

Compact Performance

Safety Relief Valves

Series 437

Series 459

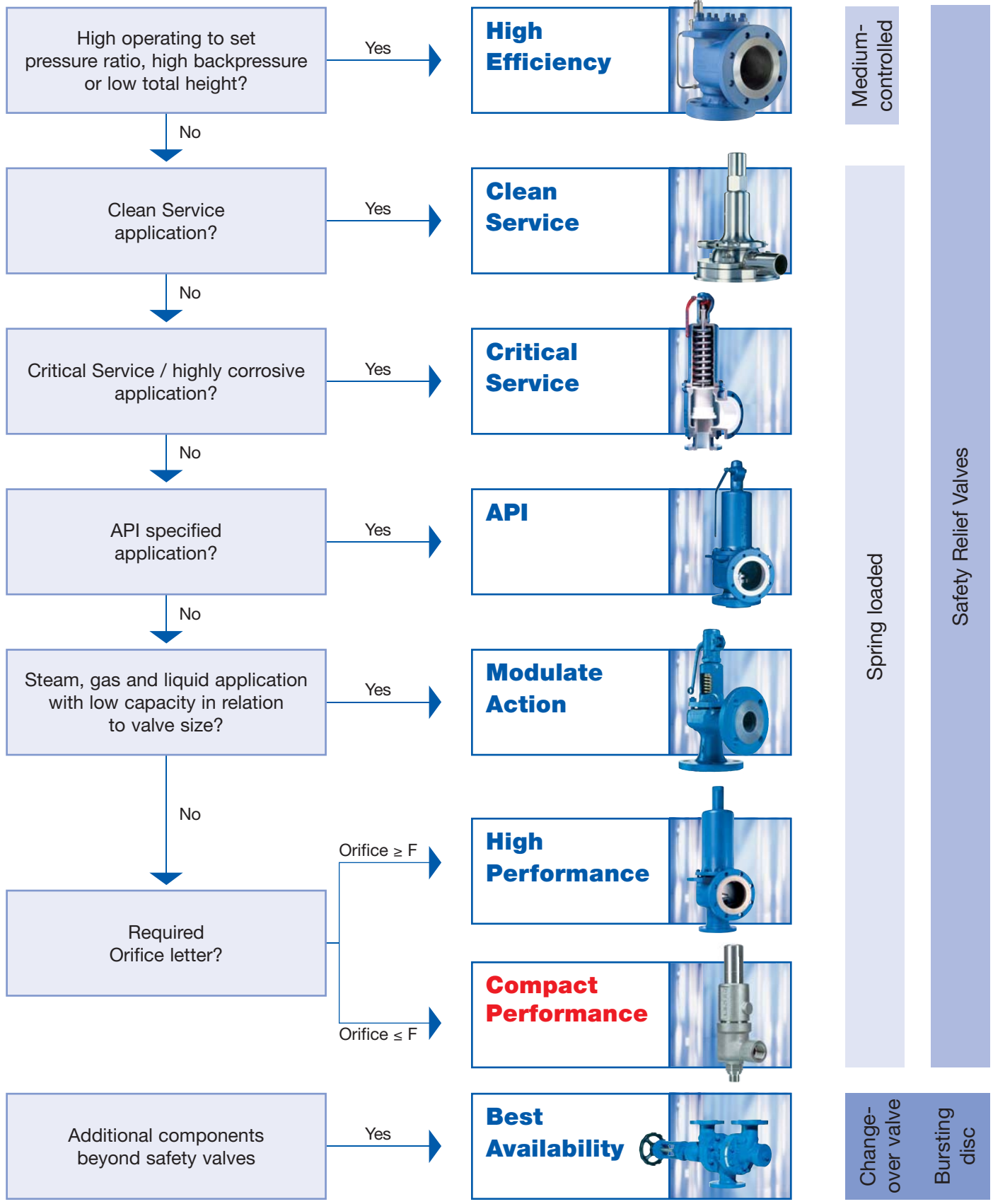


EXTENDED CATALOG

LESER

The-Safety-Valve.com

Valve Finder
How to find the right Product Group



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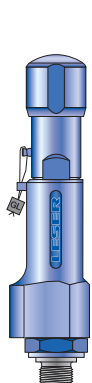
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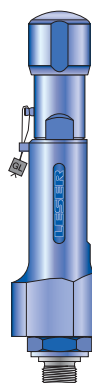
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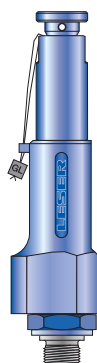
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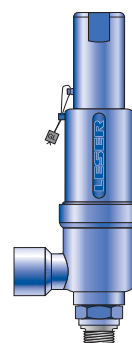
Type 437
Packed knob H4



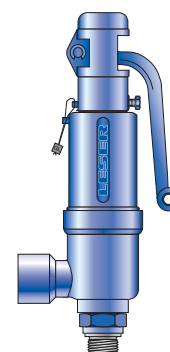
Type 437
Packed knob H4
Long version



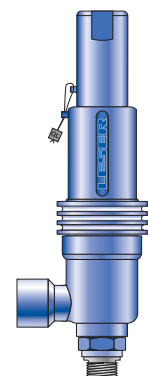
Type 437
Pull button H3



Type 459
Cap H2



Type 459
Plain lever H3



Type 459
Cap H2
Balanced bellows design

General Information



The Compact Performance product group stands for

- ✓ compact dimensions with high capacity relative
- ✓ great variety of threaded and flanged connections
- ✓ wide pressure range

LESER 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, for example:

- European Community: CE-marking according to the Pressure Equipment Directive (PED) 2014/68/EU 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
- Eurasian Custom Union: Approval acc. to Eurasian Custom Union (EAC - Eurasian Conformity)

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, EN 1092 Part I and II flanging, ASME PTC 25, ASME-Code Sec. II, ASME B 16.34, ASME B16.5 flanging, API Std. 527, API RP 576, AD 2000-Merkblatt A4, AD 2000-Merkblatt HP0.



General Information

Applications

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

Typical applications for LESER Compact Performance Safety Valves are:

- air/gas compressors and pumps
- technical gases and CO₂ plants
- cylinder filling stations
- chemical equipment and piping
- pressure vessels and piping systems containing gas, air, liquid or steam
- LPG / LNG terminals, carriers etc.
- cryogenic systems and oxygen applications
- thermal relief
- high pressure extraction plants

General Design Features

LESER Compact Performance Safety Valves cover a large variety of types, materials and options to fit any application:

- connection sizes from $\frac{3}{8}$ " to 1 $\frac{1}{2}$ " and 5 orifices (D through F) provide high suitability to the application
- Threaded connections, male and female, according to all international standards guarantee worldwide applicability
- Flanged connections according ANSI, DIN and JIS guarantee a worldwide applicability
- Inlet pressure ratings up to PN 850 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 12325 psig make Compact Performance safety valves suitable for all industrial processes
- Operating temperatures from -273 °C bis +450 °C / -454 °F to 1022 °F (acc. to DIN EN) cover a wide range of applications
- LESER Nanotightness as standard for metal-to-metal sealings. The nanotightness exceeds the requirements for functional tightness of API 527 by 50% which means e.g. less pollution when discharge to atmosphere, 50% reduction in medium loss and increased plant efficiency
- 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

Options

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



Type 437
Packed knob H4
Conventional design

Type 437
Safety Relief Valves



Type 437
Packed knob H4
Flanged connection

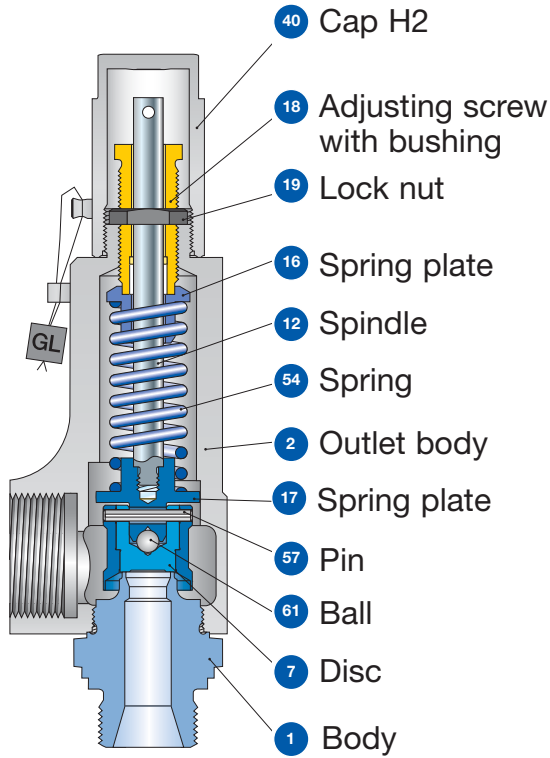
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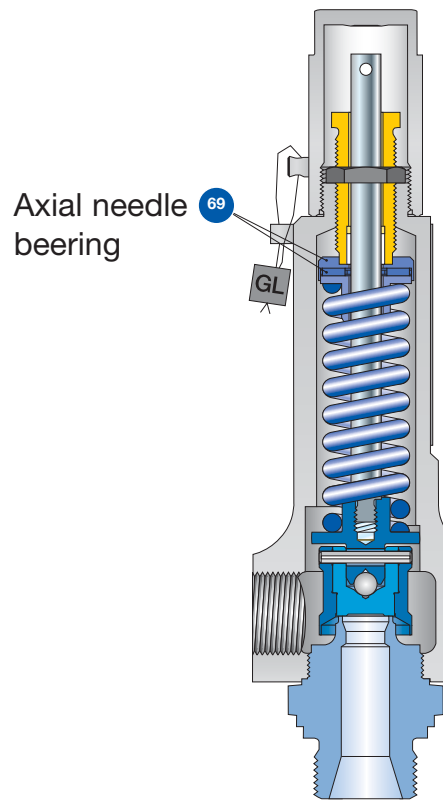
Type 437
Cap H2
Long version

**Type 437
Designs**

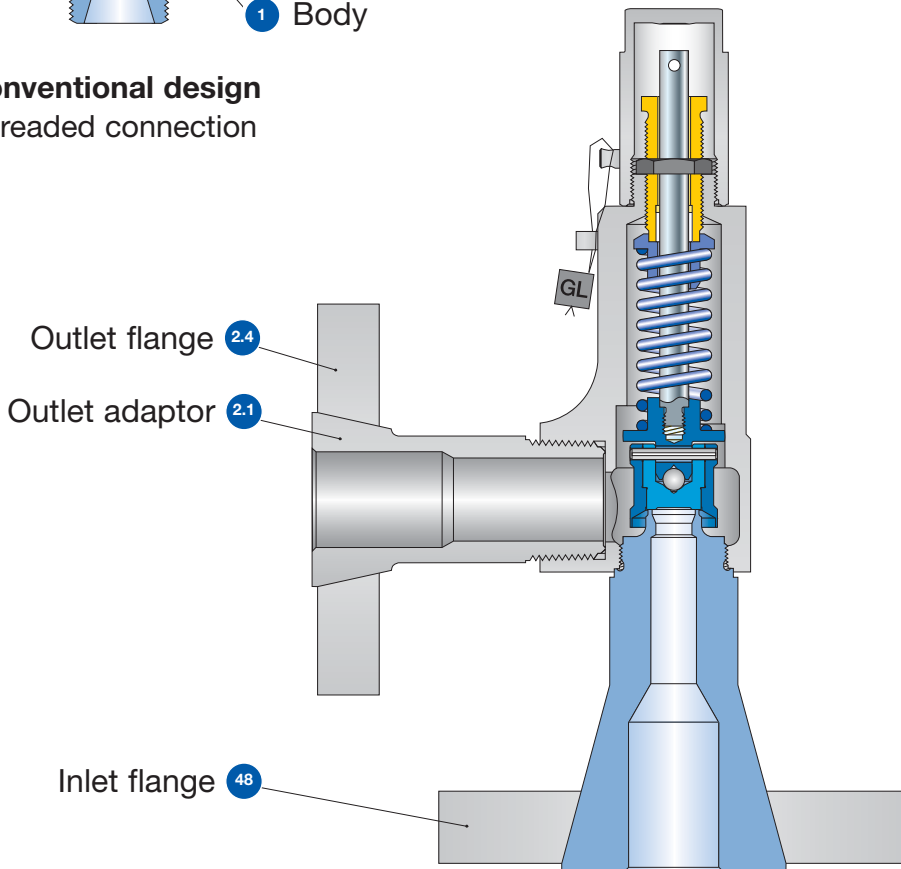
Type 437



Conventional design
Threaded connection



Long version
Threaded connection



Conventional design
Flange connection

Type 437 Materials

Item	Component	Design	Type 4373	Type 4374
1	Base/Inlet body	Threaded connection	1.4104 ^{1) 4)} , 1.4404	1.4404
			SA 479 430 ^{1) 4)} , SA 479 316L	SA 479 316L
		Flange connection	1.4404	1.4404
			SA 479 316L	SA 479 316L
Long version	1.4104 ²⁾ , 1.4404 stellited	1.4404 stellited		
	SA 479 430 ²⁾ , SA 479 316L stellited	SA 479 316L stellited		
2	Outlet body		1.4104 ⁴⁾	1.4404
			SA 479 430 ⁴⁾	SA 479 316L
2.1	Outlet adaptor	Flange connection	1.4404	1.4404
			316L	316L
2.4	Outlet flange	Flange connection	1.4404	1.4404
			316L	316L
7	Disc		1.4122	1.4404
			Hardened stainless steel	SA 316L
		Long version	d ₀ 6: 1.4404 stellited d ₀ 6: 316L stellited	d ₀ 10: 1.4122 d ₀ 10: HSS ⁵⁾
12	Spindle ³⁾		1.4021	1.4404
			420	316L
			Long Version	1.4404
16/17	Spring plate ³⁾		316L	316L
			1.4104	1.4404
			Chrome steel	316L
Long version	1.4404	1.4404		
	316L	316L		
18	Adjusting screw with bushing		1.4104 / PTFE	1.4104 / PTFE
			Chrome steel / PTFE	1.4104 / PTFE
19	Lock nut		1.0718	1.4404
			steel	316L
40	Cap H2		1.0460	1.4404
			SA 105	316L
48	Inlet flange	Flange connection	1.4404	1.4404
			316L	316L
54	Spring		1.4310	1.4310
			Stainless steel	Stainless steel
57	Pin		1.4310	1.4310
			Stainless steel	Stainless steel
61	Ball		1.3541	1.4401
			Hardened stainless steel	316
69	Axial needle bearing	Long version	1.4404	1.4404
			316L	316L

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.
- The materials shall meet the requirements of the relevant regulations (Pressure Equipment Directive (PED), acc. to PED applied harmonized standards, AD 2000-Merkblätter, VdTÜV (Werkstoffblätter) as well as further materials listed in Section 8 of the Type-Examination.

¹⁾ Only for male thread DIN ISO 228-1 G³/₈, G¹/₂, G³/₄ (Option Codes V49, V54, V55).

²⁾ Only for d₀ 10 with male thread DIN ISO 228-1 G³/₈, G¹/₂, G³/₄ (Option Codes V49, V54, V55).

³⁾ The items 12 and 17 are combined to one unit.

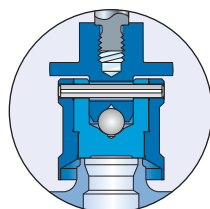
⁴⁾ Material 1.4404/316L for ASME application (Option code N68 or N70)

⁵⁾ Hardened stainless steel

Type 437

Article numbers

Type 437



Metal seat

	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)¹⁾				
H2	Art. No. 4373.²⁾	2602	2622	2612
H3	Art. No. 4373.²⁾ $p_{max.} = 16 \text{ bar}_g$	2603	-	-
H4	Art. No. 4373.²⁾	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

¹⁾ Material 1.4404/316L for ASME application (Option code N68 or N70).

²⁾ Type 4373 should not be selected when a „stainless steel“ valve is required due to corrosive medium.

Type 437

Dimensions and weights

Threaded connections [Metric units]

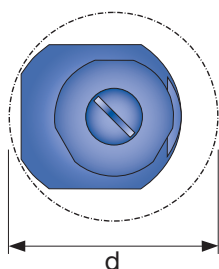
	Size Outlet body	Conventional design			Long version					
		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Actual Orifice diameter d_0 [mm]		10	10	10	6	6	6	10	10	10
Actual Orifice area A_0 [mm ²]		78.5	78.5	78.5	28.3	28.3	28.3	78.5	78.5	78.5
Weight [kg]		1.2	1.6	1.6	1.4	2.1	2.1	1.4	2.1	2.1
Required installation diameter d [mm]		65	80	80	65	80	80	65	80	80

Inlet thread female

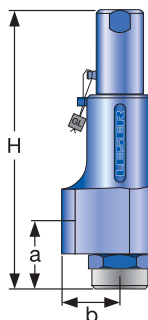
		Size outlet body	Conventional design			Long version								
			1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"			
Center to face [mm]														
DIN ISO 228-1	G	Inlet 1/2" a	46	46	49	46	46	49	46	46	49			
			ISO 7-1/BS 21	Rc	Inlet 3/4", 1" a	56	56	59	56	56	59	56	56	59
						ASME B1.20.1	NPT	Outlet b	30	37	37	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

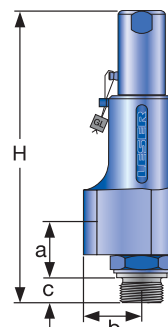
		Size outlet body	Conventional design				Long version				
			1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Center to face [mm]											
DIN ISO 228-1	G	Inlet a	33	33	36	33	33	36	33	33	36
		Outlet b	30	37	37	30	37	37	30	37	37
ISO 7-1/BS 21	R	Inlet a	31	31	34	31	31	34	31	31	34
			ASME B1.20.1	NPT	Outlet b	30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



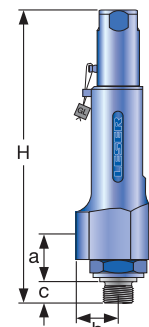
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Long version – male thread

Type 437

Dimensions and weights

Threaded connections [US units]

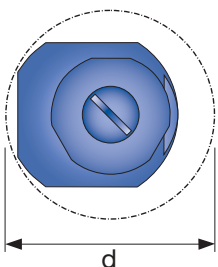
	Size Outlet body	Conventional design			Long version					
		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"
Actual Orifice diameter d ₀ [inch]		0.394	0.394	0.394	0.236	0.236	0.236	0.394	0.394	0.394
Actual Orifice area A ₀ [inch ²]		0.122	0.122	0.122	0.044	0.044	0.044	0.122	0.122	0.122
Weight [lbs]		2.6	3.5	3.5	3.1	4.6	4.6	3.1	4.6	4.6
Required installation diameter d [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

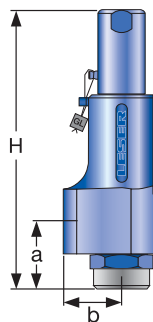
	Size outlet body	Conventional design			Long version						
		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"	
Center to face [inch]											
DIN ISO 228-1 ISO 7-1/BS 21 ASME B1.20.1	G Rc NPT	Inlet 1/2" a	1 ¹³ / ₁₆	1 ¹³ / ₁₆	1 ¹⁵ / ₁₆	1 ¹³ / ₁₆	1 ¹³ / ₁₆	1 ¹⁵ / ₁₆	1 ¹³ / ₁₆	1 ¹³ / ₁₆	1 ¹⁵ / ₁₆
		Inlet 3/4", 1"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

Inlet thread male

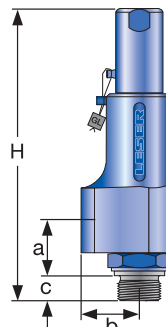
	Size outlet body	Conventional design			Long version						
		1/2"	3/4"	1"	1/2"	3/4"	1"	1/2"	3/4"	1"	
Center to face [inch]											
DIN ISO 228-1	G	Inlet a	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ¹³ / ₃₂	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ¹³ / ₃₂	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ¹³ / ₃₂
		Outlet b	1 ³ / ₁₆	1 ¹⁵ / ₃₂	1 ¹⁵ / ₃₂	1 ³ / ₁₆	1 ¹⁵ / ₃₂	1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



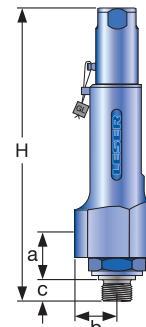
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Long version – male thread

Type 437

Dimensions and weights

Flanged connections [Metric units]

	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

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

Flange rating class PN 40			
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height	[mm]	H max.	263

Flange rating class ≥ 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	103
		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

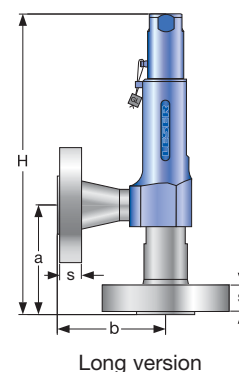
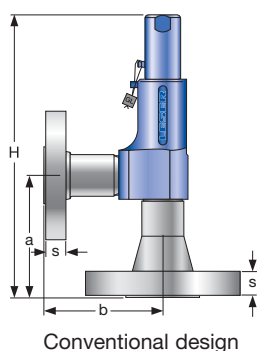
Weight

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

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

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating						
		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



Type 437

Dimensions and weights

Flanged connections [US units]

Type 437

	Conventional design	Long version
Actual Orifice diameter d_0 [inch]	0.394	0.236
Actual Orifice area A_0 [inch ²]	0.122	0.044

DIN EN 1092-1 (Available flange sizes refer to page 39)

Flange rating PN 40			
Center to face	[inch]	Inlet a	4 ¹ / 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 39)

Flange rating class 150			
Center to face	[inch]	Inlet a	4 ¹ / 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

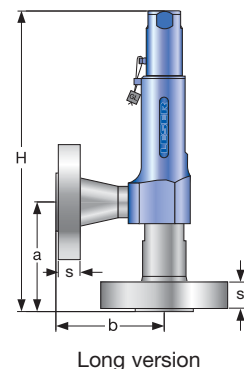
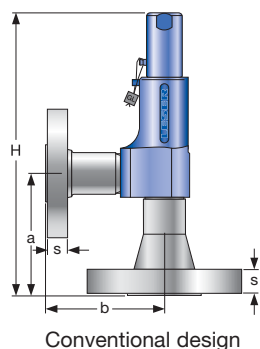
Weight

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

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

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating					
		40	100	160	250	320	400	150	300	600	900	1500	2500
DN 15		NPS 1/2"											
Flange thickness [inch]	s	23/32	-	7/8	23/32	13/32	13/16	9/16	23/32	23/32	13/32	13/32	13/16
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	13/16	1 13/32	1 9/16	2 1/32	2 7/32	2 7/32	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



Type 437

Pressure/temperature ratings

[Metric units + US units]

Metric units

Actual Orifice diameter d_0 [mm]		6				10			
Actual Orifice area A_0 [mm ²]		28.3				78.5			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 400				PN 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 [inch ²]		0,044				0,122			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Minimum set pressure	p [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			

Type 437 Approvals

Actual Orifice diameter d_0 [mm]		6	10
Actual Orifice area A_0 [mm ²]		28.3	78.5
Actual Orifice diameter d_0 [inch]		0.236	0.394
Actual Orifice area A_0 [inch ²]		0.044	0.122
Europe			
		Coefficient of discharge K_{dr}	
	Approval No.	072020111Z0008/0/21	
PED/DIN EN ISO 4126-1	S/G	0.72	0.50
	L	–	0.35
Germany			
		Coefficient of discharge α_w	
	Approval No.	TÜV SV 980	
PED/AD 2000-Merkblatt A2	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	
	Approval No.	The current approval no. can be found at www.leser.com	
CRN	S/G	–	0.458
	L	–	0.333
China			
		Coefficient of discharge α_w	
	Approval No.	The current approval no. can be found at www.leser.com	
AQSIQ	S/G	0.72	0.50
	L	–	0.35
Eurasian Custom Union			
		Coefficient of discharge α_w	
	Approval No.	The current approval no. can be found at www.leser.com	
EAC	S/G	0.72	0.50
	L	–	0.35
Classification societies			
		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	
DNV GL		www.dnvgl.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 renewal.	
		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 $\sqrt{\text{PSID}}$



Type 438
Packed knob H4
Conventional design



Type 438
Packed knob H4
Flanged connection



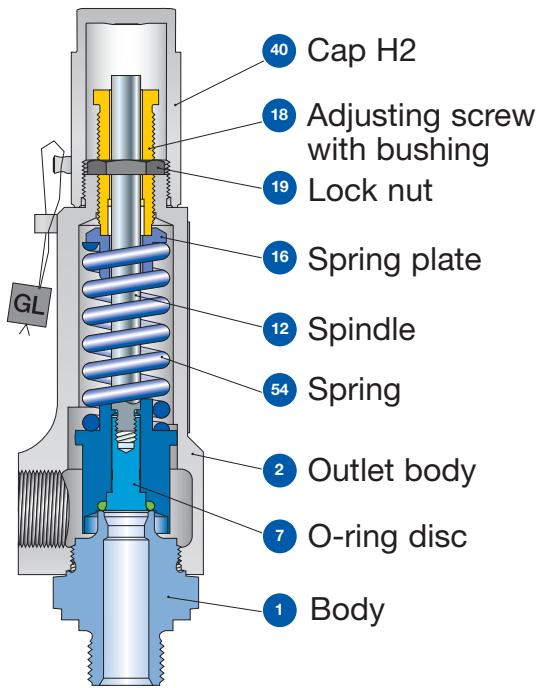
Type 438
Cap H2
Long version

Type 438 Safety Relief Valves

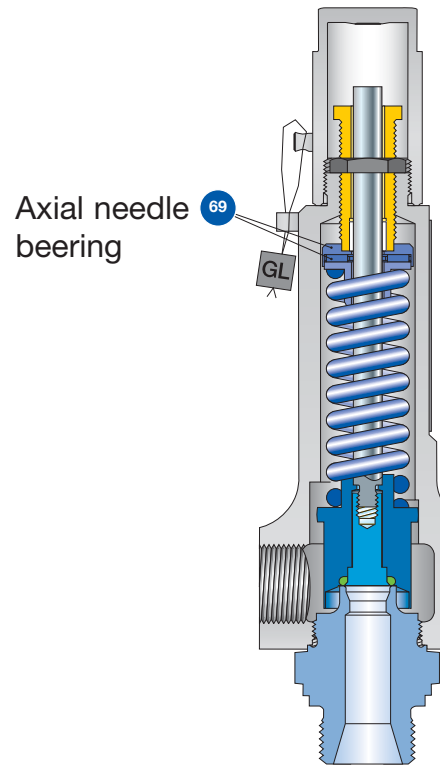
Contents	Page
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Materials	19
Article numbers	20
Dimensions and weights	
• Threaded connections	21
• Flanged connections	23
Pressure / temperature ratings	25
Approvals	26

**Type 438
Designs**

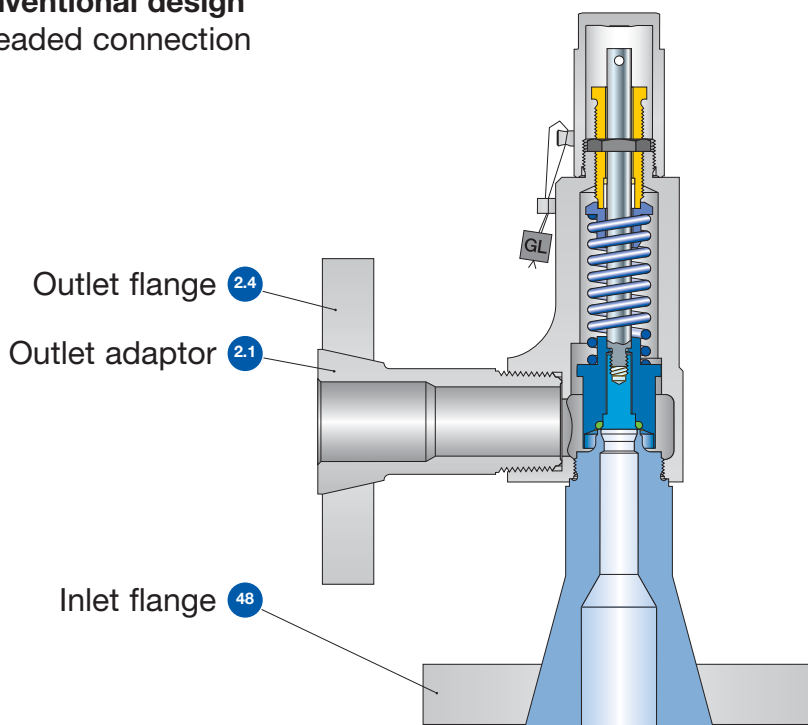
Type 438



Conventional design
Threaded connection



Long version
Threaded connection



Conventional design
Flange connection

Type 438 Materials

Item	Component	Design	Type 4383	Type 4384
1	Base / Inlet body	Threaded connection	1.4104 ^{1) 2)} , 1.4404 SA 479 430 ^{1) 2)} , 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 ²⁾ SA 479 430 ²⁾	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" ³⁾	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene
		"K" ³⁾	CR Chloroprene	CR Chloroprene
		"D" ³⁾	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene
		"L" ³⁾	FKM Fluorocarbon	FKM Fluorocarbon
		"C" ⁴⁾	FFKM Perfluor	FFKM Perfluor
12	Spindle		1.4021 420	1.4404 316L
		Long version	1.4404 316L	1.4404 316L
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		1.0460 SA 105	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 bearing	Long version	1.4404 316L	1.4404 316L

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.
- The materials shall meet the requirements of the relevant regulations (Pressure Equipment Directive (PED), acc. to PED applied harmonized standards, AD 2000-Merkblätter, VdTÜV (Werkstoffblätter) as well as further materials listed in Section 8 of the Type-Examination.

¹⁾ Only for male thread DIN ISO 228-1 G³/₈, G¹/₂, G³/₄ (Option codes V49, V54, V55).

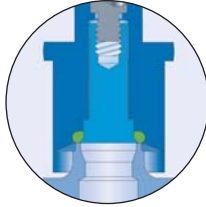
²⁾ Material 1.4404/316L for ASME application (Option code N68 or N70)

³⁾ Long version: O-ring 90 Shore for set pressures > 120 bar

⁴⁾ O-ring 90 Shore for set pressures > 40 bar

Type 438
Article numbers

Type 438



O-ring disc

		Conventional design	Long version
Actual Orifice diameter d_0 [mm]		10	10
Actual Orifice area A_0 [mm ²]		78.5	78.5
Actual Orifice diameter d_0 [inch]		0.394	0.394
Actual Orifice area A_0 [inch ²]		0.122	0.122
O-ring material		NBR "N" J30	NBR "N" J30 ³⁾
		CR "K" J21	CR "K" J21 ³⁾
		EPDM "D" J22	EPDM "D" J22 ³⁾
		FKM "L" J23	FKM "L" J23 ³⁾
		FFKM "C" J20 ⁴⁾	FFKM "C" J20 ⁴⁾
Base/Inlet body material: 1.4104 (430)¹⁾			
H2	Art. No. 4383.²⁾	2862	2872
H3	Art. No. 4383.²⁾ p_{max} = 16 bar_g	2863	-
H4	Art. No. 4383.²⁾	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

¹⁾ Material 1.4404/316L for ASME application (Option code N68 or N70)

²⁾ Type 4383 should not be selected when a „stainless steel“ valve is required due to corrosive medium.

