



# High Performance

Flanged Safety Relief Valves

Series 441

Series 441 Full nozzle

Series XXL

Series 444

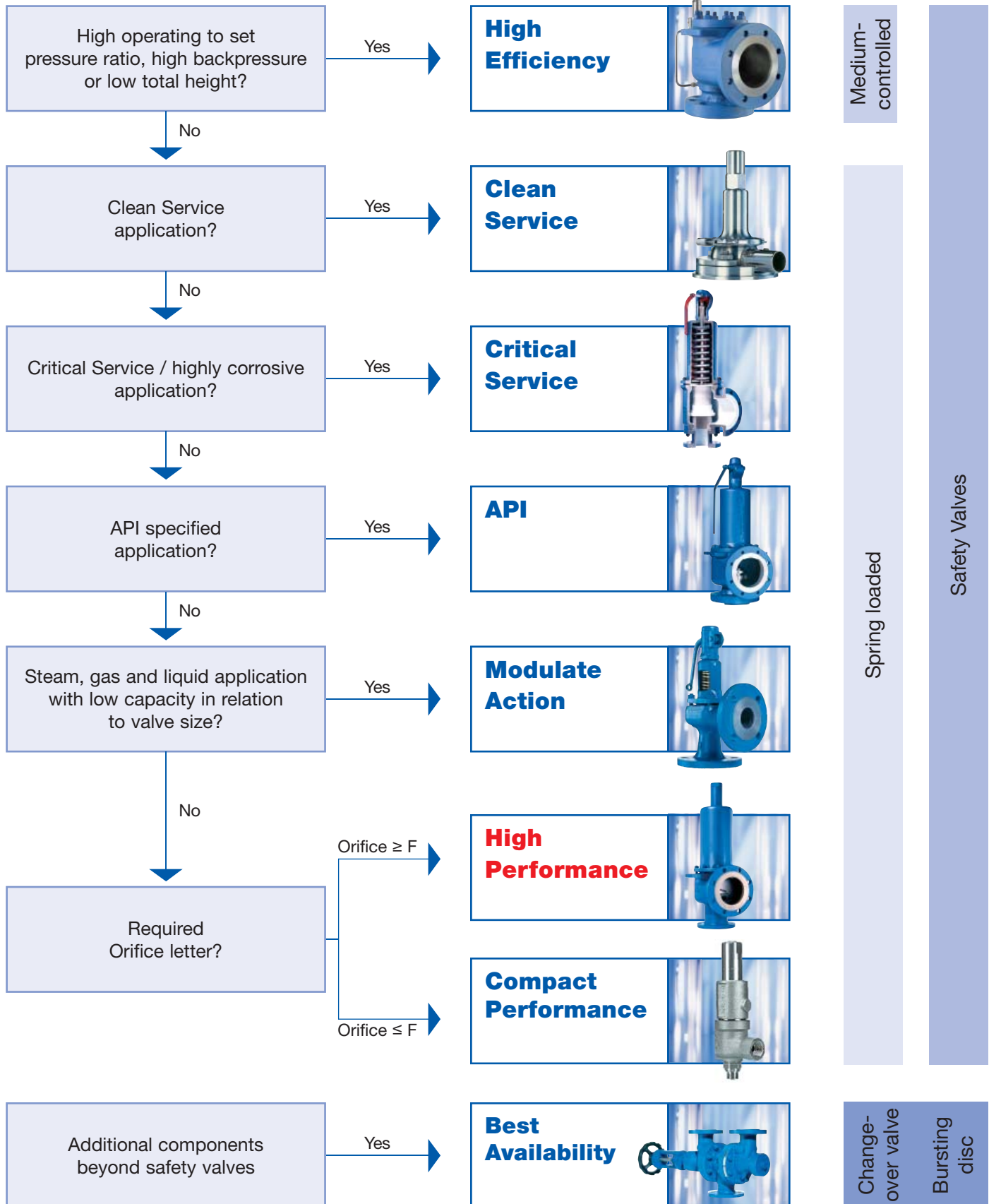
Series 458

## EXTENDED CATALOG

# LESER

[The-Safety-Valve.com](http://The-Safety-Valve.com)

## Valve finder How to find the right Product Group



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## General Information

### LESER – High Performance Sicherheitsventile

The High Performance product group represents

- ✓ High capacity related to the safety valve size
- ✓ High adaptability
- ✓ Excellent price / performance ratio

#### LESERs High Performance Safety Valves

- Are designed to meet all industrial applications.
- Open rapidly with an overpressure of 5 % to the full design lift.
- Are used particularly for vapours and gases where the maximum mass flow has to be discharged rapidly.
- Have a maximum blowdown of minus 10 % for steam/ gas service and minus 20 % for liquid service.
- Are one of the best selling spring loaded safety valve worldwide.
- Are developed in a close cooperation with plant engineers and service specialists.
- Serve for protection of processes and equipment.
- Are approved by all important approval organisations worldwide which ensures the worldwide applicability e.g.:
  - European Community: CE-marking acc. to Pressure Equipment Directive (PED) 97/23/EC resp. 2014/68/EU and EN ISO 4126-1
  - USA: UV-stamp acc. to ASME Section VIII Division 1, National Board certified capacities
  - Germany: VdTÜV approval acc. to PED, EN ISO 4126-1, TÜV SV 100 and AD 2000-Merkblatt A2
  - Canada: Canadian Registration Number acc. to the requirements of particular provinces
  - China: AQSIQ based on the approval acc. 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 High Performance safety valves are designed, marked, produced and approved acc. to the requirements of the following regulations (directives, codes, rules and standards).

EN ISO 4126-7, EN 12266-1/-2, EN 1092 Teil I and II flanging, ASME PTC 25, ASME-Code Sec. II, ASME B16.34 and ASME B16.5-flanging, API Std. 527, API RP 576, AD 2000-Merkblatt A4, AD 2000-Merkblatt HP0.



## General Information

### Applications

#### LESER – High Performance Safety Valves

Are the ultimate solution for all industrial applications for steam, gas and liquid.

Typical applications for LESER High Performance Safety Valves are:

##### Series 441

- Protection of chemical processes and equipment (e.g. distillation columns)
- Heat exchangers
- Low and medium pressure steam
- Blowers and turbo compressors

##### Series XXL

- Low pressure steam at big power stations
- Capacities beyond the limits of API and Series 441

##### Series 444

- OEM in dyeing machines or filter constructions
- Stainless steel applications up to 16 bar / 232 psig

##### Series 441 Full Nozzle

- Same applications like Series 441 when full nozzle design is preferred.
- Special requirement for nozzle material

##### Series 458

- Power stations and industrial superheated steam generation
- Required flange classes  $\geq$  PN 63 / CL600
- Protection of high pressure Chemical processes, e.g.  $\text{NH}_3$  synthesis,  $\text{CO}_2$  extraction
- Desalination plants

### General Design Features

#### LESERs High Performance Safety Valves

Offer a large variety of types, materials and options to suit any application:

- 14 valve sizes from DN 20 to DN 400 –  $\frac{3}{4}$ " to 16" provide a high connectivity to the application
- Inlet pressure ratings PN 16 to PN 400 / class 150 to class 2500 to fit all required design pressures
- Orifice sizes from E to  $> 3 \times T$  cover all capacity requirements
- Large variety of body materials; e.g.

- 0.6025 / grey iron
- 0.7043 / ductile iron
- 1.0619 / WCB
- 1.4408 / CF8M
- 1.7357 / WC6

can be selected acc. to the application

- Set pressures from 0.1 to 300 bar / 1.5 to 4350 psig make this product group suitable for all industrial processes
- Operating temperatures from  $-270$  to  $550$  °C /  $-454$  to  $1022$  °F 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 ensure an easier maintenance
- High capacity compared to the API requirements to reduce installation costs
- Ringless design needs no trim adjustments for easy maintenance
- One-piece spindle reduces friction which is leading to high operation accuracy
- Self-draining body design, avoids residues and reduces corrosion

### Options

LESER – High Performance Safety Valves can be customized with a great variety of options, e.g.

- O-ring disc for superior tightness
- Stellite or hardened metal sealing for longer product life
- Stainless steel bellows for back pressure compensation
- Heating jacket for applications with high viscosity fluids
- Every part can be replaced by other material acc. to customer specification





**Type 442 DIN**  
Plain lever H3  
Open bonnet  
Conventional design



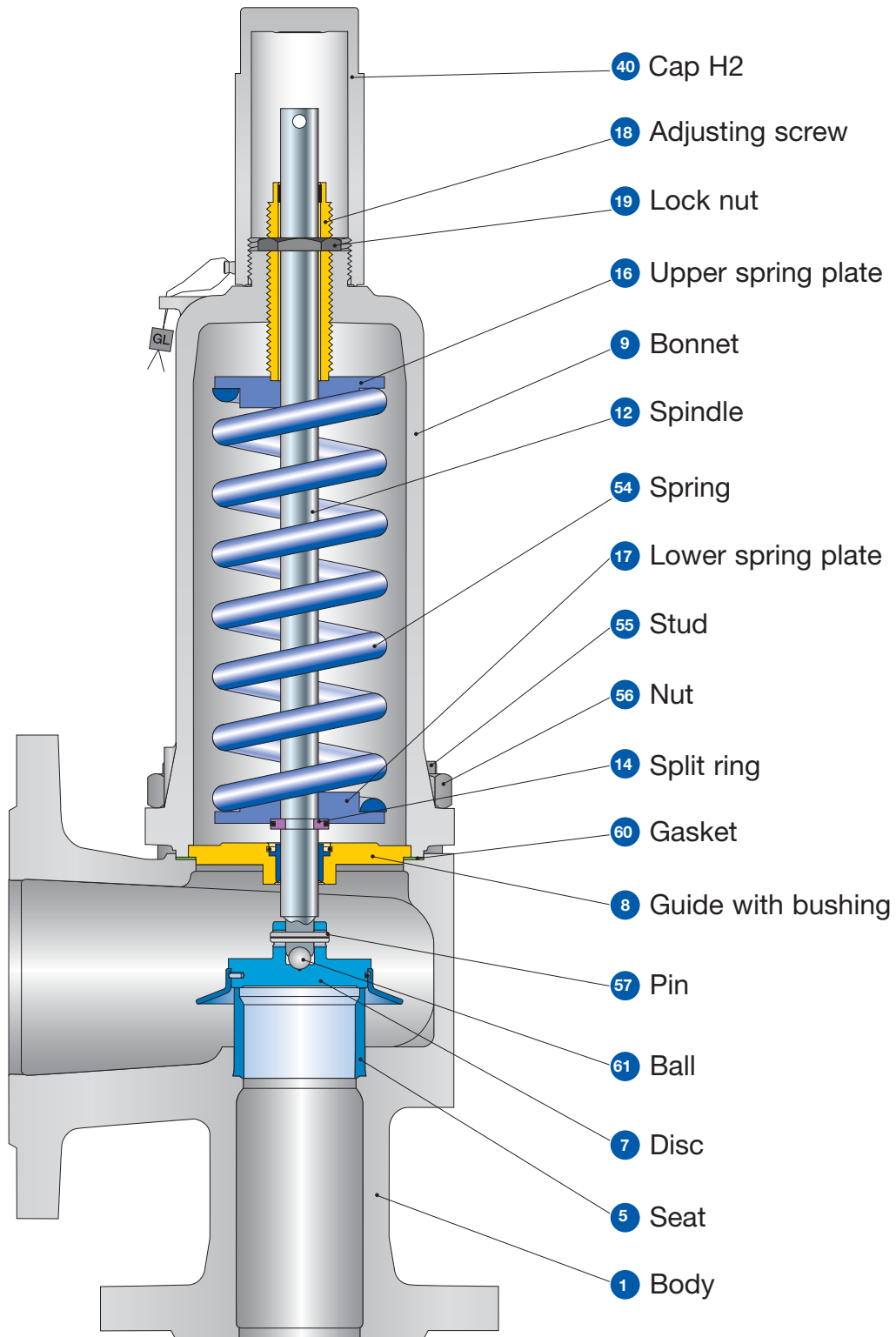
**Type 441 DIN**  
Packed lever H4  
Closed bonnet  
Conventional design

