$" x 1"	1" x 1"	$^1/_2$" x 1"	$^3/_4$" x 1"	1" x 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		[lbs]	8.7	8.7	8.7	8.7	8.7	8.7
	Balanced bellows	[lbs]	10.4	10.4	10.4	10.4	10.4	10.4
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"

Size Outlet body			$^1/_2$" x 1"	$^3/_4$" x 1"	1" x 1"	$^1/_2$" x 1"	$^3/_4$" x 1"	1" x 1"
Actual Orifice diameter d_0 [inch]			0.354	0.354	0.354	0.512	0.512	0.512
Center to face / Height								
DIN ISO 228-1 / **ASME B1.20.1**	**G** / **NPT**	Inlet a	$2^3/_{32}$	$2^7/_{32}$	$2^7/_{16}$	$2^3/_{32}$	$2^7/_{32}$	$2^7/_{16}$
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 [inch]		H max.	$11^5/_{32}$	$11^1/_{14}$	$11^1/_2$	$11^5/_{32}$	$11^1/_{14}$	$11^1/_2$
	Balanced bellows	H max.	$12^{13}/_{32}$	$12^{17}/_{32}$	$12^3/_4$	$12^{13}/_{32}$	$12^{17}/_{32}$	$12^3/_4$
ISO 7-1/BS 21	**Rc**	Inlet a	$2^3/_{32}$	$2^7/_{32}$	$2^{17}/_{32}$	$2^3/_{32}$	$2^7/_{32}$	$2^{17}/_{32}$
Center to face [inch]		Outlet b	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$
Height [inch]		H max.	$11^5/_{32}$	$11^1/_{14}$	$11^9/_{16}$	$11^5/_{32}$	$11^1/_{14}$	$11^9/_{16}$
	Balanced bellows	H max.	$12^{13}/_{32}$	$12^{17}/_{32}$	$12^{27}/_{32}$	$12^{13}/_{32}$	$12^{17}/_{32}$	$12^{27}/_{32}$

Inlet thread "Male"

Size outlet body			1"		1"
Actual Orifice diameter d_0 [inch]			0.354		0.512
Center to face [inch]					
DIN ISO 228-1	**G**	Inlet a	$2^1/_{16}$		–
		Outlet b	$2^{15}/_{16}$		$2^{15}/_{16}$
ISO 7-1/BS 21 / **ASME B1.20.1**	**R** / **NPT**	Inlet a	$1^{15}/_{16}$		$1^{15}/_{16}$
		Outlet b	$2^{15}/_{16}$		$1^{15}/_{16}$

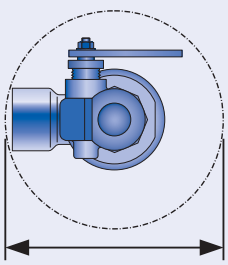
Height [inch]

			Conventional design			Balanced bellows		
		Size inlet thread	$^3/_8$"	$^1/_2$"	$^3/_8$"	$^1/_2$"	$^3/_8$"	$^1/_2$"
DIN ISO 228-1	**G**	H max.	$11^{21}/_{32}$	$11^{23}/_{32}$	$11^{27}/_{32}$	$12^{29}/_{32}$	13	$13^1/_8$
ISO 7-1/BS 21	**R**	H max.	$11^{23}/_{32}$	$11^{25}/_{32}$	$11^{15}/_{16}$	13	$13^1/_{32}$	$13^3/_{16}$
ASME B1.20.1	**NPT**	H max.	$11^{27}/_{32}$	$11^{27}/_{32}$	$12^3/_{32}$	$13^1/_8$	$13^1/_8$	$13^{11}/_{32}$

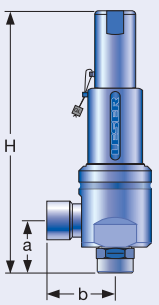
Length of screwed end "c" [inch]

		Size inlet thread	$^1/_2$"	$^3/_4$"	1"
DIN ISO 228-1	**G**		$^9/_{16}$	$^5/_8$	$^{23}/_{32}$
ISO 7-1/BS 21	**R**		$^3/_4$	$^{25}/_{32}$	$^{29}/_{32}$
ASME B1.20.1	**NPT**		$^7/_8$	$^7/_8$	$^{11}/_{16}$

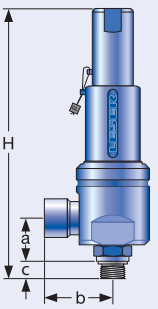
Available threaded connections refer to page 09/06.



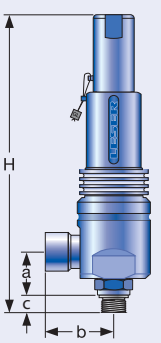
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Balanced bellows

Dimensions and weights – US Units

Flanged connection

			Conventional design		Balanced bellows	
Actual Orifice diameter d_0 [inch]			0.354	0.512	0.354	0.512
Actual Orifice area A_0 [inch²]			0.099	0.206	0.099	0.206
DIN EN 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	[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	[inch]	H max.	13	13	$14^{3}/_{4}$	$14^{3}/_{4}$

Note The outlet dimension b can differ at special combinations of nominal diameter and pressure range if flanged connections are used at the inlet and outlet. Special dimensions are possible. More information at sales@leser.com.

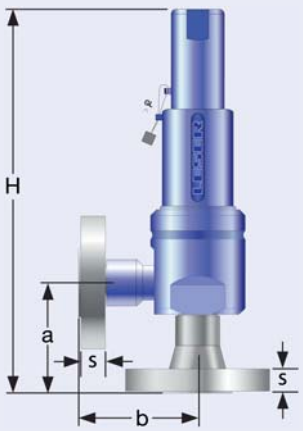
Weight

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

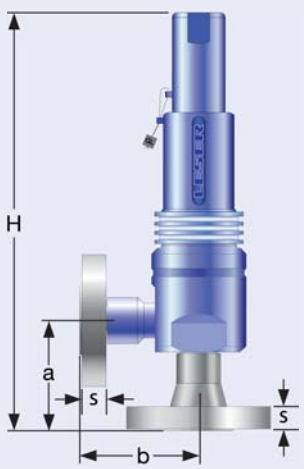
Weight net (without inlet and outlet flange)	[lbs]	m_N	5.7	5.7	8.4	8.4

Flange dimensions

			DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class						
		Size	40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15									**NPS $^{1}/_{2}$"**						
Flange thickness	[inch]	s	$^{23}/_{32}$	–	$^{7}/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$^{9}/_{16}$	$^{23}/_{32}$	$^{23}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
Weight slip on flange	[lbs]	m_F	1.8	–	2.6	5.5	5.5	7.9		1.3	2.0	2.0	4.6	4.6	6.6
DN 20									**NPS $^{3}/_{4}$"**						
Flange thickness	[inch]	s	$^{25}/_{32}$	$^{7}/_{8}$	–	–	–	–		$^{19}/_{32}$	$^{23}/_{32}$	$^{23}/_{32}$	1	1	$1^{1}/_{4}$
Weight slip on flange	[lbs]	m_F	2.4	2.9	–	–	–	–		1.8	3.1	3.1	5.1	5.1	7.7
DN 25									**NPS 1"**						
Flange thickness	[inch]	s	$^{7}/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{3}/_{32}$	$1^{9}/_{16}$		$^{21}/_{32}$	$^{27}/_{32}$	$^{27}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
Flange thickness	[lbs]	m_F	2.9	–	5.7	7.7	11.0	16.5		2.2	4.6	4.6	9.0	9.0	11.2
DN 40									**NPS $1^{1}/_{2}$"**						
Flanschblattdicke	[inch]	s	$^{13}/_{16}$	–	$^{29}/_{32}$	$1^{1}/_{4}$	–	–		$^{7}/_{8}$	$^{15}/_{16}$	$^{15}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange	[lbs]	m_F	4.5	–	6.3	9.5	–	–		3.2	4.8	4.8	8.6	–	–



Conventional design



Balanced bellows

Pressure temperature ratings

Metric Units

Actual Orifice diameter d_0 [mm]		9			13		
Actual Orifice Area A_0 [mm²]		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	$p \leq 250$ 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[1)]	min. [°C]	-45					
	max. [°C]	+150					
Temperature acc. to ASME[1)]	min. [°C]	-45					
	max. [°C]	+150					

US Units

Actual Orifice diameter d_0 [inch]		0.354			0.512		
Actual Orifice Area A_0 [inch²]		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[1)]	min. [°F]	-49					
	max. [°F]	+302					
Temperature acc. to ASME[1)]	min. [°F]	-49					
	max. [°F]	+302					

[1)] The temperature is limited by soft seal material. The stated values are valid for EPDM.