³⁾ O-ring 90 Shore for set pressures > 120 bar

⁴⁾ O-ring 90 Shore for set pressures > 40 bar

Type 438

Dimensions and weights

Threaded connections [Metric units]

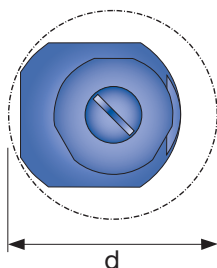
Size Outlet body	Conventional design			Long version		
	1/2"	3/4"	1"	1/2"	3/4"	1"
Actual Orifice diameter d_0 [mm]	10	10	10	10	10	10
Actual Orifice area A_0 [mm ²]	78.5	78.5	78.5	78.5	78.5	78.5
Weight [kg]	1.2	1.6	1.6	1.4	2.1	2.1
Required installation diameter d [mm]	65	80	80	65	80	80

Inlet thread female

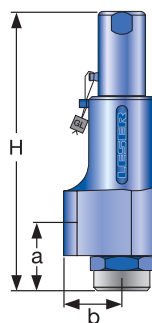
Size outlet body	Conventional design			Long version				
	1/2"	3/4"	1"	1/2"	3/4"	1"		
Center to face [mm]								
DIN ISO 228-1	G	Inlet 1/2" a	46	46	49	46	46	49
ISO 7-1/BS 21	Rc							
ASME B1.20.1	NPT	Inlet 3/4", 1" a	56	56	59	56	56	59
		Outlet b	30	37	37	30	37	37
Height [mm]								
		Inlet 1/2" H max.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

Inlet thread male

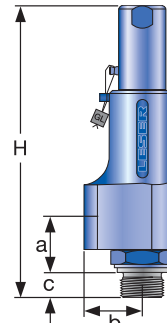
Size outlet body	Conventional design			Long version						
	1/2"	3/4"	1"	1/2"	3/4"	1"				
Center to face [mm]										
DIN ISO 228-1	G	Inlet a	33	33	36	33	33	36		
		Outlet b	30	37	37	30	37	37		
ISO 7-1/BS 21	R									
ASME B1.20.1	NPT	Inlet a	31	31	34	31	31	34		
		Outlet b	30	37	37	30	37	37		
Height [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	Conventional design			Long version						
	3/8"	1/2"	3/4"	3/4"	1"	1"				
DIN ISO 228-1	G	12	14	16	18	18				
ISO 7-1/BS 21	R	–	19	20	23	23				
ASME B1.20.1	NPT	–	22	22	27	27				



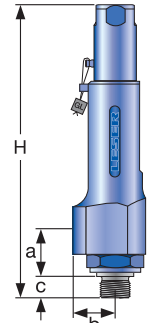
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Long version – male thread

Type 438

Dimensions and weights

Threaded connections [US units]

Size Outlet body	Conventional design			Long version		
	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "
Actual Orifice diameter d_0 [inch]	0.394	0.394	0.394	0.394	0.394	0.394
Actual Orifice area A_0 [inch ²]	0.122	0.122	0.122	0.122	0.122	0.122
Weight [lbs]	2.6	3.5	3.5	3.1	4.6	4.6
Required installation diameter d [inch]	2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂	2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂

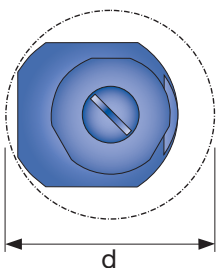
Inlet thread female

Size outlet body	Conventional design			Long version				
	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 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

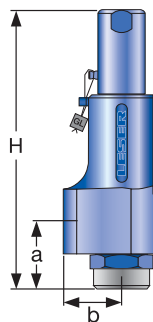
Inlet thread male

Size outlet body	Conventional design			Long version						
	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 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									
ASME B1.20.1	NPT	Inlet a	1 ⁷ / ₃₂	1 ⁷ / ₃₂	1 ¹¹ / ₃₂	1 ⁷ / ₃₂	1 ⁷ / ₃₂	1 ¹¹ / ₃₂		
		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" $\frac{3}{8}$ "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "	3/8" $\frac{3}{8}$ "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 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

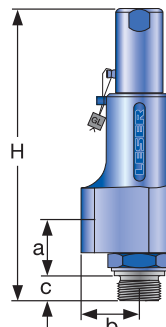
Length of screwed end c [inch]								
Size inlet thread	Conventional design			Long version				
	3/8" $\frac{3}{8}$ "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "	3/8" $\frac{3}{8}$ "	1/2" $\frac{1}{2}$ "	3/4" $\frac{3}{4}$ "	1" 1 "
DIN ISO 228-1	G		1 ⁵ / ₃₂	9 ¹ / ₁₆	3 ¹ / ₄	5 ¹ / ₈	2 ³ / ₃₂	2 ³ / ₃₂
ISO 7-1/BS 21	R		–	3 ¹ / ₄	2 ⁵ / ₃₂	2 ⁵ / ₃₂	2 ⁹ / ₃₂	2 ⁹ / ₃₂
ASME B1.20.1	NPT		–	7 ¹ / ₈	7 ¹ / ₈	7 ¹ / ₈	1 ¹ / ₁₆	1 ¹ / ₁₆



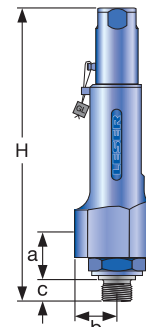
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Long version – male thread

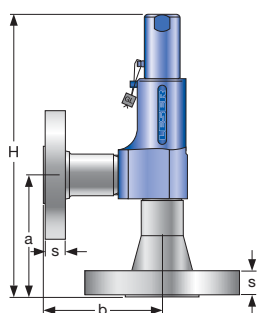
Type 438

Dimensions and weights

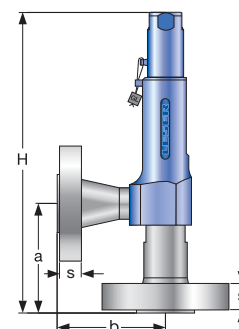
Flanged connections [Metric units]

		Conventional design		Long version	
Actual Orifice diameter d_0 [mm]		10		10	
Actual Orifice area A_0 [mm ²]		78.5		78.5	
DIN EN 1092-1					
Flange rating PN 40					
Center to face	[mm]	Inlet a	103	103	
		Outlet b	100	100	
Height	[mm]	H max.	263	284	
Flange rating \geq PN 160					
Center to face	[mm]	Inlet a	103	103	
		Outlet b	100	100	
Height	[mm]	H max.	266	287	
ASME B 16.5					
Flange rating class 150					
Center to face	[mm]	Inlet a	103	103	
		Outlet b	100	100	
Height	[mm]	H max.	263	284	
Flange rating class \geq 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	[kg]	W_N	2.4	2.8	
(without inlet and outlet flange)					

		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
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

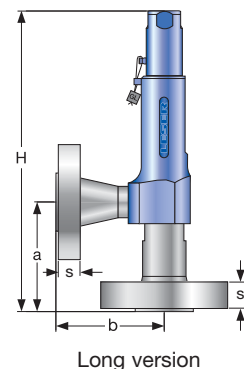
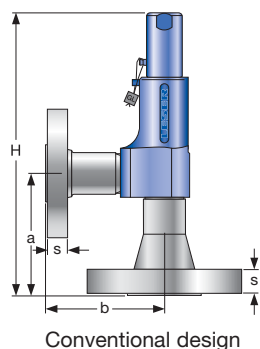
Dimensions and weights

Flanged connections [US units]

Type 438

		Conventional design		Long version	
Actual Orifice diameter d_0 [inch]		0.394		0.394	
Actual Orifice area A_0 [inch ²]		0.122		0.122	
DIN EN 1092-1 (Available flange sizes refer to page 04/05)					
Flange rating PN 40					
Center to face	[inch]	Inlet a	$4^{1/16}$		$4^{1/16}$
		Outlet b	$3^{15/16}$		$3^{15/16}$
Height	[inch]	H max.	$10^{11/32}$		$10^{3/16}$
Flange rating \geq 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	$4^{1/16}$		$4^{1/16}$
		Outlet b	$3^{15/16}$		$3^{15/16}$
Height	[inch]	H max.	$10^{11/32}$		$11^{3/16}$
Flange rating class \geq 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: $W_T = W_N + W_F(\text{Inlet}) + W_F(\text{Outlet})$					
Weight net	[lbs]	W_N	5.3		6.2
(without inlet and outlet flange)					

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	



Type 438

Pressure/temperature ratings

[Metric units + US units]

Metric units

		Conventional design				Long version			
Actual Orifice diameter d_0 [mm]		10				10			
Actual Orifice Area A_0 [mm ²]		78.5				78.5			
Body material: 1.4104 (430)									
Base / Inlet Body	Connection size	3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
	Pressure rating	PN 250				PN 250			
Outlet body	Pressure rating	PN 160				PN 160			
Minimum set pressure	p [bar _g]	5				93			
Maximum set pressure	p [bar _g]	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 250				PN 250			
Outlet body	Pressure rating	PN 160				PN 160			
Minimum set pressure	p [bar _g]	5				68			
Maximum set pressure	p [bar _g]	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

		Conventional design				Long version			
Actual Orifice diameter d_0 [inch]		0.394				0.394			
Actual Orifice area A_0 [inch ²]		0.122				0.122			
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]	72.5				1349			
Maximum set pressure	p [psig]	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]	72.5				986			
Maximum set pressure	p [psig]	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			

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

Type 438 Approvals

Type 438

Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm ²]		78.5
Actual Orifice diameter d_0 [inch]		0.394
Actual Orifice area A_0 [inch ²]		0.122
Europe		
		Coefficient of discharge K_{dr}
PED / DIN EN ISO 4126-1	Approval No.	072020111Z0008/0/21
	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
Eurasian Custom Union		
		Coefficient of discharge α_w
EAC	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
DNV GL		www.dnvgl.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 renewal.
		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 438
S	2.55 lb / hr / PSIA
G	0.904 SCFM / PSIA
L	1.49 GPM $\sqrt{\text{PSID}}$



Type 439
Packed knob H4
Conventional design



Type 439
Packed knob H4
Flanged connection



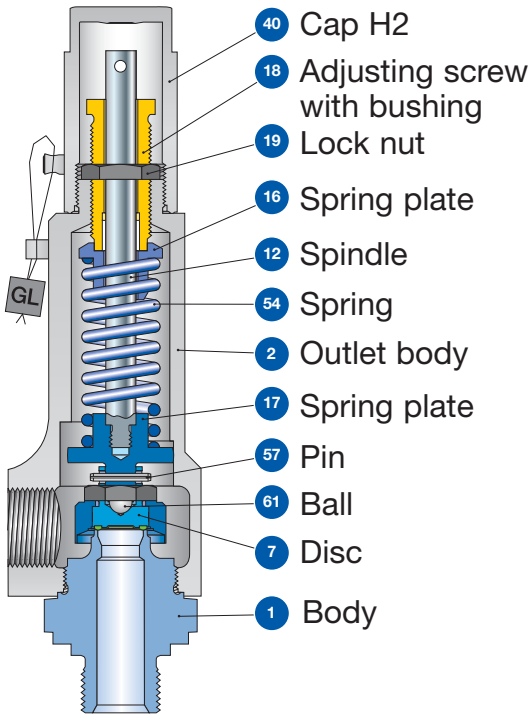
Type 439
Cap H2
Long version

Type 439 Safety Relief Valves

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Materials	19
Article numbers	20
Dimensions and weights	
• Threaded connections	21
• Flanged connections	23
Pressure / temperature ratings	25
Approvals	26
Series 437	
Available options	37
Available connections	
• Threaded connections	38
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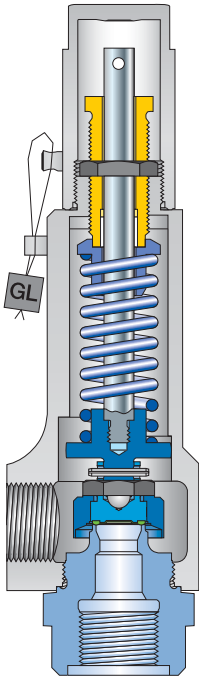
Type 439
Designs

Type 439

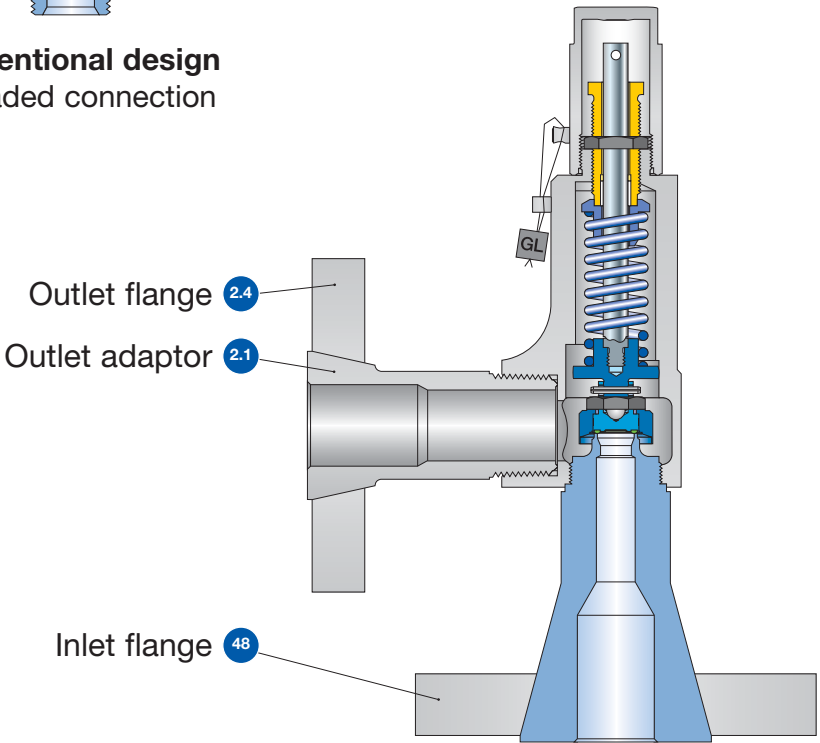


- 40 Cap H2
- 18 Adjusting screw with bushing
- 19 Lock nut
- 16 Spring plate
- 12 Spindle
- 54 Spring
- 2 Outlet body
- 17 Spring plate
- 57 Pin
- 61 Ball
- 7 Disc
- 1 Body

Conventional design
Threaded connection



Conventional design
Threaded connection



Conventional design
Flange connection

Type 439 Materials

Item	Component	Design	Type 4393	Type 4394
1	Base / Inlet body	Threaded connection	1.4104 ^{1) 3)} , 1.4404 SA 479 430 ^{1) 3)} , 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 ³⁾ SA 479 430 ³⁾	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	1.4404 316L
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		1.0460 SA 105	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L
54	Spring		1.4310 Stainless steel	1.4310 Stainless steel
57	Pin		1.4310 Stainless steel	1.4310 Stainless steel
61	Ball		1.3541 Hardened stainless steel	1.4401 316

Please notice:

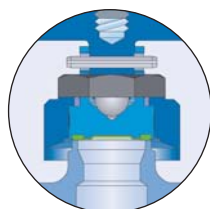
- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.
- The materials shall meet the requirements of the relevant regulations (Pressure Equipment Directive (PED), acc. to PED applied harmonized standards, AD 2000-Merkblätter, VdTÜV (Werkstoffblätter) as well as further materials listed in Section 8 of the Type-Examination.

¹⁾ Only for male thread DIN ISO 228-1 G3/8, G1/2, G3/4 (Option codes V49, V54, V55).

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

³⁾ Material 1.4404/316L for ASME application (Option code N68 or N70)

Type 439
Article numbers



Vulcanized soft seat

Type 439

Actual Orifice diameter d_0 [mm]	10		
Actual Orifice area A_0 [mm ²]	78.5		
Actual Orifice diameter d_0 [inch]	0.394		
Actual Orifice area A_0 [inch ²]	0.122		
Soft seal material	NBR	"N"	J30
	CR	"K"	J21
	EPDM	"D"	J22
	FKM	"L"	J23
	FFKM	"C"	J20
Base / Inlet body material: 1.4104 (430)¹⁾			
H2	Art. No. 4393.²⁾	2882	
H3	Art. No. 4393.²⁾ $p_{max} = 10 \text{ bar}_g$	2883	
H4	Art. No. 4393.²⁾	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	

¹⁾ Material 1.4404/316L for ASME application (Option code N68 or N70)

²⁾ Type 4393 should not be selected when a „stainless steel“ valve is required due to corrosive medium.

Type 439

Dimensions and weights

Threaded connections [Metric units]

		1/2"	3/4"	1"
Size Outlet body		1/2"	3/4"	1"
Actual Orifice diameter d ₀ [mm]		10	10	10
Actual Orifice area A ₀ [mm ²]		78.5	78.5	78.5
Weight	[kg]	1.2	1.6	1.6
Required installation diameter d	[mm]	65	80	80

Inlet thread female

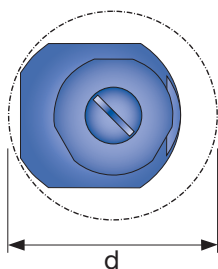
		1/2"	3/4"	1"
Size outlet body		1/2"	3/4"	1"
Center to face [mm]				
DIN ISO 228-1	G	Inlet 1/2" a	46	46
ISO 7-1/BS 21	Rc			49
ASME B1.20.1	NPT	Inlet 3/4", 1" a	56	56
		Outlet b	30	37
Height [mm]				
		Inlet 1/2" H max.	209	209
		Inlet 3/4", 1" H max.	219	219

Inlet thread male

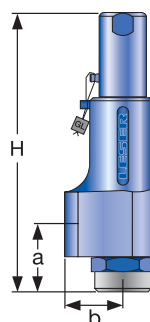
		1/2"	3/4"	1"
Size outlet body		1/2"	3/4"	1"
Center to face [mm]				
DIN ISO 228-1	G	Inlet a	33	33
		Outlet b	30	37
ISO 7-1/BS 21	R	Inlet a	31	31
ASME B1.20.1	NPT			34
		Outlet b	30	37

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

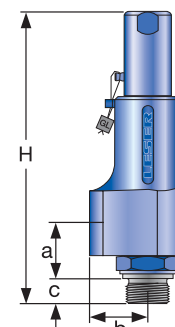
Length of screwed end c [mm]						
		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	G		12	14	16	18
ISO 7-1/BS 21	R		–	19	20	23
ASME B1.20.1	NPT		–	22	22	27



Required installation diameter



Conventional design – Female thread



Conventional design – Male thread

Type 439

Dimensions and weights

Threaded connections [US units]

Size Outlet body		1/2"	3/4"	1"
Actual Orifice diameter d ₀ [inch]		0.394	0.394	0.394
Actual Orifice area A ₀ [inch ²]		0.122	0.122	0.122
Weight	[lbs]	2.6	3.5	3.5
Required installation diameter d	[inch]	2 ⁹ / ₁₆	3 ⁵ / ₃₂	3 ⁵ / ₃₂

Inlet thread female

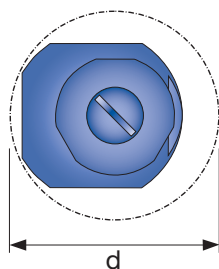
Size outlet body		1/2"	3/4"	1"	
Center to face [inch]					
DIN ISO 228-1	G	Inlet 1/2" a	1 ¹³ / ₁₆	1 ¹³ / ₁₆	1 ¹⁵ / ₁₆
ISO 7-1/BS 21	Rc				
ASME B1.20.1	NPT	Inlet 3/4", 1" a	2 ⁷ / ₃₂	2 ⁷ / ₃₂	2 ⁵ / ₁₆
		Outlet b	1 ³ / ₁₆	1 ¹⁵ / ₃₂	1 ¹⁵ / ₃₂
Height [inch]					
		Inlet 1/2" H max.	8 ⁷ / ₃₂	8 ⁷ / ₃₂	8 ¹¹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

Inlet thread male

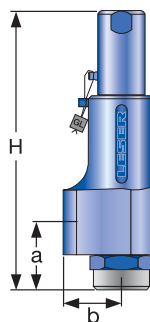
Size outlet body		1/2"	3/4"	1"	
Center to face [inch]					
DIN ISO 228-1	G	Inlet a	1 ⁵ / ₁₆	1 ⁵ / ₁₆	1 ¹³ / ₃₂
		Outlet b	1 ³ / ₁₆	1 ¹⁵ / ₃₂	1 ¹⁵ / ₃₂
ISO 7-1/BS 21	R				
ASME B1.20.1	NPT	Inlet a	1 ⁷ / ₃₂	1 ⁷ / ₃₂	1 ¹¹ / ₃₂
		Outlet b	1 ³ / ₁₆	1 ¹⁵ / ₃₂	1 ¹⁵ / ₃₂

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

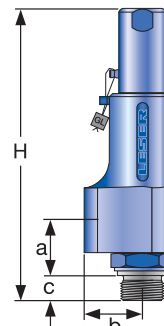
Length of screwed end c [inch]						
		Size inlet thread	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	G		1 ⁵ / ₃₂	9/16	5/8	2 ³ / ₃₂
ISO 7-1/BS 21	R		–	3/4	2 ⁵ / ₃₂	2 ⁹ / ₃₂
ASME B1.20.1	NPT		–	7/8	7/8	1 ¹ / ₁₆



Required installation diameter



Conventional design – Female thread



Conventional design – Male thread

Type 439

Dimensions and weights

Flanged connections [Metric units]

Actual Orifice diameter d_0 [mm]		10	
Actual Orifice area A_0 [mm ²]		78.5	
DIN EN 1092-1			
Flange rating PN 40			
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height	[mm]	H max.	263
Flange rating \geq PN 160			
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height	[mm]	H max.	266
ASME B 16.5			
Flange rating class 150			
Center to face	[mm]	Inlet a	103
		Outlet b	100
Height	[mm]	H max.	263
Flange rating class \geq 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.

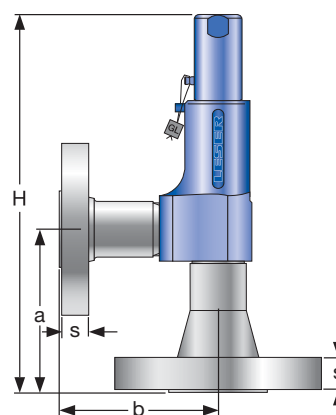
Weight

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

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

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating					
		40	100	160	250	320	400	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

Type 439

Dimensions and weights

Flanged connections [US units]

Actual Orifice diameter d_0 [inch]	0.394
Actual Orifice area A_0 [inch ²]	0.122

DIN ISO 1092-1

			Flange rating PN 40
Center to face	[inch]	Inlet a	$4\frac{1}{16}$
		Outlet b	$3\frac{15}{16}$
Height	[inch]	H max.	$10\frac{11}{32}$

			Flange rating \geq PN 160
Center to face	[inch]	Inlet a	$4\frac{1}{16}$
		Outlet b	$3\frac{15}{16}$
Height	[inch]	H max.	$10\frac{15}{32}$

ASME B 16.5

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

			Flange rating class \geq 300
Center to face	[inch]	Inlet a	$4\frac{1}{16}$
		Outlet b	$3\frac{15}{16}$
Height	[inch]	H max.	$10\frac{15}{32}$

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.

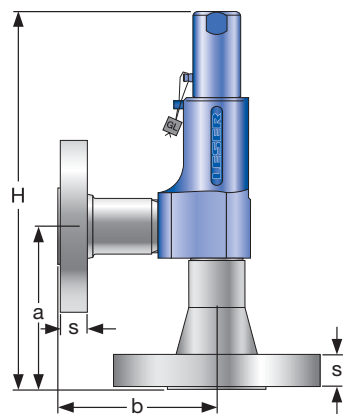
Weight

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

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

Flange dimensions

			DIN ISO 1092-1 / Flange rating PN					ASME B16.5 / Flange rating							
			40	100	160	250	320	400	Size	150	300	600	900	1500	2500
DN 15			NPS $\frac{1}{2}$"												
Flange thickness	[inch]	s	$\frac{23}{32}$	-	$\frac{7}{8}$	$1\frac{3}{32}$	$1\frac{3}{32}$	$1\frac{3}{16}$		$\frac{9}{16}$	$\frac{23}{32}$	$\frac{23}{32}$	$1\frac{1}{32}$	$1\frac{1}{32}$	$1\frac{3}{16}$
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 $\frac{3}{4}$"												
Flange thickness	[inch]	s	$\frac{25}{32}$	$\frac{7}{8}$	-	-	-	-		$\frac{19}{32}$	$\frac{23}{32}$	$\frac{23}{32}$	1	1	$1\frac{1}{4}$
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	$\frac{7}{8}$	-	$1\frac{1}{32}$	$1\frac{3}{16}$	$1\frac{13}{32}$	$1\frac{9}{16}$		$\frac{21}{32}$	$\frac{27}{32}$	$\frac{27}{32}$	$1\frac{9}{32}$	$1\frac{9}{32}$	$1\frac{9}{16}$
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

Type 439

Pressure/temperature ratings

[Metric units + US units]

Metric units

Actual Orifice diameter d_0 [mm]		10			
Actual Orifice Area A_0 [mm ²]		78.5			
Body material: 1.4104 (430)					
Base / Inlet Body	Connection size	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"
	Pressure rating	PN 250			
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	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"
	Pressure rating	PN 250			
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 [inch ²]		0.122				
Body material: 1.4104 (430)						
Base / Inlet Body	Connection size	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	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	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	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				

Type 439 Approvals

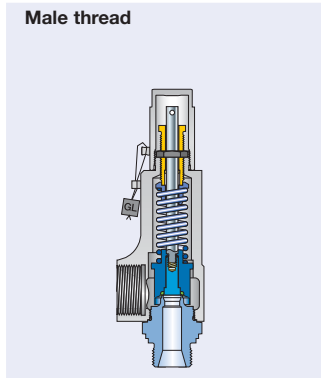
Actual Orifice diameter d_0 [mm]		10
Actual Orifice area A_0 [mm ²]		78.5
Actual Orifice diameter d_0 [inch]		0.394
Actual Orifice area A_0 [inch ²]		0.122
Europa Coefficient of discharge K_{dr}		
Approval No.		072020111Z0008/0/21
PED / DIN EN ISO 4126-1	S/G	0.45
	L	0.37
Germany Coefficient of discharge α_w		
Approval No.		TÜV SV 980
PED / AD 2000-Merkblatt A2	S/G	0.45
	L	0.37
United States Coefficient of discharge K		
Approval No.		M 37190
ASME Sec. VIII Div. 1	S/G	0.406
	Approval No.	M 37202
L		0.322
Canada Coefficient of discharge K		
Approval No.		The current approval no. can be found at www.leser.com
CRN	S/G	0.406
	L	0.322
China Coefficient of discharge α_w		
Approval No.		The current approval no. can be found at www.leser.com
AQSIQ	S/G	0.45
	L	0.37
Eurasian Custom Union Coefficient of discharge α_w		
Approval No.		The current approval no. can be found at www.leser.com
EAC	S/G	0.45
	L	0.37
Classification societies Homepage		
Bureau Veritas	BV	www.bureauveritas.com
DNV GL		www.dnvgl.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 renewal.
		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 below.

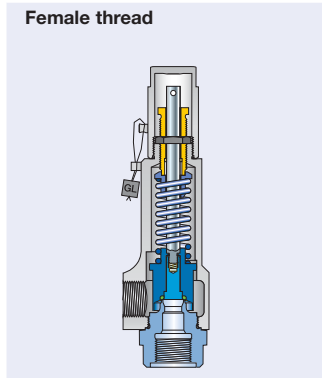
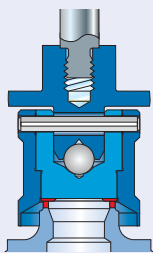
Fluid	Rated slope Type 439
S	2.55 lb / hr / PSIA
G	0.904 SCFM / PSIA
L	1.49 GPM $\sqrt{\text{PSID}}$

Series 437 Available options



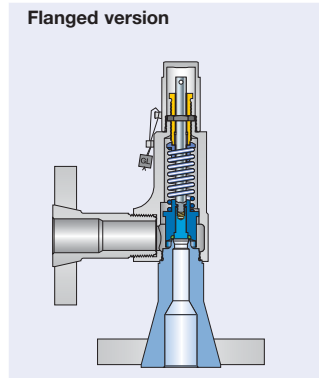
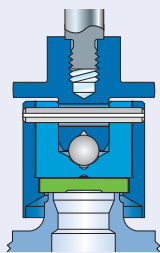
Type 437

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



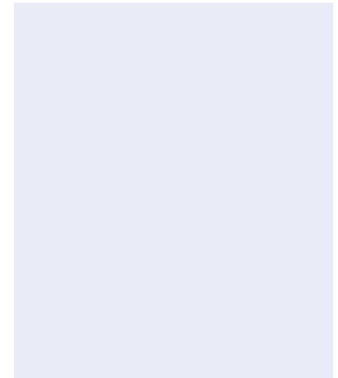
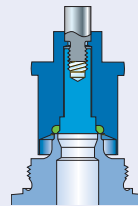
Type 437

Disc with inserted sealing plate
J44: PTFE-FDA "A"
J48: PCTFE "G"
J49: VESPEL-SP1 "T"



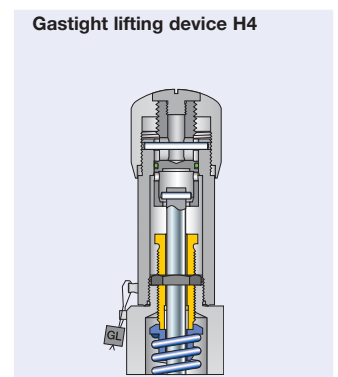
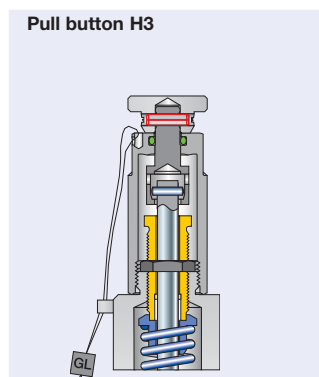
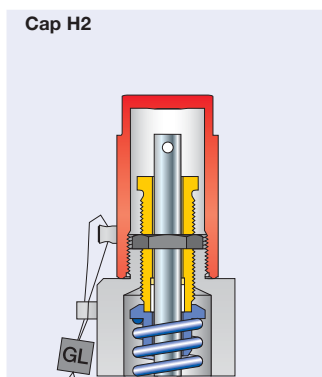
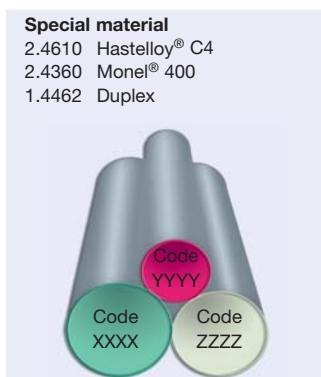
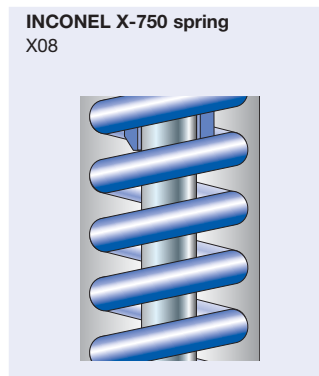
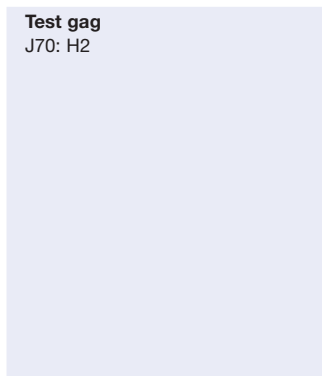
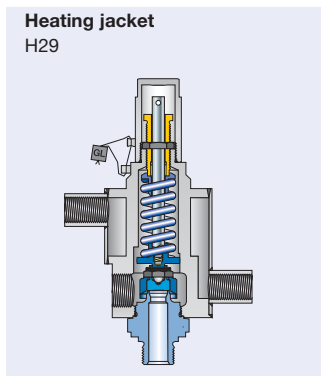
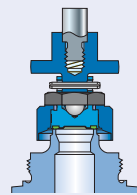
Type 438

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



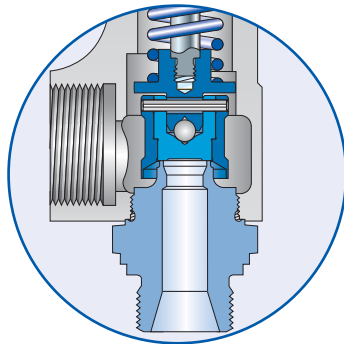
Type 439

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

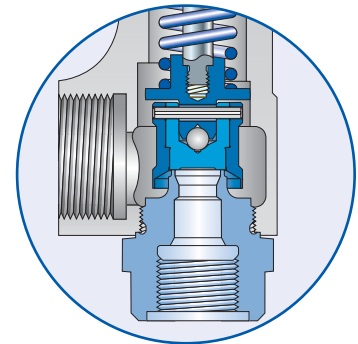


Series 437

Available connections



Male thread



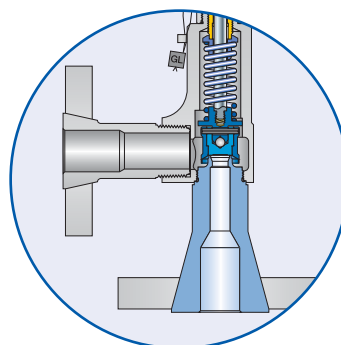
Female thread

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 ISO 7- 1 / BS 21					
R/BSPT	1/2"	V30	–	V30	–
	3/4"	V31	–	V31	–
	1"	V32	–	V32	–
Female thread 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).