## Type 441, 442 DIN Flanged Safety Relief Valves

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**Type 441, 442 DIN**  
**Conventional design**

Type 441, 442  
 DIN





## Type 441, 442 DIN

### Conventional design

#### Materials

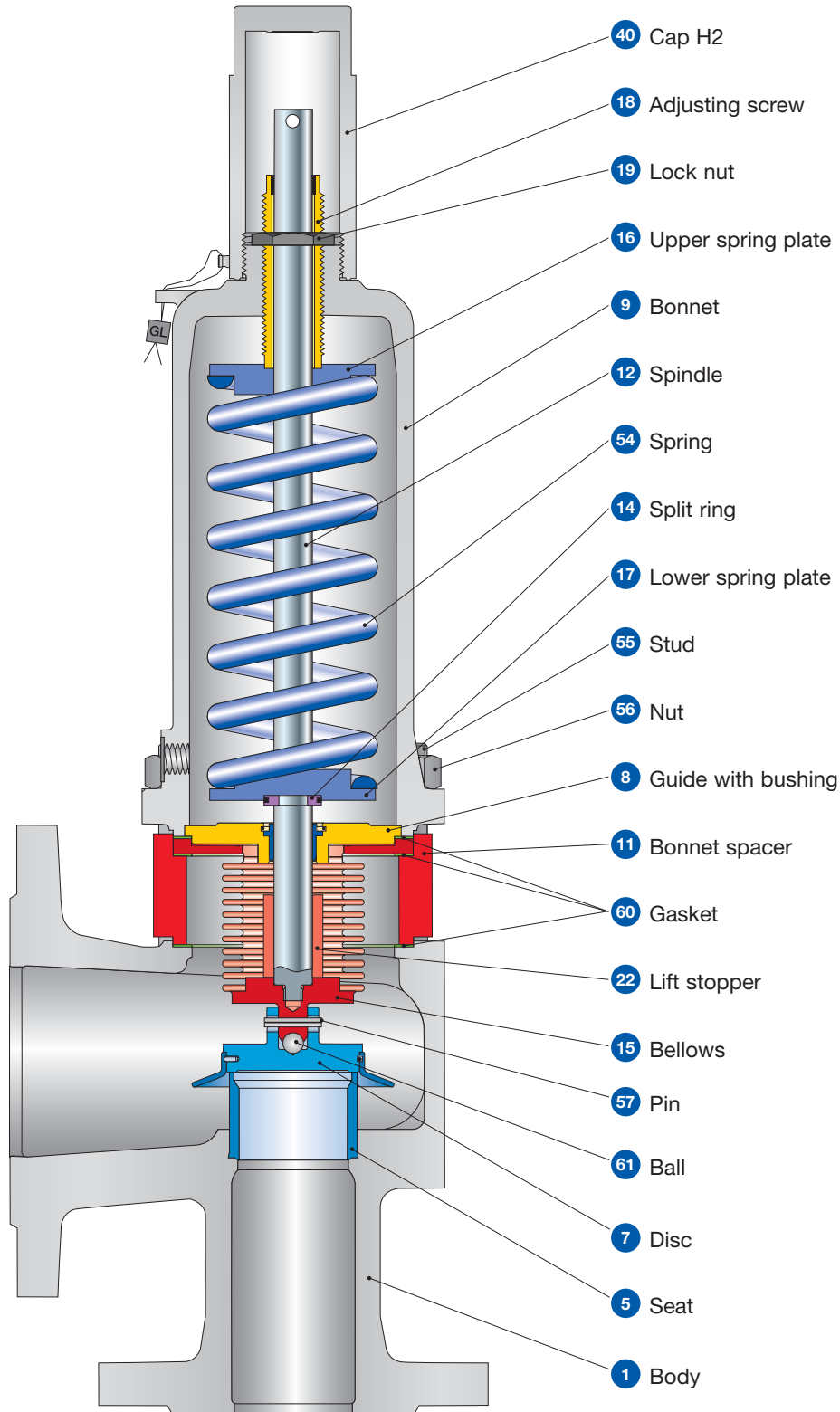
Item	Component	Type 4411 / 4421 DIN	Type 4415 / 4425 DIN	Type 4412 / 4422 DIN	Type 4414 DIN
1	Body	0.6025	0.7043	1.0619	1.4408
		Cast iron	Ductile Gr. 60-40-18	SA 216 WCB	SA 351 CF8M
5	Seat	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
7	Disc	1.4122	1.4122	1.4122	1.4404
		Hardened stainless steel	Hardened stainless steel	Hardened stainless steel	316L
8	Guide with bushing	1.4104, 1.0501, 0.7040	1.4104, 1.0501, 0.7040	1.4104, 1.0501, 0.7040	1.4404
		Chrome or carbon steel	Chrome or carbon steel	Chrome or carbon steel	316L
		1.4104 tenifer	1.4104 tenifer	1.4104 tenifer	-
		Chrome steel tenifer	Chrome steel tenifer	Chrome steel tenifer	-
9	Bonnet	0.7040, 0.7043, 1.0619	0.7040, 0.7043, 1.0619	0.7040, 0.7043, 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	Ductile Gr. 60-40-18, SA 216 WCB	Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M, SA 479 316L, SA 479 316Ti
12	Spindle	1.4021	1.4021	1.4021	1.4404
		420	420	420	316L
14	Split ring	1.4104	1.4104	1.4104	1.4404
		Chrome steel	Chrome steel	Chrome steel	316L
16/17	Spring plate	1.0718	1.0718	1.0718	1.4404
		Steel	Steel	Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4104 PTFE	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	Chrome steel PTFE	Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.0718	1.0718	1.4404
		Steel	Steel	Steel	316L
40	Cap H2	1.0460 or 0.7043	1.0460 or 0.7043	1.0460 or 0.7043	1.4404
		SA 105 or Gr. 60-40-18	SA 105 or Gr. 60-40-18	SA 105 or Gr. 60-40-18	316L
54	Spring standard Spring optional	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Carbon steel	Carbon steel	Stainless steel
55	Stud	1.4310	1.4310	1.4310	-
		Stainless steel	Stainless steel	Stainless steel	-
55	Stud	1.1181	1.1181	1.1181	1.4401
		Steel	Steel	Steel	B8M
56	Nut	1.0501	1.0501	1.0501	1.4401
		2H	2H	2H	8M
57	Pin	1.4310	1.4310	1.4310	1.4310
		Stainless steel	Stainless steel	Stainless steel	Stainless steel
60	Gasket	Graphite / 1.4401	Graphite / 1.4401	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316	Graphite / 316	Graphite / 316
61	Ball	1.3541	1.3541	1.3541	1.4401
		Hardened stainless steel	Hardened stainless steel	Hardened stainless steel	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.

**Type 441, 442 DIN**  
**Balanced bellows design**

Type 441, 442  
 DIN



## Type 441, 442 DIN

### Balanced bellows design

#### Materials

Item	Component	Type 4411 / 4421 DIN	Type 4415 / 4425 DIN	Type 4412 / 4422 DIN	Type 4414 DIN
1	Body	0.6025	0.7043	1.0619	1.4408
		Cast iron	Ductile Gr. 60-40-18	SA 216 WCB	SA 351 CF8M
5	Seat	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
7	Disc	1.4122	1.4122	1.4122	1.4404
		Hardened stainless steel	Hardened stainless steel	Hardened stainless steel	316L
8	Guide with bushing	1.4104, 1.0501, 0.7040	1.4104, 1.0501, 0.7040	1.4104, 1.0501, 0.7040	1.4404
		Chrome or carbon steel	Chrome or carbon steel	Chrome or carbon steel	316L
		1.4104 tenifer	1.4104 tenifer	1.4104 tenifer	-
		Chrome steel tenifer	Chrome steel tenifer	Chrome steel tenifer	-
9	Bonnet	0.7040, 0.7043, 1.0619	0.7040, 0.7043, 1.0619	0.7040, 0.7043, 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	Ductile Gr. 60-40-18, SA 216 WCB	Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M, SA 479 316L, SA 479 316Ti
11	Bonnet spacer	1.0460	1.0460	1.0460	1.4404
		Carbon steel	Carbon steel	Carbon steel	316L
12	Spindle	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
14	Split ring	1.4104	1.4104	1.4104	1.4404
		Chrome steel	Chrome steel	Chrome steel	316L
15	Bellows	1.4571	1.4571	1.4571	1.4571
		316Ti	316Ti	316Ti	316Ti
16/17	Spring plate	1.0718	1.0718	1.0718	1.4404
		Steel	Steel	Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4104 PTFE	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	Chrome steel PTFE	Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.0718	1.0718	1.4404
		Steel	Steel	Steel	316L
22	Lift stopper	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
40	Cap H2	1.0460 or 0.7043	1.0460 or 0.7043	1.0460 or 0.7043	1.4404
		SA 105 or Gr. 60-40-18	SA 105 or Gr. 60-40-18	SA 105 or Gr. 60-40-18	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Carbon steel	Carbon steel	Stainless steel
	Spring optional	1.4310	1.4310	1.4310	-
55	Stud	1.4401	1.4401	1.4401	1.4401
		B8M	B8M	B8M	B8M
56	Nut	1.4401	1.4401	1.4401	1.4401
		8M	8M	8M	8M
57	Pin	1.4310	1.4310	1.4310	1.4310
		Stainless steel	Stainless steel	Stainless steel	Stainless steel
60	Gasket	Graphite / 1.4401	Graphite / 1.4401	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316	Graphite / 316	Graphite / 316
61	Ball	1.3541	1.3541	1.3541	1.4401
		Hardened stainless steel	Hardened stainless steel	Hardened stainless steel	316

**Please notice:**

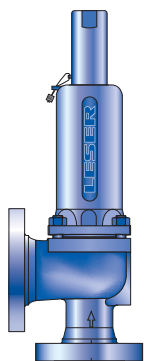
- Modifications reserved by LESER
- If several materials are specified LESER defines the material.
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## Type 441, 442 DIN

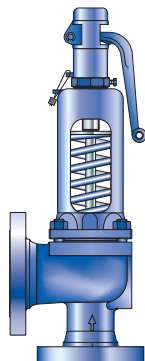
### Article numbers

Type 441, 442  
DIN

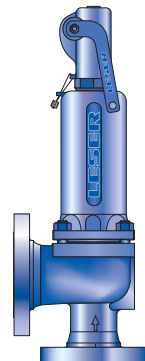
		DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
		DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
		Actual Orifice diameter d <sub>o</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
		Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
<b>Body material: 0.6025 (cast iron)</b>														
Bonnet closed	H2	Art. No. 4411.	4372	-	4382	4392	4402	4412	4422	4432	4442	4452	4462	-
	H3	Art. No. 4411.	4373	-	4383	4393	4403	4413	4423	4433	4443	4453	-	-
	H4	Art. No. 4411.	4374	-	4384	4394	4404	4414	4424	4434	4444	4454	4464	-
open	H3	Art. No. 4421.	4375	-	4385	4395	4405	4415	4425	4435	4445	4455	4465	-
<b>Body material: 0.7043 (ductile Gr. 60-40-18)</b>														
Bonnet closed	H2	Art. No. 4415.	-	-	7382	7392	7402	7412	7422	7432	7442	7452	7462	7472
	H3	Art. No. 4415.	-	-	7383	7393	7403	7413	7423	7433	7443	7453	-	-
	H4	Art. No. 4415.	-	-	7384	7394	7404	7414	7424	7434	7444	7454	7464	7474
open	H3	Art. No. 4425.	-	-	7385	7395	7405	7415	7425	7435	7445	7455	7465	7475
<b>Body material: 1.0619 (WCB)</b>														
Bonnet closed	H2	Art. No. 4412.	-	4502	4512	4522	4532	4542	4552	4562	4572	4582	4592	4612
	H3	Art. No. 4412.	-	4503	4513	4523	4533	4543	4553	4563	4573	4583	-	-
	H4	Art. No. 4412.	-	4504	4514	4524	4534	4544	4554	4564	4574	4584	4594	4614
open	H3	Art. No. 4422.	-	4505	4515	4525	4535	4545	4555	4565	4575	4585	4595	4615
<b>Body material: 1.4408 (CF8M)</b>														
Bonnet closed	H2	Art. No. 4414.	-	-	4642	4652	4662	4672	4682	4692	4702	4712	4722	-
	H4	Art. No. 4414.	-	-	4644	4654	4664	4674	4684	4694	4704	4714	4724	-