Order information – Spare Parts

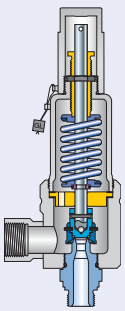
Spare parts

Actual Orifice diameter d_0 [mm]				9		13		
Actual Orifice area A_0 [mm²]				63.6		133		
Actual Orifice diameter d_0 [inch]				0.354		0.512		
Actual Orifice area A_0 [inch²]				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
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
ASME B1.20.1	**NPT**	316L	136.7449.9211	136.7549.9211	136.7649.9211	136.7949.9211	136.8049.9211	136.8149.9211

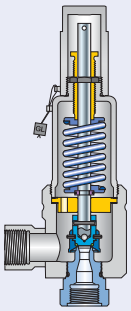
Body (Item 1): Flange design			Material-No. / Art.-No.	
DN 15 / NPS $^1/_2$"	PN 40 – 400 / CL300 – 2500	316L	136.7449.9208	136.7949.9208
DN 20 / NPS $^3/_4$"	PN 40 – 400 / CL150 – 2500	316L	136.3949.9208	136.5049.9208
DN 25 / NPS 1"	PN 40 – 400	316L	136.3449.9208	136.3549.9208
	CL150		136.7649.9202	136.8149.9202
	CL300 – 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.**	
	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/CL600		5021.1050	
	> PN 40/CL600		5021.1051	

Available Options

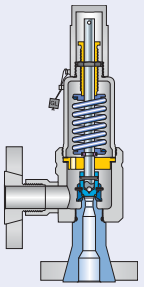
Male thread



Female thread



Flanged version

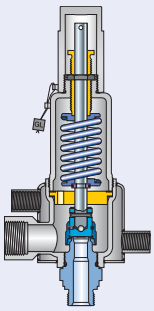


Soft seal o-ring disc

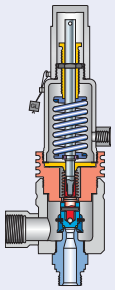
J30: NBR	“N”
J21: CR	“K”
J22: EPDM	“D”
J23: FKM	“L”
J20: FFKM	“C”

Heating jacket

H29

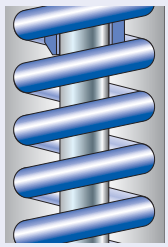


Balanced bellows



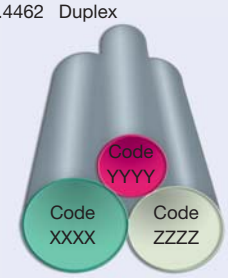
INCONEL X-750 spring

X08



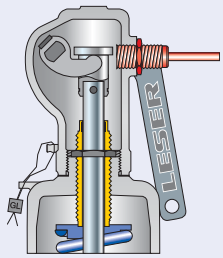
Special material

2.4610	Hastelloy® C4
2.4360	Monel® 400
1.4462	Duplex



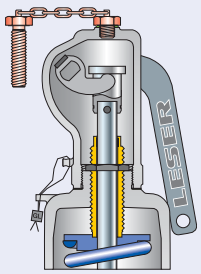
Lift indicator

J93: Lift indicator



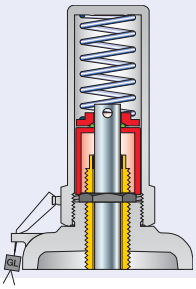
Test gag

J69: H4
J70: H2



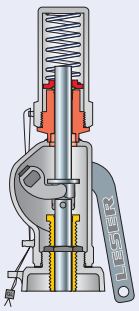
O-ring-damper H2

J65



O-ring-damper H4

J66



Approvals

Approvals			
Actual Orifice diameter d_0 [mm]		9	13
Actual Orifice area A_0 [mm²]		63.6	133
Actual Orifice diameter d_0 [inch]		0.354	0.512
Actual Orifice area A_0 [inch²]		0.099	0.206
Europe		**Coefficient of discharge K_{dr}**	
PED / DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/13 Rev. 2	
	S/G	0.83	0.81
	L	0.61	0.61
Germany		**Coefficient of discharge α_w**	
PED / 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 Div. 1	Approval No.	M 37112	
	S/G	0.811	
	Approval No.	M 37101	
	L	0.566	
Canada		**Coefficient of discharge K**	
CRN	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.811	
	L	0.566	
China		**Coefficient of discharge α_w**	
AQSIQ	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.83	0.81
	L	0.61	0.61
Russia		**Coefficient of discharge α_w**	
TR / RTN	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.83	0.81
	L	0.61	0.61
Kazakhstan		**Coefficient of discharge α_w**	
GOST-K	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.83	0.81
	L	0.61	0.61
Belarus		**Coefficient of discharge α_w**	
GOSPROMNADZOR	Approval No.	The current approval no. can be found at www.leser.com	
	S/G	0.83	0.81
	L	0.61	0.61

Klassifkationsgesellschaft		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every reneval. A sample certificate including the valid certification number can be found at www.leser.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	
U.S. Coast Guard	U.S.C.G	www uscg.org	

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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 [mm²]	63.6			133.0		
LEO*) [inch²]	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_n^3/h]	[10^3kg/h]	[kg/h]	[m_n^3/h]	[10^3kg/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		511	7.17		1040	15
14		590	7.75		1201	16.2
16		669	8.28		1363	17.3
18		748	8.78		1524	18.3
20		827	9.26		1685	19.3
22		906	9.71		1846	20.3
24		986	10.1		2007	21.2
26		1065	10.6		2168	22
28		1144	11		2329	22.9
30		1223	11.3		2490	23.7
32		1302	11.7		2651	24.4
34		1381	12.1		2812	25.2
36		1460	12.4		2973	25.9
38		1539	12.8		3134	26.6
40		1618	13.1		3295	27.3
42		1698	13.4		3456	28
44		1777	13.7		3617	28.7
46		1856	14		3779	29.3
48		1935	14.3		3940	29.9
50		2014	14.6		4101	30.5
60		2409	16		4906	33.5
70		2805	17.3		5711	36.1
80		3201	18.5		6517	38.6
90		3596	19.6		7322	41
100		3992	20.7		8127	43.2
120		4783	22.7		9738	47.3
140		5574	24.5		11349	51.1
160		6365	26.2		12959	54.6
180		7156	27.8		14570	57.9
200		7947	29.3			
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			