Series 437 Available connections



Flanged version

Flanged connections

Nominal diameter	Pressure rating	d ₀ 6 mm		d ₀ 10 mm	
DIN EN 1092-1					
		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).

Type 459
Plain lever H3



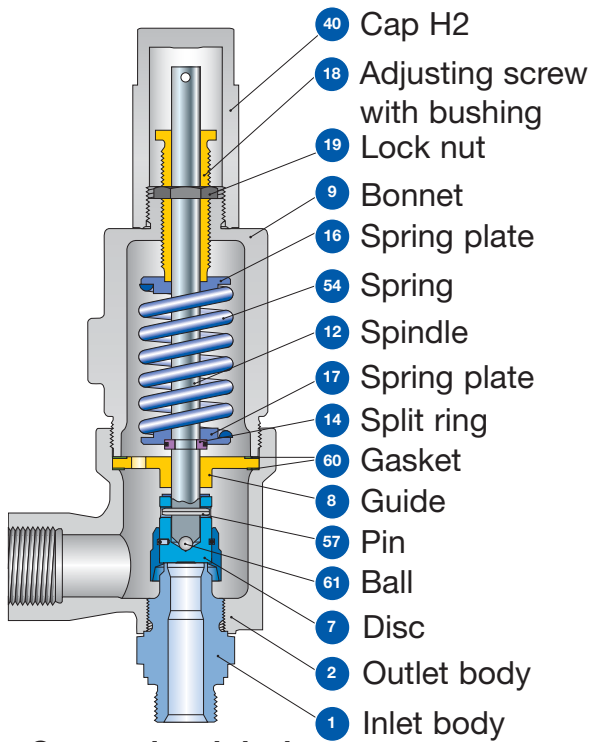
Type 459 Safety Relief Valves

Contents	Page
Designs	42
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Article numbers	44
Dimensions and weights	
• Threaded connections	45
• Flanged connections	47
Pressure / temperature ratings	49
Approvals	51

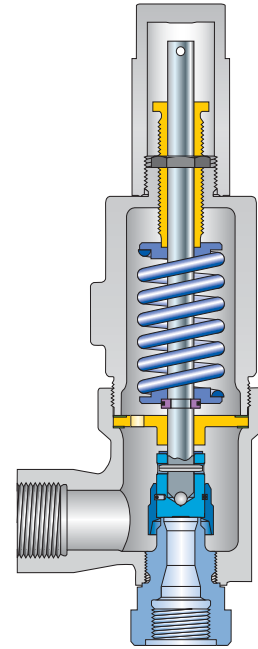
Type 459
Cap H2



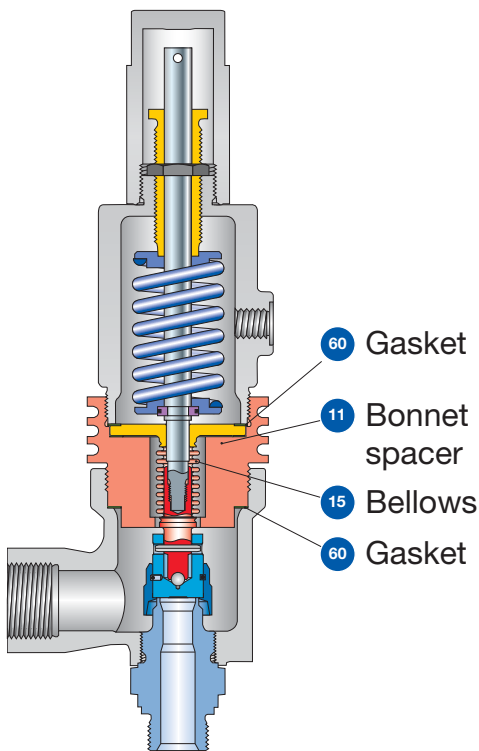
Type 459
Designs



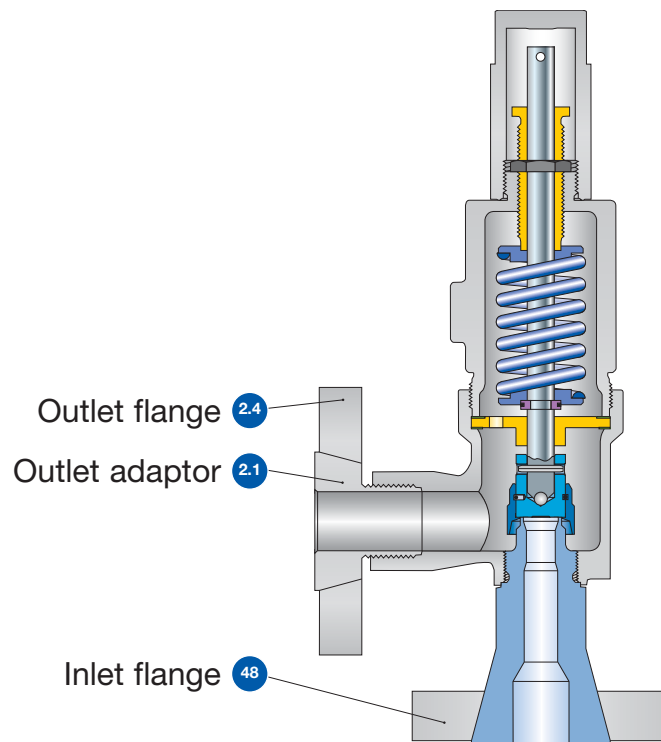
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Type 459 Materials

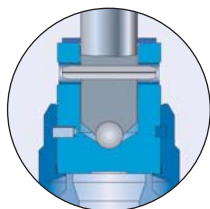
Item	Component	Design	Type 4593	Type 4592	Type 4594
1	Base / Inlet body	Threaded connection	1.4104 ¹⁾ , 1.4404 SA 479 430 ¹⁾ , SA 479 316L	1.4404 SA 479 316L	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L	1.4404 SA 479 316L	1.4404 SA 479 316L
2	Outlet body		1.0619 WCB	1.0619 WCB	1.4408 CF8M
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
			1.4104 tenifer Chrome steel tenifer	1.4104 tenifer Chrome steel tenifer	1.4404 316L
8	Guide	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
			0.7043 Ductile Gr. 60-40-18	1.0619 WCB	1.4408 CF8M
9	Bonnet	Balanced bellows design	1.0619 WCB	1.0619 WCB	1.4408 CF8M
			1.0460 Carbon steel	1.0460 Carbon steel	1.4404 316L
11	Bonnet spacer	Balanced bellows design	1.4021 420	1.4021 420	1.4404 316L
12	Spindle	Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
			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
			1.0718 Steel	1.0718 Steel	1.4404 316L
18	Adjusting screw with bushung		1.4104 Chrome steel	1.4104 Chrome steel	1.4404 316L
			PTFE PTFE	PTFE PTFE	PTFE PTFE
19	Lock nut		1.4104 Chrome steel	1.4104 Chrome steel	1.4404 316L
40	Cap H2		1.0460 SA 105	1.0460 SA 105	1.4404 316L
			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
			Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316
60	Gasket		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⁾ only valid for male thread DIN ISO 228-1 G $\frac{3}{4}$, G1, G1 $\frac{1}{2}$ (Option codes V55, V56, V57) (please note availability regarding d₀)

Type 459
Article numbers



Metal seat

	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
Outlet body casted					
Inlet body	1.4104	H2	Art. No. 4593.	2502	2512
Outlet body	1.0619	H3	Art. No. 4593.	2503	2513
	WCB				
Bonnet	0.7043	H4	Art. No. 4593.	2504	2514
	p [bar _g]		S/G/L	1.5 – 250¹⁾	0.2 – 200¹⁾
	p [psig]			21.7 – 3625¹⁾	2.9 – 2900¹⁾
Outlet body investment casted					
Inlet body	1.4404	H2	Art. No. 4592.	2472	2482
Outlet body	1.0619	H3	Art. No. 4592.	2473	2483
	WCB				
Bonnet	1.0619	H4	Art. No. 4592.	2474	2484
	p [bar _g]		S/G/L	1.5 – 250	0.2 – 200
	p [psig]			21.7 – 3625	2.9 – 2900
Outlet body investment casted					
Inlet body	1.4404	H2	Art. No. 4594.	2162	2172
Outlet body	1.4408				
	(CF8M)				
Bonnet	1.4408	H4	Art. No. 4594.	2164	2174
	p [bar _g]		S/G/L	1.5 – 250	0.2 – 200
	p [psig]			21.7 – 3625	2.9 – 2900

¹⁾ Max. set pressure 69 bar / 1000 psig for Type 4593 acc. to ASME-Code Sec. VIII, Div. 1 with UV-Stamp.
The design of Type 4593 is permitted with limitations acc. to ASME-Code Sec. VIII, Div. 1, UCD-2, UCD-3.
Type 4593 shall not be used for lethal substances, irrespective of their state of aggregation.

Type 459

Dimensions and weights

Threaded connections [Metric units]

	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 [mm ²]		63.6	63.6	63.6	133	133	133	241	241	241	241
Weight [kg]		3.1	3.1	3.1	3.1	3.1	3.1	3.9	3.9	3.9	3.9
Balanced bellows [kg]		3.9	3.9	3.9	3.9	3.9	4.7	4.7	4.7	4.7	4.7
Required installation diameter d [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 G	Inlet a	53	56	62	53	56	62	60	66	67	73
ASME B1.20.1 NPT	Outlet b	75	75	75	75	75	75	75	75	75	75
Center to face [mm]	H max	283	286	292	283	286	292	287	293	294	300
Height [mm]	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

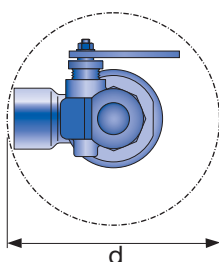
Inlet thread male

	Size outlet body	1" - 1 1/2"	1" - 1 1/2"	1 1/2"	2"
Actual Orifice diameter d ₀ [mm]		9	13	17.5	17.5
Center to face [mm]					
DIN ISO 228-1 G	Inlet 1/2" - 1" a	52	52	-	-
	Inlet 1" - 1 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	53
	Outlet b	75	75	75	100

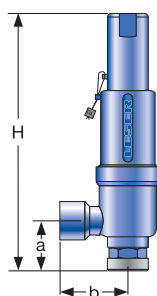
		Conventional design						Balanced bellows					
Size inlet thread		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1 G	H max.	296	298	301	303	305	-	328	330	333	335	337	-
ISO 7-1/BS 21 R	H max.	298	299	303	-	305	-	330	331	335	-	337	-
ASME B1.20.1 NPT	H max.	301	301	307	308	308	309	333	333	339	340	340	341

Length of screwed end c [mm]		1/2"	3/4"	1"	1 1/4"	1 1/2"	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

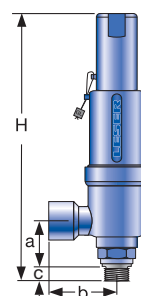
¹⁾ Inlet thread R only up to 1 1/2".



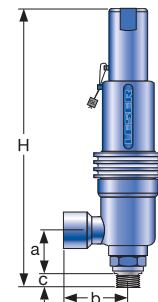
Required installation diameter



Conventional design - female thread



Conventional design - male thread



Balanced bellows

Type 459

Dimensions and weights

Threaded connections [US units]

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]	6.8	6.8	6.8	6.8	6.8	6.8	8.6	8.6	8.6	8.6
Balanced bellows	[lbs]	8.6	8.6	8.6	8.6	8.6	8.6	10.4	10.4	10.4	10.4
Required installation diameter d	[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	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
	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 ¹ / ₁₆	–	3 ¹ / ₃₂
	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
	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

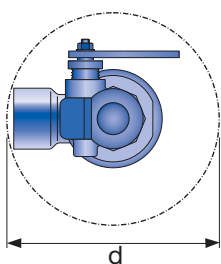
Inlet thread male

Size outlet body		1" – 1 1/2"	1" – 1 1/2"	1 1/2"	2"
Actual Orifice diameter d ₀ [mm]		0.354	0.512	0.689	0.689
Center to face [inch]					
DIN ISO 228-1 G	Inlet 1/2" – 1" a	2 ¹ / ₁₆	2 ¹ / ₁₆	–	–
	Inlet 1" – 1 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" a¹⁾	–	–	2 ³ / ₃₂	2 ³ / ₃₂
	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	4

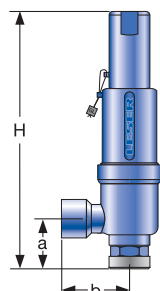
Height [inch]		Conventional design						Balanced bellows					
Size inlet thread		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1 G	H max.	11 ²¹ / ₃₂	11 ²³ / ₃₂	11 ²⁷ / ₃₂	11 ¹⁵ / ₁₆	12	–	12 ²⁹ / ₃₂	13	13 ¹ / ₈	13 ³ / ₁₆	13 ⁹ / ₃₂	–
ISO 7-1/BS 21 R	H max.	11 ²³ / ₃₂	11 ²⁵ / ₃₂	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]		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

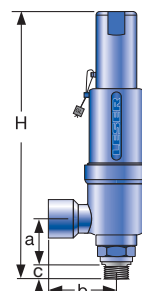
¹⁾ Inlet thread R only to 1 1/2".



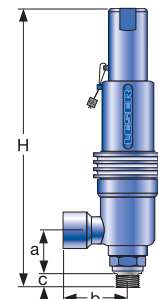
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Balanced bellows

Type 459

Dimensions and weights

Flanged connections [Metric units]

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [mm]	9	13	17.5	9	13	17.5
Actual Orifice area A_0 [mm ²]	63.6	133	241	63.6	133	241

DIN 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.

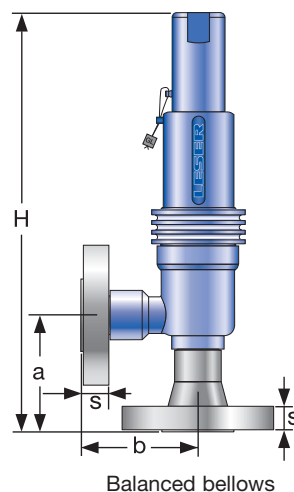
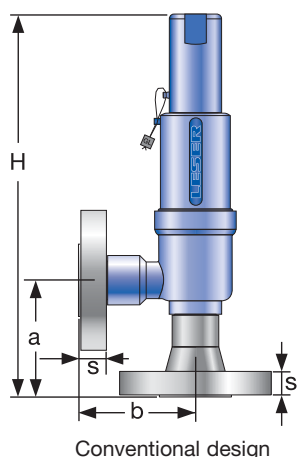
Weight

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

Weight net	[kg]	m_N	3.1	3.1	3.9	4.3	4.3	5.1
(without inlet and outlet flange)								

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating					
		40	100	160	250	320	400	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	–	–



Type 459

Dimensions and weights

Flanged connections [US units]

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [inch]	0.354	0.512	0.689	0.354	0.512	0.689
Actual Orifice area A_0 [inch ²]	0.099	0.206	0.374	0.099	0.206	0.374

DIN EN 1092-1

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

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.

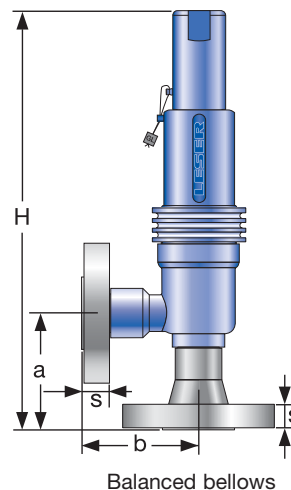
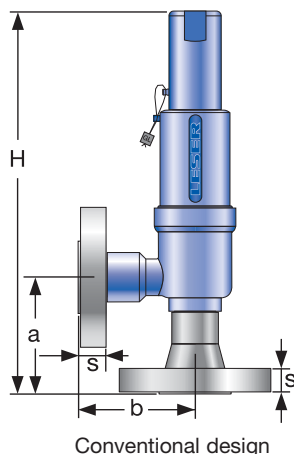
Weight

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

Weight net	[lbs]	m_N	6.8	6.8	8.6	9.5	9.5	11.3
(without inlet and outlet flange)								

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		$2^{3}/_{32}$	–	$7/_{8}$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$		$9/_{16}$	$2^{3}/_{32}$	$2^{3}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
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		$2^{5}/_{32}$	$7/_{8}$	–	–	–	–		$1^{9}/_{32}$	$2^{3}/_{32}$	$2^{3}/_{32}$	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		$7/_{8}$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{13}/_{32}$	$1^{9}/_{16}$		$2^{1}/_{32}$	$2^{7}/_{32}$	$2^{7}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
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		$1^{3}/_{16}$	–	$2^{9}/_{32}$	$1^{1}/_{4}$	–	–		$7/_{8}$	$1^{5}/_{16}$	$1^{5}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange	[lbs] m_F		4.5	–	6.3	9.5	–	–		3.2	4.8	4.8	8.6	–	–



Type 459

Type 459

Pressure/temperature ratings

[Metric units]

Actual Orifice diameter d_0 [mm]		9			13				17.5			
Actual Orifice Area A_0 [mm ²]		63.6			133				241			
Body material: 1.4104 (430)				Type 4593								
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 400			PN 250			PN 160				
Outlet body	Pressure rating	PN 40			PN 40			PN 40				
Minimum set pressure	p [bar _g] S/G/L	1.5			0.2			0.2				
Min. set pressure standard bellows	p [bar _g] S/G/L	3			3			3				
Min. set pressure⁵⁾ 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]				+300							
Body material: 1.4404 (316L)				Type 4592								
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
	Pressure rating	PN 250 PN 500 (Option code L20)			PN 160 PN 250 (Option code L20)			PN 160				
Outlet Body	Pressure rating	PN 160			PN 160			PN 160				
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 pressure⁵⁾ 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 ¹⁾							
	max. [°C]				+450 ²⁾							
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 160			PN 160			PN 160				
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 pressure⁵⁾ 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]				-273 ³⁾							
	max. [°C]				+400 ²⁾							
Temperature acc. to ASME	min. [°C]				-196							
	max. [°C]				+450 ^{2) 4)}							

¹⁾ For DIN EN applications at temperatures under -10 °C please proceed in accordance to AD-2000 Merkblatt W10:

- Load case II: under -10 °C / 14 °F to -60 °C / -76 °F, $p_{max} = PN \times 0.75$
- Load case III: under -60 °C / -76 °F to -85 °C / -121 °F, $p_{max} = PN \times 0.25$

²⁾ Please notice: from 300 °C / 572 °F a bellows or suitable spring material e.g. Inconel X750 should be selected (refer to LDs 3001.19).

³⁾ For DIN EN applications at temperatures under -200 °C please proceed in accordance to AD-2000 Merkblatt W10:

- Load case II: under -200 °C / -328 °F to -255 °C / -427 °F, $p_{max} = PN \times 0.75$
- Load case III: under -255 °C / -427 °F to -273 °C / -459 °F, $p_{max} = PN \times 0.25$

⁴⁾ The temperature is limited by the standard inlet body. For applications up to 538 °C / 1000 °F (temperature limit of outlet body) a suitable inlet body material and a bellows or Inconel spring is required.

⁵⁾ 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.

Type 459

Pressure/temperature ratings

[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 ⁵⁾ 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	3625			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 ⁵⁾ 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	3625			2900			1450				
Temperature acc. to DIN EN	min. [°F]				-121 ¹⁾							
	max. [°F]				+752 ²⁾							
Temperature acc. to ASME	min. [°F]				-20							
	max. [°F]				+800 ²⁾							
Body material: 1.4404 (316L)			Type 4594									
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"
Minimum set pressure	p [psig] S/G/L	21.8			2.9			2.9				
Min. set pressure ⁵⁾ 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	3625			2900			1450				
Temperature acc. to DIN EN	min. [°F]				-328 ³⁾							
	max. [°F]				+752 ²⁾							
Temperature acc. to ASME	min. [°F]				-321							
	max. [°F]				+842 ^{2) 4)}							

¹⁾ For DIN EN applications at temperatures under -10 °C please proceed in accordance to AD-2000 Merkblatt W10:

- Load case II: under -10 °C / 14 °F to -60 °C / -76 °F, $p_{max} = PN \times 0.75$
- Load case III: under -60 °C / -76 °F to -85 °C / -121 °F, $p_{max} = PN \times 0.25$

²⁾ Please notice: from 300 °C / 572 °F a bellows or suitable spring material e.g. Inconel X750 should be selected (refer to LDsS 3001.19).

³⁾ For DIN EN applications at temperatures under -200 °C please proceed in accordance to AD-2000 Merkblatt W10:

- Load case II: under -200 °C / -328 °F to -255 °C / -427 °F, $p_{max} = PN \times 0.75$
- Load case III: under -255 °C / -427 °F to -273 °C / -459 °F, $p_{max} = PN \times 0.25$

⁴⁾ The temperature is limited by the standard inlet body. For applications up to 538 °C/1000 °F (temperature limit of outlet body) a suitable inlet body material and a bellows or Inconel spring is required.

⁵⁾ 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.

Type 459 Approvals

Actual Orifice diameter d_0 [mm]		9	13	17.5
Actual Orifice area A_0 [mm ²]		63.6	133	241
Actual Orifice diameter d_0 [inch]		0.354	0.512	0.689
Actual Orifice area A_0 [inch ²]		0.099	0.206	0.374
Europe		Coefficient of discharge K_{dr}		
	Approval No.	072021409Z0022/15/D/0135		
PED / DIN EN ISO 4126-1	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
Germany		Coefficient of discharge α_w		
	Approval No.	TÜV SV 909		
PED / AD 2000-Merkblatt A2	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
United States		Coefficient of discharge K		
	Approval No.	M 37112		
ASME Sec. VIII Div. 1	S/G	0.811		
	Approval No.	M 37101		
	L	0.566		
Canada		Coefficient of discharge K		
	Approval No.	The current approval no. can be found at www.leser.com		
CRN	S/G	0.811		
	L	0.566		
China		Coefficient of discharge α_w		
	Approval No.	The current approval no. can be found at www.leser.com		
AQSIQ	S/G	0.83	0.81	0.79
	L	0.61	0.53	0.52
Eurasian Custom Union		Coefficient of discharge α_w		
	Approval No.	The current approval no. can be found at www.leser.com		
EAC	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 renewal.	
DNV GL		www.dnvgl.com		
Lloyd's Register EMEA	LREMEA	www.lr.org	A sample certificate including the valid certification number can be found at www.leser.com	
Registro Italiano Navale	RINA	www.rina.org		
U.S. Coast Guard	U.S.C.G	www.uscg.org		



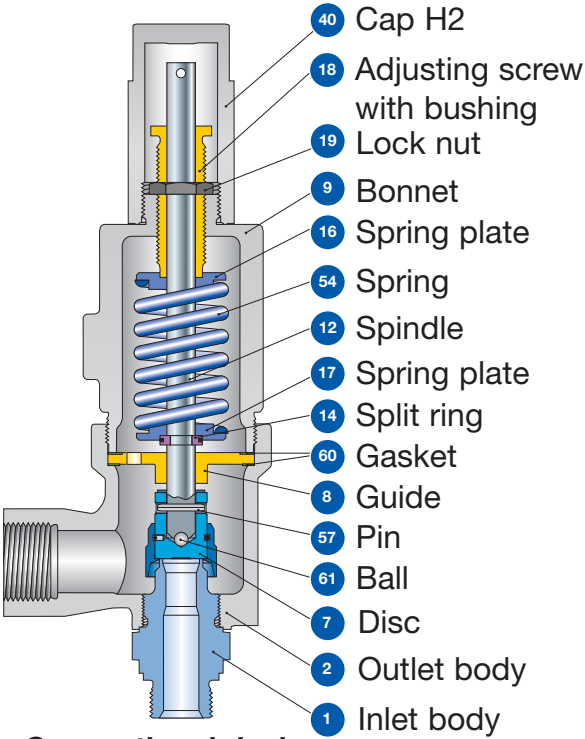
Type 459 HDD

Type 459 HDD
Safety Relief Valves

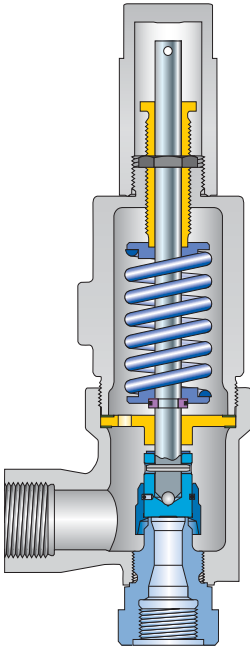
Contents	Page
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• Threaded connections	56
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Pressure / temperature ratings	60
Approvals	61

Type 459 HDD
Cap H2

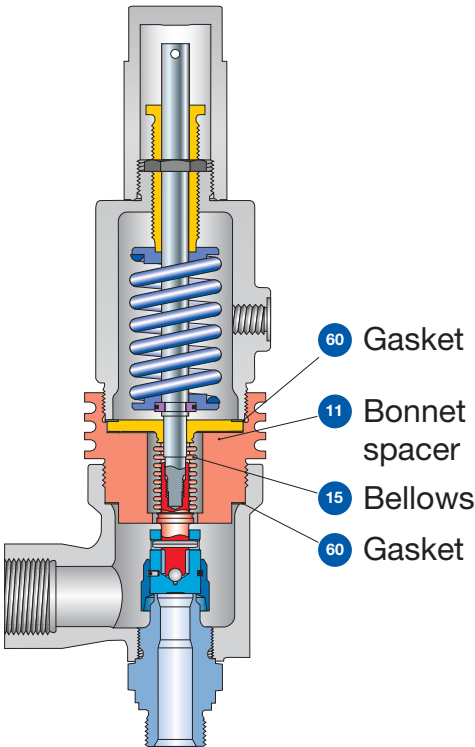
Type 459 HDD
Designs



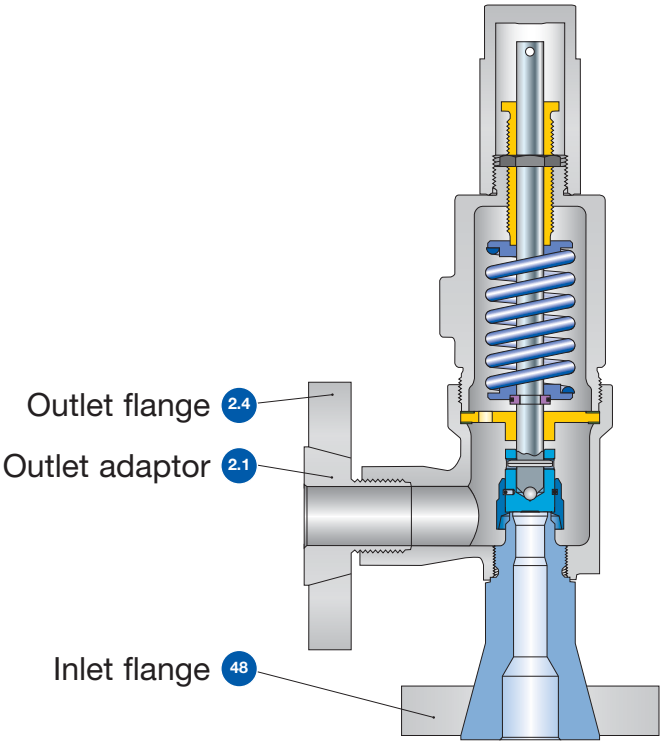
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Type 459 HDD

Type 459 HDD

Materials

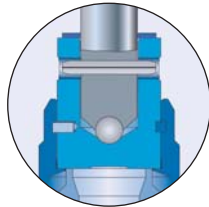
Item	Component	Design	Type 4594 HDD
1	Base / Inlet body	Threaded connection	1.4404 stelled SA 479 316L stelled
		Flange connection	1.4404 stelled SA 479 316L stelled
2	Outlet body		1.4408 CF8M
2.1	Outlet adaptor	Flange connection	1.4404 316L
2.4	Outlet flange	Flange connection	1.4404 316L
7	Disc	Metal seat	1.4404 stelled SA 479 316L stelled
8	Guide		1.4404 316L
		Balanced bellows design	1.4404 / SA 316L Upper connection of balanced bellows
9	Bonnet		1.4408 CF8M
		Balanced bellows design	1.4408 CF8M
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

Please notice:

- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.
- The materials shall meet the requirements of the relevant regulations (Pressure Equipment Directive (PED), acc. to PED applied harmonized standards, AD 2000-Merkblätter, VdTÜV (Werkstoffblätter) as well as further materials listed in Section 8 of the Type-Examination.

Type 459 HDD

Article numbers



Metal seat

Actual Orifice diameter d_0 [mm]		6 ¹⁾		9	
Actual Orifice area A_0 [mm ²]		28.3		63.9	
Actual Orifice diameter d_0 [inch]		0.236		0.354	
Actual Orifice area A_0 [inch ²]		0.044		0.099	
Body material: 14404 (316L)					
Outlet body	1.4408	H2	Art. No. 4594.	2132	2142
	CF8M				
Bonnet	1.4404	H4	Art. No. 4594.	2134	2144
	1.4408				
	p [bar _g]				
p [psig]	6091 – 12328	3626 – 6091			

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

Type 459 HDD

Dimensions and weights

Threaded connections [Metric units]

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]	6	6	6	9	9	9
Actual Orifice area A_0 [mm ²]	28.3	28.3	28.3	63.6	63.6	63.6
Weight [kg]	3.1	3.1	3.1	3.1	3.1	3.1
Balanced bellows [kg]	3.9	3.9	3.9	3.9	3.9	3.9
Required installation diameter d [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]	6	6	6	9	9	9		
Center to face / Height								
DIN ISO 228-1 G	Inlet a		53	53	62 ^{*)}	53	56	62
ASME B1.20.1 NPT	Outlet b		75	75	75 ^{*)}	75	75	75
Center to face [mm]	H max.		283	286	292 ^{*)}	283	286	292
Height [mm]	Balanced bellows H max.		315	318	342 ^{*)}	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]	6	9	
Center to face [mm]			
DIN ISO 228-1 G	Inlet a	52	52
	Outlet b	75	75
ISO 7-1/BS 21 R	Inlet a	49	49
ASME B1.20.1 NPT	Outlet b	75	75

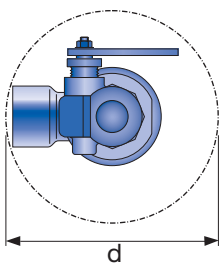
Height [mm]

			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

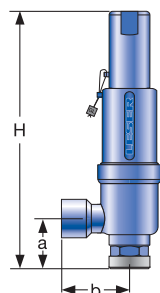
Length of screwed end c [mm]

	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

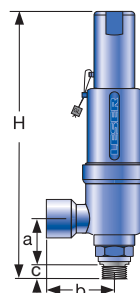
^{*)} DIN ISO 228-1 G not possible.