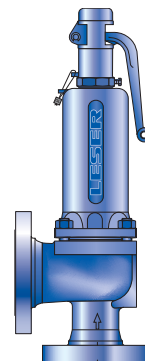
**Type 441**  
Cap H2  
Closed bonnet  
Conventional design



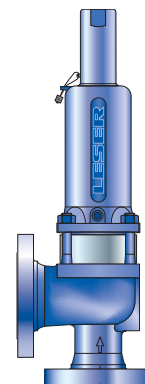
**Type 442**  
Plain lever H3  
Open bonnet  
Conventional design



**Type 441**  
Packed lever H4  
Closed bonnet  
Conventional design



**Type 441**  
Plain lever H3  
Closed bonnet  
Conventional design



**Type 441**  
Cap H2  
Closed bonnet  
Balanced bellows design

## Type 441, 442 DIN

### Dimensions and weights

Metric Units

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d <sub>o</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
<b>Weight</b>		9	9	9	12	16	22	32	56	75	85	131	285
[kg]	with bellows	9,4	9,4	10	13	17	24	36	60	83	93	142	289
<b>Center to face</b>	Inlet a	85	85	105	115	140	150	170	195	220	250	285	290
[mm]	Outlet b	95	95	100	110	115	120	140	160	180	200	225	300
<b>Height (H4)</b>	Standard H max.	304	304	339	446	512	569	699	801	883	913	1083	1380
[mm]	Bellows H max.	337	337	378	488	550	615	769	860	939	969	1141	1380
<b>Support brackets</b>	A									277	277	320	490
[mm]	B									160	160	185	<sup>1)</sup>
(drilled only on request, Option code H42)	C									Ø 18	Ø 18	Ø 18	Ø 18
	D									293	318	392	<sup>1)</sup>
	E									21	21	28	<sup>1)</sup>

#### Body material: 0.6025 (cast iron)

<b>DIN Flange<sup>2)</sup></b>	Inlet	PN 16	-										PN 16
	Outlet	PN 16	-										PN 16

#### Body material: 0.7043 (ductile Gr. 60-40-18)

<b>DIN Flange<sup>2)</sup></b>	Inlet	-	-				PN 40					PN 16	PN 25
	Outlet	-	-						PN 16				PN 10

#### Body material: 1.0619 (WCB)

<b>DIN Flange<sup>2)</sup></b>	Inlet	-	-						PN 40				PN 25
	Outlet	-	-							PN 16			

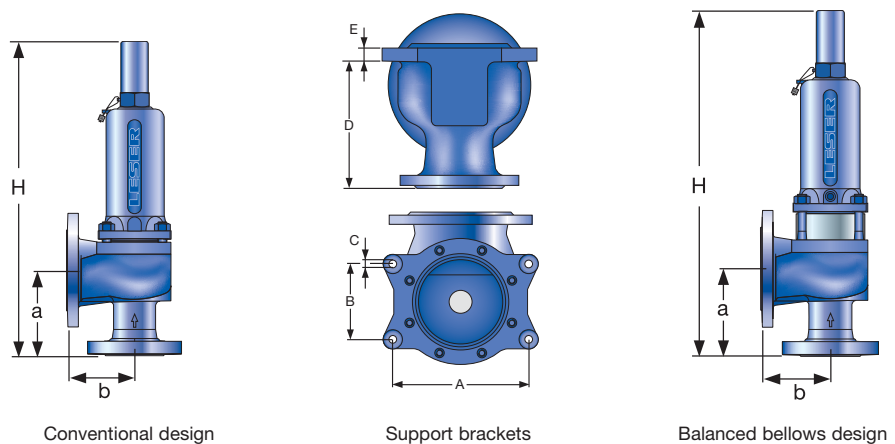
#### Body material: 1.4408 (CF8M)

<b>DIN Flange<sup>2)</sup></b>	Inlet	-	-										PN 40
	Outlet	-	-										PN 16

1)

Body material	B	D	E
	[mm]	[mm]	[mm]
0.6025	150	290	16
0.7043	150	489	25
1.0619	160	489	25
1.4408	150	489	25

2) Standard flange rating. For other flange drillings and facings please refer to page 19.



## Type 441, 442 DIN

### Dimensions and weights

#### US Units

 Type 441, 442  
DIN

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200	
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300	
	Actual Orifice diameter d <sub>0</sub> [inch]	0.71	0.71	0.91	1.14	1.46	1.81	2.36	2.91	3.62	3.86	4.92	6.5	
	Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.394	0.394	0.644	1.024	1.667	2.576	4.383	6.666	10.304	11.691	19.021	33.142	
<b>Weight</b>														
	[lbs]	20	20	20	26	35	49	71	123	165	187	289	628	
	with bellows	21	21	21	28	38	52	79	132	183	205	313	637	
<b>Center to face</b>														
	[inch]	Inlet a	3 11/32	3 11/32	4 1/8	4 17/32	5 16/32	5 29/32	6 11/16	7 11/16	8 21/32	9 27/32	11 7/32	11 13/32
		Outlet b	3 3/4	3 3/4	3 15/16	4 11/32	4 17/32	4 23/32	5 16/32	6 5/16	7 3/32	7 7/8	8 27/32	11 13/16
<b>Height (H4)</b>														
	[inch]	Standard H max.	11 13/16	11 13/16	13 11/32	17 9/16	20 5/32	22 13/32	27 17/32	31 17/32	34 3/4	35 15/16	42 5/8	54 11/32
		Bellows H max.	13 9/32	13 9/32	14 7/8	19 7/32	21 21/32	24 7/32	30 9/32	33 27/32	36 31/32	38 5/32	45	54 11/32
<b>Support brackets</b>														
	[inch]	A									10 29/32	10 29/32	12 19/32	19 19/32
		B									6 1/4	6 1/4	7 9/32	1)
		C									Ø 3/4	Ø 3/4	Ø 3/4	Ø 3/4
		D									11 17/32	12 17/32	15 7/16	1)
		E									26/32	26/32	1 3/32	1)

#### Body material: 0.6025 (cast iron)

<b>DIN Flange<sup>2)</sup></b>	Inlet	PN 16	–											PN 16
	Outlet	PN 16	–											PN 16

#### Body material: 0.7043 (ductile Gr. 60-40-18)

<b>DIN Flange<sup>2)</sup></b>	Inlet	–	–											PN 40	PN 16	PN 25
	Outlet	–	–											PN 16		PN 10

#### Body material: 1.0619 (WCB)

<b>DIN Flange<sup>2)</sup></b>	Inlet	–	–											PN 40		PN 25
	Outlet	–	–											PN 16		

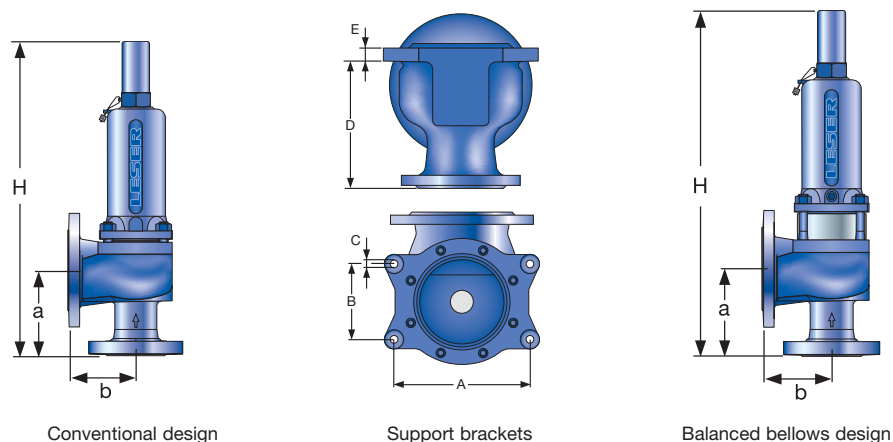
#### Body material: 1.4408 (CF8M)

<b>DIN Flange<sup>2)</sup></b>	Inlet	–	–											PN 40		
	Outlet	–	–											PN 16		

1)

Body material	B	D	E
	[inch]	[inch]	[inch]
0.6025	5 29/32	11 13/32	5/8
0.7043	5 29/32	11 17/32	13/16
1.0619	6 1/4	11 17/32	13/16
1.4408	5 29/32	11 17/32	13/16

<sup>2)</sup> Standard flange rating. For other flange drillings please refer to page 19.



## Type 441, 442 DIN

### Pressure temperature ratings

#### Metric Units

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d <sub>o</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382

#### Body material: 0.6025 (cast iron)

<b>DIN Flange</b>	Inlet	PN 16	-	PN 16										-
	Outlet	PN 16	-	PN 16										-
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	-	3	3	3	3	3	3	2.74	2.01	0.2	-	
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	2.00	-	0.98	1.41	1.11	1.81	1.50	1.05	1.18	1.41	-	-	
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	16	-	16	16	16	16	16	16	16	16	16	-	
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	16	-	16	16	16	16	16	16	16	16	16	-	
<b>Temperature acc. to DIN EN</b>	min. [°C]	-10	-	-10										-
	max. [°C]	+300	-	+300										-
<b>Temperature acc. to ASME</b>	min. [°C]	-	-	-										-
	max. [°C]	-	-	-										-

#### Body material: 0.7043 (ductile Gr. 60-40-18)

<b>DIN Flange</b>	Inlet	-	-	PN 40								PN 16	PN 25	
	Outlet	-	-	PN 16								PN 10	PN 10	
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	-	-	3	3	3	3	3	3	2.74	2.01	0.2	0.2	
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	-	-	0.98	1.41	1.11	1.81	1.50	1.05	1.18	1.41	-	-	
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	-	-	40	40	40	40	40	32	40	16	16	20	
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	-	-	40	40	40	40	40	40	40	16	16	25	
<b>Temperature acc. to DIN EN</b>	min. [°C]	-	-	-60										-
	max. [°C]	-	-	+350										-
<b>Temperature acc. to ASME</b>	min. [°C]	-	-	-10										-
	max. [°C]	-	-	+350										-

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 441, 442 DIN

### Pressure temperature ratings

#### Metric Units

DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
Actual Orifice diameter d <sub>o</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382

#### Body material: 1.0619 (WCB)

DIN Flange		Inlet	-	PN 40										PN 25
				PN 16										
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
				3	3	3	3	3	3	3	2.74	2.01	0.2	0.2
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	-	2.00	0.98	1.41	1.11	1.81	1.50	1.05	1.18	1.41	-	-	
				40	40	40	40	40	32	40	28	17	20	
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	-	40	40	40	40	40	40	40	40	28	25	25	
<b>Temperature<sup>2)</sup> acc. to DIN EN</b>		min. [°C]	-	-85										
				max. [°C]	+450									
<b>Temperature<sup>2)</sup> acc. to ASME</b>		min. [°C]	-		-29									
				max. [°C]	+427									

#### Body material: 1.4408 (CF8M)

DIN Flange		Inlet	-	PN 40										-
				PN 16										
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	
				3	3	3	3	3	3	2.74	2.01	0.2	-	
<b>Min. set pressure<sup>1)</sup> low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	-	-	0.98	1.41	1.11	1.81	1.50	1.05	1.18	1.41	-	-	
				40	40	40	33	28	13.6	20	17.7	7	-	
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	-	-	40	40	40	37	28	25	26	24	10	-	
<b>Temperature<sup>2)</sup> acc. to DIN EN</b>		min. [°C]	-	-270										
				max. [°C]	+400									
<b>Temperature<sup>2)</sup> acc. to ASME</b>		min. [°C]	-		-268									
				max. [°C]	+538									

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>2)</sup> Between -10 °C and lowest temperature indicated „AD 2000-Merkblatt“ W10 shall be taken into account.