*) $LEO_{S/G/L}$ = 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 plus10% 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	**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.]
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		281	28.2		584	58.7
180		313	29.9		652	62.3
200		346	31.5		719	65.6
220		378	33.1		787	68.8
240		410	34.5		854	71.9
260		443	36		921	74.8
280		475	37.3		989	77.6
300		508	38.6		1056	80.4
320		540	39.9		1124	83
340		572	41.1		1191	85.6
360		605	42.3		1259	88
380		637	43.5		1326	90.5
400		670	44.6		1393	92.8
420		702	45.7		1461	95.1
440		734	46.8		1528	97.3
460		767	47.8		1596	99.5
480		799	48.9		1663	102
500		832	49.9		1731	104
550		913	52.3		1899	109
600		994	54.6		2068	114
650		1075	56.9		2236	118
700		1156	59		2405	123
750		1237	61.1		2573	127
800		1318	63.1		2742	131
850		1399	65		2911	135
900		1480	66.9		3079	139
950		1561	68.7		3248	143
1000		1642	70.5		3416	147
1100		1804	74		3753	154
1200		1966	77.2		4091	161
1300		2128	80.4		4428	167
1400		2290	83.4		4765	174
1500		2452	86.4		5102	180
1600		2614	89.2		5439	186
1700		2776	91.9		5776	191
1800		2938	94.6		6113	197
1900		3100	97.2		6451	202
2000		3262	99.7		6788	208
2500		4072	111		8473	232
3000		4882	122		10159	254
3500		5692	132			
4000		6502	141			
4500		7313	150			
5000		8123	158			
5500		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

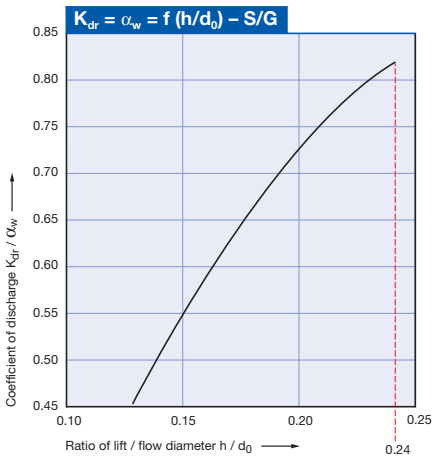
Determination of coefficent of discharge in case of lift restriction or back pressure

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

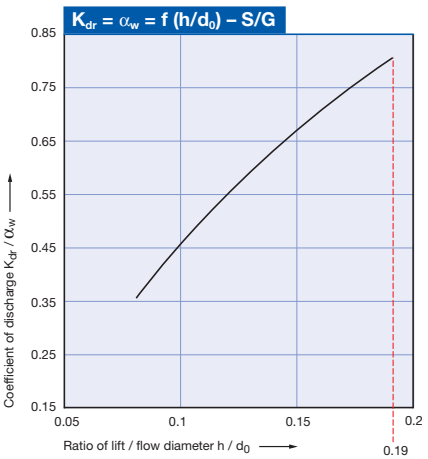
How to use please refer to page 00/08

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

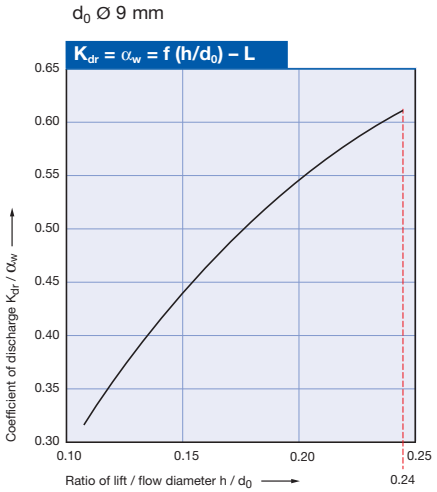
d_0 Ø 9 mm



d_0 Ø 13 mm



d_0 Ø 9 mm



d_0 Ø 13 mm

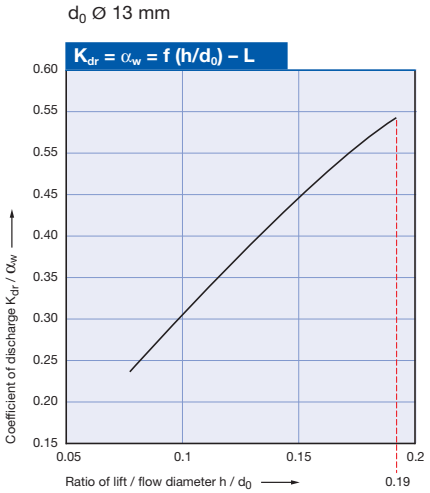
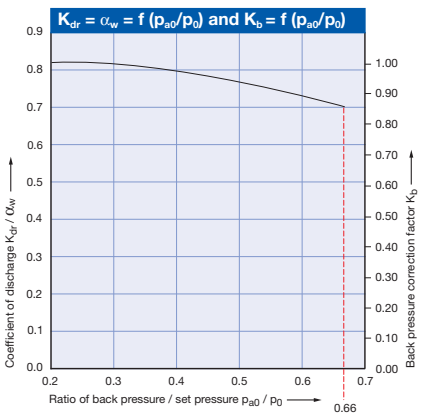
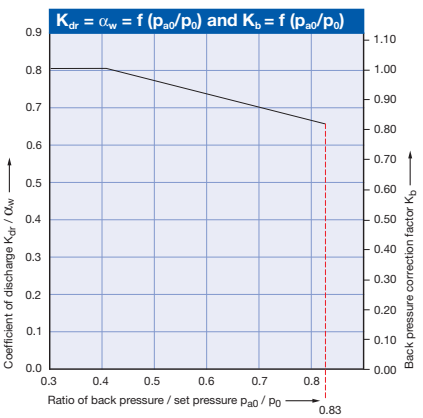


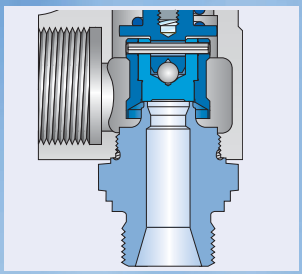
Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)

d_0 Ø 9 mm



d_0 Ø 13 mm





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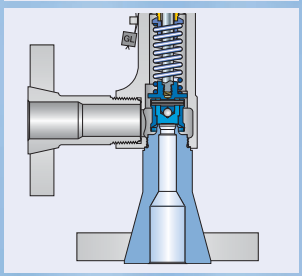