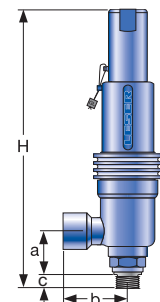
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Balanced bellows

Type 459 HDD

Dimensions and weights

Threaded connections [US units]

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]	0.236	0.236	0.236	0.354	0.354	0.354
Actual Orifice area A_0 [inch ²]	0.044	0.044	0.044	0.099	0.099	0.099
Weight [lbs]	6.8	6.8	6.8	6.8	6.8	6.8
Balanced bellows [lbs]	8.6	8.6	8.6	8.6	8.6	8.6
Required installation diameter d [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]	0.236	0.236	0.236	0.354	0.354	0.354		
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
ASME B1.20.1 NPT	Outlet b		2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆ *)	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆
Center to face [inch]	H max.		11 ⁵ / ₃₂	11 ¹ / ₁₄	11 ¹ / ₂ *)	11 ⁵ / ₃₂	11 ¹ / ₁₄	11 ¹ / ₂
Height [inch]	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 ⁷ / ₃₂	2 ³ / ₃₂	2 ⁷ / ₃₂	2 ⁷ / 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]	1/4	11/32	
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
ISO 7-1/BS 21 R	Inlet a	1 ¹⁵ / ₁₆	1 ¹⁵ / ₁₆
ASME B1.20.1 NPT	Outlet b	2 ¹⁵ / ₁₆	2 ¹⁵ / ₁₆

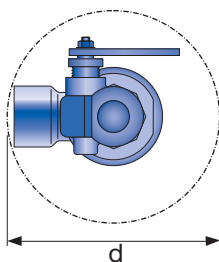
Height [inch]

			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

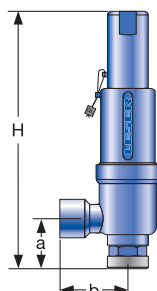
Length of screwed end c [inch]

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

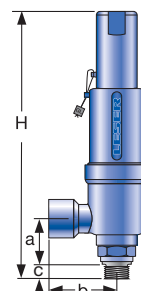
*) DIN ISO 228-1 G not possible.



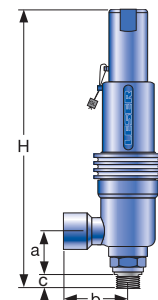
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Balanced bellows

Type 459 HDD

Dimensions and weights

Flanged connections [Metric units]

	Conventional design		Balanced bellows	
Actual Orifice diameter d_0 [mm]	6	9	6	9
Actual Orifice area A_0 [mm ²]	28.3	63.6	28.3	63.6

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

Flange rating PN 40 – PN 400

Center to face	[mm]	Inleta	Conventional design		Balanced bellows	
			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	Conventional design		Balanced bellows	
			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.

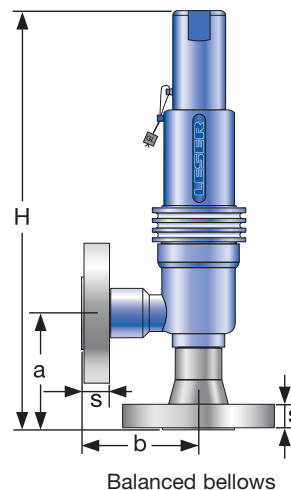
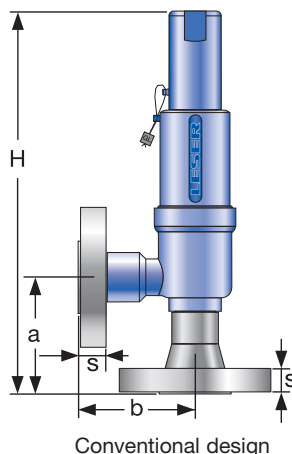
Weight

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

Weight net	[kg]	Conventional design		Balanced bellows	
(without inlet and outlet flange)	m_N	3.1	3.1	4.3	4.3

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						DIN ISO 1092-1 / Flange rating class					
		40	100	160	250	320	400	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	-	-



Type 459 HDD

Dimensions and weights

Flanged connections [US units]

	Conventional design		Balanced bellows	
Actual Orifice diameter d_0 [inch]	0.236	0.354	0.236	0.354
Actual Orifice area A_0 [inch ²]	0.044	0.099	0.044	0.099

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

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

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

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

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.

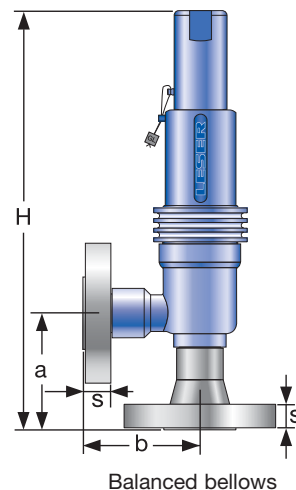
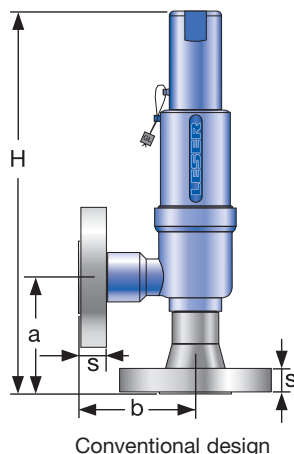
Weight

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

Weight net [lbs] (without inlet and outlet flange)	m_N	6.8	6.8	9.5	9.5
--	-------	-----	-----	-----	-----

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class					
		40	100	160	250	320	400	Size	150	300	600	900	1500
DN 15		NPS $1/2$"											
Flange thickness [mm]	s	$2^{3}/_{32}$	–	$7/8$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$	$9/_{16}$	$2^{3}/_{32}$	$2^{3}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
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	$2^{5}/_{32}$	$7/8$	–	–	–	–	$1^{9}/_{32}$	$2^{3}/_{32}$	$2^{3}/_{32}$	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	$7/8$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{3}/_{32}$	$1^{9}/_{16}$	$2^{1}/_{32}$	$2^{7}/_{32}$	$2^{7}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
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	$1^{3}/_{16}$	–	$2^{9}/_{32}$	$1^{1}/_{4}$	–	–	$7/8$	$1^{5}/_{16}$	$1^{5}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange [kg]	m_F	4.5	–	6.3	9.5	–	–	3.2	4.8	4.8	8.6	–	–



Type 459 HDD

Pressure/temperature ratings

[Metric units + US units]

Metric units

Actual Orifice diameter d_0 [mm]		6	9
Actual Orifice Area A_0 [mm ²]		28.3	63.6
Body material 1.4404 (316L)		Type 4594	
Base / Inlet Body	Connection size	1/2"	3/4"
	Pressure rating	PN 850	PN 500
Outlet body	Pressure rating	PN 160	PN 160
Minimum set pressure	p [bar _g] S/G/L	420	250.01
Maximum set pressure	p [bar _g] S/G	850	420
	p [bar _g] L	–	
Temperature acc. to DIN EN	min. [°C]	-273 ¹⁾	-273 ¹⁾
	max. [°C]	+400 ²⁾	+400 ²⁾
Temperature acc. to ASME	min. [°C]	-196	-196
	max. [°C]	+450 ³⁾	+450 ³⁾

US units

Actual Orifice diameter d_0 [inch]		0.236	0.354
Actual Orifice Area A_0 [inch ²]		0.044	0.099
Body material 1.4404 (316L)		Type 4594	
Base / Inlet Body	Connection size	1/2"	3/4"
	Pressure rating	PN 850	PN 500
Outlet body	Pressure rating	PN 160	PN 160
Minimum set pressure	p [psig] S/G/L	6091	3625
Maximum set pressure	p [psig] S/G	12328	6091
	p [psig] L	–	
Temperature acc. to DIN EN	min. [°F]	-459 ¹⁾	-459 ¹⁾
	max. [°F]	+752 ²⁾	+752 ²⁾
Temperature acc. to ASME	min. [°F]	-321	-321
	max. [°F]	+842 ³⁾	+842 ³⁾

¹⁾ For DIN EN applications at temperatures under -200 °C / -328 °F please proceed in accordance to AD-2000 Merkblatt W10.

• Load case II: under -200 °C / -328 °F to -255 °C / -427 °F, $p_{max} = PN \times 0.75$

• Load case III: under -255 °C / -427 °F to -273 °C / -459 °F, $p_{max} = PN \times 0.25$

²⁾ Please notice: from 300 °C / 572 °F, a bellows or suitable spring material e.g. Inconel X750 should be selected (refer to LDsS 3001.19). For the temperature range >400 °C / >752 °F an outlet body material e.g. 1.4552 or 1.4581 (special casting) is required.

³⁾ The temperature is limited by the standard inlet body. For applications up to 538 °C/1000 °F (temperature limit of outlet body) a suitable inlet body material and a bellows or Inconel spring is required.

Type 459 HDD

Approvals

Actual Orifice diameter d_0 [mm]	6	9
Actual Orifice area A_0 [mm ²]	28.3	63.6
Actual Orifice diameter d_0 [inch]	0.236	0.354
Actual Orifice area A_0 [inch ²]	0.044	0.099
Europe		
		Coefficient of discharge K_{dr}
Approval No.	072021409Z0022/15/D/0135	
PED / DIN EN ISO 4126-1	S/G	0.81
	L	0.70
Germany		
		Coefficient of discharge α_w
Approval No.	TÜV SV 909	
PED / AD 2000-Merkblatt A2	S/G	0.81
	L	0.70
United States		
		Coefficient of discharge K
Approval No.	M 37112	
ASME Sec. VIII Div. 1	S/G	0.811
	Approval No.	M 37112
	L	0.566
Canada		
		Coefficient of discharge K
Approval No.	The current approval no. can be found at www.leser.com	
CRN	S/G	0.811
	L	0.566
China		
		Coefficient of discharge α_w
Approval No.	The current approval no. can be found at www.leser.com	
AQSIQ	S/G	0.81
	L	0.70
Eurasian Custom Union		
		Coefficient of discharge α_w
Approval No.	The current approval no. can be found at www.leser.com	
EAC	S/G	0.81
	L	0.70
Classification societies		
		Homepage
Bureau Veritas	BV	www.bureauveritas.com
DNV GL		www.dnvgl.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 renewal.
		A sample certificate including the valid certification number can be found at www.leser.com

**Type 462
Plain lever H3**



**Type 462
Safety Relief Valves**

Contents	Page
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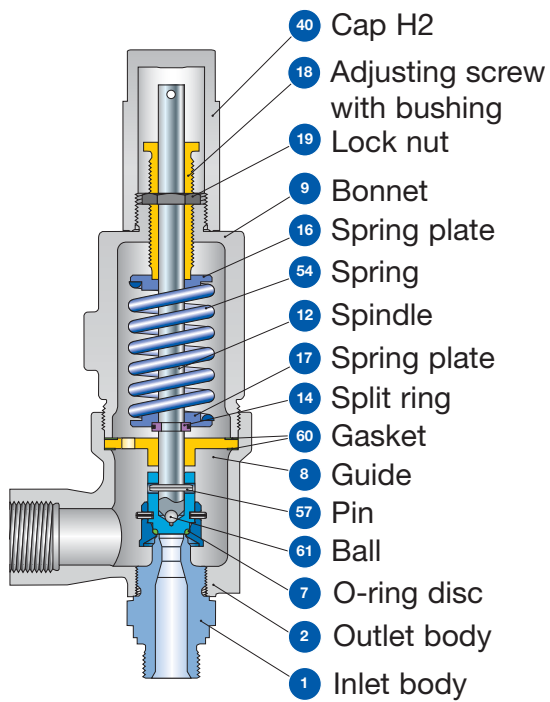


**Type 462
Cap H2**

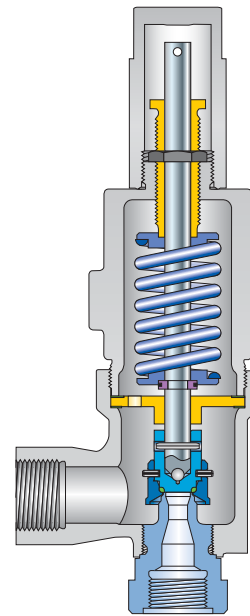


**Type 462
Refrigeration
technology**

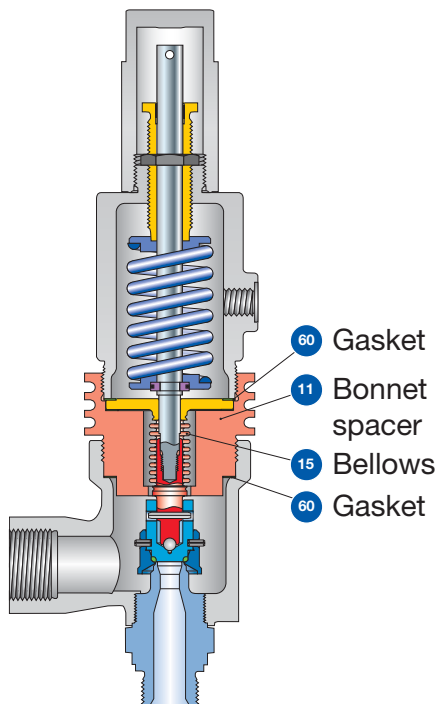
**Type 462
Designs**



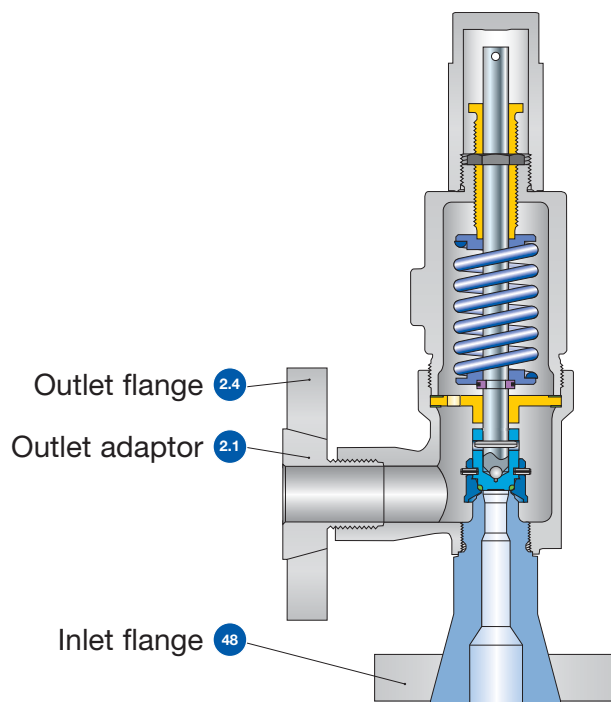
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Type 462 Materials

Item	Component	Design	Type 4623	Type 4622	Type 4624
1	Base / Inlet body	Threaded connection	1.4104 ¹⁾ , 1.4404 SA 479 430 ¹⁾ , 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		1.0619 WCB	1.0619 WCB	1.4408 CF8M
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" ²⁾	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene	NBR Nitrile-Butadiene
		"K" ²⁾	CR Chloroprene	CR Chloroprene	CR Chloroprene
		"D" ²⁾	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene	EPDM Ethylen-Propylene-Diene
		"L" ²⁾	FKM Fluorocarbon	FKM Fluorocarbon	FKM Fluorocarbon
		"C" ³⁾	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	1.0619 WCB	1.4408 CF8M
		Balanced bellows design	1.0619 WCB	1.0619 WCB	1.4408 CF8M
11	Bonnet spacer	Balanced bellows design	1.4404 316L	1.4404 316L	1.4404 316L
			1.4021 420	1.4404 316L	1.4404 316L
12	Spindle		1.4404 316L	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
			1.0718 Steel	1.0718 Steel	1.4404 316L
16/17	Spring plate		1.4104 / PTFE Chrome steel / PTFE	1.4104 / PTFE Chrome steel / PTFE	1.4104 / PTFE Chrome steel / PTFE
18	Adjusting screw with bushing		1.4104 430	1.4104 430	1.4404 316L
			1.0460 SA 105	1.0460 SA 105	1.4404 316L
48	Inlet flange	Flange connection	1.4404 316L	1.4404 316L	1.4404 316L
			1.1200 / 1.8159 / 1.7107 Carbon steel	1.1200 / 1.8159 / 1.7107 Carbon steel	1.4310 Stainless steel
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
			Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316	Graphite / 1.4401 Graphite / 316
60	Gasket		1.3541 Hardened stainless steel	1.3541 Hardened stainless steel	1.4401 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.
- The materials shall meet the requirements of the relevant regulations (Pressure Equipment Directive (PED), acc. to PED applied harmonized standards, AD 2000-Merkblätter, VdTÜV (Werkstoffblätter) as well as further materials listed in Section 8 of the Type-Examination.

¹⁾ only valid for male thread DIN ISO 228-1 G $\frac{3}{4}$ G1, G1 $\frac{1}{2}$ (Option codes V55, V56, V57) (please note availability regarding d₀)

²⁾ d₀ 9 + 13: O-ring 90 Shore for set pressure > 100 bar

³⁾ d₀ 9 + 13: O-ring 90 Shore for set pressure > 40 bar

Type 462

Article numbers

Type 462

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 ²⁾	
		CR "K" J21 ²⁾	
		EPDM "D" J22 ²⁾	
		FKM "L" J23 ²⁾	
		FFKM "C" J20 ³⁾	
Outlet body casted			
Inlet body	1.4104	H2 Art. No. 4623.	2902
Outlet body	1.0619	H3 Art. No. 4623.	2903
Bonnet	0.7043	H4 Art. No. 4623.	2904
	p [bar _g]	S/G/L	0.5 – 250¹⁾
	p [psig]		7.3 – 3625¹⁾
			0.5 – 180¹⁾
			0.5 – 92.5¹⁾
			7.3 – 2610¹⁾
			7.3 – 1342¹⁾
Outlet body investment casted			
Inlet body	1.4404	H2 Art. No. 4622.	3772
Outlet body	1.0619	H3 Art. No. 4622.	3773
Bonnet	1.0619	H4 Art. No. 4622.	3774
	p [bar _g]	S/G/L	0.5 – 250
	p [psig]		7.3 – 3625
			0.5 – 180
			0.5 – 92.5
			7.3 – 2610
			7.3 – 1342
Outlet body investment casted			
Inlet body	1.4404		
Outlet body	1.4408	H2 Art. No. 4624.	2192
Bonnet	1.4408	H4 Art. No. 4624.	2194
	p [bar _g]	S/G/L	0.5 – 250
	p [psig]		7.3 – 3625
			0.5 – 180
			0.5 – 92.5
			7.3 – 2610
			7.3 – 1342

Type 462 Refrigeration technology

DN_E	15, 20	15, 20, 25	25
DN_A	20	25	32
Actual Orifice diameter d_0 [mm]	13	13	17.5
Actual Orifice area A_0 [mm ²]	133	133	241
Weight [kg]	3.1	3.1	3.9
O-ring material		NBR "N" J30	
		CR "K" J21	
		EPDM "D" J22	
Outlet body investment casted			
Inlet + Outlet PN 40			
Inlet body	1.4404	H2 Art. No. 4622.	3882
Outlet body	1.0619		
Bonnet	1.0619		
	p [bar _g]	D/G/F 0,5 –	40
			40
			40

Also all other LESER valve types can be designed for refrigeration technology.

¹⁾ Max. set pressure 69 bar / 1000 psig for Type 4623 acc. to ASME-Code Sec. VIII, Div. 1 with UV-Stamp.
The design of Type 4623 is permitted with limitations acc. to ASME-Code Sec. VIII, Div. 1, UCD-2, UCD-3.
Type 4623 shall not be used for lethal substances, irrespective of their state of aggregation.

²⁾ d_0 9 + 13: O-ring 90 Shore for set pressure > 100 bar

³⁾ d_0 9 + 13: O-ring 90 Shore for set pressure > 40 bar

Type 462

Dimensions and weights

Threaded connections [Metric units]

	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 [mm ²]		63.6	63.6	63.6	133	133	133	241	241	241	241
Weight	[kg]	3.1	3.1	3.1	3.1	3.1	3.1	3.9	3.9	3.9	3.9
Balanced bellows	[kg]	3.9	3.9	3.9	3.9	3.9	3.9	4.7	4.7	4.7	4.7
Required installation diameter d	[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 G	Inlet a	53	56	62	53	56	62	60	66	67	73
ASME B1.20.1 NPT	Outlet b	75	75	75	75	75	75	75	75	75	75
Center to face [mm]	H max.	283	286	292	283	286	292	287	293	294	300
Height [mm]	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

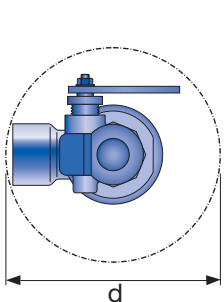
Inlet thread male

	Size outlet body	1" - 1 1/2"	1" - 1 1/2"	1 1/2"	2"
Actual Orifice diameter d ₀ [mm]		9	13	17.5	17.5
Center to face [mm]					
DIN ISO 228-1 G	Inlet 1/2" - 1" a	52	52	-	-
	Inlet 1" - 1 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	53
	Outlet b	75	75	75	100
Height [mm]					

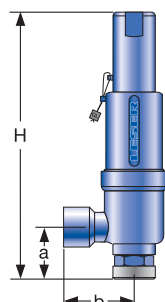
		Conventional design						Balanced bellows					
Size inlet thread		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
DIN ISO 228-1 G	H max.	296	298	301	303	305	-	328	330	333	335	337	-
ISO 7-1/BS 21 R	H max.	298	299	303	-	305	-	330	331	335	-	337	-
ASME B1.20.1 NPT	H max.	301	301	307	307	308	309	333	333	339	340	340	341

		Length of screwed end c [mm]					
Size inlet thread		1/2"	3/4"	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

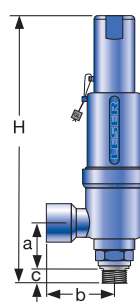
¹⁾ Inlet thread R only up to 1 1/2".



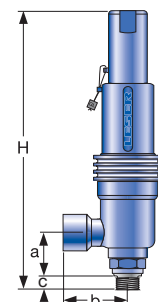
Required installation diameter



Conventional design - Female thread



Conventional design - Male thread



Balanced bellows

Type 462

Dimensions and weights

Threaded connections [US units]

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]		6.8	6.8	6.8	6.8	6.8	6.8	8.6	8.6	8.6	8.6
Balanced bellows [lbs]		8.6	8.6	8.6	8.6	8.6	8.6	10.4	10.4	10.4	10.4
Required installation diameter d [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 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 / ₈	2 ¹⁹ / ₃₂	2 ⁵ / ₈	2 ⁷ / ₈
		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]	Balanced bellows	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
		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	–
Height [inch]	Balanced bellows	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
		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

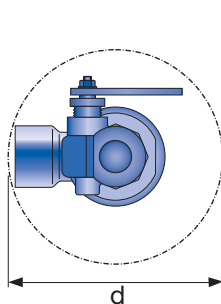
Inlet thread male

Size outlet body		1" – 1 1/2"	1" – 1 1/2"	1 1/2"	2"	
Actual Orifice diameter d ₀ [mm]		0.354	0.512	0.689	0.689	
Center to face [inch]						
DIN ISO 228-1	G	Inlet 1/2" – 1" a	2 ¹ / ₁₆	2 ¹ / ₁₆	–	
		Inlet 1" – 1 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

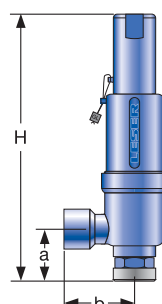
Height [inch]		Conventional design					Balanced bellows							
Size inlet thread		1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	
DIN ISO 228-1	G	H max.	11 ²¹ / ₃₂	11 ²³ / ₃₂	11 ²⁷ / ₃₂	11 ¹⁵ / ₁₆	12	–	12 ²⁹ / ₃₂	13	13 ¹ / ₈	13 ³ / ₁₆	13 ⁹ / ₃₂	–
		H max.	11 ²³ / ₃₂	11 ²⁵ / ₃₂	11 ¹⁵ / ₁₆	–	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	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

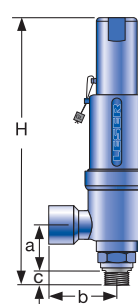
¹⁾ Inlet thread R only up to 1 1/2".



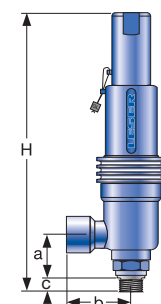
Required installation diameter



Conventional design – Female thread



Conventional design – Male thread



Balanced bellows

Type 462

Dimensions and weights

Flanged connections [Metric units]

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [mm]	9	13	17.5	9	13	17.5
Actual Orifice area A_0 [mm ²]	63.6	133	241	63.6	133	241

DIN EN 1092-1

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

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.

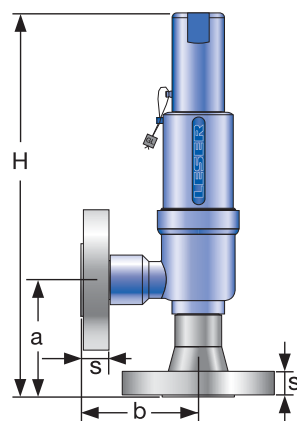
Weight

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

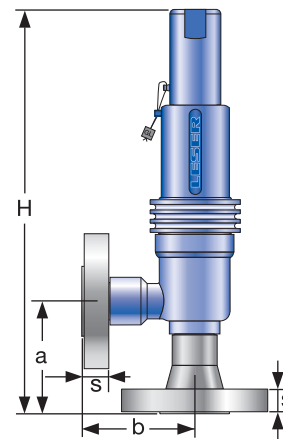
Weight net (without inlet and outlet flange)	[kg]	m_N	3.1	3.1	3.5	4.3	4.3	4.7
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Flange dimensions

		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

Type 462

Dimensions and weights

Flanged connections [US units]

	Conventional design			Balanced bellows		
Actual Orifice diameter d_0 [inch]	0.354	0.512	0.689	0.354	0.512	0.689
Actual Orifice area A_0 [inch ²]	0.099	0.206	0.374	0.099	0.206	0.374

DIN EN 1092-1

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

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.

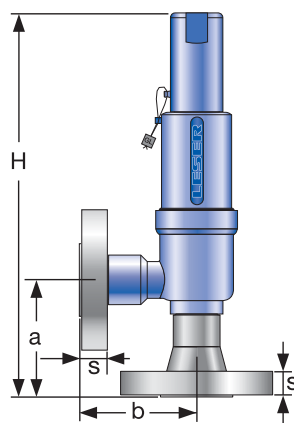
Weight

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

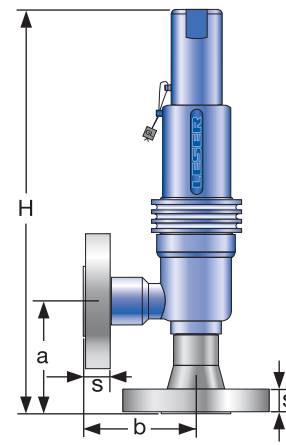
Weight net [lbs]	m_N	6.8	6.8	7.7	9.5	9.5	10.4
(without inlet and outlet flange)							

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	2 ³ / ₃₂	-	7/8	1 ³ / ₃₂	1 ³ / ₃₂	1 ³ / ₁₆		9/16	2 ³ / ₃₂	2 ³ / 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	2 ⁵ / ₃₂	7/8	-	-	-	-		1 ⁹ / ₃₂	2 ³ / ₃₂	2 ³ / 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		2 ¹ / ₃₂	2 ⁷ / ₃₂	2 ⁷ / 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	1 ³ / ₁₆	-	2 ⁹ / ₃₂	1 ¹ / ₄	-	-		7/8	1 ⁵ / ₁₆	1 ⁵ / 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

Type 462

Pressure/temperature ratings

Metric units

Actual Orifice diameter d_0 [mm]		9			13			17.5					
Actual Orifice Area A_0 [mm ²]		63.6			133			241					
Body material: 1.4104 (430F)												Type 4623	
Base / Inlet Body	Connection size	1/2"	3/4"	1"	1/2"	3/4"	1"	3/4"	1"	1 1/4"	1 1/2"	2"	
	Pressure rating	PN 400			PN 250			PN 160					
Outlet body	Pressure rating	PN 40			PN 40			PN 40					
Minimum set pressure	p [bar _g] S/G/L	0.5			0.5			0.5					
Min. set pressure standard bellows	p [bar _g] S/G/L	3			3			3					
Min. set pressure¹⁾ 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 EN³⁾	min. [°C]				-10 ²⁾								
	max. [°C]				+150								
Temperature acc. to ASME³⁾	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 160			PN 160			PN 160					
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 pressure¹⁾ 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 EN³⁾	min. [°C]				-45								
	max. [°C]				+150								
Temperature acc. to ASME³⁾	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 160			PN 160			PN 160					
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 pressure¹⁾ 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 EN³⁾	min. [°C]				-45								
	max. [°C]				+150								
Temperature acc. to ASME³⁾	min. [°C]				-45								
	max. [°C]				+150								

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

²⁾ For DIN EN applications at temperatures under -10°C please proceed according to AD 2000-Merkblatt W10.

³⁾ The temperature is limited by the soft seal material. The stated values are valid for EPDM.

Type 462

Pressure/temperature ratings

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 pressure¹⁾ high press. bellows	p [psig] S/G/L	580			580			580				
Maximum set pressure	p [psig] S/G/L	3625			2610			1342				
Temperature	min. [°F]				+14 ²⁾							
acc. to DIN EN ³⁾	max. [°F]				+302							
Temperature	min. [°F]				-20							
acc. to ASME ³⁾	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 pressure¹⁾ high press. bellows	p [psig] S/G/L	580			580			580				
Maximum set pressure	p [psig] S/G/L	3625			2610			1342				
Temperature	min. [°F]				-49							
acc. to DIN EN ³⁾	max. [°F]				+302							
Temperature	min. [°F]				-20							
acc. to ASME ³⁾	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 pressure¹⁾ high press. bellows	p [psig] S/G/L	580			580			580				
Maximum set pressure	p [psig] S/G/L	3625			2610			1342				
Temperature	min. [°F]				-49							
acc. to DIN EN ³⁾	max. [°F]				+302							
Temperature	min. [°F]				-49							
acc. to ASME ³⁾	max. [°F]				+302							

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

²⁾ For DIN EN applications at temperatures under -10°C please proceed according to AD 2000-Merkblatt W10.

³⁾ The temperature is limited by the soft seal material. The stated values are valid for EPDM.