## Type 441, 442 DIN

### Pressure temperature ratings

#### US Units

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Actual Orifice diameter d <sub>o</sub> [inch]	0.71	0.71	0.91	1.14	1.46	1.81	2.36	2.91	3.62	3.86	4.92	6.5
	Actual Orifice area A <sub>o</sub> [inch <sup>2</sup> ]	0.394	0.394	0.644	1.024	1.667	2.576	4.383	6.666	10.304	11.691	19.021	33.142

#### Body material: 0.6025 (cast iron)

<b>DIN Flange</b>	Inlet	<b>PN 16</b>	-	<b>PN 16</b>										-
	Outlet	<b>PN 16</b>	-	<b>PN 16</b>										-
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	-	
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [psig] S/G/L	43.5	-	43.5	43.5	43.5	43.5	43.5	43.5	39.7	29.1	2.9	-	
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L	29	-	14	20	16	26	22	15	17	20	-	-	
<b>Maximum set pressure</b>	p [psig] S/G/L	232	-	232	232	232	232	232	232	232	232	232	-	
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	232	-	232	232	232	232	232	232	232	232	232	-	
<b>Temperature acc. to DIN EN</b>	min. [°F]	+14	-	+14										-
	max. [°F]	+572	-	+572										-
<b>Temperature acc. to ASME</b>	min. [°F]	-	-	-										-
	max. [°F]	-	-	-										-

#### Body material: 0.7043 (ductile Gr. 60-40-18)

<b>DIN Flange</b>	Inlet	-	-	<b>PN 40</b>								<b>PN 16</b>	<b>PN 25</b>
	Outlet	-	-	<b>PN 16</b>								<b>PN 10</b>	
<b>Minimum set pressure</b>	p [psig] S/G/L	-	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [psig] S/G/L	-	-	43.5	43.5	43.5	43.5	43.5	43.5	39.7	29.1	2.9	2.9
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L	-	-	14	20	16	26	22	15	17	20	-	-
<b>Maximum set pressure</b>	p [psig] S/G/L	-	-	580	580	580	580	580	464	580	232	232	290
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	-	-	580	580	580	580	580	580	580	232	232	363
<b>Temperature acc. to DIN EN</b>	min. [°F]	-	-	-76									
	max. [°F]	-	-	+662									
<b>Temperature acc. to ASME</b>	min. [°F]	-	-	+14									
	max. [°F]	-	-	+662									

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 441, 442 DIN

### Pressure temperature ratings

#### US Units

DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
Actual Orifice diameter d <sub>o</sub> [inch]	0.71	0.71	0.91	1.14	1.46	1.81	2.36	2.91	3.62	3.86	4.92	6.5
Actual Orifice area A <sub>o</sub> [inch <sup>2</sup> ]	0.394	0.394	0.644	1.024	1.667	2.576	4.383	6.666	1.304	11.691	19.021	33.142

#### Body material: 1.0619 (WCB)

DIN Flange	Inlet		PN 40										PN 25	
	Outlet		PN 16											
<b>Minimum set pressure</b>	p [psig]	S/G/L	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [psig]	S/G/L	-	43.5	43.5	43.5	43.5	43.5	43.5	43.5	39.7	29.1	2.9	2.9
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L	-	29	14	20	16	26	22	15	17	20	-	-
<b>Maximum set pressure</b>	p [psig]	S/G/L	-	580	580	580	580	580	580	464	580	406	247	290
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	-	580	580	580	580	580	580	580	580	406	363	363
<b>Temperature<sup>2)</sup> acc. to DIN EN</b>	min. [°F]		-121											
	max. [°F]		+842											
<b>Temperature<sup>2)</sup> acc. to ASME</b>	min. [°F]		-20											
	max. [°F]		+800											

#### Body material: 1.4408 (CF8M)

DIN Flange	Inlet		PN 40										-	
	Outlet		PN 16										-	
<b>Minimum set pressure</b>	p [psig]	S/G/L	-	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	-
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [psig]	S/G/L	-	-	43.5	43.5	43.5	43.5	43.5	43.5	39.7	29.1	2.9	-
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L	-	-	14	20	16	26	22	15	17	20	-	-
<b>Maximum set pressure</b>	p [psig]	S/G/L	-	-	580	580	580	479	406	197	290	257	102	-
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	-	-	580	580	580	537	406	363	377	348	145	-
<b>Temperature<sup>2)</sup> acc. to DIN EN</b>	min. [°F]		-454											
	max. [°F]		+752											
<b>Temperature<sup>2)</sup> acc. to ASME</b>	min. [°F]		-450											
	max. [°F]		+1000											

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>2)</sup> Between -10 °C and lowest temperature indicated „AD 2000-Merkblatt“ W10 shall be taken into account.

## Type 441, 442 DIN Flange drillings

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200	
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300	
	Valve size	–	3/4" x 1 1/2"	1" x 1 1/2"	1 1/4" x 2"	1 1/2" x 2 1/2"	2" x 3"	2 1/2" x 4"	3" x 5"	4" x 6"	5" x 8"	6" x 10"	8" x 12"	
	Actual Orifice diameter d <sub>o</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165	
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382	
<b>Body material: 0.6025 (cast iron)</b>														
Inlet	DIN EN 1092	PN 10	*	*	*	*	*	*	*	*	*	*	*	
		PN 16	*	*	*	*	*	*	*	*	*	*	*	
		PN 25	–	–	–	–	–	–	–	–	–	–	–	
		PN 40	–	–	–	–	–	–	–	–	–	–	–	
Outlet	DIN EN 1092	PN 10	*	*	*	*	*	*	*	*	H50	H50		
		PN 16	*	*	*	*	*	*	*	*	*	*	*	
		PN 25	–	–	–	–	–	–	–	–	–	–	–	
		PN 40	–	–	–	–	–	–	–	–	–	–	–	
<b>Body material: 0.7043 (ductile Gr. 60-40-18)</b>														
Inlet	DIN EN 1092	PN 10		*	*	*	*	H45	*	H45	*	*	H44	
		PN 16		*	*	*	*	*	*	*	*	*	H45	
		PN 25		*	*	*	*	*	*	*	*	–	–	*
		PN 40		*	*	*	*	*	*	*	*	–	–	–
Outlet	DIN EN 1092	PN 10		*	*	*	*	*	*	*	H50	H50	*	
		PN 16		*	*	*	*	*	*	*	*	*	(H51)	
		PN 25		*	(*)	(H15)	(*)	–	–	–	–	–	–	
		PN 40		*	(*)	(H15)	(*)	–	–	–	–	–	–	
<b>Body material: 1.0619 (WCB), 1.4408 (CF8M)</b>														
Inlet	DIN EN 1092	PN 10	*	*	*	*	*	H45	H45	H45	H45	H45	H44	
		PN 16	*	*	*	*	*	H45	H45	H45	H45	H45	H44	
		PN 25	*	*	*	*	*	*	*	*	*	*	*	
		PN 40	*	*	*	*	*	*	*	*	*	*	*	
	ASME B16.5 <sup>1)</sup>	CL150	H64	H64	H64	H64	H64	H64	H64	H64	[H64]	H64	H64	H64
		CL300	–	–	H65	–	[H65]	–	–	–	–	–	–	–
Outlet	DIN EN 1092	PN 10	*	*	*	*	*	*	*	*	H50	H50	H50	
		PN 16	*	*	*	*	*	*	*	*	*	*	*	
		PN 25	*	*	*	(H15)	(*)	–	–	–	–	–	H52	
		PN 40	*	*	*	(H15)	(*)	–	–	–	–	–	H52	
	ASME B16.5 <sup>1)</sup>	CL150	H79	H79	H79	H79	H79	[H79]	H79	H79	H79	H79	H79	H79
		CL300	–	–	[H80]	–	–	–	–	–	–	–	–	–

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

<sup>1)</sup>For flange drillings acc. to ASME B16.5 please use preferred Type 441, 442 ANSI.

## Type 441, 442 DIN Flange facings

 Type 441, 442  
DIN

Indication	Norm	Inlet	Outlet	Remark
<b>General</b>				
Flange undrilled	–	H38	H39	
Linde-V-Nut, Form V48	Linde Standard 420-08	J07	J08	Groove: Rz 16
Linde-V-Nut, Form V48A	LDeS 3313.36	J05	J06	Groove: Rz 4, e.g. with hydrogen
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	J11	J12	

Acc. to DIN EN 1092				
		Inlet	Outlet	Remark
<b>Flange facing</b> (see LDeS 3313.40)		PN 10 – PN 40	PN 10 – PN 40	Rz-data according to DIN EN 1092 in µm
Raised face	Type B1	*	*	Facing: Rz = 12.5 – 50
	Type B2	L36	L38	Facing: Rz = 3.2 – 12.5
Tongue face C <sup>1)</sup>		H94	H92	Steel flange only
Groove face D <sup>1)</sup>		H93	H91	
Male face E		H96	H98	
Female face F		H97	H99	
O-ring male face G		J01	J02	
O-ring female face H		J03	J04	

Acc. to ASME B16.5										
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		RTJ- Class	Option code	RTJ- Class	Option code
1.0619, 1.4408	all	all	L52	L53	*	*	CL150	H62	CL150	H63

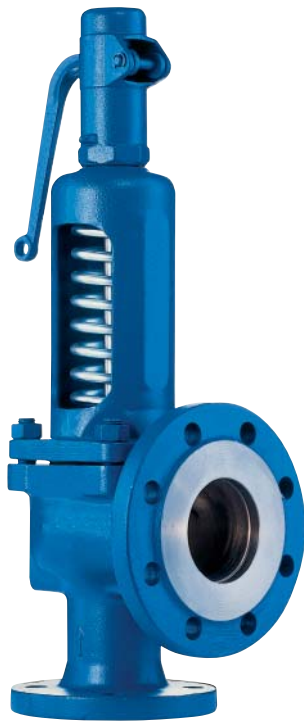
<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled".