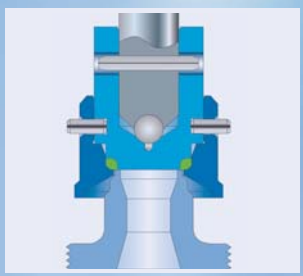

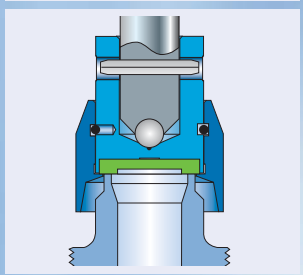

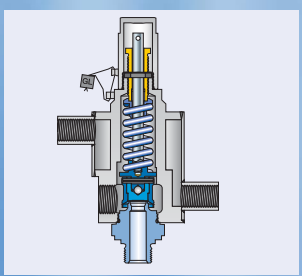

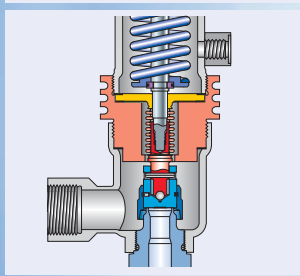

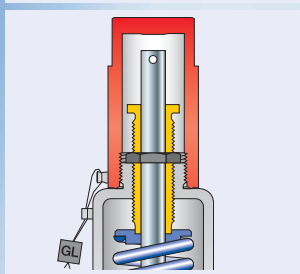

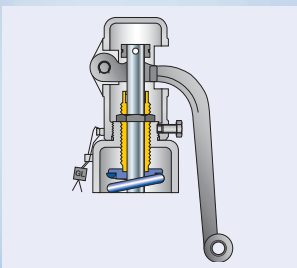

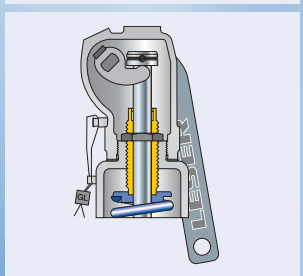

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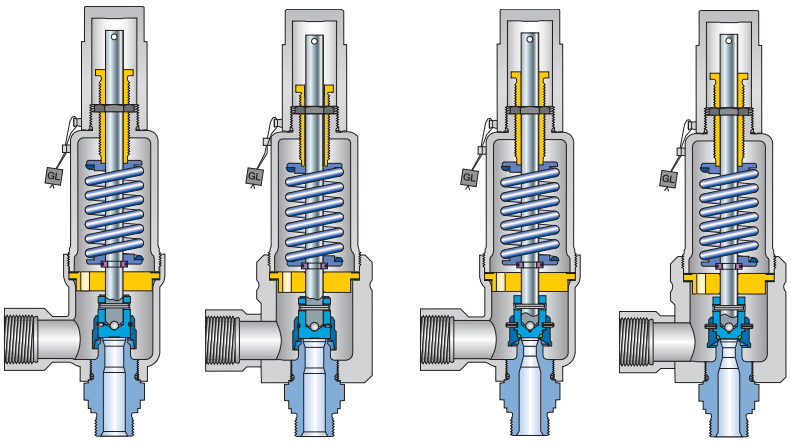


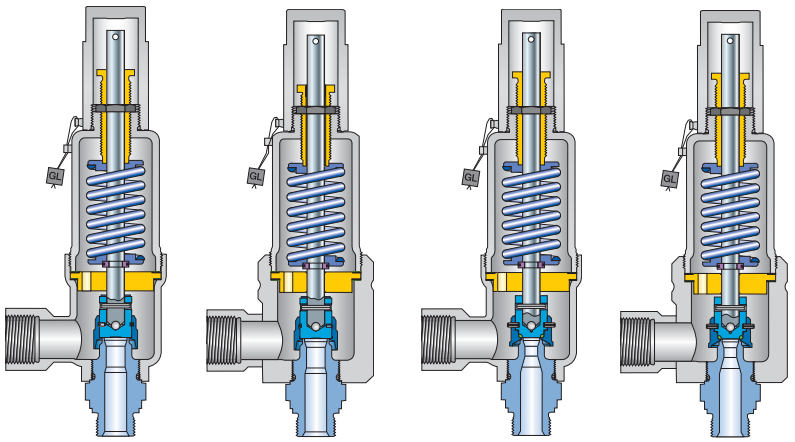
Options

Type	Option code	459	459 HDD	462	462 HDD
Base / Inlet body (Pos. 1)					
Male thread		✓	✓	✓	✓
Female thread		✓	✓	✓	✓
Flanged version – DIN EN 1092-1					
DN 15		✓	✓	✓	✓
Inlet		Flange rating PN 40 – 400			
Outlet		–			
DN 20		✓	✓	✓	✓
Inlet		Flange rating PN 40 + PN 160			
Outlet		–			
DN 25		✓	✓	✓	✓
Inlet		Flange rating PN 40 – 400			
Outlet		Flange rating PN 40 – PN 400			
DN 40		✓	✓	✓	✓
Inlet		–			
Outlet		Flange rating PN 40 – 400			
Flanged version – ASME B16.5					
NPS $^1/_2$"		✓	✓	✓	✓
Inlet		Flange rating class 150 – 2500			
Outlet		–			
NPS $^3/_4$"		✓	✓	✓	✓
Inlet		Flange rating class 150 – 2500			
Outlet		–			
NPS 1"		✓	✓	✓	✓
Inlet		Flange rating class 150 – 2500			
Outlet		Flange rating class 150 – 900			
NPS 1 $^1/_2$"		✓	✓	✓	✓
Inlet		–			
Outlet		Flange rating class 150 – 900			
Caps and levers (Pos. 40)					
H2		✓	✓	✓	✓
H3		✓	–	✓	–
H4		✓	✓	✓	✓
Disc (Pos. 7)					
Disc stellited	L25	✓	*	–	–

Accessories and Options

LESER

Overview

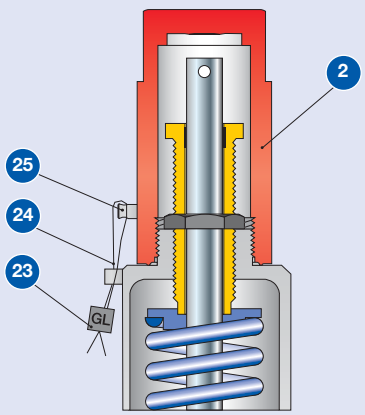


Options

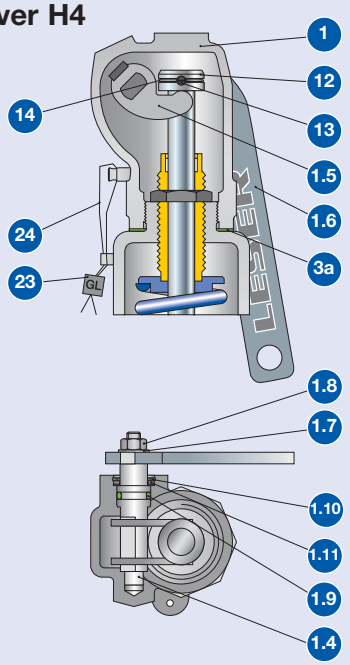
			Type	Option code	459	459 HDD	462	462 HDD
Type of sealing								
Metal seat			Metal to metal		✓	✓	–	–
			Metal to metal stellited	L20	✓	*	✓	*
Soft seal	O-ring		CR “K”	J21	–	–	✓	✓
			NBR “N”	J30	–	–	✓	✓
			EPDM “D”	J22	–	–	✓	✓
			FKM “L”	J23	–	–	✓	✓
			FFKM “C”	J20	–	–	✓	✓
	Sealing plate		SP “T”	J49	✓	✓	–	–
			PCTFE “G”	J48	✓	✓	–	–
			PTFE “A”	J44	✓	✓	–	–
Heating jacket								
			Outlet body	H29	✓	✓	✓	✓
			Bonnet spacer	H33	✓	✓	✓	✓
Test gag								
			H2	J70	✓	✓	✓	✓
			H4	J69	✓	✓	✓	✓
Bellows (Pos. 15)								
			Balanced bellows	J78	✓	✓	✓	✓
			High pressure bellows	J55J78	✓	✓	✓	✓
			Hasteloy® or special material	S15	✓	✓	✓	✓
			High temperature equipment	J88	–	✓	–	✓
			Elastomer	J79	✓	–	✓	–
Spring (Pos. 54)								
			Heat resistant 1.8159 / 1.7102	X01	✓	✓	✓	✓
			Corrosion resistant 1.4310	X04	✓	✓	✓	✓
			INCONEL X-750	X08	✓	✓	✓	✓
Lift indicator								
			Lifting device H4	J39J93	✓	✓	✓	✓
Lift stopper								
			Bush	J51	✓	✓ except d_0 6 mm	✓	✓
			Gag H4	J50	✓	✓	✓	✓
O-ring damper								
			H2	J65	✓	–	✓	–
			H4	J66	✓	–	✓	–