Type 462 Approvals

Actual Orifice diameter d_0 [mm]	9	13	17.5
Actual Orifice area A_0 [mm ²]	63.6	133	241
Actual Orifice diameter d_0 [inch]	0.354	0.512	0.689
Actual Orifice area A_0 [inch ²]	0.099	0.206	0.374
Europe		Coefficient of discharge K_{dr}	
	Approval No.	072021409Z0022/15/D/0135	
PED / DIN EN ISO 4126-1	S/G	0.83	0.81
	L	0.61	0.61
Germany		Coefficient of discharge α_w	
	Approval No.	TÜV SV 909	
PED / AD 2000-Merkblatt A2	S/G	0.83	0.81
	L	0.61	0.61
United States		Coefficient of discharge K	
	Approval No.	M 37112	
ASME Sec. VIII Div. 1	S/G	0.811	
	Approval No.	M 37101	
	L	0.566	
Canada		Coefficient of discharge K	
	Approval No.	The current approval no. can be found at www.leser.com	
CRN	S/G	0.811	
	L	0.566	
China		Coefficient of discharge α_w	
	Approval No.	The current approval no. can be found at www.leser.com	
AQSIQ	S/G	0.83	0.81
	L	0.61	0.61
Eurasian Custom Union		Coefficient of discharge α_w	
	Approval No.	The current approval no. can be found at www.leser.com	
EAC	S/G	0.83	0.81
	L	0.61	0.61
Classification societies		Homepage	
Bureau Veritas	BV	www.bureauveritas.com	The valid certification number is changed with every renewal.
DNV GL	DNV	www.dnvgl.com	
Lloyd's Register EMEA	LREMEA	www.lr.org	A sample certificate including the valid certification number can be found at www.leser.com
Registro Italiano Navale	RINA	www.rina.org	
U.S. Coast Guard	U.S.C.G	www.uscg.org	

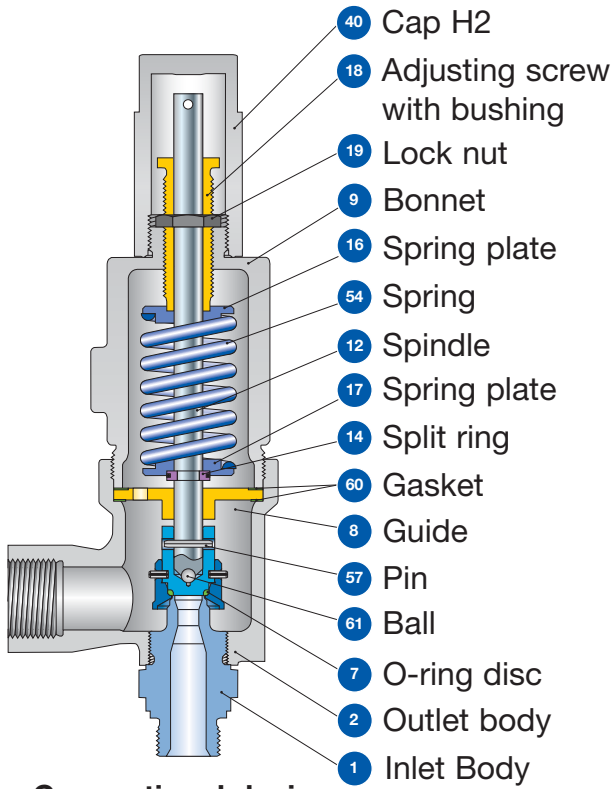


Type 462 HDD
Cap H2

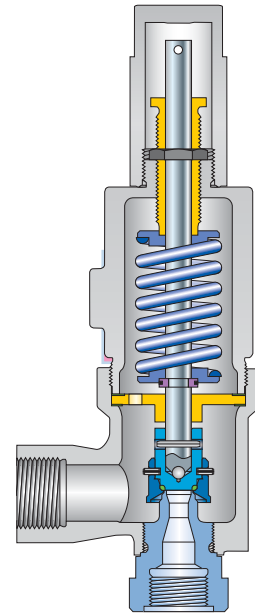
Type 462 HDD Safety Relief Valves

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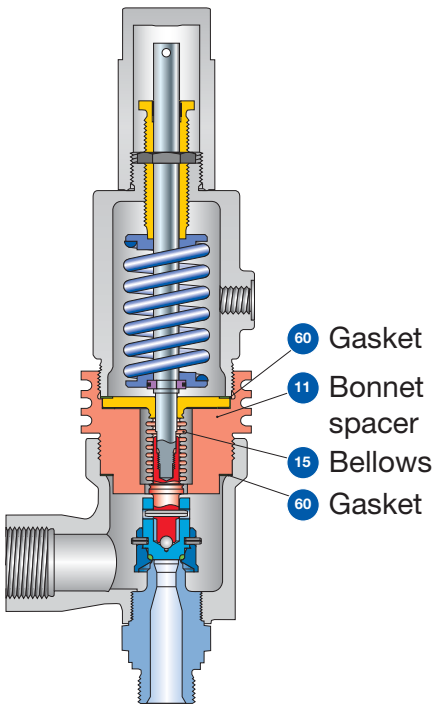
Type 462 HDD
Designs



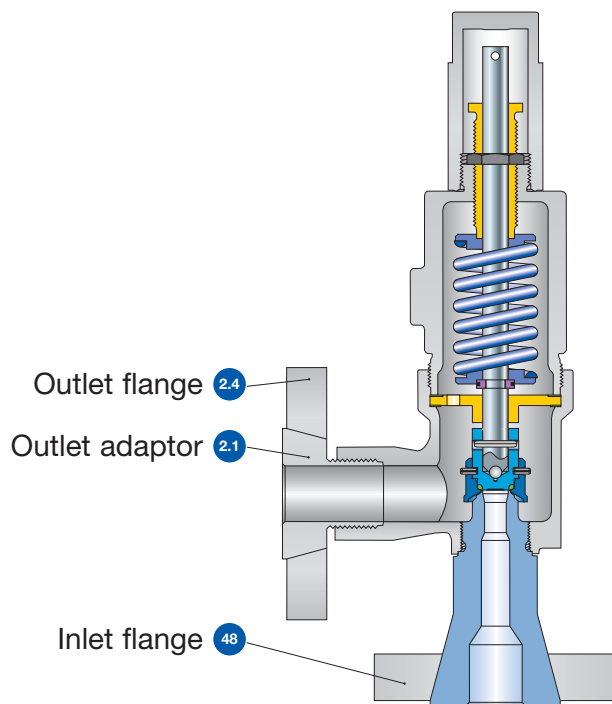
Conventional design
Threaded connection



Conventional design
Threaded connection



Balanced bellows
Threaded connection



Conventional design
Flange connection

Type 462 HDD

Materials

Item	Component	Design	Type 4624 HDD
1	Base / Inlet body	Threaded connection	1.4404 SA 479 316L
		Flange connection	1.4404 SA 479 316L
2	Outlet body		1.4408 CF8M
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
			NBR Nitrile-Butadiene
7.4	Soft seal O-ring	"N" ¹⁾	CR Chloroprene
		"K" ¹⁾	EPDM Ethylen-Propylene-Diene
		"D" ¹⁾	FKM Fluorocarbon
		"L" ¹⁾	FFKM Perfluor
		"C" ²⁾	
8	Guide		1.4404 316L
		Balanced bellows design	1.4404 / SA 316L Upper conn. part of balanced bellows
9	Bonnet		1.4408 CF8M
		Balanced bellows design	1.4408 CF8M
11	Bonnet spacer		1.4404 316L
		Balanced bellows design	
12	Spindle		1.4404 316L
		Balanced bellows design	1.4404 316L
14	Split ring		1.4404 316L
15	Bellows		1.4571 316Ti
		Balanced bellows design	
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

Please notice:

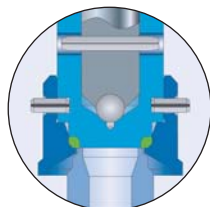
- Modifications reserved by LESER.
- LESER can upgrade materials without notice.
- Every part can be replaced by other material acc. to customer specification.
- The materials shall meet the requirements of the relevant regulations (Pressure Equipment Directive (PED), acc. to PED applied harmonized standards, AD 2000-Merkblätter, VdTÜV (Werkstoffblätter) as well as further materials listed in Section 8 of the Type-Examination.

¹⁾ O-ring 90 Shore for set pressures > 100 bar

²⁾ O-ring 90 Shore for set pressures > 40 bar

Type 462 HDD

Article numbers



O-ring disc

Actual Orifice diameter d_0 [mm]				9
Actual Orifice area A_0 [mm ²]				63,9
Actual Orifice diameter d_0 [inch]				0.354
Actual Orifice area A_0 [inch ²]				0.099
O-ring material				NBR "N" J30 ¹⁾
				CR "K" J21 ¹⁾
				EPDM "D" J22 ¹⁾
				FKM "L" J23 ¹⁾
				FFKM "C" J20 ²⁾
Body material: 1.4404 (316L)				
Outlet body	1.4408 CF8M	H2	Art. No. 4624.	2152
Bonnet	1.4404 1.4408	H4	Art. No. 4624.	2154
p [bar _g]	S/G/L			250.01 – 350
p [psig]				3625 – 5076

¹⁾ O-ring 90 Shore for set pressures > 100 bar

²⁾ O-ring 90 Shore for set pressures > 40 bar

Type 462 HDD

Dimensions and weights

Threaded connections [Metric units]

		1/2" x 1"	3/4" x 1"	1" x 1"
Size Outlet body		1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d ₀ [mm]		9	9	9
Actual Orifice area A ₀ [mm ²]		63.6	63.6	63.6
Weight	[kg]	3.1	3.1	3.1
Balanced bellows	[kg]	3.9	3.9	3.9
Required installation diameter d	[mm]	165	165	165

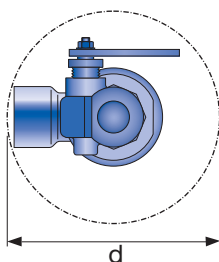
Inlet thread female

		1/2" x 1"	3/4" x 1"	1" x 1"
Size Outlet body		1/2" x 1"	3/4" x 1"	1" x 1"
Actual Orifice diameter d ₀ [mm]		9	9	9
Center to face / Height				
DIN ISO 228-1 G	Inlet a	53	56	62
ASME B1.20.1 NPT	Outlet b	75	75	75
Center to face [mm]	H max.	283	286	292
Height [mm]	Balanced bellows H max.	315	318	324
ISO 7-1/BS 21 Rc	Inlet a	53	56	64
Center to face [mm]	Outlet b	75	75	75
Height [mm]	H max.	283	286	294
Balanced bellows	H max.	315	318	326

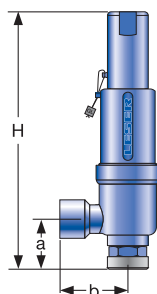
Inlet thread male

		1"					
Size outlet body		1"					
Actual Orifice diameter d ₀ [mm]		9					
Center to face [mm]							
DIN ISO 228-1 G	Inlet a	52					
	Outlet b	75					
ISO 7-1/BS 21 R	Inlet a	49					
ASME B1.20.1 NPT	Outlet b	75					
Height [mm]							
	Size inlet thread	Conventional design	Balanced bellows				
		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

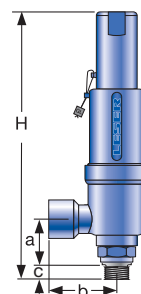
Length of screwed end c [mm]				
		1/2"	3/4"	1"
DIN ISO 228-1 G		14	16	18
ISO 7-1/BS 21 R		19	20	23
ASME B1.20.1 NPT		22	22	27



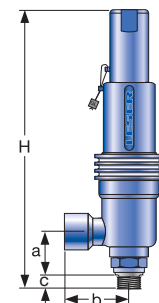
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Balanced bellows

Type 462 HDD

Dimensions and weights

Threaded connections [US units]

Size Outlet body	$1/2'' \times 1''$	$3/4'' \times 1''$	$1'' \times 1''$
Actual Orifice diameter d_0 [inch]	0.354	0.354	0.354
Actual Orifice area A_0 [inch ²]	0.099	0.099	0.099
Weight [lbs]	6.8	6.8	6.8
Balanced bellows [lbs]	8.6	8.6	8.6
Required installation diameter d [inch]	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$

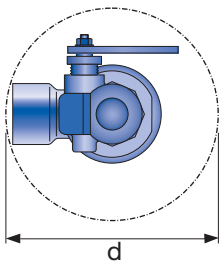
Inlet thread female

Size Outlet body	$1/2'' \times 1''$	$3/4'' \times 1''$	$1'' \times 1''$
Actual Orifice diameter d_0 [inch]	0.354	0.354	0.354
Center to face / Height			
DIN ISO 228-1 G	Inlet a	$2\frac{3}{32}$	$2\frac{7}{32}$
ASME B1.20.1 NPT	Outlet b	$2\frac{15}{16}$	$2\frac{15}{16}$
Center to face [inch]	H max.	$11\frac{5}{32}$	$11\frac{1}{14}$
Height [inch]	Balanced bellows H max.	$12\frac{13}{32}$	$12\frac{17}{32}$
ISO 7-1/BS 21 Rc	Inlet a	$2\frac{3}{32}$	$2\frac{7}{32}$
Center to face [inch]	Outlet b	$2\frac{15}{16}$	$2\frac{15}{16}$
Height [inch]	H max.	$11\frac{5}{32}$	$11\frac{1}{14}$
	Balanced bellows H max.	$12\frac{13}{32}$	$12\frac{17}{32}$

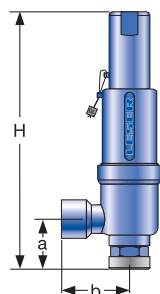
Inlet thread male

Size outlet body	1"						
Actual Orifice diameter d_0 [inch]	0.354						
Center to face [inch]							
DIN ISO 228-1 G	Inlet a	$2\frac{1}{16}$					
	Outlet b	$2\frac{15}{16}$					
ISO 7-1/BS 21 R	Inlet a	$1\frac{15}{16}$					
ASME B1.20.1 NPT	Outlet b	$2\frac{15}{16}$					
Height [inch]							
	Size inlet thread	Conventional design		Balanced bellows			
		$3/8''$	$1/2''$	$3/8''$	$1/2''$	$3/8''$	$1/2''$
DIN ISO 228-1 G	H max.	$11\frac{21}{32}$	$11\frac{23}{32}$	$11\frac{27}{32}$	$12\frac{29}{32}$	13	$13\frac{1}{8}$
ISO 7-1/BS 21 R	H max.	$11\frac{23}{32}$	$11\frac{25}{32}$	$11\frac{15}{16}$	13	$13\frac{1}{32}$	$13\frac{3}{16}$
ASME B1.20.1 NPT	H max.	$11\frac{27}{32}$	$11\frac{27}{32}$	$12\frac{3}{32}$	$13\frac{1}{8}$	$13\frac{1}{8}$	$13\frac{11}{32}$

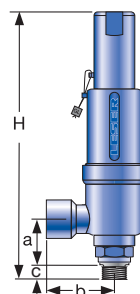
Length of screwed end "c" [inch]				
	Size inlet thread	$1/2''$	$3/4''$	1"
DIN ISO 228-1 G		$9/16$	$5/8$	$23/32$
ISO 7-1/BS 21 R		$3/4$	$25/32$	$29/32$
ASME B1.20.1 NPT		$7/8$	$7/8$	$11/16$



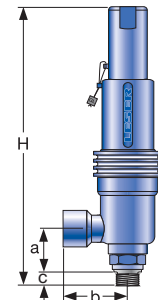
Required installation diameter



Conventional design – female thread



Conventional design – male thread



Balanced bellows

Type 462 HDD

Dimensions and weights

Flanged connections [Metric units]

	Conventional design	Balanced bellows
Actual Orifice diameter d_0 [mm]	9	9
Actual Orifice area A_0 [mm ²]	63.6	63.6

DIN EN 1092-1

Flange rating PN 40 – 400

Center to face	[mm]	Inlet a	100	100
		Outlet b	100	100
Height	[mm]	H max.	330	375

ASME B 16.5

Flange rating class 150 – 2500

Center to face	[mm]	Inlet a	100	100
		Outlet b	100	100
Height	[mm]	H max.	330	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.

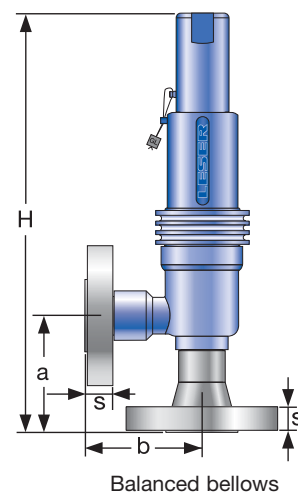
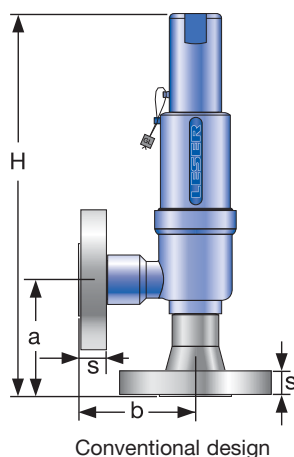
Weight

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

Weight net	[kg]	m_N	3.1	4.3
(without inlet and outlet flange)				

Flange dimensions

	Size	DIN EN 1092-1 / Flange rating PN						ASME B16.5 / Flange rating class							
		40	100	160	250	320	400	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	-	-		



Type 462 HDD

Dimensions and weights

Flanged connections [US units]

	Conventional design	Balanced bellows
Actual Orifice diameter d_0 [inch]	0.354	0.354
Actual Orifice area A_0 [inch ²]	0.099	0.099

DIN EN 1092-1

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

ASME B 16.5

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

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.

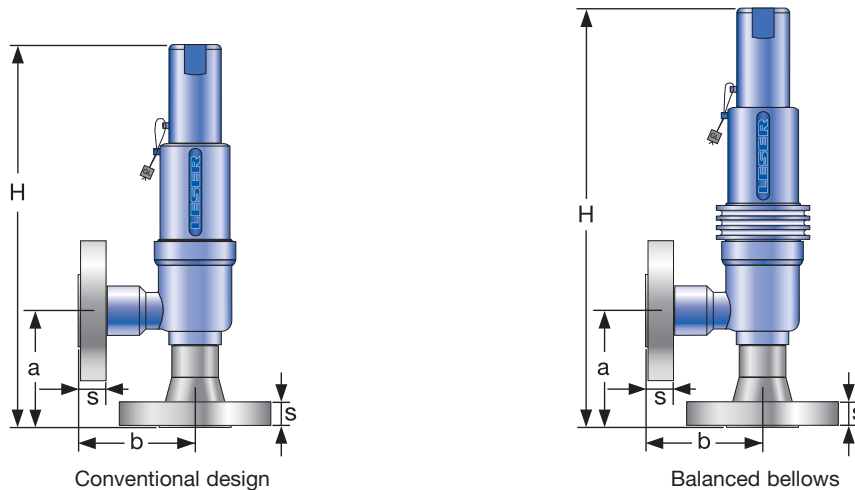
Weight

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

Weight net	[lbs]		6.8	9.5
(without inlet and outlet flange)	m_N			

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			$2^{3}/_{32}$	–	$7/8$	$1^{3}/_{32}$	$1^{3}/_{32}$	$1^{3}/_{16}$			$9/_{16}$	$2^{3}/_{32}$	$2^{3}/_{32}$	$1^{1}/_{32}$	$1^{1}/_{32}$	$1^{3}/_{16}$
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			$2^{5}/_{32}$	$7/8$	–	–	–	–			$1^{9}/_{32}$	$2^{3}/_{32}$	$2^{3}/_{32}$	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			$7/8$	–	$1^{1}/_{32}$	$1^{3}/_{16}$	$1^{3}/_{32}$	$1^{9}/_{16}$			$2^{1}/_{32}$	$2^{7}/_{32}$	$2^{7}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{32}$	$1^{9}/_{16}$
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			$1^{3}/_{16}$	–	$2^{9}/_{32}$	$1^{1}/_{4}$	–	–			$7/8$	$1^{5}/_{16}$	$1^{5}/_{16}$	$1^{1}/_{4}$	–	–
Weight slip on flange	[lbs] m_F			4.5	–	6.3	9.5	–	–			3.2	4.8	4.8	8.6	–	–



Type 462 HDD

Pressure temperature ratings

[Metric units + US units]

Metric units

Actual Orifice diameter d_0 [mm]		9		
Actual Orifice Area A_0 [mm ²]		63.6		
Body material 1.4404 (316L)		Type 4624		
Base / Inlet Body	Connection size	1/2"	3/4"	1"
	Pressure rating	PN 500		
Outlet body	Pressure rating	PN 160		
Minimum set pressure	p [bar _g] S/G/L	250.01		
Maximum set pressure	p [bar _g] S/G/L	350		
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

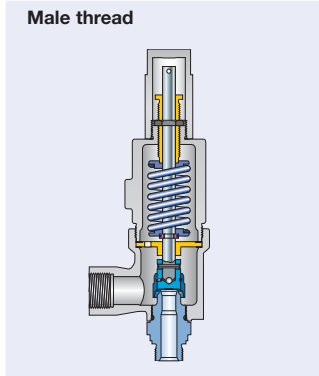
Actual Orifice diameter d_0 [inch]		0.354		
Actual Orifice Area A_0 [inch ²]		0.099		
Body material 1.4404 (316L)		Type 4624		
Base / Inlet Body	Connection size	1/2"	3/4"	1"
	Pressure rating	3625		
Minimum set pressure	p [psig] S/G/L	3625		
Maximum set pressure	p [psig] S/G/L	5076		
Temperature acc. 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.

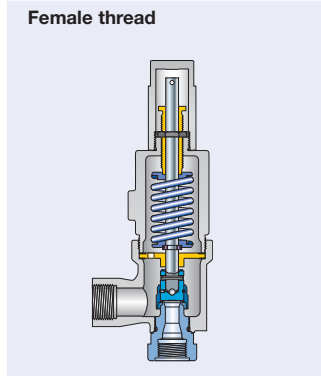
Type 462 HDD Approvals

Actual Orifice diameter d_0 [mm]		9
Actual Orifice area A_0 [mm ²]		63.6
Actual Orifice diameter d_0 [inch]		0.354
Actual Orifice area A_0 [inch ²]		0.099
Europe		Coefficient of discharge K_{dr}
	Approval No.	072021409Z0022/15/D/0135
PED / DIN EN ISO 4126-1	S/G	0.83
	L	0.61
Germany		Coefficient of discharge α_w
	Approval No.	TÜV SV 909
PED / AD 2000-Merkblatt A2	S/G	0.83
	L	0.61
United States		Coefficient of discharge K
	Approval No.	M 37112
ASME Sec. VIII Div. 1	S/G	0.811
	Approval No.	M 37101
	L	0.566
Canada		Coefficient of discharge K
	Approval No.	The current approval no. can be found at www.leser.com
CRN	S/G	0.811
	L	0.566
China		Coefficient of discharge α_w
	Approval No.	The current approval no. can be found at www.leser.com
AQSIQ	S/G	0.83
	L	0.61
Eurasian Custom Union		Coefficient of discharge α_w
	Approval No.	The current approval no. can be found at www.leser.com
EAC	S/G	0.83
	L	0.61
Classification societies		Homepage
Bureau Veritas	BV	www.bureauveritas.com
DNV GL		www.dnvgl.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 renewal.
		A sample certificate including the valid certification number can be found at www.leser.com

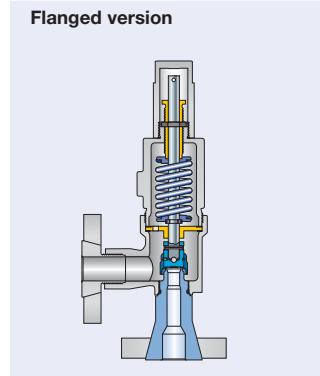
Series 459 Available Options



Type 459



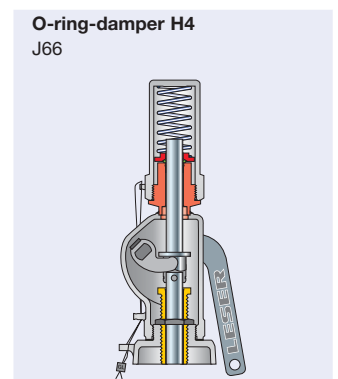
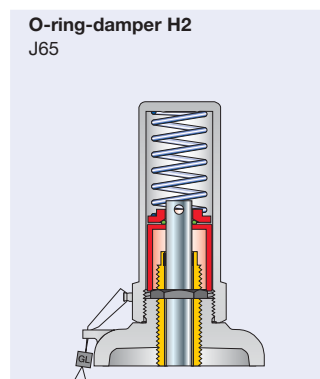
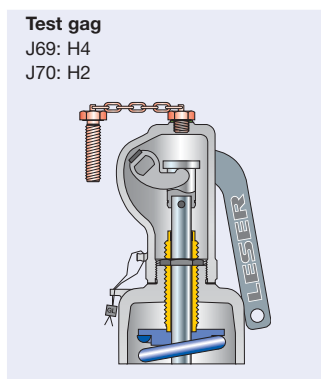
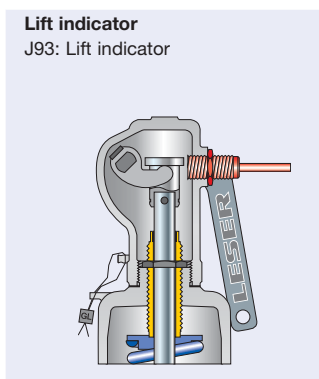
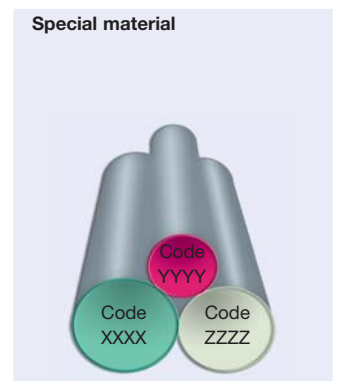
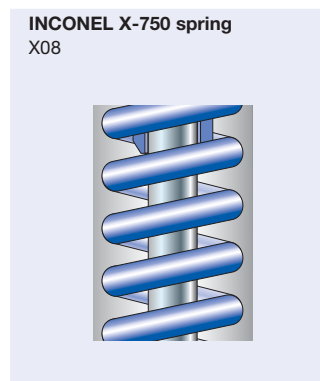
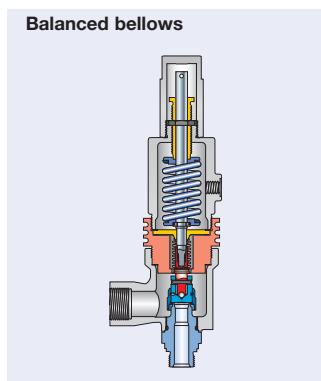
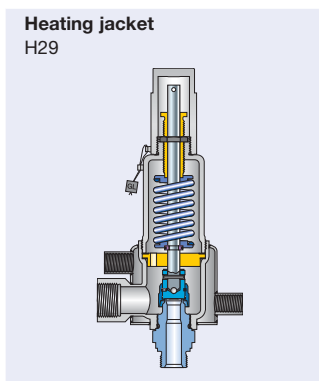
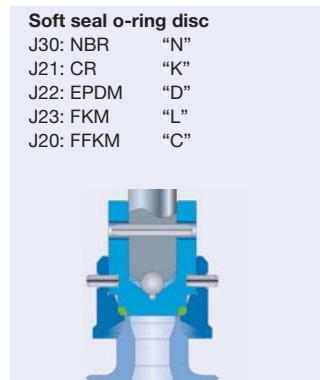
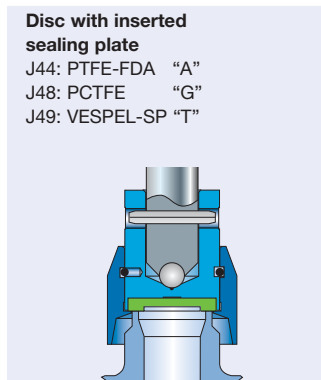
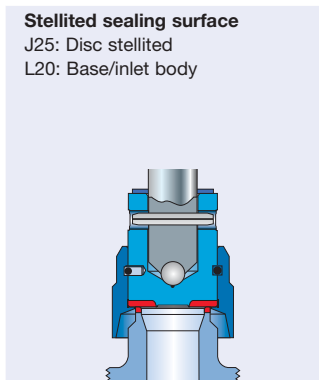
Type 459



Type 462



Type 462



Series 459

Available connections

Threaded connections

Actual Orifice diameter d_0 [mm]	6		9 / 13		17.5		
Actual Orifice area A_0 [mm ²]	28.3		63.9 / 133		241		
Actual Orifice diameter d_0 [inch]	0.236		0.345 / 0.512		0.689		
Actual Orifice area A_0 [inch ²]	0.044		0.099 / 0.206		0.374		
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	
Male thread DIN ISO 228-1							
G	1/2"	V54 ⁵⁾	–	V54 ¹⁾	–	–	
	3/4"	V55 ⁵⁾	–	V55	–	–	
	1"	V56 ⁵⁾	–	V56	V68	V56	
	1 1/4"	–	–	–	–	V83	
	1 1/2"	–	V69	–	V69	V57	V69
Female thread DIN ISO 228-1							
G	1/2"	V50 ⁵⁾	–	V50	–	–	
	3/4"	V51 ⁵⁾	–	V51	–	V51	
	1"	–	V66	V52 ²⁾	V66	V52	
	1 1/4"	–	V81	–	V81	V84	
	1 1/2"	–	V67	–	V67	V53	V67
Male thread ISO 7-1/BS 21							
R/BSPT	1/2"	V30 ^{3) 5)}	–	V30 ⁶⁾	–	–	
	3/4"	V31 ⁵⁾	–	V31	–	–	
	1"	V32 ⁵⁾	–	V32	V42	V32	
	1 1/2"	–	V43	–	V43	V33	V43
Female thread ISO 7-1/BS 21							
Rc/BSPT	1/2"	V38 ⁵⁾	–	V38	–	–	
	3/4"	V39 ⁵⁾	–	V39	–	V39	
	1"	V40 ⁵⁾	–	V40	V36	V40	
	1 1/2"	–	V37	–	V37	V41	V37
Male thread ANSI/ASME B1.20.1							
NPT	1/2"	V61 ⁵⁾	–	V61 ⁴⁾	–	–	
	3/4"	V62 ⁵⁾	–	V62	–	–	
	1"	V63 ⁵⁾	–	V63	V73	V63	
	1 1/4"	–	–	–	–	V85	
	1 1/2"	–	V74	–	V74	V64	V74
	2"	–	–	–	–	–	V86
Female thread ANSI/ASME B1.20.1							
NPT	1/2"	V58 ⁵⁾	–	V58	–	–	
	3/4"	V59 ⁵⁾	–	V59	–	V59	
	1"	V60 ⁵⁾	V71	V60	V71	V60	
	1 1/4"	–	V80	–	V80	V87	
	1 1/2"	–	V72	–	V72	V75	V72
	2"	–	–	–	–	–	V88

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⁾ max. PN 700: For higher set pressures a special inlet body is required (see LDeS 3001.19)

⁶⁾ V30 d_0 9 mm

Series 459

Available connections

Flanged connections

Nominal diameter		Pressure rating	d ₀ 6 mm		d ₀ 9 mm		d ₀ 13 mm		d ₀ 17.5 mm	
DIN EN 1092-1										
DN		PN	Option code		Option code		Option code		Option code	
			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	–
		160	I27	–	I27	–	I27	–	I27	–
25		40	I31	I46	I31	I46	I31	I46	I31	–
		160	I32	I47	I32	I47	I32	I47	I32	–
		250	I33	I48 ²⁾	I33	I48 ¹⁾	I33	I48 ¹⁾	I33	–
		320	I34	–	I34	–	I34	–	I34	–
		400	I35	–	I35	–	I35	–	I35	–
40		40	–	–	–	I49	–	I49	–	I49
		160	–	–	–	I50	–	I50	–	I50
		250	–	–	–	I51 ¹⁾	–	I51 ¹⁾	–	I51 ¹⁾
ANSI/ASME B 16.5										
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	–	V09	V18	V09	V18	V09	–
		300	V10	V19	V10	V19	V10	V19	V10	–
		600	V10	V19	V10	V19	V10	V19	V10	–
		900	V11	–	V11	–	V11	–	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

Type 462 Refrigeration technology – Flange facings DIN EN 1092, groove face D

Nominal diameter		Center to face [mm]		d ₀ 13 mm		d ₀ 13 mm		d ₀ 17.5 mm	
DIN EN 1092-1									
DN		a	b	Option code		Option code		Option code	
Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
15	20	90	80	I1C	I1J	–	–	–	–
20	20	90	80	I1D	I1J	–	–	–	–
15	25	100	100	–	–	I1A	I1H	–	–
15	25	95	95	–	–	I1F	I1L	–	–
20	25	90	80	–	–	I1D	I1K	–	–
20	25	95	95	–	–	I1G	I51	–	–
25	25	100	100	–	–	I1B	I1H	–	–
25	25	90	80	–	–	I1E	I1K	–	–
25	32	100	100	–	–	–	–	I1B	I1M

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

¹⁾ Caution! Only connecting dimensions correspond to PN 250, outlet body and bonnet are designed for PN 160.