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

## Change of nominal diameter with welding flange

Designation	Material	DN / NPS		
Type 441 DIN		<b>32</b>	<b>40</b>	<b>80</b>
Change nominal diameter inlet to DN 40 / NPS 1½"	1.0619 (WCB)	I28	–	–
	1.4408 (CF8M)	I28	–	–
Change nominal diameter outlet to DN 80 / NPS 3"	1.0619 (WCB)	–	I29	–
	1.4408 (CF8M)	–	I29	–
Change nominal diameter outlet to DN 150 / NPS 6"	1.0619 (WCB)	–	–	I30
	1.4408 (CF8M)	–	–	I30



**Type 442 ANSI**  
Plain lever H3  
Open bonnet  
Conventional design



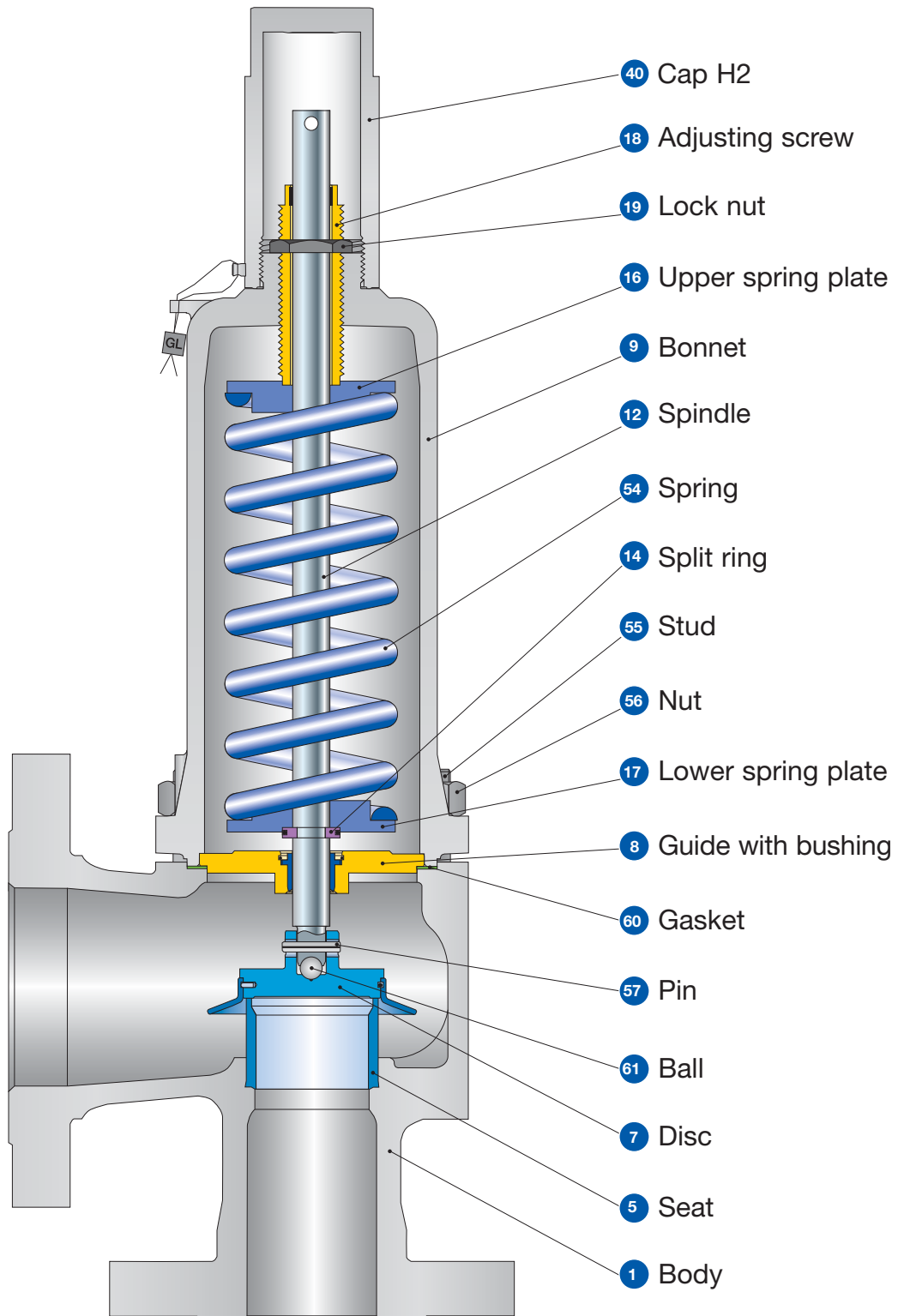
**Type 441 ANSI**  
Packed lever H4  
Closed bonnet  
Conventional design

## Type 441, 442 ANSI Flanged Safety Relief Valves

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**Type 441, 442 ANSI**  
**Conventional design**

Type 441, 442  
 ANSI



## Type 441, 442 ANSI

### Conventional design

#### Materials

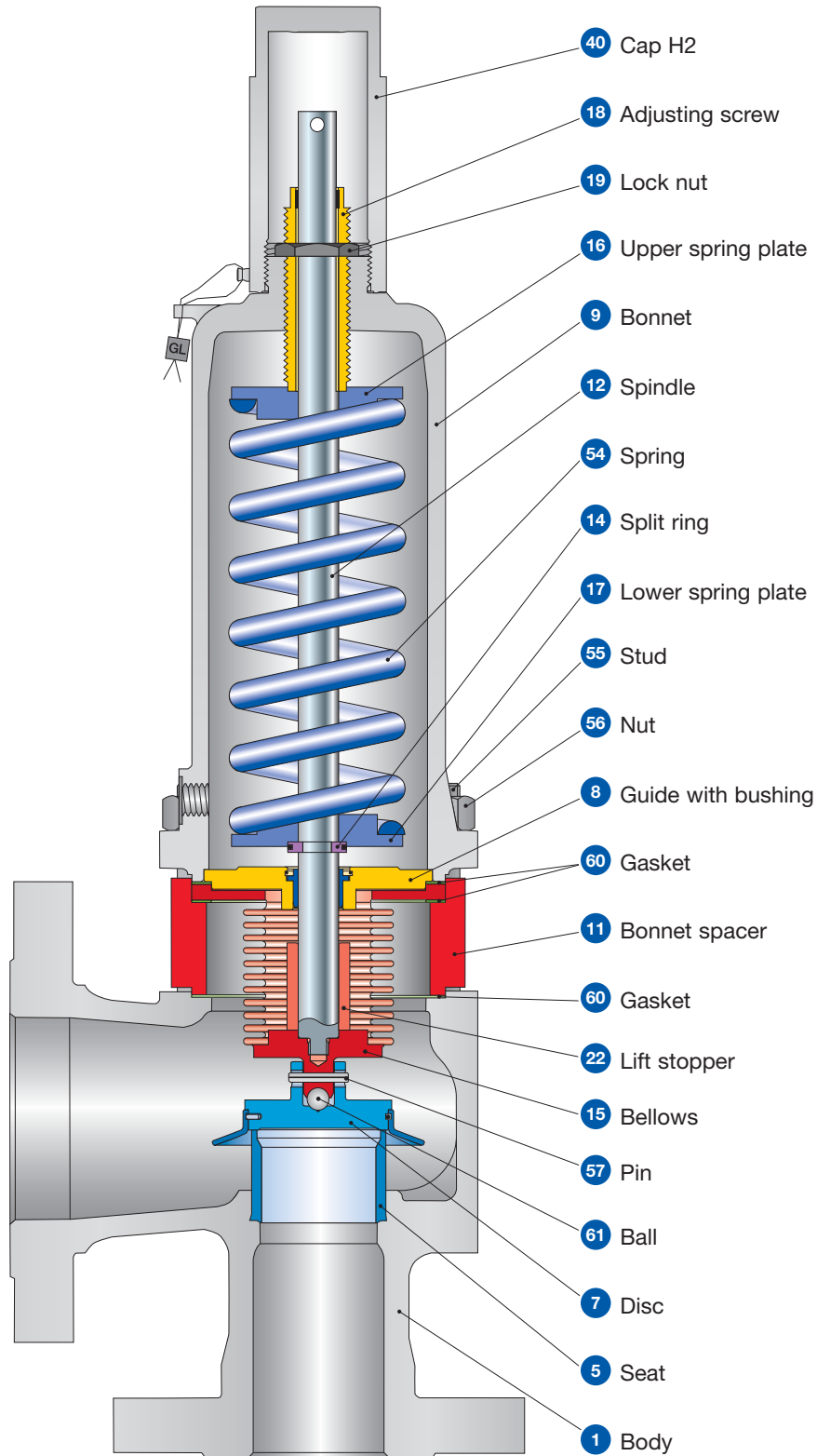
Item	Component	Type 4412 / 4422 ANSI	Type 4414 ANSI
1	Body	1.0619	1.4408
		SA 216 WCB	SA 351 CF8M
5	Seat	1.4404	1.4404
		316L	316L
7	Disc	1.4122	1.4404
		Hardened stainless steel	316L
8	Guide with bushing	1.4104, 1.0501, 0.7040	1.4404
		Chrome or carbon steel	316L
		1.4104 tenifer	-
		Chrome steel tenifer	-
9	Bonnet	0.7040, 0.7043, 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M, SA 479 316L, SA 479 316Ti
12	Spindle	1.4021	1.4404
		420	316L
14	Split ring	1.4104	1.4404
		Chrome steel	316L
16 / 17	Spring plate	1.0718	1.4404
		Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.4404
		Steel	316L
40	Cap H2	1.0460 or 0.7043	1.4404
		SA 105 or Gr. 60-40-18	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Stainless steel
54	Spring optional	1.4310	-
		Stainless steel	-
55	Stud	1.1181	1.4401
		Steel	B8M
56	Nut	1.0501	1.4401
		2H	8M
57	Pin	1.4310	1.4310
		Stainless steel	Stainless steel
60	Gasket	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316
61	Ball	1.3541	1.4401
		Hardened stainless steel	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.

**Type 441, 442 ANSI**  
**Balanced bellows design**

Type 441, 442  
 ANSI





## Type 441, 442 ANSI

### Balanced bellows design

#### Materials

Item	Component	Type 4412 / 4422 ANSI	Type 4414 ANSI
1	Body	1.0619	1.4408
		SA 216 WCB	SA 351 CF8M
5	Seat	1.4404	1.4404
		316L	316L
7	Disc	1.4122	1.4404
		Hardened stainless steel	316L
8	Guide with bushing	1.4104, 1.0501, 0.7040	1.4404
		Chrome steel or carbon steel	316L
		1.4104 tenifer	-
		Chrome steel tenifer	-
9	Bonnet	0.7040, 0.7043, 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M, SA 479 316L, SA 479 316Ti
11	Bonnet spacer	1.4404	1.4404
		316L	316L
12	Spindle	1.4404	1.4404
		316L	316L
14	Split ring	1.4104	1.4404
		Chrome steel	316L
15	Bellows	1.4571	1.4571
		316Ti	316Ti
16 / 17	Spring plate	1.0718	1.4404
		Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.4404
		Steel	316L
22	Lift stopper	1.4404	1.4404
		316L	316L
40	Cap H2	1.0460 or 0.7043	1.4404
		SA 105 or Gr. 60-40-18	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Stainless steel
	Spring optional	1.4310	-
		Stainless steel	-
55	Stud	1.4401	1.4401
		B8M	B8M
56	Nut	1.4401	1.4401
		8M	8M
57	Pin	1.4310	1.4310
		Stainless steel	Stainless steel
60	Gasket	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316
61	Ball	1.3541	1.4401
		Hardened stainless steel	316

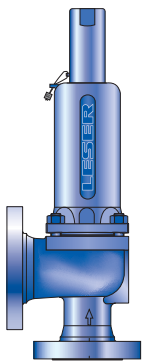
**Please notice:**

- 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.