Caps and levers – Subassembly item 40

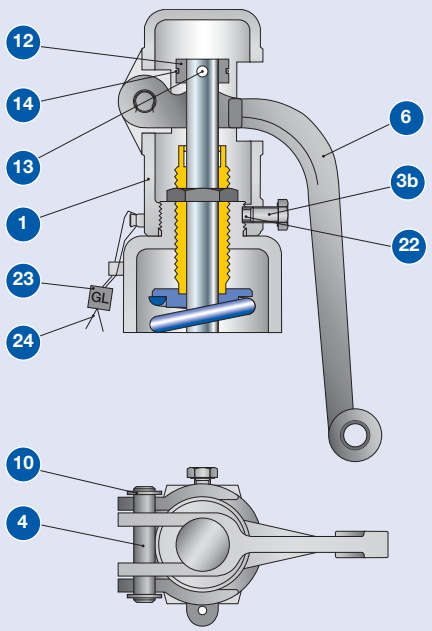
Cap H2



Packed lever H4

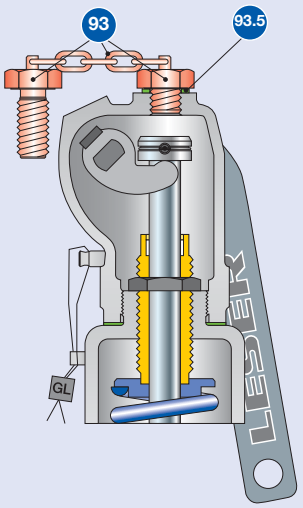


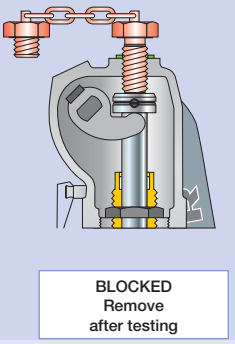
Plain lever H3



Test gag

Cap H2: J70
Packed lever H4: J69





Test gag

The test gag prevents the spindle from lifting 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

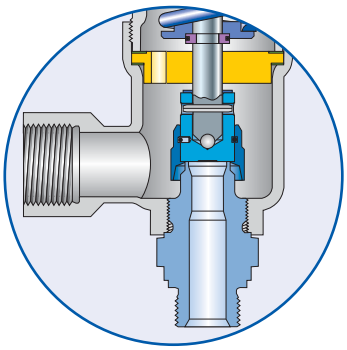
		Steel			Stainless steel	
Item	**Component**	**Cap H2**	**Plain lever H3**	**Packed lever H4**	**Cap H2**	**Packed lever H4**
1	Lever cover	–	0.7040	0.7040	–	1.4408
		–	Gr. 60-40-18	Gr. 60-40-18	–	CF8M
2	Cap	1.0718	–	–	1.4404	–
		Steel	–	–	316L	–
3a	Spacer	–	–	1.4571	–	1.4571
		–	–	316Ti	–	316Ti
3b	Hex 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	–	–
		–	–	FKM	–	–
	Packing ring precast	–	–	–	–	Graphite
		–	–	–	–	Graphite
10 / 1.10	Retaining clip	–	Carbon steel	Carbon steel	–	–
		–	Carbon steel	Carbon steel	–	–
1.11	Support ring	–	–	Carbon steel	–	–
		–	–	Carbon steel	–	–
12	Spindle cap	–	1.0718	1.0718	–	1.4404
		–	Carbon steel	Carbon steel	–	316L
13	Pin	–	Steel	Steel	–	A4
		–	Steel	Steel	–	8M
14	Retaining clip	–	1.4571	1.4571	–	1.4571
		–	316Ti	316Ti	–	316Ti
22	Plug	–	Plastic	–	–	–
		–	Plastic	–	–	–
23	Seal	Plastic	Plastic	Plastic	Plastic	Plastic
		Plastic	Plastic	Plastic	Plastic	Plastic
24	Seal wire	1.4541	1.4541	1.4541	1.4541	1.4541
		321	321	321	321	321
93	Test gag	1.4401	–	1.4401	1.4401	1.4401
		B8M	–	B8M	B8M	B8M
93.5	Washer	Fiber	–	Fiber	Fiber	Fiber
		Fiber	–	Fiber	Fiber	Fiber

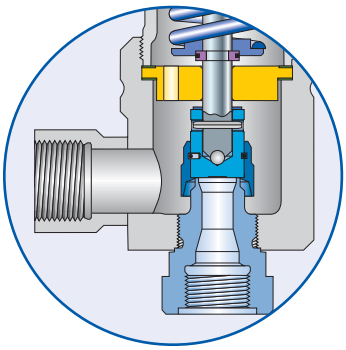
Accessories and Options

LESER

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





Threaded connections

	Male thread				Female thread	
Actual Orifice diameter d_0 [mm]	6		9 / 13		17.5	
Actual Orifice area A_0 [mm²]	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 [inch²]	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	–	V54[1]	–	–	–
	3/4 "	V55	–	V55	–	–	–
	1"	V56	V68	V56	V68	V56	–
	1 1/4"	–	V79	–	V79	V83	V79
	1 1/2"	–	V69	–	V69	V57	V69
Female thread DIN ISO 228-1						
G	**1/2"**	V50	–	V50	–	–	–
	3/4 "	V51	–	V51	–	V51	–
	1"	–	V66	V52[2]	V66	V52	–
	1 1/4"	–	V81	–	V81	V84	V81
	1 1/2"	–	V67	–	V67	V53	V67
Male thread DIN ISO 7-1/BS 21						
R/BSPT	**1/2"**	V30[3]	–	V30[6]	–	–	–
	3/4 "	V31	–	V31	–	–	–
	1"	V32	V42	V32	V42	V32	–
	1 1/2"	–	V43	–	V43	V33	V43
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	V37
Male thread ANSI/ASME B1.20.1						
NPT	**1/2"**	V61	–	V61[4]	–	–	–
	3/4 "	V62	–	V62	–	–	–
	1"	V63	V73	V63	V73	V63	–
	1 1/4"	–	V82	–	V82	V85	V82
	1 1/2"	–	V74	–	V74	V64	V74
	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	V80
	1 1/2"	–	V72	–	V72	V75	V72
	2"	–	–	–	–	–	V88[5]

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

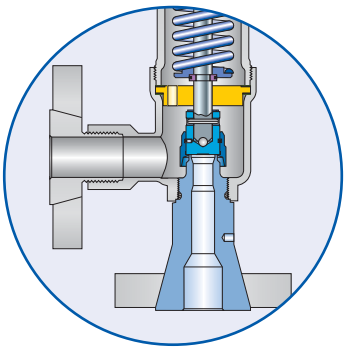
[1] Only for d_0 9 mm
[2] d_0 9 mm: up to PN 420
[3] Only as special design
[4] d_0 13 mm: up to 125 bar and 455 °C
[5] Only for outlet body investment casted 1.0619 and 1.4408
[6] V30 only for d_0 9 mm