Series 459

LESER Original Spare Parts Kits Type 459

Article numbers

	d₀	9	13	17,5
Art. No.				
Type 459	5012.	1230	1231	1232

The LESER Spare Parts Kits contain all the parts recommended for the regular maintenance of a LESER safety valve



Contents – Type 459

Item	Component	Material	Quantity
7	Disc	1.4404 / 316L	1
14	Split ring	1.4404 / 316L	2
40.3	Spacer	1.4571 / 316Ti	3
57	Pin	1.4310 / Stainless steel	1
59	Securing ring (split ring)	1.4571 / 316Ti	1
60	Gasket	Graphite / 1.4401 Graphite / 316	2
61	Ball	1.4401 / 316	1
63	Gasket	Graphite / 1.4401 Graphite / 316	1

Series 459

LESER Original Spare Parts Kits Type 462, 462 HDD

Article numbers

	d ₀	9	13	17,5
Art. No.				
Type 462	5012.	1233	1234	1235
Type 462 HDD	5012.	1233	-	-

The LESER Spare Parts Kits contain all the parts recommended for the regular maintenance of a LESER safety valve



Contents – Type 462, 462 HDD

Item	Component	Material	Quantity
7.1	O-ring disc body	1.4404 / 316L	1
7.2	Lifting aid	1.4404 / 316L	1
7.4	O-ring	FKM 70/75 Shore A, FKM 90 Shore A EPDM 70 Shore A, EPDM 90 Shore A	4
7.5	Pin	1.4310 / Stainless steel	1
14	Split ring	1.4404 / 316L	2
40.3	Spacer	1.4571 / 316Ti	3
57	Pin	1.4310 / Stainless steel	1
59	Securing ring (split ring)	1.4571 / 316Ti	1
60	Gasket	Graphite / 1.4401 Graphite / 316	2
61	Ball	1.4401 / 316	1
63	Gasket	Graphite / 1.4401 Graphite / 316	1

The Compact Performance Type 462 Original Spare Parts Kit is equipped with four O-rings (Item 7.4) in the two most commonly used materials – FKM and EPDM – with different shore hardness. The correct O-ring should be selected depending on the set pressure.

Extension



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Type 437

Spare parts

Actual Orifice diameter d_0 [mm]	6	10
Actual Orifice area A_0 [mm ²]	28.3	78.5
Actual Orifice diameter d_0 [inch]	0.236	0.394
Actual Orifice area A_0 [inch ²]	0.044	0.122

Body (Item 1): Male thread			Material-No. / Art. No.							
Connection Size			3/8"	1/2"	3/4"	1"	3/8"	1/2"	3/4"	1"
DIN ISO 228-1	G	1.4104	-	-	-	-	136.5239.9000	136.4439.9000	136.4539.9000	136.5839.9000
		316L	-	-	-	-	136.5249.9000	136.4449.9000	136.4549.9000	136.4849.9000
		316L stellited	136.5169.9000	136.4369.9000	136.5569.9000	136.6769.9000	-	-	-	-
R		316L	-	-	-	-	-	136.4449.9220	136.4549.9220	136.5849.9220
		316L stellited	-	136.4369.9220	136.5569.9220	136.6769.9220	-	-	-	-
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
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 \varnothing [mm]	-	-	6	-	-	-	6	-	-
	1.4401	-	-	510.0104.0000	-	-	-	510.0104.0000	-	-

Type 438 Spare parts

Actual Orifice diameter d_0 [mm]	10			
Actual Orifice area A_0 [mm ²]	78.5			
Actual Orifice diameter d_0 [inch]	0.394			
Actual Orifice area A_0 [inch ²]	0.122			
Body (Item 1): Male thread		Material-No. / Art. No.		
Connection Size	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"
DIN ISO 228-1 G	1.4104	136.5339.9000	136.4939.9000	136.5439.9000
	316L	136.5349.9000	136.4949.9000	136.5449.9000
ISO 7-1/BS 21 R	316L	–	136.4949.9220	136.5449.9220
ASME B1.20.1 NPT	316L	–	136.4949.9204	136.5449.9204
Body (Item 1): Female thread		Material-No. / Art. No.		
Connection Size	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"
DIN ISO 228-1 G	316L	–	136.4949.9210	136.5449.9210
ISO 7-1/BS 21 Rc	316L	–	136.4949.9222	136.5449.9222
ASME B1.20.1 NPT	316L	–	136.4949.9211	136.5449.9211
Body (Item 1): Flange design		Material-No. / Art. No.		
DN 15 / NPS $\frac{1}{2}$"	PN 40 – 400	316L	136.4949.9208	
	CL150	316L	136.4949.9202	
	CL300 – 2500	316L	136.4949.9208	
DN 20 / NPS $\frac{3}{4}$"	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"	Type 438 Conventional design Type 438 Long version \leq 120 bar	Type 438 Long version $>$ 120 bar	
		200.8349.9781	200.9949.9083	
		200.8349.9751	200.9949.9053	
		200.8349.9741	200.9949.9043	
		200.8349.9771	200.9949.9073	
	FFKM "C"	Type 438 Conventional design \leq 40 bar Type 438 Long version \leq 40 bar	Type 438 Conventional design $>$ 40 bar Type 438 Long version $>$ 40 bar	
		200.8349.9791	200.9949.9093	
O-ring (Item 7.4)		Material-No. / Art. No.		
O-ring	NBR "N"	Type 438 Conventional design Type 438 Long version \leq 120 bar	Type 438 Long Version $>$ 120 bar	
		502.0107.2681 (70 Shore A)	502.0107.2683 (90 Shore A)	
		502.0107.2651 (70 Shore A)	502.0107.2653 (90 Shore A)	
		502.0107.2641 (70 Shore A)	502.0107.2643 (90 Shore A)	
		502.0107.2671 (70/75 Shore A)	502.0107.2673 (90 Shore A)	
	FFKM "C"	Type 438 Conventional design \leq 40 bar Type 438 Long version \leq 40 bar	Type 438 Conventional design $>$ 40 bar Type 438 Long version $>$ 40 bar	
		502.0107.2691 (75 Shore A)	502.0107.2693 (90 Shore A)	

Type 439

Spare parts

Actual Orifice diameter d_0 [mm]	10
Actual Orifice area A_0 [mm ²]	78.5
Actual Orifice diameter d_0 [inch]	0.394
Actual Orifice area A_0 [inch ²]	0.122

Body (Item 1): Male thread			Material-No. / Art. No.			
Connection Size			$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"
DIN ISO 228-1	G	1.4104	136.5339.9000	136.4939.9000	136.5439.9000	136.6839.9000
		316L	136.5349.9000	136.4949.9000	136.5449.9000	136.6849.9000
ISO 7-1/BS 21	R	316L	–	136.4949.9220	136.5449.9220	136.6849.9220
ASME B1.20.1	NPT	316L	–	136.4949.9204	136.5449.9204	136.6849.9204

Body (Item 1): Female thread			Material-No. / Art. No.			
Connection Size			$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"
DIN ISO 228-1	G	316L	–	136.4949.9210	136.5449.9210	136.6849.9210
ISO 7-1/BS 21	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			Material-No. / Art. No.			
DN 15 / NPS $\frac{1}{2}$"	PN 40 – 400	316L			136.4949.9208	
	CL150	316L			136.4949.9202	
	CL300 – 2500	316L			136.4949.9208	
DN 20 / NPS $\frac{3}{4}$"	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 \varnothing [mm]				6	
	1.4401				510.0104.0000	

Type 437

Capacities – Steam

Metric Units

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

AD 2000-Merkblatt A2 [kg/h]

Act. Orifice dia. d_0 [mm]	6	10
Act. Orifice area A_0 [mm ²]	28.3	78.5
LEO _{S/G} [*] [inch ²]	0.021	0.057
Set pressure [bar]	Capacities [kg/h]	
0.1	No saturated steam application in set pressure range	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	

US Units

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.

ASME Section VIII [lb/h]

Act. Orifice dia. d_0 [inch]	0.236	0.394
Act. Orifice area A_0 [inch ²]	0.044	0.122
LEO _{S/G} [*] [inch ²]	0.021	0.057
Set pressure [psig]	Capacities [lb/h]	
15	No saturated steam application in set pressure range	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	

Type 437

Capacities – Air

Metric Units

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.

AD 2000-Merkblatt A2 [m_n^3/h]

Act. Orifice dia. d_0 [mm]	6	10
Act. Orifice area A_0 [mm ²]	28.3	78.5
LEO _{S/G} * [inch ²]	0.021	0.057
Set pressure [bar]	Capacities [m_n^3/h]	
0.1		14
0.2		19
0.5		34
1		51
2		84
3		115
4		145
5		174
6		204
7		233
8		262
9		292
10		321
12		380
14		439
16		498
18		556
20		615
22		674
24		733
26		792
28		851
30		909
32		968
34		1027
36		1086
38		1145
40		1204
42		1262
44		1321
46		1380
48		1439
50		1498
60		1792
70		2086
80		2380
90		2674
100		2969
110		3263
120		3557
130		3851
140		4145
150		4439
160		4734
170		5028
180		5322
190	2911	
200	3064	
210	3216	
220	3369	
230	3521	
240	3674	
250	3826	
260	3979	
270	4131	
280	4284	
290	4436	
300	4589	
310	4741	
320	4894	
330	5046	
340	5199	
350	5351	
360	5504	
370	5656	
380	5809	

US Units

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.

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	

Capacities
Type 437

Type 437

Capacities – Water

Metric Units

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.

AD 2000-Merkblatt A2 [10^3kg/h]

Act. Orifice dia. d_0 [mm]	6	10
Act. Orifice area A_0 [mm ²]	28.3	78.5
LEO _L [*] [inch ²]	0.021	0.062
Set pressure [bar]	Capacities [10^3kg/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

US Units

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.

ASME Section VIII [US-G.P.M.]

Act. Orifice dia. d_0 [inch]	0.236	0.394
Act. Orifice area A_0 [inch ²]	0.044	0.122
LEO _L [*] [inch ²]	0.021	0.062
Set pressure [psig]	Capacities [US-G.P.M.]	
15		6.54
20		7.39
30		8.86
40		10.2
50		11.4
60		12.5
70		13.5
80		14.5
90		15.3
100		16.2
120		17.7
140		19.1
160		20.5
180		21.7
200		22.9
220		24
240		25
260		26.1
280		27.1
300		28
320		28.9
340		29.8
360		30.7
380		31.5
400		32.3
420		33.1
440		33.9
460		34.7
480		35.4
500		36.2
600		39.6
700		42.8
800		45.7
900		48.5
1000		51.5
1100		53.6
1200		56
1300		58.3
1400		60.5
1500		62.6
2000		72.3
2500		80.8

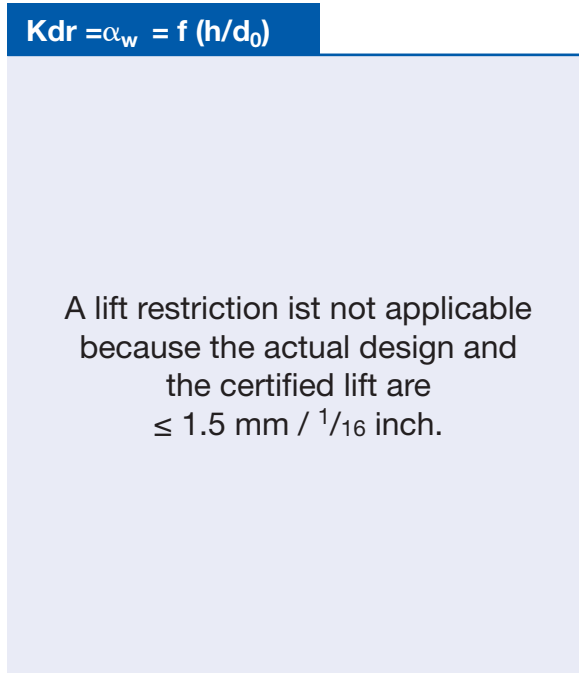
No TÜV approval, useable for thermal expansion

Type 437

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

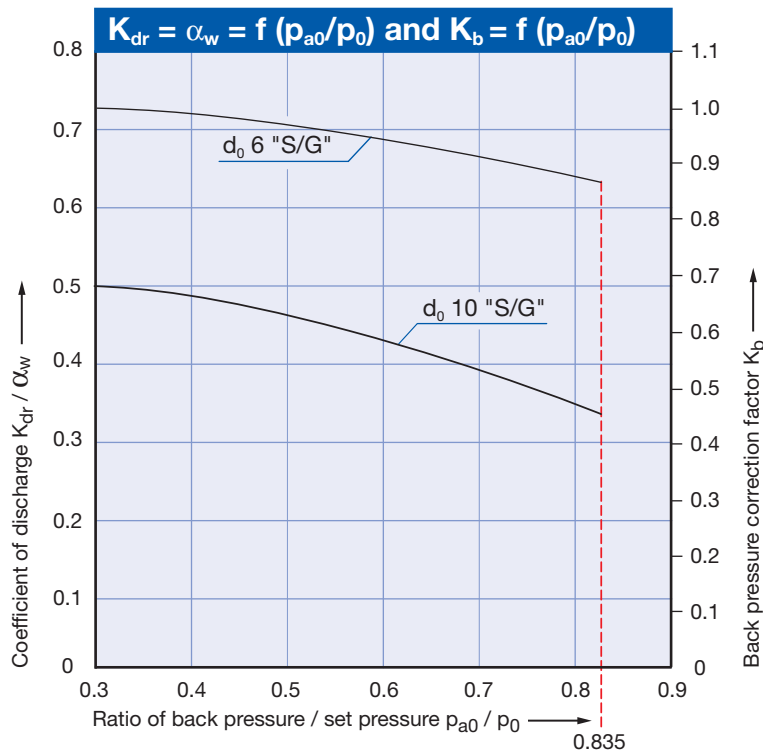
Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)

- 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 5.3



Capacities Type 437

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

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.

AD 2000-Merkblatt A2

Actual Orifice diameter d_0 [mm]	10		
Actual Orifice area A_0 [mm ²]	78.5		
LEO ^{*)} [inch ²]	S/G = 0.051 L = 0.06		
Set pressure	Capacities		
	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]
0.5	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

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.

ASME Section VIII

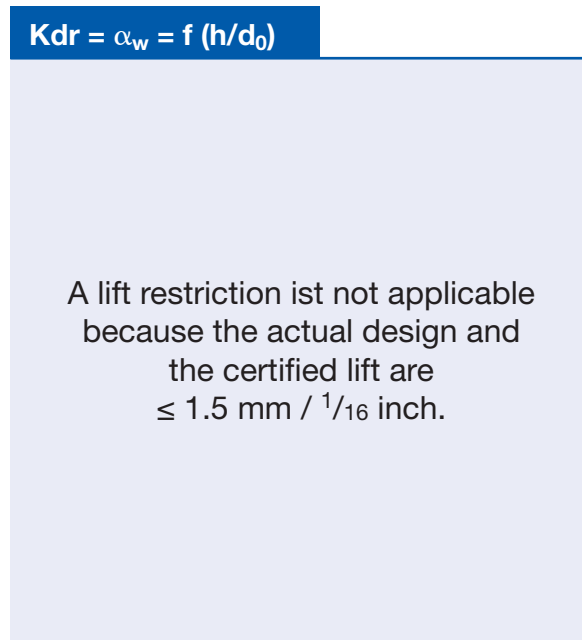
Actual Orifice diameter d_0 [inch]	0.394		
Actual Orifice area A_0 [inch ²]	0.122		
LEO ^{*)} [inch ²]	S/G = 0.051 L = 0.06		
Set pressure	Capacities		
	Steam saturated	Air 60°F and 14.5 psig	Water 70°F
[psig]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]
10	Please select Type 439		
20			
30			
40			
50			
60	205	73	12.1
70	233	83	13.1
80	261	93	14
90	289	103	14.8
100	317	113	15.6
120	373	133	17.1
140		153	18.5
160		173	19.8
180		193	21
200		213	22.1
220		233	23.2
240		253	24.2
260		273	25.2
280		293	26.2
300		313	27.1
320		333	28
340		353	28.8
360		373	29.7
380		393	30.5
400		413	31.3
420		433	32
440		453	32.8
460		473	33.5
480		493	34.3
500		513	35
600		613	38.3
700		713	41.4
800		813	44.2
900		913	46.9
1000		1013	49.4
1100		1113	51.9
1200		1213	54.2
1300		1313	56.4
1400		1413	58.5
1500		1513	60.5
1600		1613	62.5
1700		1713	64.5
1800		1813	66.3
1900		1912	68.1
2000		2012	69.9
2500		2512	78.2
2650		2662	80.5

Type 438

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

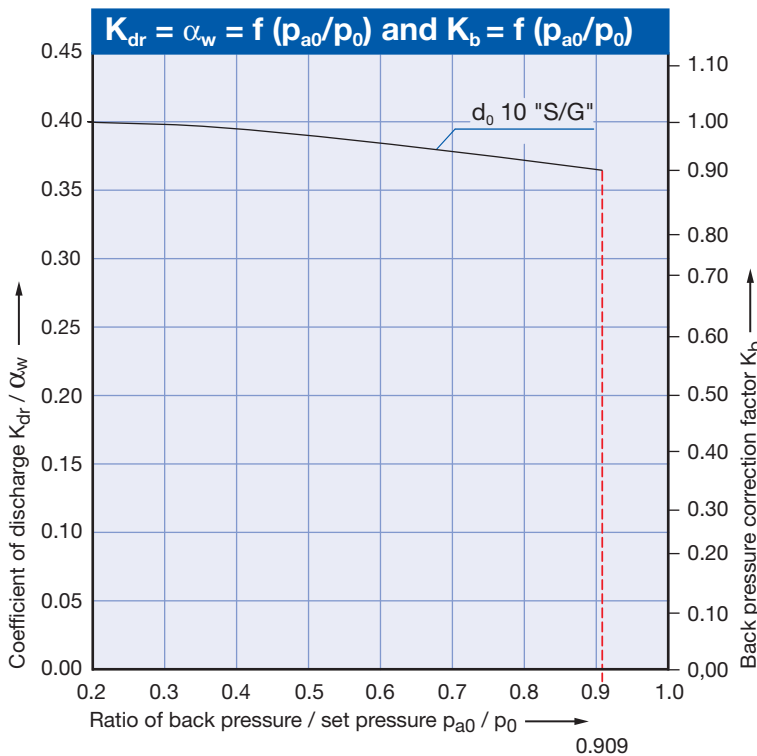
- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 5.3

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



Capacities Type 438

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



Type 439

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.

AD 2000-Merkblatt A2

Actual Orifice diameter d_0 [mm]	10		
Actual Orifice area A_0 [mm ²]	78.5		
LEO*) [inch ²]	S/G = 0.051 L = 0.06		
Set pressure	Capacities		
	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]	[kg/h]	[m ³ /h]	[10 ³ kg/h]
0.1	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

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.

ASME Section VIII

Actual Orifice diameter d_0 [inch]	0.394		
Actual Orifice area A_0 [inch ²]	0.122		
LEO*) [inch ²]	S/G = 0.051 L = 0.06		
Set pressure	Capacities		
	Steam saturated	Air 60°F and 14.5 psig	Water 70°F
[psig]	[lb/h]	[S.C.F.M.]	[US-G.P.M.]
5	58	21	4.22
10	70	25	5.37
15	83	30	6.32
20	96	34	7.15
25	109	39	7.89
30	121	43	8.56
35	135	48	9.25
40	149	53	9.90
45	163	58	10.50
50	177	63	11.10
55	191	68	11.60
60	205	73	12.10
65	219	78	12.60
70	233	83	13.10
75	247	88	13.50
80	261	93	14.00
85	275	98	14.40
90	289	103	14.80
95	303	108	15.20
100	317	113	15.60
110	345	123	16.40
120	373	133	17.10
130	401	143	17.80
140	429	153	18.50
150	457	163	19.10
160		173	19.80
170		183	20.40
180		193	21.00
190		203	21.50
200		213	22.10
210		223	22.70
220		233	23.20
230		243	23.70

Type 439

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

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

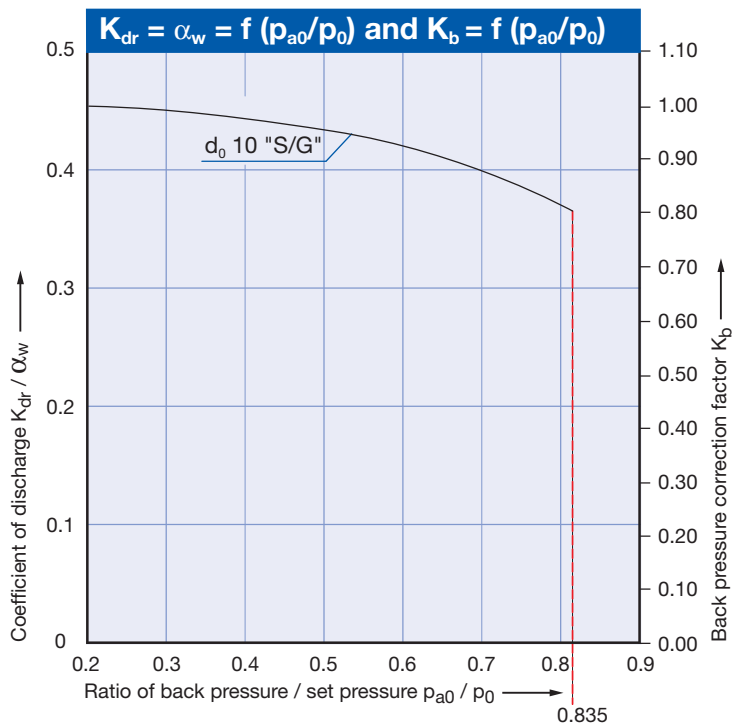
- h = Lift [mm]
- d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d_0 = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p_0 = Set pressure [bar_a]
- p_{a0}/p_0 = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN 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 5.3

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

A lift restriction is not applicable because the actual design and the certified lift are $\leq 1.5 \text{ mm} / 1/16 \text{ inch}$.

Capacities
Type 439

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 459

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.

AD 2000-Merkblatt A2

Actual Orifice diameter d_0 [mm]	9			13			17.5		
Actual Orifice area A_0 [mm ²]	63.6			133.0			241.0		
LEO*) [inch ²]	S/G = 0.082 L = 0.086			S/G = 0.171 L = 0.179			S/G = 0.310 L = 0.325		
Set pressure	Capacities			Capacities			Capacities		
	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]
0.2				53	61	1.96	85	98	3.48
0.5				84	98	2.77	134	157	4.93
1				120	143	3.75	200	238	6.67
1.5	77	92	2.54	156	188	4.6	265	318	8.17
2	93	113	2.93	190	229	5.31	331	400	9.44
3	127	155	3.59	258	316	6.5	456	558	11.6
4	158	195	4.14	322	396	7.51	569	700	13.3
5	189	234	4.63	386	477	8.39	681	842	14.9
6	220	247	5.07	449	557	9.19	793	985	16.3
7	251	313	5.48	511	638	9.93	902	1127	17.7
8	282	353	5.86	573	718	10.6	1013	1269	18.9
9	312	392	6.21	636	799	11.3	1124	1412	20
10	343	432	6.55	699	879	11.9	1235	1554	21.1
12	405	511	7.17	824	1040	13	1457	1839	23.1
14	465	590	7.75	947	1201	14	1674	2123	25
16	527	669	8.28	1072	1363	15	1895	2408	26.7
18	588	748	8.78	1197	1524	15.9	2116	2693	28.3
20	650	827	9.26	1323	1685	16.8	2338	2977	29.8
22	709	906	9.71	1444	1846	17.6	2553	3262	31.3
24	771	986	10.1	1570	2007	18.4	2775	3547	32.7
26	833	1065	10.6	1696	2168	19.1	2997	3831	34
28	895	1144	11	1822	2329	19.9	3221	4116	35.3
30	957	1223	11.3	1949	2490	20.6	3445	4401	36.5
32	1020	1302	11.7	2076	2651	21.2	3669	4685	37.7
34	1079	1381	12.1	2198	2812	21.9	3884	4970	38.9
36	1142	1460	12.4	2325	2973	22.5	4110	5255	40
38	1205	1539	12.8	2453	3134	23.1	4336	5539	41.1
40	1268	1618	13.1	2582	3295	23.7	4564	5824	42.2
42	1332	1698	13.4	2711	3456	24.3	4792	6109	43.2
44	1395	1777	13.7	2841	3617	24.9	5021	6393	44.3
46	1459	1856	14	2971	3779	25.5	5251	6678	45.3
48	1524	1935	14.3	3102	3940	26	5483	6963	46.2
50	1588	2014	14.6	3234	4101	26.5	5715	7247	47.2
60	1910	2409	16	3889	4906	29.1	6874	8671	51.7
70	2245	2805	17.3	4571	5711	31.4	8079	10094	55.8
80	2583	3201	18.5	5259	6517	33.6	9294	11518	59.7
90	2938	3596	19.6	5982	7322	35.6	10572	12941	63.3
100	3296	3992	20.7	6711	8127	37.5	11862	14364	66.7
120	4077	4783	22.7	8302	9738	41.1			
140	4958	5574	24.6	10096	11349	44.4			
160	5977	6365	26.2	12171	12959	47.5			
180	7262	7156	27.8	14786	14570	50.3			
200	8989	7947	29.3	18303	16181	53.1			
220		8738	30.7						
240		9529	32.1						
250		9924	32.7						

Type 459
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.

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.]
15	134	48	9.02	281	100	18.8	509	181	34
20	155	55	10.2	324	115	21.2	586	209	38.4
30	196	70	12.2	410	146	25.4	742	264	46
40	242	86	14.1	504	180	29.3	913	326	53.1
50	287	103	15.8	599	213	32.8	1085	387	59.4
60	332	119	17.3	693	247	35.9	1256	448	65.1
70	377	135	18.7	788	281	38.8	1427	509	70.3
80	423	151	19.9	882	315	41.5	1599	570	75.1
90	468	167	21.2	977	348	44	1770	631	79.7
100	513	184	22.3	1071	382	46.4	1941	692	84
120	604	216	24.4	1260	449	50.8	2284	814	92
140	695	248	26.4	1449	517	54.9	2626	936	99.4
160	785	281	28.2	1638	584	58.7	2969	1058	106
180	876	313	29.9	1827	652	62.3	3311	1180	113
200	966	346	31.5	2016	719	65.6	3654	1302	119
220	1057	378	33.1	2205	787	68.8	3996	1424	125
240	1148	410	34.5	2394	854	71.9	4339	1546	130
260	1238	443	36	2584	921	74.8	4682	1669	135
280	1329	475	37.3	2773	989	77.6	5024	1791	141
300	1419	508	38.6	2962	1056	80.4	5367	1913	146
320	1510	540	39.9	3151	1124	83	5709	2035	150
340	1601	572	41.1	3340	1191	85.6	6052	2157	155
360	1691	605	42.3	3529	1259	88	6394	2279	159
380	1782	637	43.5	3718	1326	90.5	6737	2401	164
400	1872	670	44.6	3907	1393	92.8	7080	2523	168
420	1963	702	45.7	4096	1461	95.1	7422	2645	172
440	2054	734	46.8	4285	1528	97.3	7765	2767	176
460	2144	767	47.8	4474	1596	100	8107	2889	180
480	2235	799	48.9	4663	1663	102	8450	3011	184
500	2326	832	49.9	4852	1731	104	8792	3134	188
550	2552	913	52.3	5352	1899	109	9649	3439	197
600	2779	994	54.6	5797	2068	114	10505	3744	206
650	3005	1075	56.9	6270	2236	118	11362	4049	214
700	3232	1156	59	6742	2405	123	12218	4354	222
750	3458	1237	61.1	7215	2573	127	13075	4660	230
800	3685	1318	63.1	7688	2742	131	13931	4965	238
850	3911	1399	65	8160	2911	135	14787	5270	245
900	4138	1480	66.9	8633	3079	139	15644	5575	252
950	4364	1561	68.7	9105	3248	143	16500	5881	259
1000	4591	1642	70.5	9578	3416	147	17357	6186	266
1100	5044	1804	74	10523	3753	154	19070	6796	279
1200	5497	1966	77.2	11469	4091	161	20782	7407	291
1300	5950	2128	80.4	12414	4428	167	22495	8017	303
1400	6394	2290	83.4	13340	4765	174	24174	8628	314
1500	6889	2452	86.4	14373	5102	180			
1600	7393	2614	89.2	15424	5439	186			
1700	7907	2776	91.9	16497	5776	191			
1800	8433	2938	94.6	17594	6113	197			
1900	8971	3100	97.2	18718	6451	202			
2000	9525	3262	100	19872	6788	208			
2200	10684	3586	105	22292	7462	218			
2400	11935	3910	109	24901	8136	227			
2600	13310	4234	114	27770	8811	237			
2800	14864	4558	118	31012	9485	246			
3000		4882	122						
3200		5206	126						
3400		5530	130						
3600		5854	134						

Type 459

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

- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 5.3

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

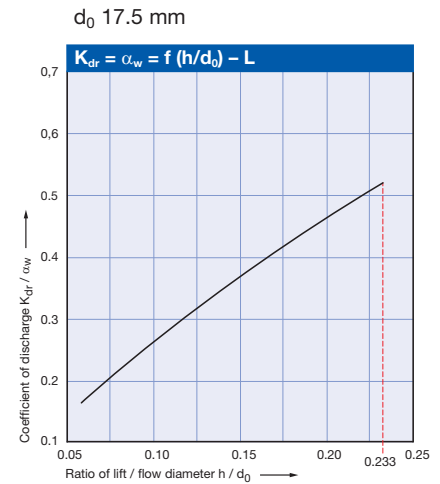
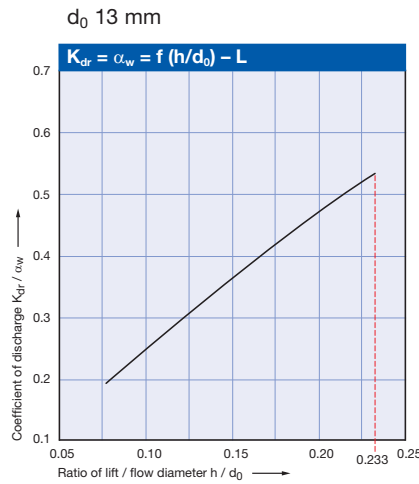
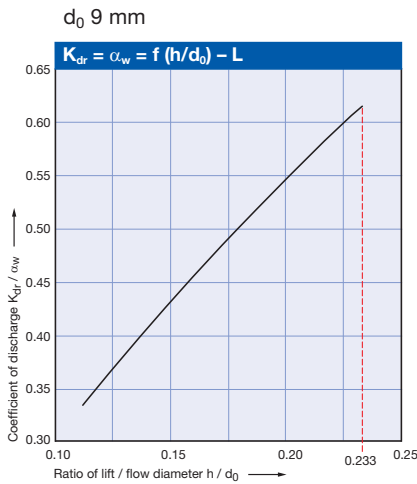
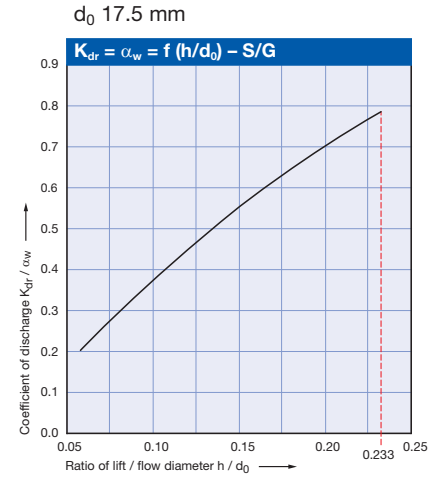
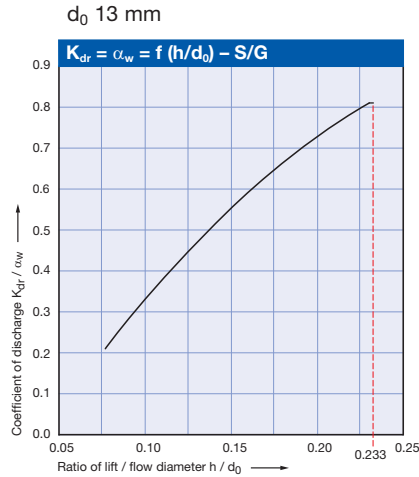
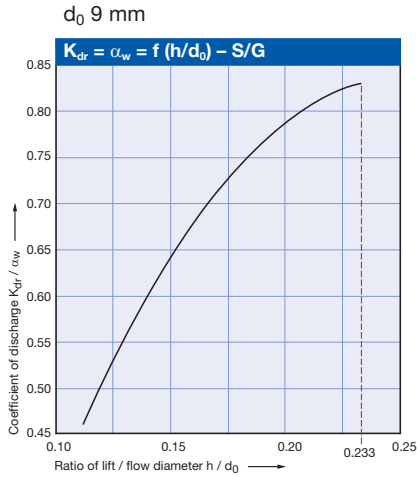
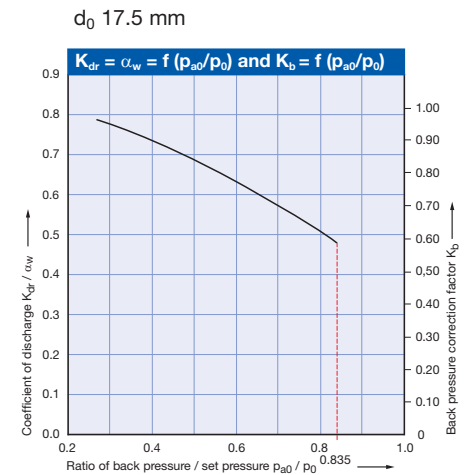
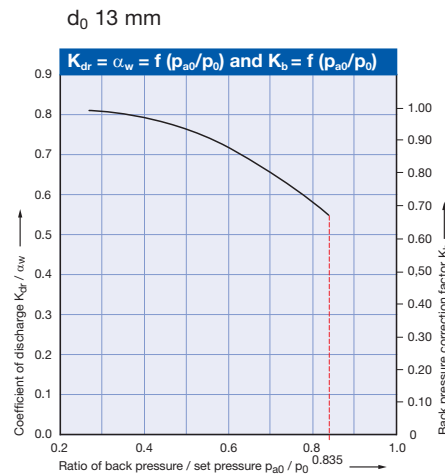
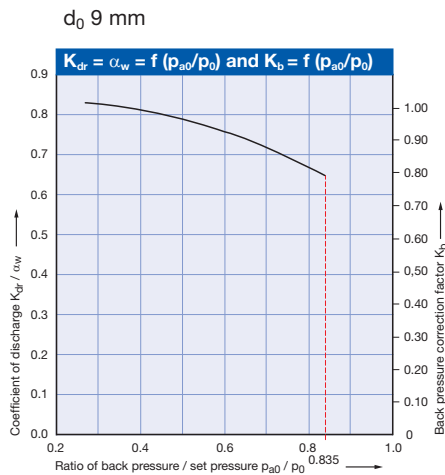


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)



Type 459 HDD

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.