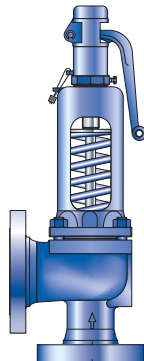
**Type 441, 442 ANSI**  
**Article numbers**

Type 441, 442  
 ANSI

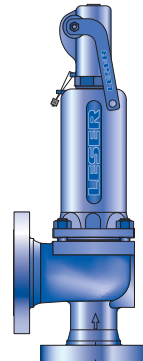
Valve size			1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter $d_o$ [mm]			23	29	37	46	60	92
Actual Orifice area $A_o$ [mm <sup>2</sup> ]			416	661	1075	1662	2827	6648
<b>Body material: 1.0619 (WCB)</b>								
<b>Bonnet</b> closed	<b>H2</b>	Art. No. <b>4412.</b>	<b>4812</b>	<b>4822</b>	<b>4832</b>	<b>4842</b>	<b>4862</b>	<b>4872</b>
	<b>H3</b>	Art. No. <b>4412.</b>	<b>4813</b>	<b>4823</b>	<b>4833</b>	<b>4843</b>	<b>4863</b>	<b>4873</b>
	<b>H4</b>	Art. No. <b>4412.</b>	<b>4814</b>	<b>4824</b>	<b>4834</b>	<b>4844</b>	<b>4864</b>	<b>4874</b>
open	<b>H3</b>	Art. No. <b>4422.</b>	<b>4815</b>	<b>4825</b>	<b>4835</b>	<b>4845</b>	<b>4865</b>	<b>4875</b>
<b>Body material: 1.4408 (CF8M)</b>								
<b>Bonnet</b> closed	<b>H2</b>	Art. No. <b>4414.</b>	<b>7912</b>	–	<b>7932</b>	<b>7942</b>	<b>7962</b>	<b>7972</b>
	<b>H4</b>	Art. No. <b>4414.</b>	<b>7914</b>	–	<b>7934</b>	<b>7944</b>	<b>7964</b>	<b>7974</b>



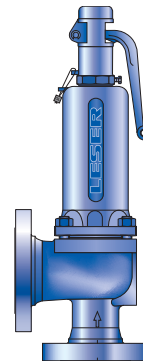
**Type 441**  
 Cap H2  
 Closed bonnet  
 Conventional design



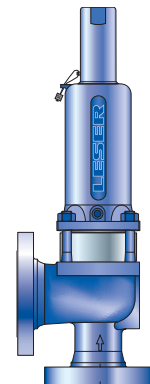
**Type 442**  
 Plain lever H3  
 Bonnet open  
 Conventional design



**Type 441**  
 Packed lever H4  
 Closed bonnet  
 Conventional design



**Type 441**  
 Plain lever H3  
 Closed bonnet  
 Conventional design



**Type 441**  
 Cap H2  
 Closed bonnet  
 Balanced bellows design

## Type 441, 442 ANSI

### Dimensions and weights

Metric Units

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter $d_o$ [mm]	23	29	37	46	60	92
Actual Orifice area $A_o$ [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
<b>Weight</b> [kg]	10	13	16	22	33	75
with bellows	11	14	17	24	37	83
<b>Center to face</b> [mm]						
Inlet a	105	124	124	136	156	181
Outlet b	114	121	121	124	165	229
<b>Height (H4)</b> [mm]						
Standard H max.	339	455	496	556	685	844
Bellows H max.	378	497	534	602	741	902
<b>Support brackets</b> [mm]						
A						280
B						160
(drilled only on request, option code H42)						Ø 18
C						250
D						25
E						

Type 441, 442  
ANSI

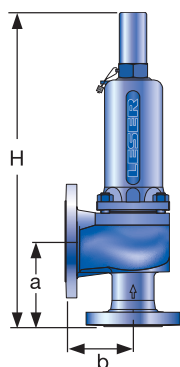
#### Body material: 1.0619 (WCB)

<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	CL150 or CL300
	Outlet	CL150

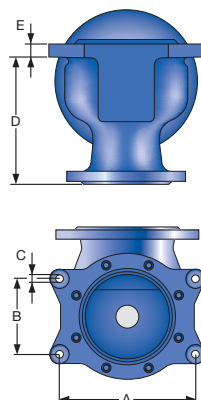
#### Body material: 1.4408 (CF8M)

<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	CL150 or CL300	-	CL150 or CL300
	Outlet	CL150	-	CL150

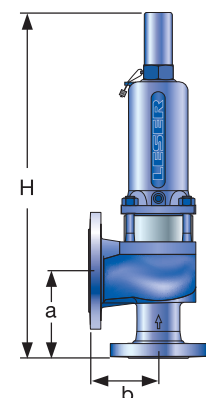
<sup>1)</sup>Standard flange rating. For other flange drillings and facings please refer to page 31.



Conventional design



Support brackets



Balanced bellows design

## Type 441, 442 ANSI

### Dimensions and weights

US Units

Type 441, 442  
ANSI

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2 x 3"	3 x 4"	4 x 6"
Actual Orifice diameter $d_0$ [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Actual Orifice area $A_0$ [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
<b>Weight</b> [lbs]	22	29	35	49	73	165
with bellows	23	30	38	52	81	183
<b>Center to face</b> [inch]						
Inlet a	4 1/8	4 7/8	4 7/8	5 3/8	6 1/8	7 1/8
Outlet b	4 1/2	4 3/4	4 3/4	4 7/8	6 1/2	9
<b>Height (H4)</b> [inch]						
Standard H max.	13 11/32	17 29/32	19 17/32	21 1/16	26 31/32	33 7/32
Bellows H max.	14 7/8	19 9/16	21 1/32	23 11/16	29 3/16	35 1/2
<b>Support brackets</b> [inch]						
A						11
B						6 1/4
(drilled only on request, option code H42)						Ø 3/4
D						9 7/8
E						25

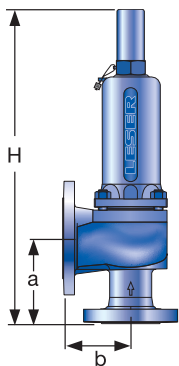
#### Body material: 1.0619 (WCB)

<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	CL150 or CL300
	Outlet	CL150

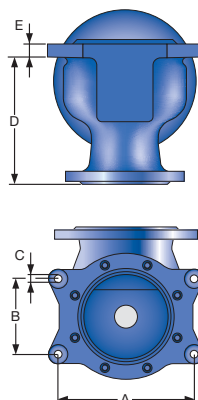
#### Body material: 1.4408 (CF8M)

<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	CL150 or CL300	-	CL150 or CL300
	Outlet	CL150	-	CL150

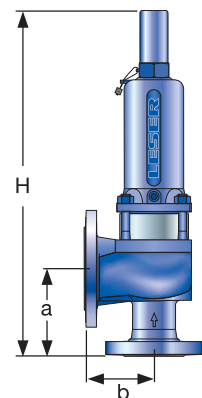
<sup>1)</sup>Standard flange rating. For other flange drillings and facings please refer to page 31.



Conventional design



Support brackets



Balanced bellows design

## Type 441, 442 ANSI

### Pressure temperature ratings

#### Metric Units

Valve size		1" x 2"	1½" x 2"	1½" x 2½"	2 x 3"	3 x 4"	4 x 6"
Actual Orifice diameter $d_o$ [mm]		23	29	37	46	60	92
Actual Orifice area $A_o$ [mm <sup>2</sup> ]		416	661	1075	1662	2827	6648
<b>Body material: 1.0619 (WCB)</b>							
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL150 or CL300</b>					
	Outlet	<b>CL150</b>					
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	0.1	0.1	0.1	0.1	0.1
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	3	3	3	3	3
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.98	1.41	1.11	1.81	1.50	1.18
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	49	48	46	40 <sup>4)</sup>	40	34
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	51	48	46	40 <sup>4)</sup>	40	34
<b>Temperature<sup>3)</sup> acc. to DIN EN</b>	min. [°C]	-85					
	max. [°C]	+450					
<b>Temperature<sup>3)</sup> acc. to ASME</b>	min. [°C]	-29					
	max. [°C]	+427					

<b>Body material: 1.4408 (CF8M)</b>							
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL150 or CL300</b>	-	<b>CL150 or CL300</b>			
	Outlet	<b>CL150</b>	-	<b>CL150</b>			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	-	0.1	0.1	0.1	0.1
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	-	3	3	3	3
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.98	-	1.11	1.81	1.50	1.18
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	42.5	-	40	32	27	20
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	51	-	40	40	27	25
<b>Temperature<sup>3)</sup> acc. to DIN EN</b>	min. [°C]	-270	-	-270			
	max. [°C]	+400	-	+400			
<b>Temperature<sup>3)</sup> acc. to ASME</b>	min. [°C]	-268	-	-268			
	max. [°C]	+538	-	+538			

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B 16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>3)</sup> Between -10 °C and lowest temperature indicated „AD 2000-Merkblatt“ W10 shall be taken into account.

<sup>4)</sup> For applications with CE marking. Maximum set pressure for ASME application 49 bar.

## Type 441, 442 ANSI

### Pressure temperature ratings

#### US Units

 Type 441, 442  
ANSI

Valve size		1" x 2"	1 1/2" x 2"	1 1/2" x 2 1/2"	2 x 3"	3 x 4"	4 x 6"	
Actual Orifice diameter $d_0$ [inch]		0.91	1.14	1.46	1.81	2.36	3.62	
Actual Orifice area $A_0$ [inch <sup>2</sup> ]		0.644	1.024	1.667	2.576	4.383	1.304	
<b>Body material: 1.0619 (WCB)</b>								
ANSI Flange Class <sup>1)</sup>	Inlet		CL150 or CL300					
	Outlet		CL150					
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	1.5	1.5	1.5	1.5	1.5	
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig] S/G/L	43.5	43.5	43.5	43.5	43.5	43.5	
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L	14	20	16	26	22	17	
<b>Maximum set pressure</b>	p [psig] S/G/L	711	696	667	580 <sup>4)</sup>	580	493	
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	740	696	667	580 <sup>4)</sup>	580	493	
<b>Temperature<sup>3)</sup> acc. to DIN EN</b>	min. [°F]						-121	
	max. [°F]						+842	
<b>Temperature<sup>3)</sup> acc. to ASME</b>	min. [°F]						-20	
	max. [°F]						+800	

<b>Body material: 1.4408 (CF8M)</b>							
ANSI Flange Class <sup>1)</sup>	Inlet		CL150 or CL300	-	CL150 or CL300		
	Outlet		CL150	-	CL150		
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	-	1.5	1.5	1.5	1.5
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig] S/G/L	43.5	-	43.5	43.5	43.5	43.5
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L	14	-	16	26	22	17
<b>Maximum set pressure</b>	p [psig] S/G/L	616	-	580	464	392	290
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	740	-	580	580	392	363
<b>Temperature<sup>3)</sup> acc. to DIN EN</b>	min. [°F]	-454	-				-454
	max. [°F]	+752	-				+752
<b>Temperature<sup>3)</sup> acc. to ASME</b>	min. [°F]	-450	-				-450
	max. [°F]	+1000	-				+1000

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B 16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>3)</sup> Between -10 °C and lowest temperature indicated „AD 2000-Merkblatt“ W10 shall be taken into account.

<sup>4)</sup> For applications with CE marking. Maximum set pressure for ASME application 711 psig.

## Type 441, 442 ANSI Flange drillings

Valve size		1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter $d_o$ [mm]		23	29	37	46	60	92
Actual Orifice area $A_o$ [mm <sup>2</sup> ]		416	661	1075	1662	2827	6648
<b>Body material: 1.0619 (WCB), 1.4408 (CF8M)</b>							
Inlet	ASME B16.5	CL150	H64	H64	H64	H64	H64
		CL300	*	*	*	*	*
Outlet	ASME B16.5	CL150	*	*	*	*	*
		CL300	-	-	-	-	-

## Flange facings

Indication	Standard	Inlet	Outlet	Remark						
<b>General</b>										
Flange undrilled	-	H38	H39							
Linde-V-Nut, Type V48	Linde Standard 420-08 LDeS 3313.36	J07	J08	Groove: Rz 16						
Linde-V-Nut, Type V48A		J05	J06	Groove: Rz 4, e.g. with hydrogen						
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	J11	J12							
<b>Acc. to DIN EN 1092</b>										
		Inlet	Outlet	Remark						
	<b>Flange facing</b> (see LDeS 3313.40)	PN 10 – PN 40	PN 10 – PN 40	Rz-data according to DIN EN 1092 in $\mu\text{m}$						
Raised face	Type B1	*	*	Facing: Rz = 12.5 – 50						
	Type B2	L36	L38	Facing: Rz = 3.2 – 12.5						
Tongue face C <sup>1)</sup>		H94	H92	Steel flange only						
Groove face D <sup>1)</sup>		H93	H91							
Male face E		H96	H98							
Female face F		H97	H99							
O-ring male face G		J01	J02							
O-ring female face H		J03	J04							
<b>Acc. to ASME B16.5</b>										
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		RTJ- Class	Option code	RTJ- Class	Option code
1.0619, 1.4408	all	all	L52	L53	*	*	CL150	H62	CL150	H63

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled".

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.