Accessories and Options

LESER

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 version

Flanged connections

Valve size	Pressure rating	d_0 6 mm		d_0 9 mm		d_0 13 mm		d_0 17.5 mm	
DIN EN 1092-1 (PN > 100: DIN 2501)									
		Option code		Option code		Option code		Option code	
DN	PN	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
15	40	I21	–	I21	–	I21	–	–	–
	160	I22	–	I22	–	I22	–	–	–
	250	I23	–	I23	–	I23	–	–	–
	320	I24	–	I24	–	I24	–	–	–
	400	I25	–	I25	–	I25	–	–	–
20	40	I26	–	I26	–	I26	–	I26	–
	100	I27	–	I27	–	I27	–	I27	–
25	40	I31	I46	I31	I46	I31	I46	I31	–
	160	I32	I47	I32	I47	I32	I47	I32	–
	250	I33	I48	I33	I48	I33	I48	I33	–
	320	I34	–	I34	–	I34	–	I34	–
	400	I35	–	I35	–	I35	–	I35	–
40	40	–	–	–	I49	–	I49	–	I49
	160	–	–	–	I50	–	I50	–	I50
	250	–	–	–	I51	–	I51	–	I51
ANSI/ASME B 16.5									
		Option code		Option code		Option code		Option code	
NPS	CL	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
$^1/_2$"	150	V01	–	V01	–	V01	–	–	–
	300	V02	–	V02	–	V02	–	–	–
	600	V02	–	V02	–	V02	–	–	–
	900	V03	–	V03	–	V03	–	–	–
	1500	V03	–	V03	–	V03	–	–	–
	2500	V04	–	V04	–	V04	–	–	–
$^3/_4$"	150	V05	–	V05	–	V05	–	V05	–
	300	V06	–	V06	–	V06	–	V06	–
	600	V06	–	V06	–	V06	–	V06	–
	900	V07	–	V07	–	V07	–	V07	–
	1500	V07	–	V07	–	V07	–	V07	–
	2500	V08	–	V08	–	V08	–	V08	–
1"	150	V09	V18	V09	V18	V09	V18	V09	–
	300	V10	V19	V10	V19	V10	V19	V10	–
	600	V10	V19	V10	V19	V10	V19	V10	–
	900	V11	V20	V11	V20	V11	V20	V11	–
	1500	V11	–	V11	–	V11	–	V11	–
	2500	V12	–	V12	–	V12	–	V12	–
$1^1/_2$"	150	–	–	–	V21	–	V21	–	V21
	300	–	–	–	V22	–	V22	–	V22
	600	–	–	–	V22	–	V22	–	V22
	900	–	–	–	V23	–	V23	–	V23

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

Accessories and Options

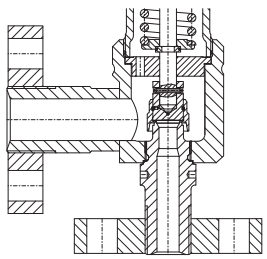
LESER

Connections and fittings

Overview available flange facings for Compact Performance safety valves with flanged connection

Flange facings acc. to DIN EN 1092	Option code		Flange facings acc. to ASME B16.5	Option code		Other flange facings	Option code	
	Inlet	Outlet		Inlet	Outlet		Inlet	Outlet
Tongue face C	H94	I98	RTJ-Nut	H62	H63	Linde-V-Nut, Form V48	J07	J08
Groove face D	H93	I99				Linde-V-Nut, Form V48A	J05	J06
Male face E	H96	I94						
Female face F	H97	I95						
O-ring male face G	J01	I97						
O-ring female face H	J03	I96						
Lens seal form L	J11	J12						

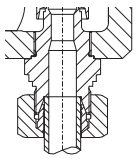
IG flange (BASF High pressure technology)



Pressure rating	Valve size	d_0 6 mm		d_0 9 mm		d_0 17.5 mm	
PN	DN	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
325	16	–	–	W02	–	–	–
	24	W03	W18	W03	W18	W03	–
	30	–	–	–	W19	–	–
	45	–	–	W05	W20	–	–
500	10	W06	W21	–	–	–	–
	24	W08	–	W08	–	–	–
700	10	W26	–	–	–	–	–

Screwed fittings

Progressive – cutting ring – screw fitting DIN 2353 / DIN EN ISO 8434-1 (e.g. ERMETO)



Pipe dimension				
Outer Ø x Wall thickness	d_0 13 mm		d_0 17.5 mm	
mm	Inlet	Outlet	Inlet	Outlet
25 x 2.5	V46	–	–	–
28 x 2.0	–	–	V47	–

Weld-on end

Pipe dimension		
Outer Ø x Wall thickness	all d_0	
mm	Inlet	Outlet
≥ 33	W51	W52

LESER supplies components with weld-on end in 1.4404 / 316L, 1.4408 / CF8M

Note: To manufacture the requested weld-on end as specified, LESER requires the dimensions and the material on the form LWN 288.20-EN, which can be downloaded at www.leser.com

Further connections

Please state the required connections, dimensions and standards. LESER will verify the manufacturing of the connection.

Sour gas service (H_2S)

Normative basis

NACE MR0175-2003
In accordance with NACE standard **MR 0175-2003** sour gas service means the presence of H_2S in the following conditions:

Section 1.4.1.1 All gas, gas condensate, and sour crude oil – When the partial pressure of H_2S 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:

Section 1.4.2.1 Low-pressure gas
When the total pressure is lower than 4,5 bar_a (65 psia)

Section 1.4.2.2 Low-pressure oil and gas multiphase systems: …

Other Sour gas standards:

NACE MR0103-2003: 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 H_2S containing environments in oil and gas production – Part 1: General principles for selection of cracking-resistant materials (ISO 15156-1:2001)

Works standard: LWN 001.91

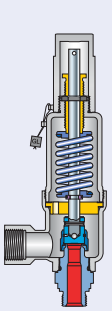
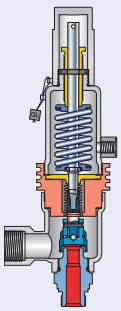
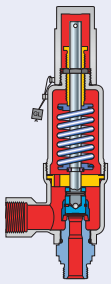
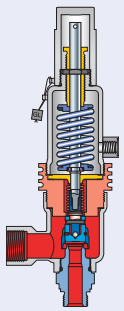
General requirements for sour gas service

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-Sauergas-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
Contact 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	Conventional design	Body / Nozzle Disc		all	
	Balanced bellows design	Body / Nozzle Disc		Body / Nozzle Disc, 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 design	Disc	1.4404 / 316L	L44	1.4404 / 316L	L44
		Balanced bellows	1.4571 / 316Ti	J78 / J55	1.4571 / 316Ti	J78 / J55
4593	Conventional	Body	1.4404 / 316L	L18	Please choose type 4594	
		Disc	1.4404 / 316L	L44		
	Balanced bellows design	Body	1.4404 / 316L	L18	Please choose type 4592 or 4594	
		Disc	1.4404 / 316L	L44		
		Balanced bellows	1.4571 / 316Ti	J78 / J55		
4594 + 4594 HDD	Conventional	Spring	No modification required		2.4669 / Inconel X-750	X08
	Balanced bellows design	Balanced bellows	1.4571 / 316Ti	J78 / J55	1.4571 / 316Ti	J78 / J55

Type of sealing

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.

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.

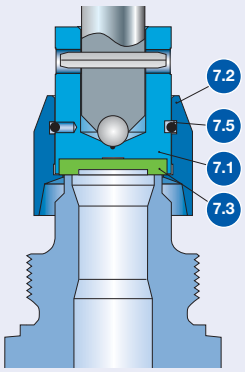
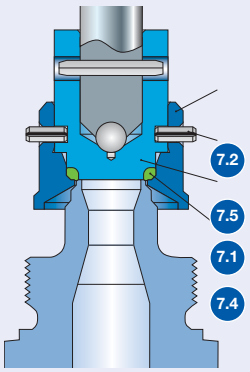
Type of sealing

Types 459 and 462 – Soft seal

LESER soft seal solutions allow for superior tightness.