AD 2000-Merkblatt A2

Actual Orifice diameter d_0 [mm]	6			9			
Actual Orifice area A_0 [mm ²]	28.3			63.6			
LEO*) [inch ²]	S/G = 0.036 L = 0.038			S/G = 0.082 L = 0.086			
Set pressure	Capacities			Capacities			
[bar]	Steam saturated [kg/h]	Air 0°C and 1013 mbar [m _n ³ /h]	Water 20°C [10 ³ kg/h]	Steam saturated [kg/h]	Air 0°C and 1013 mbar [m _n ³ /h]	Water 20°C [10 ³ kg/h]	
0.2							
1							
1.5							
2							
3							
4							
5							
6							
7							
8							
9							
10							
12							
14							
16							
18							
20							
25							
30							
35							
40							
45							
50							
60							
70							
80							
90							
100							
120							
140							
160							
180							
200							
220							
240					9529	32.1	
260					10320	33.4	
280					11111	34.6	
300					11902	35.9	
320					12693	37	
340					13484	38.2	
360					14275	39.3	
380					15066	40.4	
400					15857	41.4	
420					16648	42.4	
440		7221	21.6	No saturated steam application in set pressure range			
460		7564	22.1				
480		7907	22.6				
500		8250	23.1				
520		8593	23.6				
540		8936	24.1				
560		9280	24.5				
580		9623	25				
600		9966	25.4				
650		10309	25.9				
700		11167	26.9				
750		18024	27.9				
800		12882	28.9				
850		13740	29.9				
		14598	30.8				
	No saturated steam application in set pressure range						

Type 459 HDD

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.

ASME Section VIII

Actual Orifice diameter d_0 [inch]	0.236			0.354		
Actual Orifice area A_0 [inch ²]	0.044			0.099		
LEO*) [inch ²]	S/G = 0.036 L = 0.038			S/G = 0.082 L = 0.086		
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						
10						
20						
30						
40						
50						
60						
70						
80						
90						
100						
150						
200						
250						
300						
350						
400						
450						
500						
600						
700						
800						
900						
1000						
1100						
1200						
1300						
1400						
1500						
1600						
1700						
1800						
1900						
2000						
2250						
2500						
2750						
3000						
3250						
3500					5692	132
3750					6097	137
4000					6502	141
4250					6908	145
4500					7313	150
4750					7718	154
5000					8123	158
5250					8528	162
5500					8933	165
5750					9338	169
6000					9743	173
6250		4330	76.8		10148	176
6500		4510	78.4			
6750		4690	79.9			
7000		4870	81.4			
7250		5050	82.9			
7500		5230	84.4			
7750		5410	85.8			
8000		5590	87.3			
8250		5770	88.6			
8500		5950	90			
8750		6130	91.4			
9000		6310	92.7			
9500		6490	94			
10000		6851	96.6			
11000		7211	99.1			
12000		7931	104.0			
12000		8651	109.0			
	No saturated steam application in set pressure range			No saturated steam application in set pressure range		

Type 459 HDD

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

- h = Lift [mm]
- d₀ = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d₀ = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p₀ = Set pressure [bar_a]
- p_{a0}/p₀ = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 5.3

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

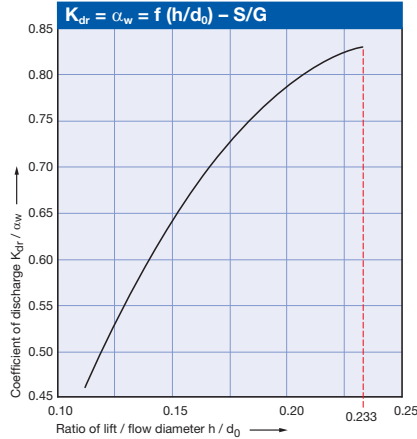
d₀ 6 mm

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

A lift restriction is not applicable because the actual design and the certified lift $\leq 1.5 \text{ mm} / 1/16 \text{ inch}$.

d₀ 9 mm

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



d₀ 6 mm

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

A lift restriction is not applicable because the actual design and the certified lift $\leq 1.5 \text{ mm} / 1/16 \text{ inch}$.

d₀ 9 mm

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

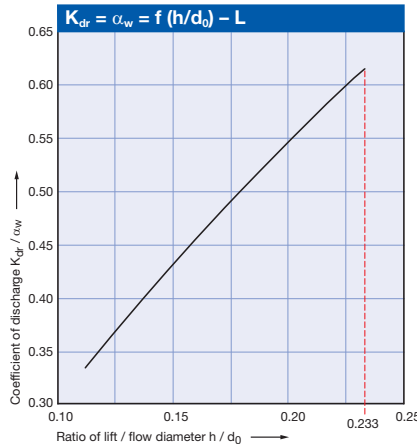


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)

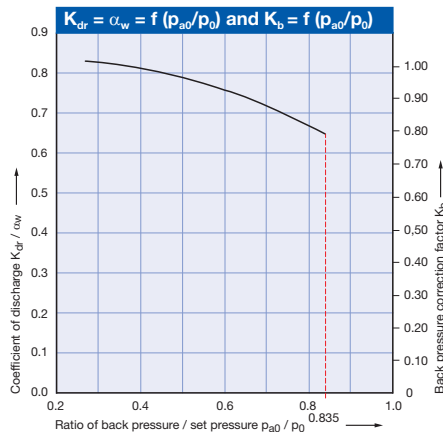
d₀ 6 mm

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

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

d₀ 9 mm

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



Type 462

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.

AD 2000-Merkblatt A2

Actual Orifice diameter d_0 [mm]	9			13			17.5		
Actual Orifice area A_0 [mm ²]	63.6			133.0			241.0		
LEO*) [inch ²]	S/G = 0.082 L = 0.086			S/G = 0.171 L = 0.179			S/G = 0.310 L = 0.325		
Set pressure	Capacities			Capacities			Capacities		
	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C	Steam saturated	Air 0°C and 1013 mbar	Water 20°C
[bar]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]	[kg/h]	[m _n ³ /h]	[10 ³ kg/h]
0.5	40	47	1.53	87	102	3.19	134	157	4.93
1	58	69	2.07	125	149	4.32	200	238	6.67
2	93	113	2.93	195	235	6.11	331	400	9.44
3	127	155	3.59	258	316	7.48	456	558	11.6
4	158	195	4.14	322	396	8.64	569	700	13.3
5	189	234	4.63	386	477	9.66	681	842	14.9
6	220	274	5.07	449	557	10.6	793	985	16.3
7	251	313	5.48	511	638	11.4	902	1127	17.7
8	282	353	5.86	573	718	12.2	1013	1269	18.9
9	312	392	6.21	636	799	13	1124	1412	20
10	343	432	6.55	699	879	13.7	1235	1554	21.1
12		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						

Type 462

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.

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						

Type 462

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

- h = Lift [mm]
- d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d_0 = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p_0 = Set pressure [bar_a]
- p_{a0}/p_0 = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 5.3

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

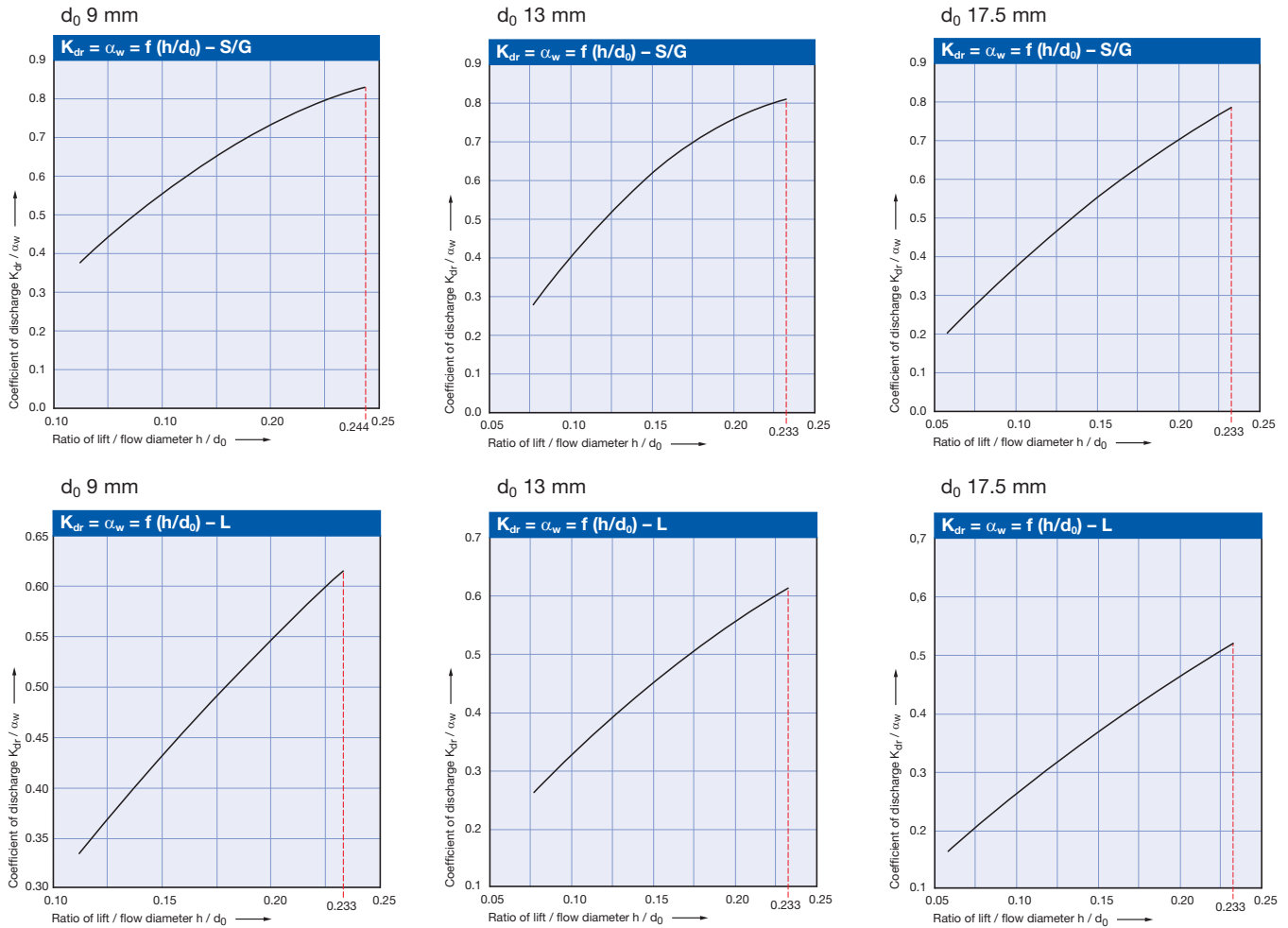
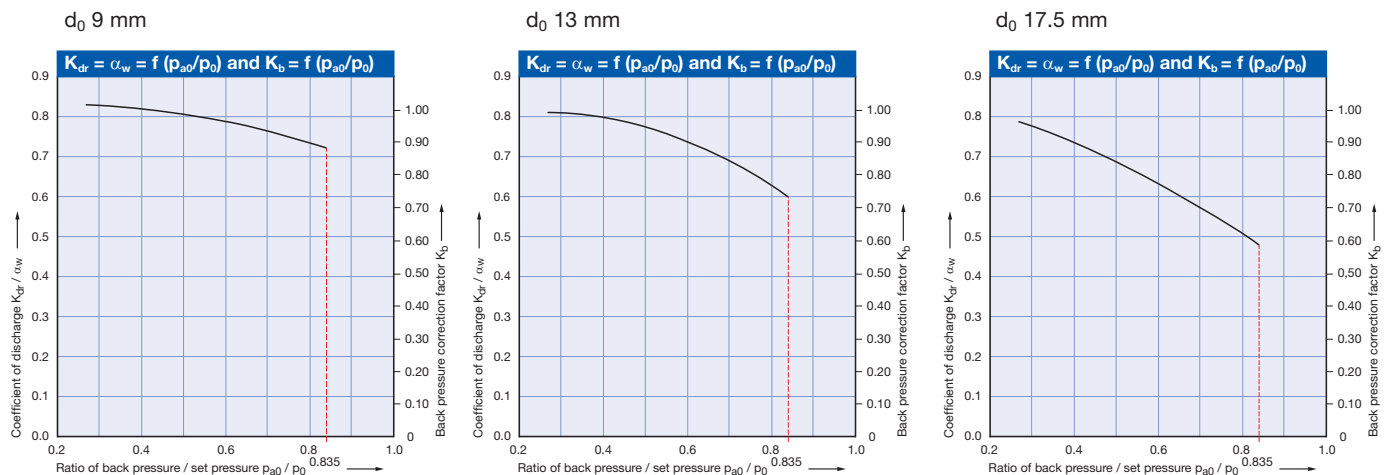


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)



Type 462 HDD

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.

ASME Section VIII

Actual Orifice diameter d_0 [inch]	0.354		
Actual Orifice area A_0 [inch ²]	0.099		
LEO*) [inch ²]	S/G = 0.082 L = 0.086		
Set pressure	Capacities		
	Steam saturated	Air 60° F and 14.5 psig [S.C.F.M.]	Water 70°F [US-G.P.M.]
[psig]	[lb/h]		
5			
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
120			
140			
160			
180			
200			
220			
240			
260			
280			
300			
320			
340			
360			
380			
400			
420			
440			
460			
480			
500			
550			
600			
650			
700			
750			
800			
850			
900			
950			
1000			
1100			
1200			
1300			
1400			
1500			
1600			
1700			
1800			
1900			
2000			
2500			
3000			
3500		5692	132
4000		6502	141
4500	No saturated steam application in set pressure range	7313	150
5000		8123	158
5500		8933	165

Type 462 HDD

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

- h = Lift [mm]
- d_0 = Flow diameter [mm] of selected safety valve, refer to table article numbers
- h/d_0 = Ratio of lift / flow diameter
- p_{a0} = Back pressure [bar_a]
- p_0 = Set pressure [bar_a]
- p_{a0}/p_0 = Ratio of back pressure / set pressure
- K_{dr} = Coefficient of discharge acc. to DIN EN ISO 4126-1
- α_w = Coefficient of discharge acc. to AD 2000-Merkblatt A2
- K_b = Back pressure correction factor acc. to API 520 topic 5.3

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

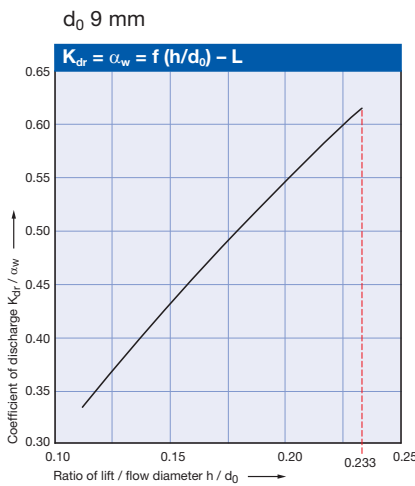
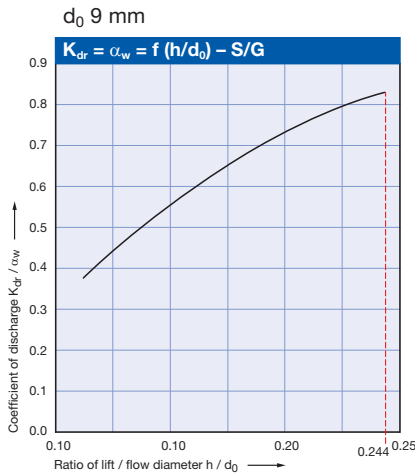
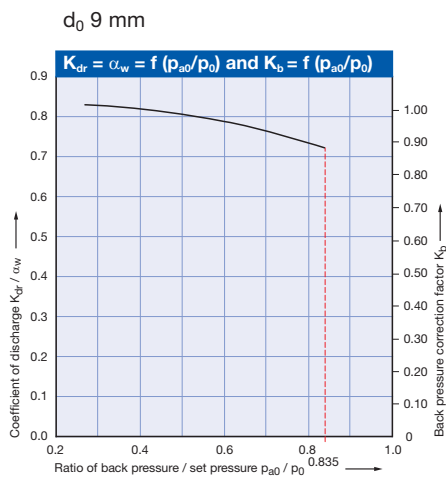
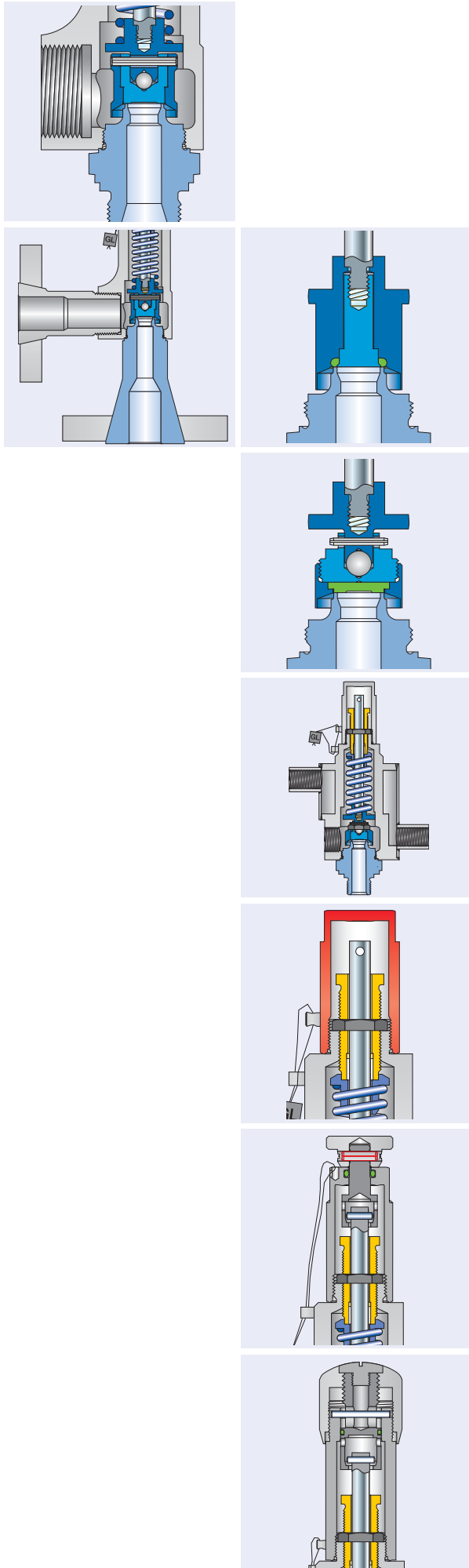


Diagram for evaluation of ratio of the coefficient of discharge (K_{dr}/α_w) in reference to the ratio of back pressure / set pressure (p_{a0}/p_0)





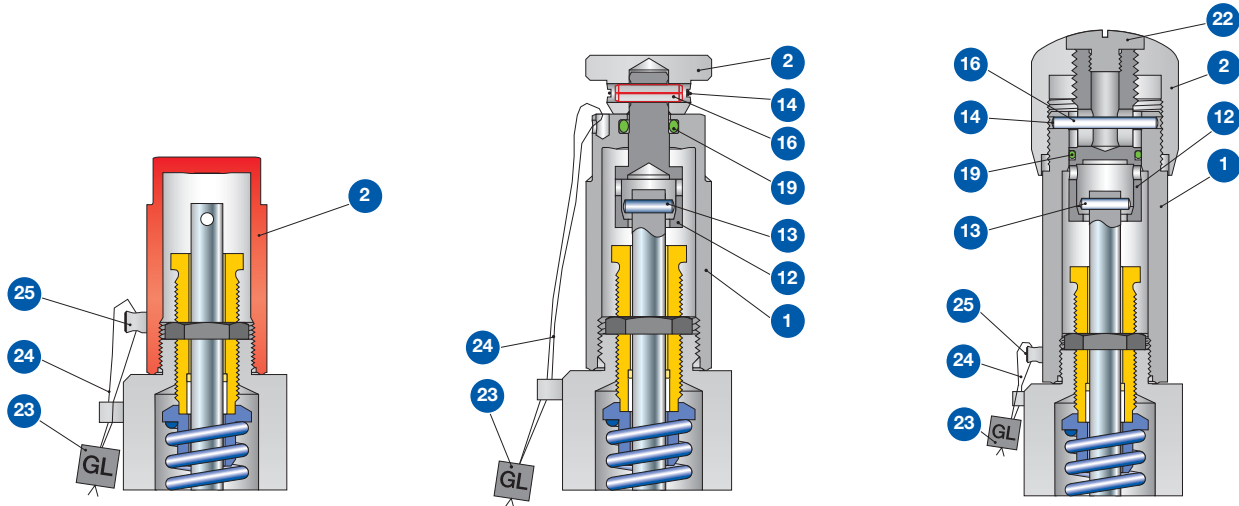
Accessories and Options
Compact Performance

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Options Series 437

Caps and levers – subassembly item 40

Materials



Options Series 437

Item	Component	Steel			Stainless steel	
		Cap H2	Pull button H3	Packed knob H4	Cap H2	Packed knob H4
1	Lever cover	–	1.0460	1.4104	–	1.4404
		–	SA 105	430	–	316L
2	Cap	1.0460	–	1.4104	1.4404	1.4404
	Knob	SA 105	–	430	316L	316L
12	Spindle cap	–	1.0718	–	–	–
		–	Steel	–	–	–
13	Pin	–	1.4021	1.4021	–	1.4404
		–	420	420	–	316L
14	Retaining clip	–	A4	A4	–	A4
		–	Stainless steel	Stainless steel	–	Stainless steel
16	Pin	–	1.4571	1.4571	–	1.4571
		–	316Ti	316Ti	–	316Ti
19	O-ring	–	1.4310	1.4310	–	1.4310
		–	Stainless steel	Stainless steel	–	Stainless steel
22	Stop unit	–	FKM	FKM	–	FKM
		–	Fluorocarbon	Fluorocarbon	–	Fluorocarbon
23	Seal	–	–	1.4104	–	1.4404
		–	–	430	–	316L
24	Seal wire	Plastic	Plastic	Plastic	Plastic	Plastic
		Plastic	Plastic	Plastic	Plastic	Plastic
25	Sealing nose	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

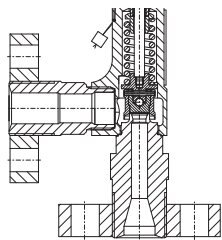
Options Series 437

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						

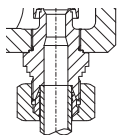
IG flange (BASF High pressure technology)



Pressure rating	Valve size	d ₀ 6 mm		d ₀ 10 mm	
		Inlet	Outlet	Inlet	Outlet
325	DN 10	W01	–	–	–
	16	W02	W17	W02	W17
	24	–	W18	–	–
	45	–	W20	–	–
500	16	–	–	W12	–
700	10	W26	–	–	–

Screwed fittings

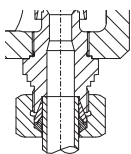
Progressive – cutting ring – screw fitting DIN 2353 / DIN EN ISO 8434-1 (e. g. ERMETO)



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

Screwed fittings

Two-ferrule bite type screw fitting (Original SWAGelok)



Pipe dimension	d ₀ 10 mm	
	Inlet	Outlet
Outer Ø x Wall thickness		
mm		
18 x 1,5	V44	–

Weld-on end

Pipe dimension	All d ₀	
	Inlet	Outlet
Outer Ø x Wall thickness		
mm		
≤ 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 LDeS 3288.20-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.

Options Series 437
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).



Options
 Series 437

Options Series 437

Type of sealing

Type 437 – Metal seat

LESER safety valves are supplied with Nanotightness as a standard and therefore exceed requirements for functional tightness of the API 527 by 50%. The LESER Nanotightness is produced by multistage lapping, grinding and polishing processes and ensures flatness and roughness of the sealing surfaces like in the nanometer range.

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 d₀ 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

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.

Options Series 437

Type of sealing

Types 437, 438, 439 – Soft seal

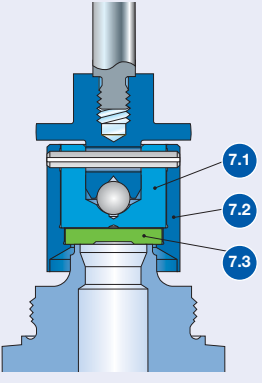
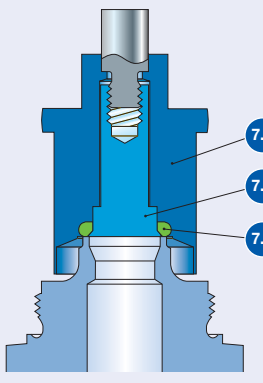
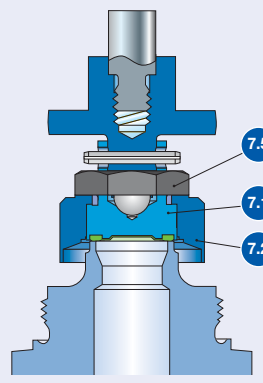
LESER soft seal solutions allow for superior tightness.

Features and benefits

- 3 different designs for a wide variety application
- large selection of soft seal materials to best adapt to the application

- increased service life of sealing surfaces compared to a metal to metal seat
- simple replacement of the soft seal reduces maintenance costs
- standard ARP O-ring sizes for easy worldwide procurement
- one standard durometer per O-ring material for all set pressures to reduce stocking expenses

Soft seal solutions

Type	437 – Sealing plate	438 – O-ring disc	439 – Vulcanized soft seal disc
			
Requirements	Improved tightness related to metal seat is required and the temperature is lower than -20°C / -4 °F	Superior tightness is required and the set pressure is higher than 5 bar / 75 psig	Superior tightness is required and the set pressure is below 16 bar / 232 psig
Tightness according to LGS 0201	9.4 x 10 ⁻² mbarl/s	9 x 10 ⁻⁵ mbarl/s	9 x 10 ⁻⁵ mbarl/s
Example application	Liquefied gases	Gas storage tanks, compressors	Glass systems at laboratories

Materials – Subassembly of the disc (item 7)

	Item 7.1	1.4404	Item 7.1	1.4404	Item 7.1	1.4404
Disc		SA 479 316L		SA 479 316L		SA 479 316L
Soft seal Materials refer to next page	Item 7.3	sealing plate	Item 7.3	O-ring		vulcanized disc
Lifting aid	Item 7.2	1.4404 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 119.

Options Series 437

Soft seal selection

Abbreviation ASTM 14	Trade name (Designation)	Code letter ¹⁾	Option- code	T _{min}		T _{max}		Application ²⁾
				[°C]	[°F]	[°C]	[°F]	
O-ring								
CR	Neoprene®	K	J21	-40	-40	100	212	Paraffins, mineral oils, silicon oils and greases, water and aqueous solutions, refrigerants, ozone
NBR	Buna-N® (Nitrile-Butadiene)	N	J30	-25	-13	100	212	Hydraulic oils, plant and animal fats and oils
EPDM	Buna-EP® (Ethylene-Propylene-Diene)	D	J22	-45	-49	150	302	Hot water and hot steam up to 150 °C, 302 °F, many organic and inorganic acids, silicon oils and greases FDA conforming compound
FKM	Viton® (Fluorocarbon)	L	J23	-20	-4	180	356	High temperatures (not hot steam), mineral oils and greases, silicon oils and greases, plant and animal oils and fats, ozone FDA conforming compound on request
FFKM	Kalrez® (Perfluor)	C	J20	0	32	250	482	Almost all chemicals, standard compound is Kalrez® 6375 with steam resistance FDA conforming compound on request
Sealing plate								
SP	VESPEL SP-1® (Polyimide)	T	J49	-270	-454	260	500	High-temperature and high-pressure applications (no steam), chemical resistance, see manufacturer's specifications
PCTFE	KEL-F® (Polychlorotrifluoroethylene)	G	J48	-240	-400	150	302	Low-temperature and refrigeration system applications, flammable media, gaseous acid up to 50 bar, 725 psig at 60 °C, 140 °F
PTFE	Teflon® (Polytetrafluoroethylene)	A	J44	-200	-328	200	392	Almost all chemicals
Other not listed materials		X	For other materials, please contact your local representative or sales@leser.com					

¹⁾ The code letters are stamped on the disc (Item 1)

²⁾ The pressure and temperature application range must be observed in all cases. The chemical resistance is based on specifications from the soft seal manufacturer. LESER assumes no guarantee.