**Type 442 Full nozzle**  
Plain lever H3  
Bonnet open  
Conventional design



**Type 442 Full nozzle**  
Plain lever H3  
Bonnet open  
Conventional design

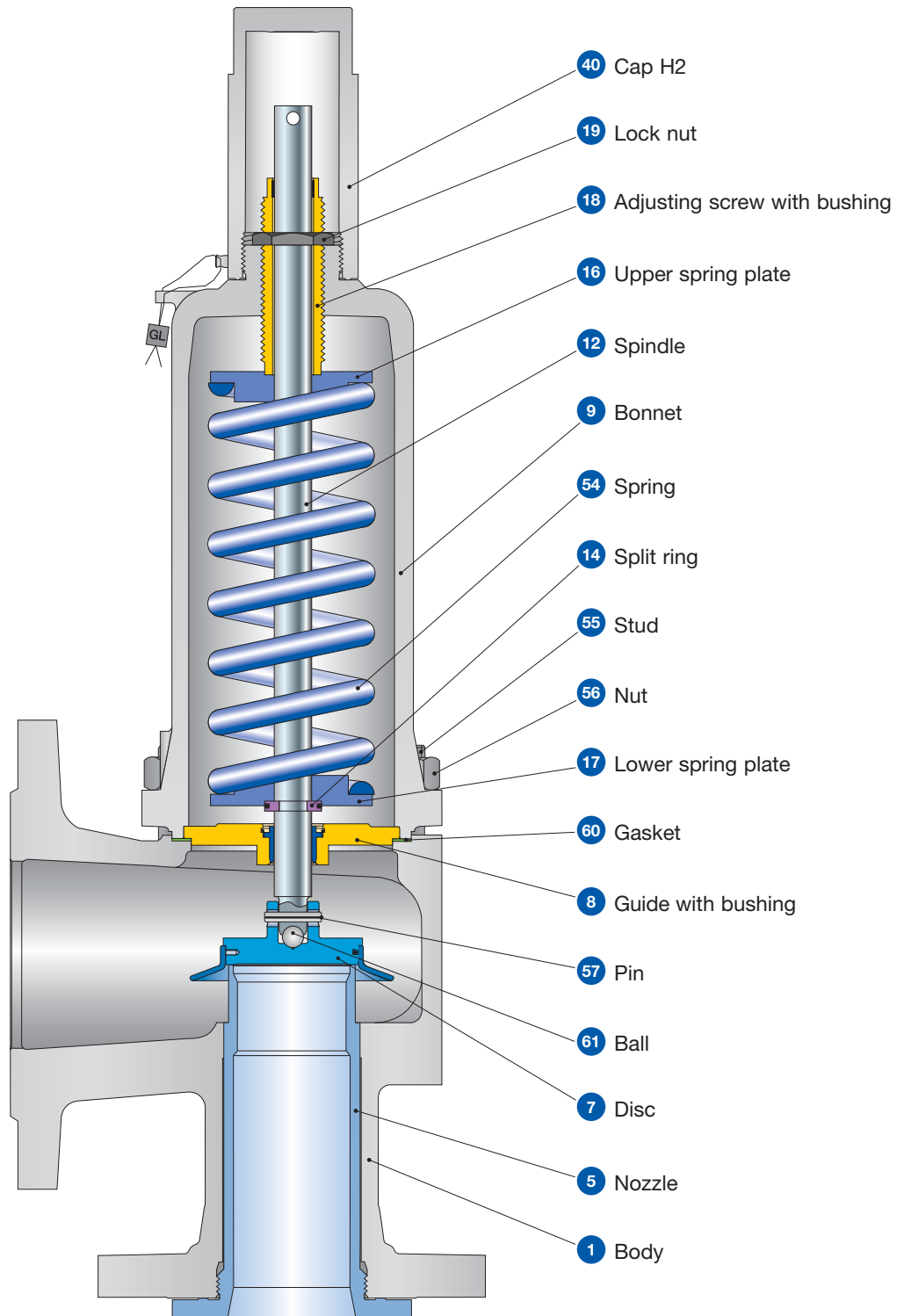
**Type 441, 442 Full nozzle DIN**  
**Type 441, 442 Full nozzle ANSI**  
**Flanged Safety Relief Valve**

Type 441, 442  
Full nozzle

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**Type 441, 442 Full nozzle DIN, ANSI**  
**Conventional design**

Type 441, 442  
 Full nozzle



## Type 441, 442 Full nozzle DIN, ANSI

### Conventional design

#### Materials

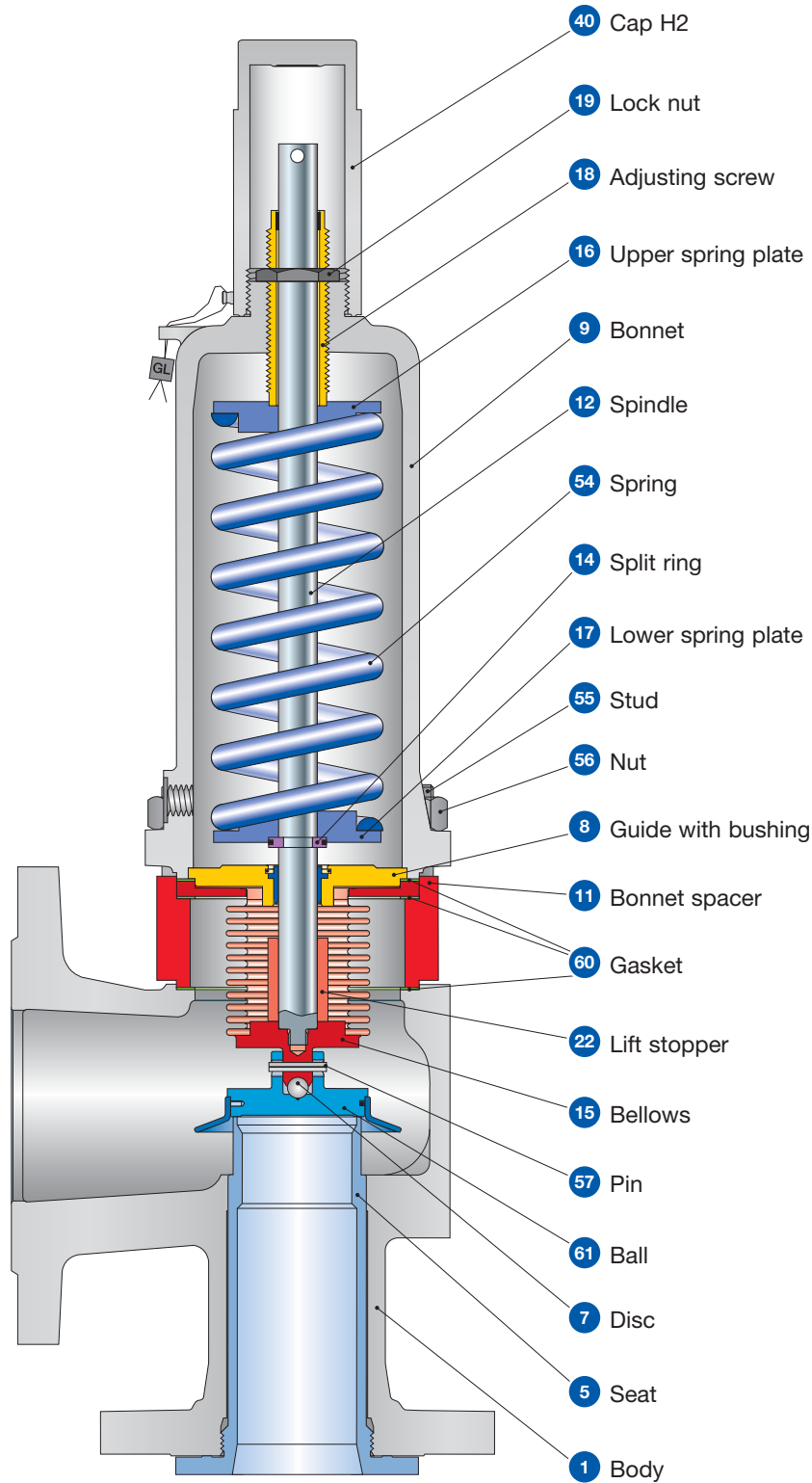
Item	Component	Type 4412 / 4422 Full nozzle	Type 4414 Full nozzle
1	Body	1.0619	1.4408
		SA 216 WCB	SA 351 CF8M
5	Seat	1.4404	1.4404
		316L	316L
7	Disc	1.4122	1.4404
		Hardened stainless steel	316L
8	Guide with bushing	1.0501	1.4404
		Carbon steel	316L
		1.4104 tenifer	-
		Chrome steel tenifer	-
9	Bonnet	0.7040, 0.7043, 1.0619	1.4408 or 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	SA CF8M or SA 479 316Ti
12	Spindle	1.4021	1.4404
		420	316L
14	Split ring	1.4104	1.4404
		Chrome steel	316L
16 / 17	Spring plate	1.0718	1.4404
		12L13	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.4404
		Steel	316L
40	Cap H2	1.0460	1.4404
		SA 105	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Stainless steel
	Spring optional	1.4310	-
55	Stud	1.1181	1.4401
		Steel	B8M
56	Nut	1.0501	1.4401
		2H	8M
57	Pin	1.4310	1.4310
		Stainless steel	Stainless steel
60	Gasket	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316
61	Ball	1.3541	1.4401
		Hardened stainless steel	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.

**Type 441, 442 Full nozzle DIN, ANSI**  
**Balanced bellows design**

Type 441, 442  
 Full nozzle



## Type 441, 442 Full nozzle DIN, ANSI

### Balanced bellows design

#### Materials

Item	Component	Type 4412 / 4422 Full nozzle	Type 4414 Full nozzle
1	Body	1.0619	1.4408
		SA 216 WCB	SA 351 CF8M
5	Seat	1.4404	1.4404
		316L	316L
7	Disc	1.4122	1.4404
		Hardened stainless steel	316L
8	Guide with bushing	1.0501	1.4404
		Carbon steel	316L
		1.4104 tenifer	-
		Chrome steel tenifer	-
9	Bonnet	0.7040, 0.7043, 1.0619	1.4408 or 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M or SA 479 316Ti
11	Bonnet spacer	1.0460	1.4404
		Carbon steel	316L
12	Spindle	1.4404	1.4404
		316L	316L
14	Split ring	1.4104	1.4404
		Chrome steel	316L
15	Bellows	1.4571	1.4571
		316Ti	316Ti
16 / 17	Spring plate	1.0718	1.4404
		Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.4404
		Steel	316L
22	Lift stopper	1.4404	1.4404
		316L	316L
40	Cap H2	1.0460	1.4404
		SA 105	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Stainless steel
	Spring optional	1.4310	-
		Stainless steel	-
55	Stud	1.4401	1.4401
		B8M	B8M
56	Nut	1.4401	1.4401
		8M	8M
57	Pin	1.4310	1.4310
		Stainless steel	Stainless steel
60	Gasket	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316
61	Ball	1.3541	1.4401
		Hardened stainless steel	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.