Features and bennefits

- 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

Materials				
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

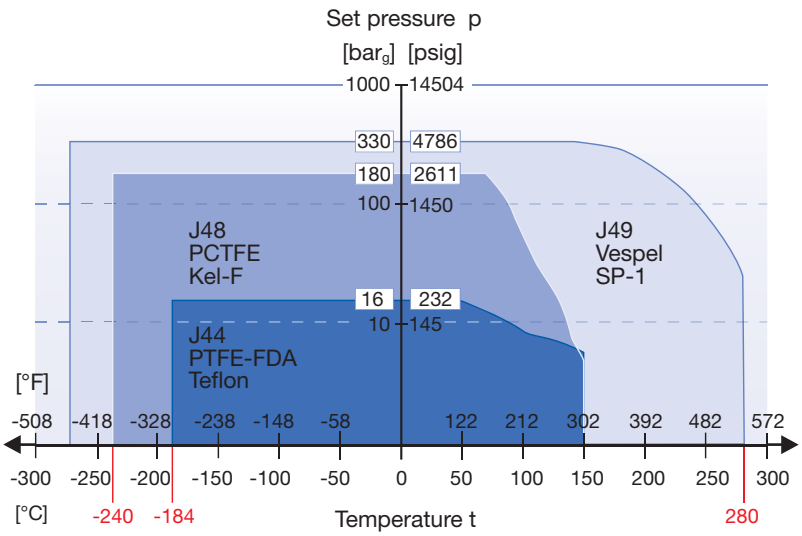
For temperature limits and medium resistance please refer to the soft seal material selection, page 09/10.

Accessories and Options

Soft seal material selection

Type 459/459 HDD – Sealing plate

Material selection

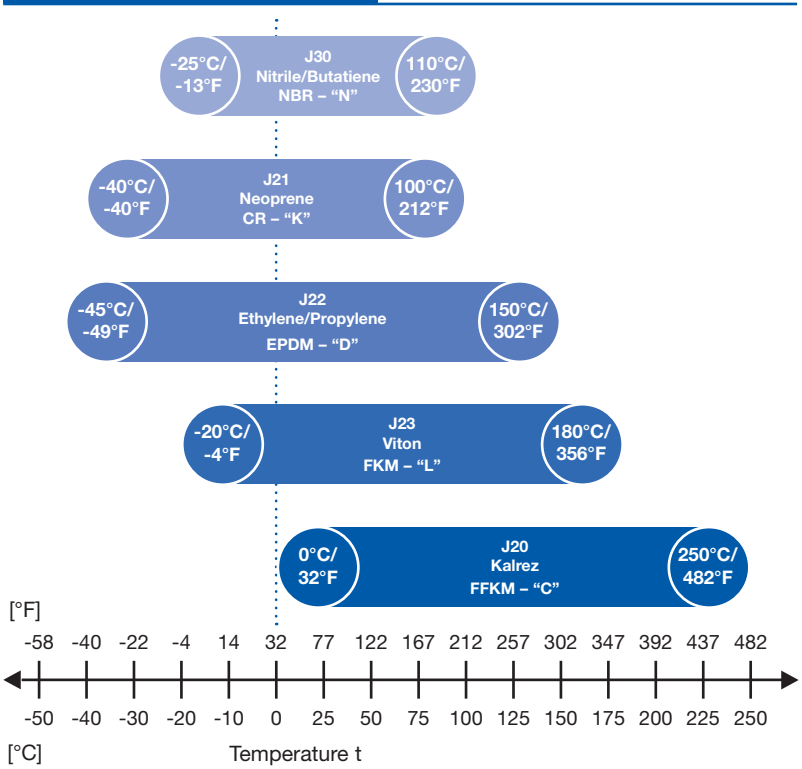


Option code

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

Type 462/462 HDD – O-ring disc

Soft seal materials Selection



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.

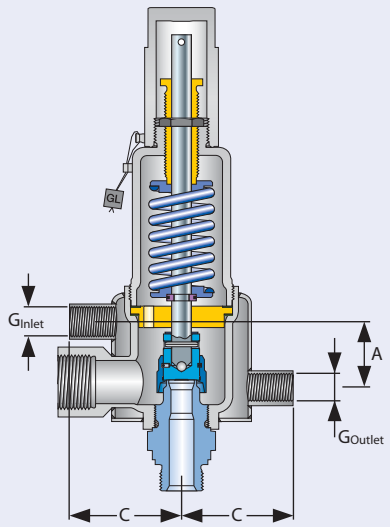
Heating jacket

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.



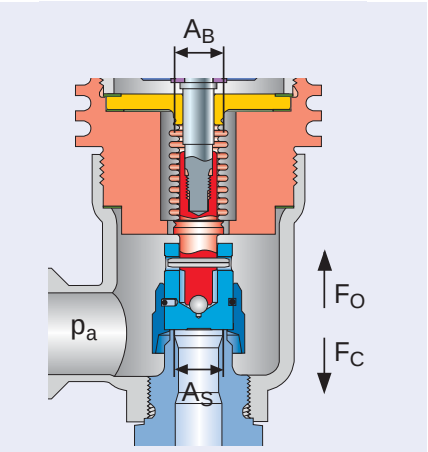
Heating jacket

		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 [mm²]		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 [inch²]		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 mm² / 0.206 inch², but the same design is also used in the smaller A_0 = 63.9 mm² / 0.099 inch² and A_0 = 241 mm² / 0.689 inch² 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 constucted 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

Bellows design	Standard	High pressure
Set pressure range	p ≤ 40 bar / 580 psig	p > 40 bar / 580 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.

INCONEL X-750 spring

LESER offers the spring material INCONEL X-750 / 2.4669 as an Option of Series 459 for all valve sizes and the complete pressure range.

Applications

INCONEL X-750 is recommended in the following applications:

– **Sour gas applications acc. to NACE MR 0175 and NACE MR 0103:**
if NACE conditions are present at the outlet of the safety valve (NACE Level 2) and no balanced bellows are used. INCONEL X-750 is a spring material which is recommended in the NACE standards.

– **High temperature applications:**
INCONEL X-750 allows higher operating temperatures than other standard spring materials which are often the restricting components. Thus, the full temperature range of the valve type can be utilized.

– **Highly corrosive applications:**
applications that require a spring material with a corrosion resistance superior to that of stainless steel, e.g. seawater applications.

Option Code

Option code X08: Spring material INCONEL X-750

Ordering

The option code for ordering is X08. Spring part numbers and pressure limits can be taken from the actual spring charts LGS 3608.

O-ring damper – Subassembly item 40

The O-ring damper effective suppress or reduce 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 occuring 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 exists (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.

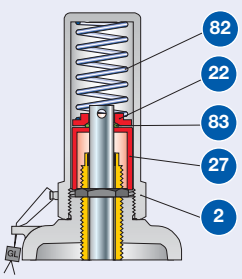
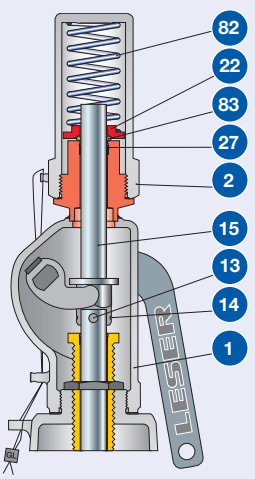
flutter: "Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disc does not contact the seat." Causes for fluttering are vibrations with small or hardly measurable amplitude, where high frequency vibrations accumulate from external influences. The vibrations 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 to +180 °C	
	-4 °F to +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
		–	PTFE 15% glas
82	Spring	1.4310	1.4310
		Stainless steel	Stainless steel
83	O-ring	FKM	FKM
		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 [mm²]		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 [inch²]		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

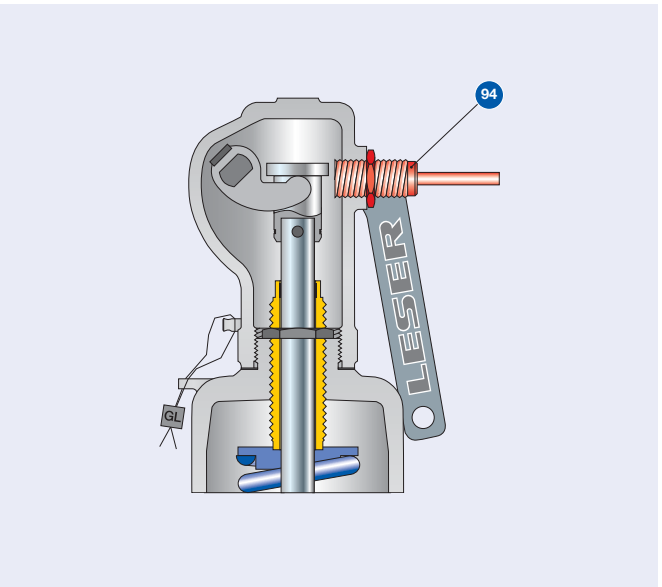
Lift indicator

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 323.02-E.