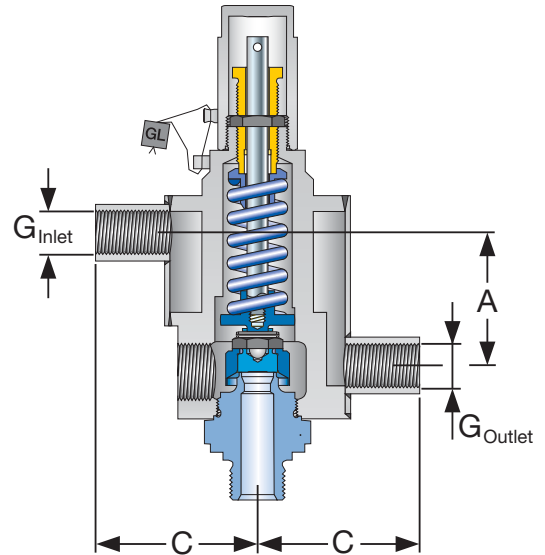
Options Series 437
Heating jacket

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.



Actual Orifice diameter d_0 [mm]	6	10
Actual Orifice area A_0 [mm ²]	28.3	78.5
Actual Orifice diameter d_0 [inch]	0.236	0.394
Actual Orifice area A_0 [inch ²]	0.044	0.122

Materials		
Outlet body	Series 437	1.4404
		316L
Heating jacket		1.4541
		321
Connection		
Couplings	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

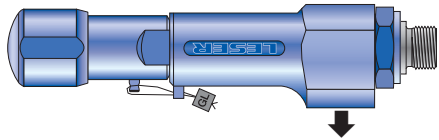
Size outlet body	1/2"	3/4"	1"
Dimensions			
A [inch]	1 ¹⁵ / ₁₆	1 ¹⁵ / ₁₆	1 ¹⁵ / ₁₆
C [inch]	2 ³ / ₈	2 ³ / ₄	2 ³ / ₄
G ["]	3/8	3/8	3/8
Operating conditions		Operating pressure [psig]	
Temperature	68 [°F]	363	
	410 [°F]	261	

Options Series 437

Installing note

Horizontal fitting

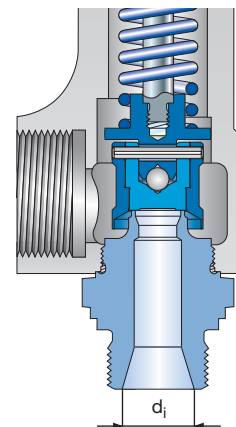
For horizontal fitting certified



Attention! Only with outlet in direction downwards.

Inlet pipe dimension

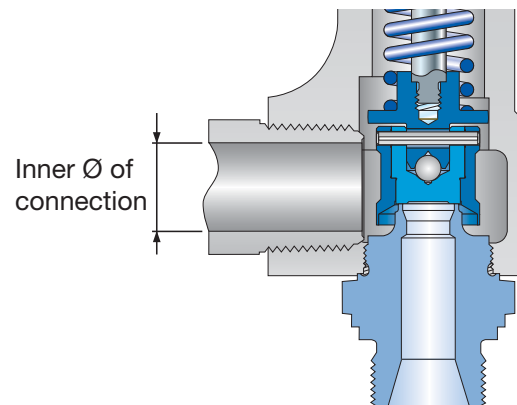
Actual orifice diameter d_0	[mm]	6	10
	[inch ²]	0.236	0.394
Actual orifice area A_0	[mm ²]	28.3	78.5
	[inch ²]	0.044	0.122
Inner Ø of pipe d_i	[mm]	8	12.5
	[inch]	3/8"	1/2"



Outlet connection

Caution!

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



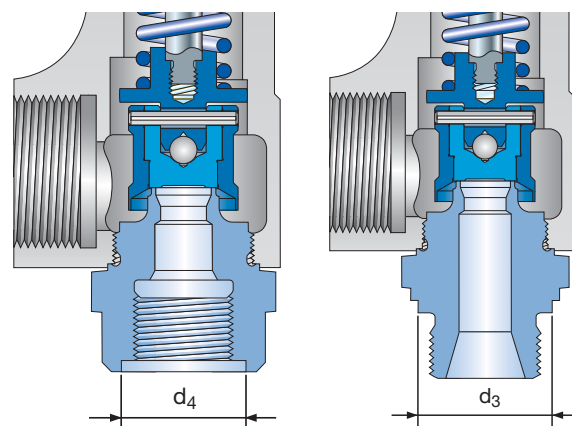
Screwed plugs – DIN ISO 228 / G

Male

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

Female

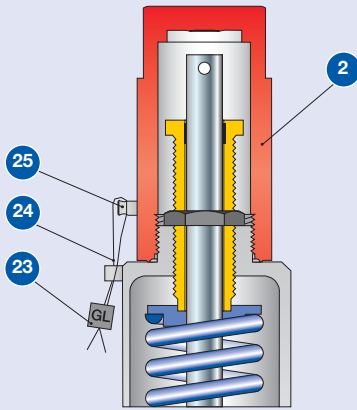
Design of diameter d_4 according to DIN 3852 – Part 2, form Y for small gasket.



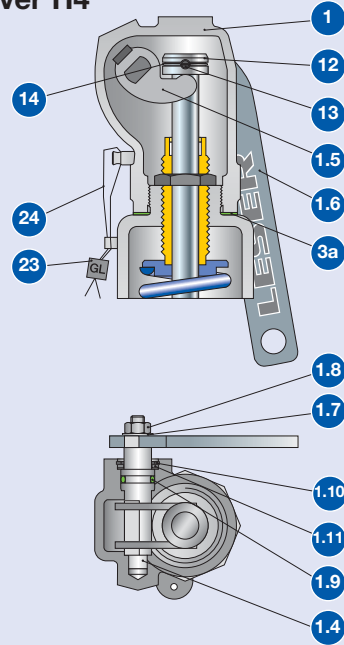
Options Series 459

Caps and levers – subassembly item 40

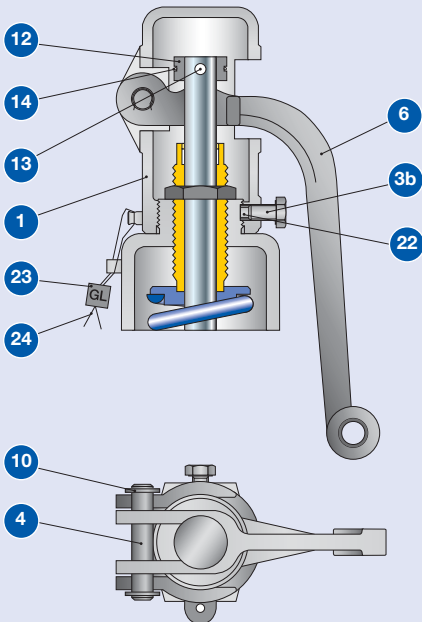
Cap H2



Packed lever H4

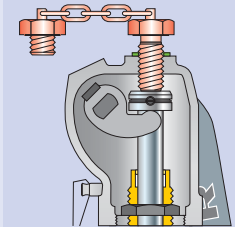
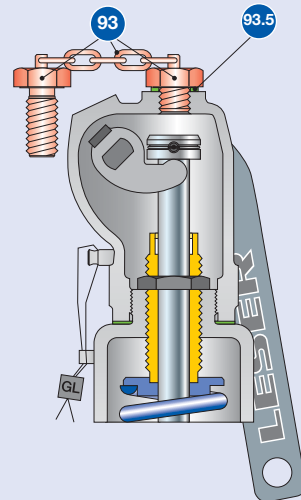


Plain lever H3



Test gag

Cap H2: J70
Packed lever H4: J69



BLOCKED
Remove
after testing

Test gag

The test gag 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!

Options Series 459

Caps and levers – subassembly item 40

Materials

Item	Component	Steel			Stainless steel	
		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	1.0460	–	–	1.4404	–
		SA 105	–	–	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
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

Please notice:

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

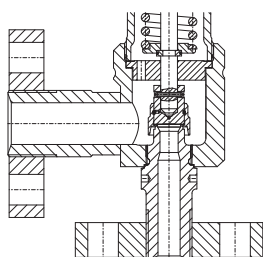
Options Series 459

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						

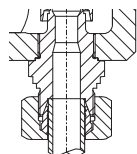
IG flange (BASF High pressure technology)



Pressure rating	Valve size DN	d ₀ 6 mm		d ₀ 9 mm		d ₀ 17.5 mm	
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
325	16	–	–	W02	–	–	–
	24	W03	–	W03	–	W03	–
	30	–	–	–	W19	–	–
	45	–	–	W05	W20	–	–
500	10	W06	–	–	–	–	–
	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 mm	d ₀ 13 mm				d ₀ 17.5 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 mm	all d ₀	
≥ 33	Inlet	Outlet
	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 LDeS 3288.20-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.

Options Series 459

NACE-Compliant Safety Valves

General requirements for safety valves in sour gas service

Media such as sour gas, which is especially common in oil and gas production, can have a corrosive effect on safety valves. The National Association of Corrosion Engineers (NACE) is a global association that deals with the development of corrosion control measures and defines these in standards such as NACE MR0175 and NACE MR0103. Both of these standards identify requirements for metallic materials used for piping and related components, to include safety valves, in the oil and gas industry.

The aim here is to protect the environment from escaping media. The focus is on the prevention of various types of corrosion (e.g. sulfur-induced stress corrosion cracking) of used materials that can be caused by acidic media.

Both standards define the maximum material hardness for prevention of corrosion damage because hardness increases corrosion resistance. NACE MR0175 provides requirements for materials used in oil and gas extraction (upstream) whereas NACE MR0103 specifies less stringent requirements for materials used in refinery processes (downstream).

Various components of LESER safety valves can be constructed in corrosion resistant materials using a level concept. This way, LESER can offer efficient safety valve solutions according to the requirements of NACE MR0175 and NACE MR0103 for different application conditions.

Norms

NACE MR0175/ISO15156 – 2003

1 Scope: This part of NACE MR0175/ISO 15156 describes general principles and gives requirements and recommendations for the selection and qualification of metallic materials for service in equipment used in oil and gas production and in natural gas sweetening plants in H₂S-containing environments, where the failure of such equipment could pose a risk to the health and safety of the public and personnel or to the environment.

NACE MR0103 – 2012

•1.1.1: This standard establishes material requirements for resistance to SSC in sour petroleum refining and related processing environments containing H₂S either as a gas or dissolved in an aqueous (liquid water) phase with or without the presence of hydrocarbon.

•1.1.2: Specifically, this standard is directed at the prevention of SSC of equipment (including pressure vessels, heat exchangers, piping, valve bodies, and pump and compressor cases) and components used in the refining industry.

Works standard: LDeS 3001.91

	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				
Safety valve operation	closed		opened	
Parts concerned	Inlet body, disc	Inlet body, disc	all	Inlet body, disc, bonnet spacer, bellows

LESER already uses NACE compliant materials as standard for many of its components. This means that material adjustments are required for only certain components – these are listed in the table below.

Necessary material modification NACE MR0175/ISO 15156 – 2003 (Option code N78) and NACE MR0103 – 2012 (Option code N77)						
Type	Design	Part	Material	Option code	Material	Option code
4592	Conventional	Disc	1.4404 / 316L stellited	L44 / J25	1.4404 / 316L stellited	L44 / J25
		Spring	No modification required		2.4669 / Inconel X-750	X08
	Balanced bellows	Disc	1.4404 / 316L stellited	L44 / J25	1.4404 / 316L stellited	L44 / J25
		Balanced bellows	1.4571 / 316Ti	J78 / J55	1.4571 / 316Ti	J78 / J55
4593	Conventional		Please choose Type 4594			
	Balanced bellows		Please choose Type 4592 or 4594			
4594 4594 HDD	Conventional	Spring	No modification required		2.4669 / Inconel X-750	X08
	Balanced bellows	Balanced bellows	1.4571 / 316Ti	J78 / J55	1.4571 / 316Ti	J78 / J55

Options Series 459

Type of sealing

Type 459 – Metal seat

LESER safety valves are supplied with a nanotightness and therefore exceed requirements for functional tightness of the API 527 by 50%. The LESER Nanotightness is produced by multistage lapping, grinding and polishing processes and ensures flatness and roughness of the sealing surfaces like in the nanometer range.

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

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.

Options Series 459 Type of sealing

Types 459 and 462 – Soft seal

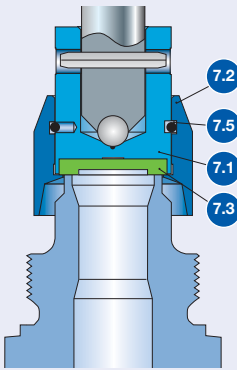
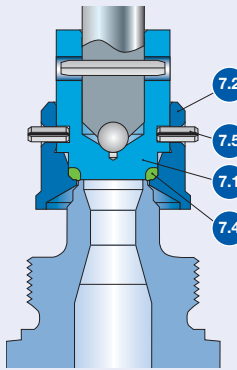
LESER soft seal solutions allow for superior tightness.

Features and benefits

- two different designs for a wide variety application
- large selection of soft seal materials to best adapt to the application
- increased service life of sealing surfaces compared to a metal to metal seat

- simple replacement of the soft seal reduces maintenance costs
- standard ARP O-ring sizes for easy worldwide procurement
- one standard durometer per O-ring material for all set pressures to reduce stocking expenses

Soft seal solutions

	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: 0.5 – 250 bar, 7.3 – 3626 psig
Example application	Liquefied gases	Gas storage tanks

Materials – Subassembly of the disc (item 7)

	Item 7.1	1.4404 SA 479 316L	Item 7.1	1.4404 SA 479 316L
Disc				
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 128

Options Series 459

Soft seal selection

Abbreviation ASTM 14	Trade name (Designation)	Code letter ¹⁾	Option- code	T _{min}		T _{max}		Application ²⁾
				[°C]	[°F]	[°C]	[°F]	
O-ring								
CR	Neoprene®	K	J21	-40	-40	100	212	Paraffins, mineral oils, silicon oils and greases, water and aqueous solutions, refrigerants, ozone
NBR	Buna-N® (Nitrile-Butadiene)	N	J30	-25	-13	100	212	Hydraulic oils, plant and animal fats and oils
EPDM	Buna-EP® (Ethylene-Propylene-Diene)	D	J22	-45	-49	150	302	Hot water and hot steam up to 150 °C, 302 °F, many organic and inorganic acids, silicon oils and greases FDA conforming compound
FKM	Viton® (Fluorocarbon)	L	J23	-20	-4	180	356	High temperatures (not hot steam), mineral oils and greases, silicon oils and greases, plant and animal oils and fats, ozone FDA conforming compound on request
FFKM	Kalrez® (Perfluor)	C	J20	0	32	250	482	Almost all chemicals, standard compound is Kalrez® 6375 with steam resistance FDA conforming compound on request
Sealing plate								
SP	VESPEL SP-1® (Polyimide)	T	J49	-270	-454	260	500	High-temperature and high-pressure applications (no steam), chemical resistance, see manufacturer's specifications
PCTFE	KEL-F® (Polychlorotrifluoroethylene)	G	J48	-240	-400	150	302	Low-temperature and refrigeration system applications, flammable media, gaseous acid up to 50 bar, 725 psig at 60 °C, 140 °F
PTFE	Teflon® (Polytetrafluoroethylene)	A	J44	-200	-328	200	392	Almost all chemicals
Other not listed materials		X	For other materials, please contact your local representative or sales@leser.com					

¹⁾ The code letters are stamped on the disc (Item 1)

²⁾ The pressure and temperature application range must be observed in all cases. The chemical resistance is based on specifications from the soft seal manufacturer. LESER assumes no guarantee.

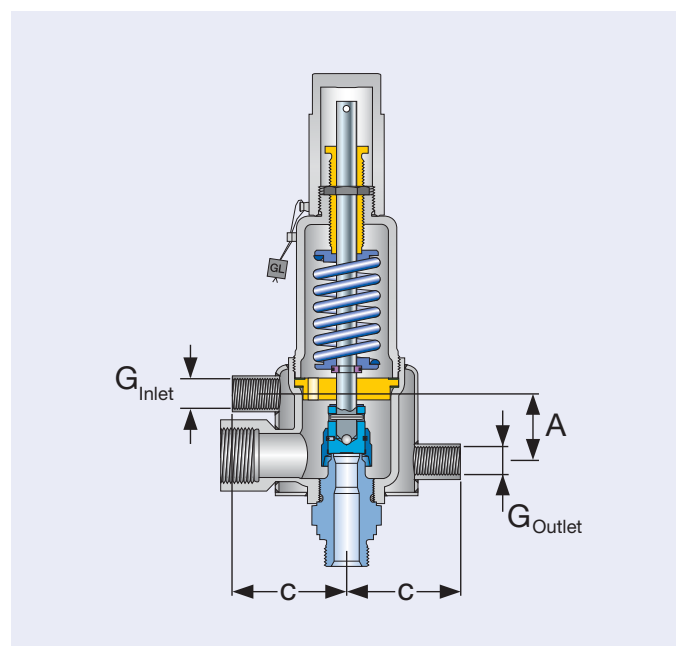
Options Series 459 Heating jacket

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.



		Type 459, Type 462				Type 459 HDD, Type 462 HDD	
Actual Orifice diameter d_0 [mm]		6	9	13	17.5	6	9
Actual Orifice area A_0 [mm ²]		28.3	63.9	133	241	28.3	63.9
Actual Orifice diameter d_0 [inch]		0.236	0.345	0.512	0.689	0.236	0.345
Actual Orifice area A_0 [inch ²]		0.044	0.099	0.206	0.374	0.044	0.099
Option code		H29				H29	
Materials							
Outlet body		1.4408				1.4408	
		CF8M				CF8M	
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	

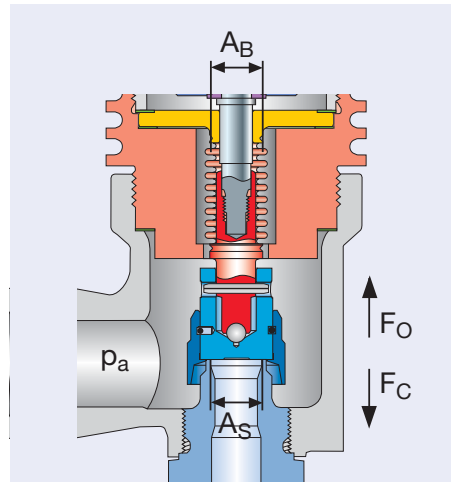
Options Series 459
Balanced bellows – Subassembly item 15

Balanced bellows are generally used for two 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). The balanced bellows constitutes an area equal to the seat area, creating a force acting in the opening direction (F_O), thus compensating the force in closing direction.

A quantitative representation is shown in the table below:



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

LESER Series 459 is the first safety valve line in the world to offer stainless steel bellows in sizes less than an API D orifice. The stainless steel bellows was designed to compensate for back pressure in the valve size $A_0 = 133 \text{ mm}^2 / 0.206 \text{ inch}^2$,

but the same design is also used in the smaller $A_0 = 63.9 \text{ mm}^2 / 0.099 \text{ inch}^2$ and $A_0 = 241 \text{ mm}^2 / 0.689 \text{ inch}^2$ sizes. For this reason, the bellows do not completely balance the smaller orifice size.

Sealing the bonnet from the outlet chamber

LESER's balanced bellows reliably seal the bonnet from the outlet chamber; protecting the guide, moving parts and the

spring from problems associated with the media, such as dirt, corrosion, impurities of temperature.

Material and design

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

Hastelloy® or Inconel® are available as well. A control thread DIN ISO 228-1 size G $1/4$ " is fitted into the bonnet to monitor the condition of the bellows.

A discharge pipe can be fitted to the G $1/4$ " control thread to allow safe discharge of aggressive or toxic fluids.

Option codes

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

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

Options Series 459

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.

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		WI 3037.06

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.

Options Series 459
O-ring damper – Subassembly item 40

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

Background:

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

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

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

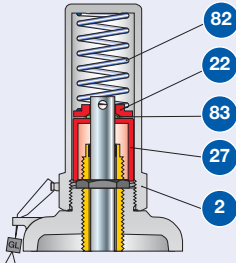
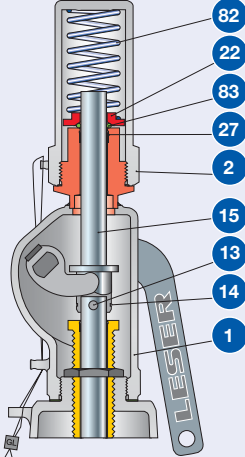
flutter: “Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disc does not contact the seat.” Causes for fluttering are vibrations with small or hardly measurable amplitude, where high-frequency vibrations accumulate from external influences. The vibrations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

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

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

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

Available design

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

Options Series 459

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	459	462, 462 HDD	462	
Actual Orifice diameter d_0 [mm]	9	13	9	13	
Actual Orifice area A_0 [mm ²]	63.9	133	63.9	133	
Actual Orifice diameter d_0 [inch]	0.345	0.512	0.345	0.512	
Actual Orifice area A_0 [inch ²]	0.099	0.206	0.099	0.206	
Option code					
Cap H2	✓	✓	✓	✓	
Packed lever H4	✓	✓	✓	✓	
Set pressure range					
Metric units	[bar _g]	8.7 – 27.5	8.7 – 120	17.0 – 125	6 – 110
US units	[psig]	261 – 400	126 – 1740	247 – 1810	98 – 1595

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

Options Series 459

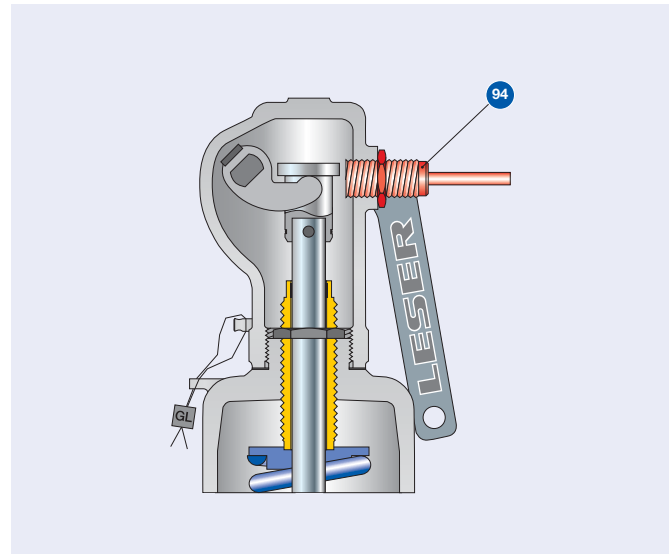
Lift indicator

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. 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

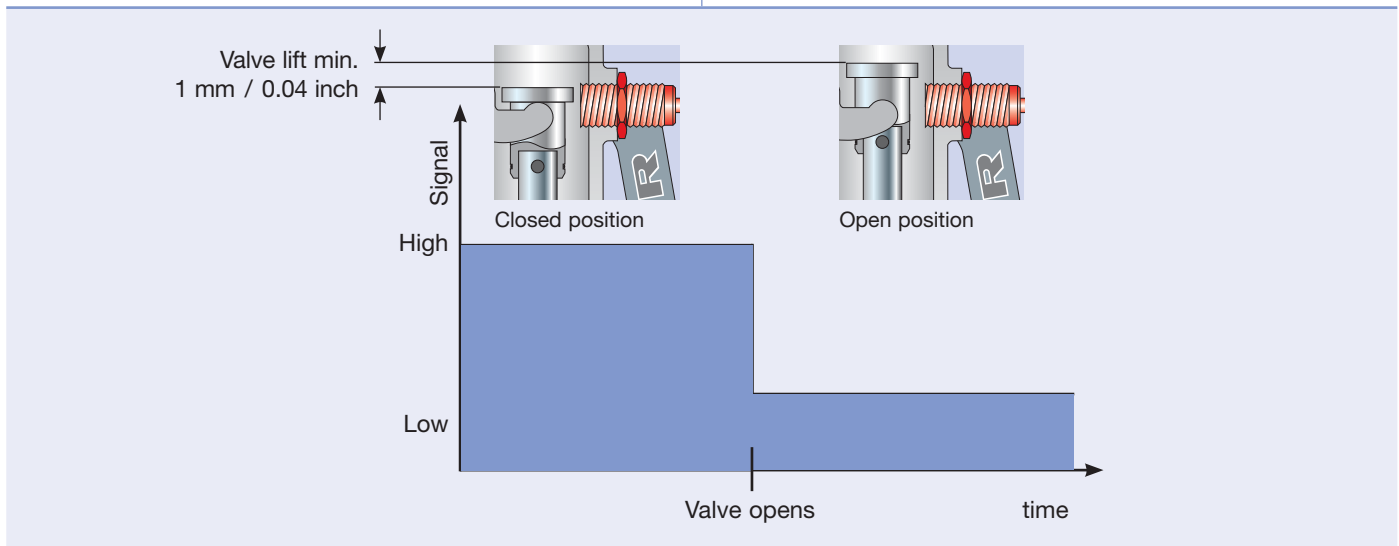
For assembly and adjustment refer to LESER works standard WI 3323.02.



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).



Options Series 459

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.

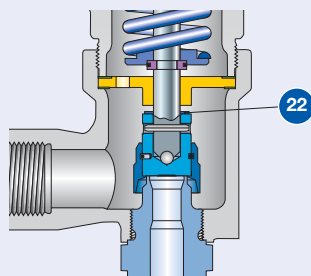
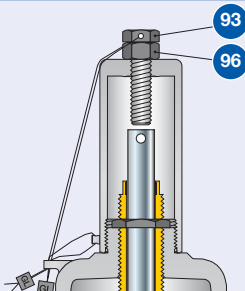
Requirements			
Code / standard	EN ISO 4126-1, section 5.1.3	ASME Code case 1945-4	AD 2000-Merkblatt A2, section 10.3
Lift	≥ 30% full rated lift not less than 1.0 mm / 1/16 inch	≥ 30% full rated lift not less than 0.08 inch / 2.0 mm	≥ 30% full rated lift not less than 1.0 mm / 1/16 inch
Coefficient of discharge	-	-	$\alpha_w [S/G] \geq 0.08$ $\alpha_w [L] \geq 0.05$
Name plate marking	Marking of reduced coefficient of discharge	- Capacity replaced with "Restricted capacity" - Restricted lift = ____ inch / mm	Marking of reduced coefficient of discharge
Design according to ASME code case 1945-4	The restriction of valve capacity shall be permitted only by the use of a lift restraining device, which shall limit valve lift and shall not otherwise interfere with flow throughout of the valve. The lift restricting device shall be designed so that the adjustable feature can be mechanically locked and have access sealed.		

Determining the restricted lift

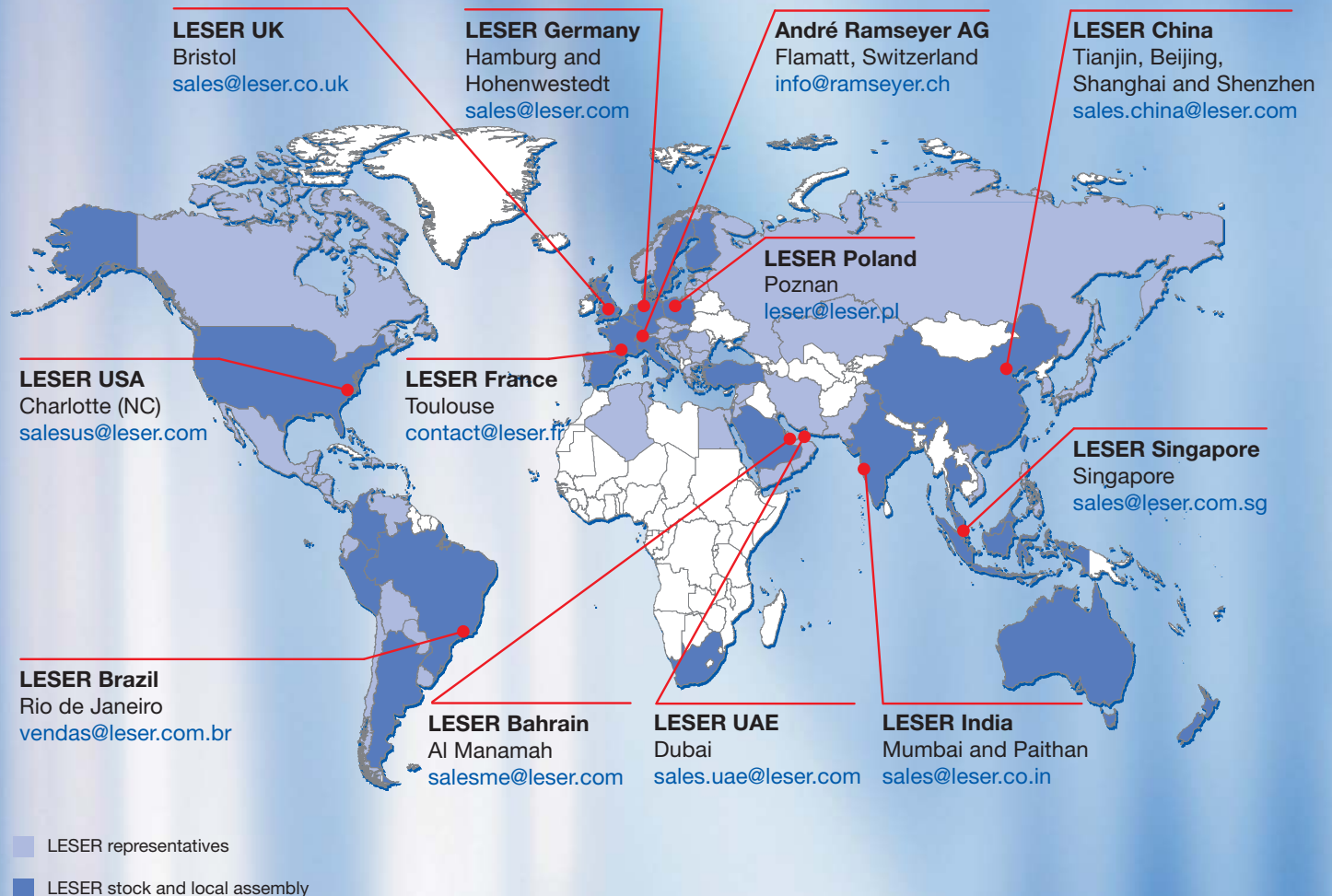
Determining the restricted lift can be done by using:

- the "Diagram for evaluation of ratio of lift / flow diameter (h/d_0) in reference to the coefficient of discharge (K_{dr}/α_w)".
- 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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The-Safety-Valve.com

LESER GmbH & Co. KG

20537 Hamburg, Wendenstr. 133-135
20506 Hamburg, P.O. Box 26 16 51

Fon +49 (40) 251 65-100
Fax +49 (40) 251 65-500

E-Mail: sales@leser.com
www.leser.com