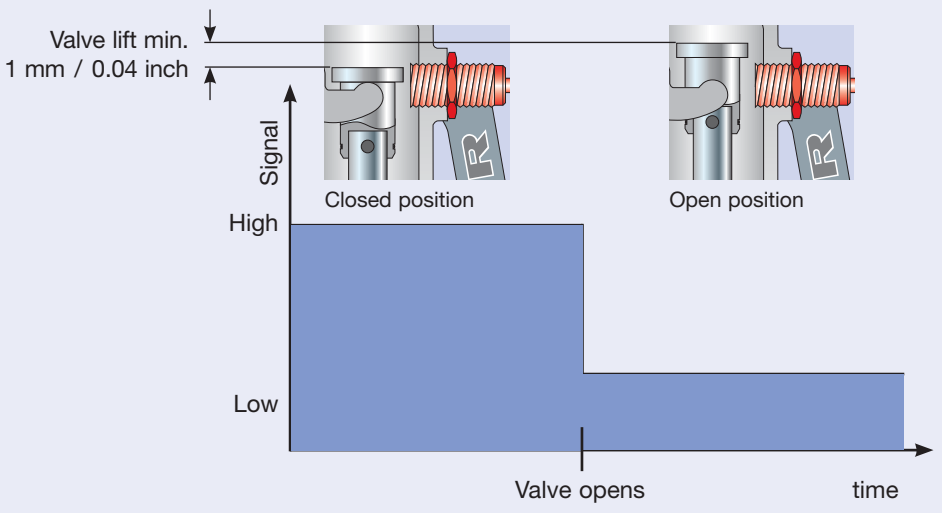
Packed lever H4

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	B, open position
The lift indicator is positioned in front of the coupling or control sleeve when the safety valve is closed.	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	–	–	α_w [S/G] ≥ 0.08
	–	–	α_w [L] ≥ 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.		

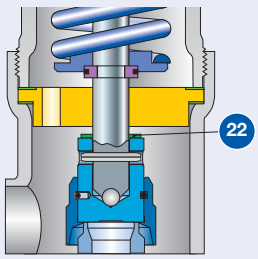
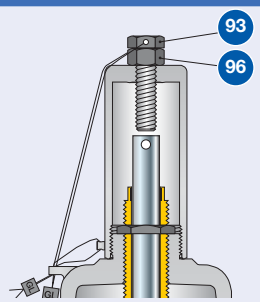
Determining the restricted lift

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".
An explanation on how to use this diagram may be found on page 00/08.

– LESER sizing program "VALVESTAR®"
– LESER sizing web page www.valvestar.com

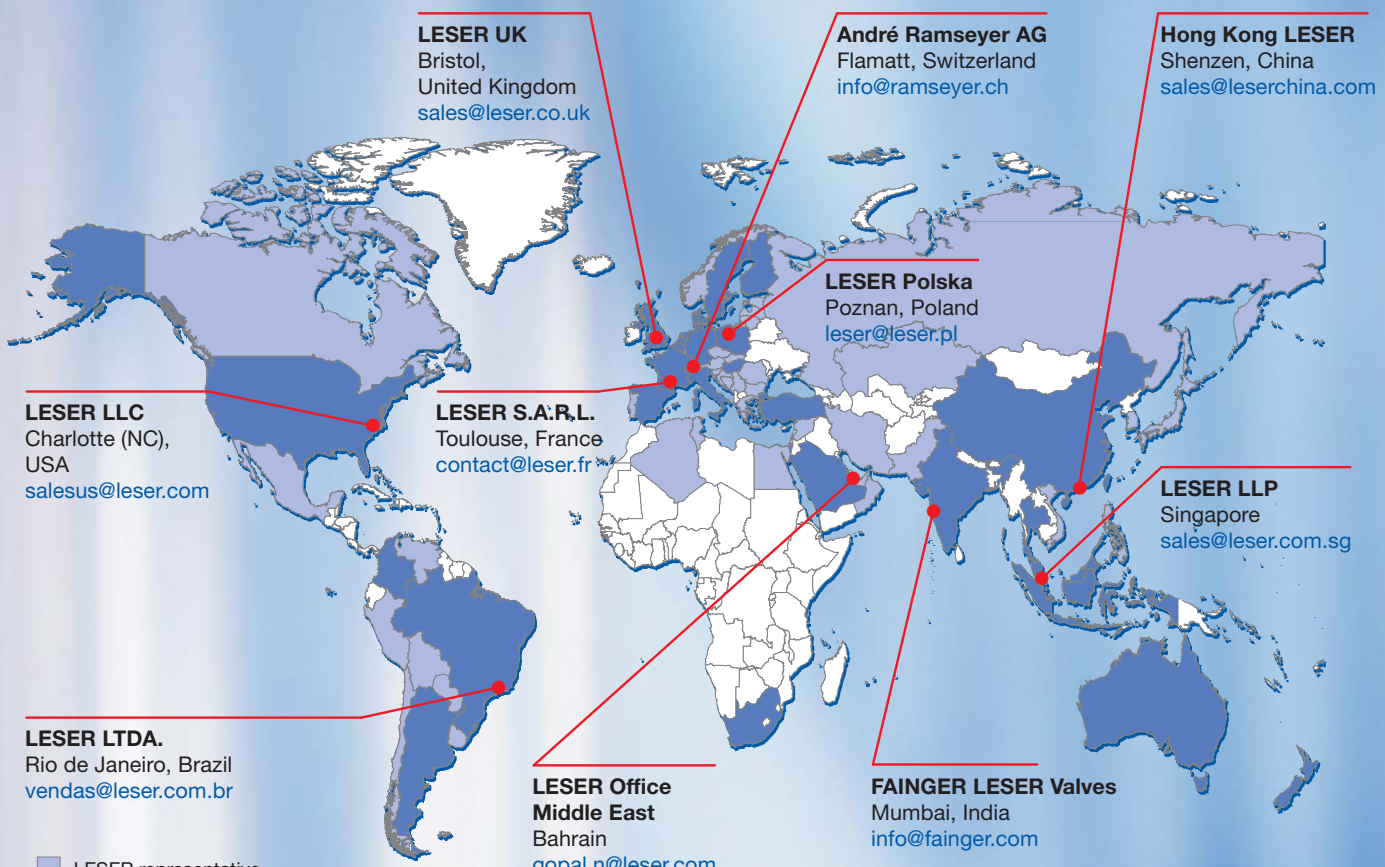
Lift restrictions

	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
		–	B8M
96	Hex nut	–	1.4401
		–	8M

LESER worldwide



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