**Type 441, 442 Full nozzle DIN, ANSI**  
**Article numbers**

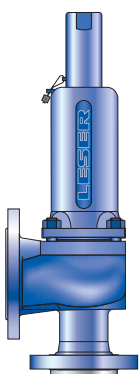
Type 441, 442 Full nozzle DIN

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	50	65	80
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662
<b>Body material: 1.0619 (WCB)</b>				
<b>Bonnet closed</b>	<b>H2</b>	Art. No. <b>4412.</b>	<b>0572</b>	<b>0582</b>
	<b>H3</b>	Art. No. <b>4412.</b>	<b>0573</b>	<b>0583</b>
	<b>H4</b>	Art. No. <b>4412.</b>	<b>0574</b>	<b>0584</b>
<b>open</b>	<b>H3</b>	Art. No. <b>4422.</b>	<b>0575</b>	<b>0585</b>
<b>Body material: 1.4408 (CF8M)</b>				
<b>Bonnet closed</b>	<b>H2</b>	Art. No. <b>4414.</b>	<b>0952</b>	<b>0962</b>
	<b>H4</b>	Art. No. <b>4414.</b>	<b>0954</b>	<b>0964</b>

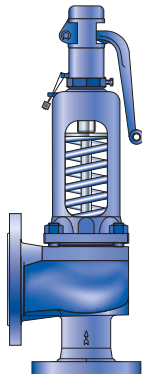
Type 441, 442 Full nozzle

Type 441, 442 Full nozzle ANSI

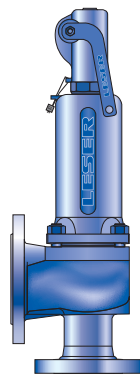
	Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
	Actual Orifice diameter d <sub>o</sub> [mm]	23	29	37	46	60	92
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
<b>Body material: 1.0619 (WCB)</b>							
<b>Bonnet closed</b>	<b>H2</b>	Art. No. <b>4412.</b>	<b>1282</b>	<b>1292</b>	<b>1302</b>	<b>1312</b>	<b>1322</b>
	<b>H3</b>	Art. No. <b>4412.</b>	<b>1283</b>	<b>1293</b>	<b>1303</b>	<b>1313</b>	<b>1323</b>
	<b>H4</b>	Art. No. <b>4412.</b>	<b>1284</b>	<b>1294</b>	<b>1304</b>	<b>1314</b>	<b>1324</b>
<b>open</b>	<b>H3</b>	Art. No. <b>4422.</b>	<b>1285</b>	<b>1295</b>	<b>1305</b>	<b>1315</b>	<b>1325</b>
<b>Body material: 1.4408 (CF8M)</b>							
<b>Bonnet closed</b>	<b>H2</b>	Art. No. <b>4414.</b>	<b>5682</b>	-	<b>5702</b>	<b>5712</b>	<b>5722</b>
	<b>H4</b>	Art. No. <b>4414.</b>	<b>5684</b>	-	<b>5704</b>	<b>5714</b>	<b>5724</b>



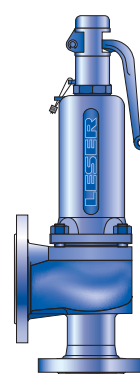
**Type 441 Full nozzle**  
 Cap H2  
 Closed bonnet  
 Conventional design



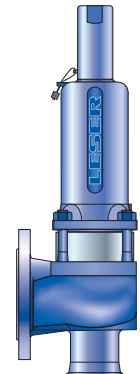
**Type 442 Full nozzle**  
 Plain lever H3  
 Bonnet open  
 Conventional design



**Type 441 Full nozzle**  
 Packed lever H4  
 Closed bonnet  
 Conventional design



**Type 441 Full nozzle**  
 Plain lever H3  
 Closed bonnet  
 Conventional design



**Type 441 Full nozzle**  
 Cap H2  
 Closed bonnet  
 Balanced bellows design

## Type 441, 442 Full nozzle DIN Dimensions and weights

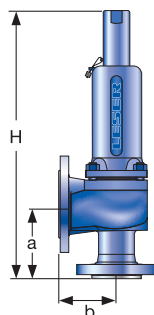
### Metric Units

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	50	65	80
	Actual Orifice diameter d <sub>0</sub> [mm]	23	37	46
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	416	1075	1662
<b>Weight</b>				
[kg]		9	16	22
	with bellows	10	17	24
<b>Center to face</b>				
[mm]	Inlet a	111	143.5	154
	Outlet b	100	115	120
<b>Height (H4)</b>				
[mm]	Standard H max.	345	515.5	573
	Bellows H max.	384	553.5	619
<b>Body material: 1.0619 (WCB)</b>				
<b>DIN Flange<sup>1)</sup></b>				
	Inlet		PN 40 or 16	
	Outlet		PN 16	
<b>Body material: 1.4408 (CF8M)</b>				
<b>DIN Flange<sup>1)</sup></b>				
	Inlet		PN 40 or 16	
	Outlet		PN 16	

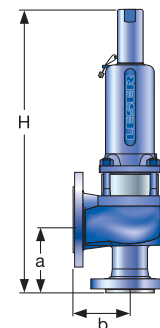
### US Units

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	50	65	80
	Actual Orifice diameter d <sub>0</sub> [inch]	0.91	1.46	1.81
	Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576
<b>Weight</b>				
[lbs]		20	35	49
	with bellows	21	38	52
<b>Center to face</b>				
[inch]	Inlet a	4 3/8	5 5/8	6 1/16
	Outlet b	3 15/16	4 1/2	4 3/4
<b>Height (H4)</b>				
[inch]	Standard H max.	9 3/16	13	14 5/8
	Bellows H max.	10 11/16	14	16 1/8
<b>Body material: 1.0619 (WCB)</b>				
<b>DIN Flange<sup>1)</sup></b>				
	Inlet		PN 40 or 16	
	Outlet		PN 16	
<b>Body material: 1.4408 (CF8M)</b>				
<b>DIN Flange<sup>1)</sup></b>				
	Inlet		PN 40 or 16	
	Outlet		PN 16	

<sup>1)</sup> Standard flange rating. For other flange drillings please refer to page 46.



Conventional design



Balanced bellows design

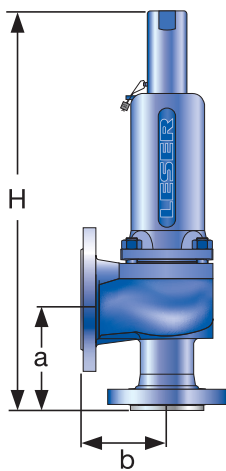
## Type 441, 442 Full nozzle ANSI

### Dimensions and weights

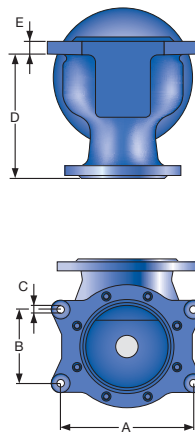
Metric Units

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter $d_o$ [mm]	23	29	37	46	60	92
Actual Orifice area $A_o$ [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
<b>Weight</b> [kg]	10	13	16	22	33	75
with bellows	11	14	17	24	37	83
<b>Center to face</b> [mm]						
Inlet a	109	129,5	129,5	141	163	188
Outlet b	114	121	121	124	165	229
<b>Height (H4)</b> [mm]						
Standard H max.	339	455	496	556	685	844
Bellows H max.	378	497	534	602	741	902
<b>Support brackets</b> [mm]						
A						280
B						160
(drilled only on request, Option code H42)						Ø 18
D						250
E						25
<b>Body material: 1.0619 (WCB)</b>						
<b>ANSI Flange<sup>1)</sup></b>	Inlet	CL150 or CL300				
<b>Class</b>	Outlet	CL150				
<b>Body material: 1.4408 (CF8M)</b>						
<b>ANSI Flange<sup>1)</sup></b>	Inlet	CL150 or CL300	-	CL150 or CL300		
<b>Class</b>	Outlet	CL150	-	CL150		

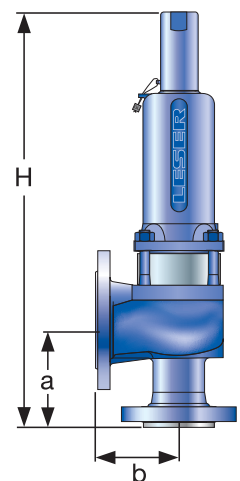
<sup>1)</sup> Standard flange rating. For other flange drillings please refer to page 46.



Conventional design



Support brackets



Balanced bellows design



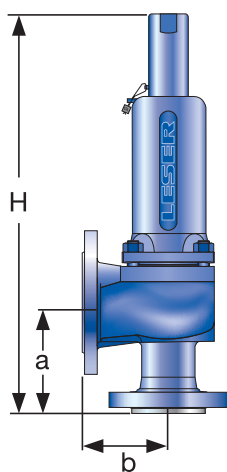
## Type 441, 442 Full nozzle ANSI

### Dimensions and weights

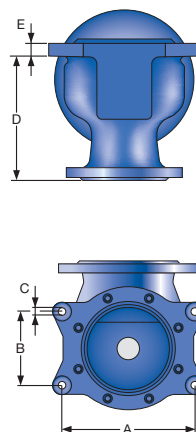
US Units

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter $d_0$ [inch]	0.91	1.14	1.46	1.81	2.36	3,62
Actual Orifice area $A_0$ [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10,304
<b>Weight</b> [lbs]	22	29	35	49	73	165
with bellows	23	30	38	52	81	183
<b>Center to face</b> [inch]						
Inlet a	4 ¼	5 ⅛	5 ⅛	5 ½	6 ⅜	7 ⅜
Outlet b	4 ½	4 ¾	4 ¾	4 ⅞	6 ½	9
<b>Height (H4)</b> [inch]						
Standard H max.	13 ¼	18 ⅛	19 ¾	22 ⅛	27 ¼	33 ½
Bellows H max.	15 ⅛	19 ⅜	21 ¼	23 ⅞	29 ⅞	35 ⅜
<b>Support brackets</b> [inch]						
A						11
B						6 ¼
(drilled only on request, Option code H42)						Ø ¾
D						9 ⅞
E						1
<b>Body material: 1.0619 (WCB)</b>						
<b>ANSI Flange<sup>1)</sup></b> <b>Class</b>	Inlet	CL150 or CL300				
	Outlet	CL150				
<b>Body material: 1.4408 (CF8M)</b>						
<b>ANSI Flange<sup>1)</sup></b> <b>Class</b>	Inlet	CL150 or CL300	–	CL150 or CL300		
	Outlet	CL150	–	CL150		

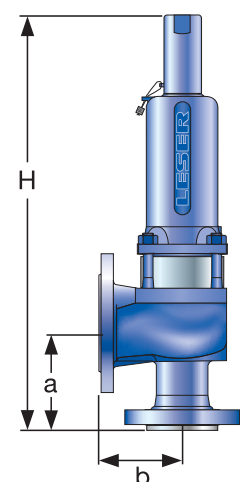
<sup>1)</sup> Standard flange rating. For other flange drillings please refer to page 46.



Conventional design



Support brackets



Balanced bellows design

## Type 441, 442 Full nozzle DIN

### Pressure temperature ratings

Metric Units

 Type 441, 442  
Full nozzle

		DN <sub>i</sub>	25	40	50
		DN <sub>o</sub>	50	65	80
		Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46
		Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662
<b>Body material: 1.0619 (WCB)</b>					
<b>DIN Flange</b>	Inlet	<b>PN 40 or 16</b>			
	Outlet	<b>PN 16</b>			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	0.1	0.1	0.1
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	3	3	3
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.98	1.11	1.81	1.81
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	40	40	40	40
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	40	40	40	40
<b>Temperature<sup>2)</sup> acc. to DIN EN</b>	min. [°C]	-85			
	max. [°C]	+450			
<b>Temperature<sup>2)</sup> acc. to ASME</b>	min. [°C]	-29			
	max. [°C]	+427			

<b>Body material: 1.4408 (CF8M)</b>					
<b>DIN Flange</b>	Inlet	<b>PN 40 or 16</b>			
	Outlet	<b>PN 16</b>			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	0.1	0.1	0.1
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	3	3	3
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.98	1.11	1.81	1.81
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	40	40	33	33
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	40	40	37	37
<b>Temperature<sup>2)</sup> acc. to DIN EN</b>	min. [°C]	-270			
	max. [°C]	+400			
<b>Temperature<sup>2)</sup> acc. to ASME</b>	min. [°C]	-268			
	max. [°C]	+538			

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>2)</sup> Between -10 °C and lowest temperature indicated „AD 2000-Merkblatt“ W10 shall be taken into account.

## Type 441, 442 Full nozzle DIN

### Pressure temperature ratings

#### US Units

	DN <sub>E</sub>	25	40	50
	DN <sub>A</sub>	50	65	80
	Actual Orifice diameter d <sub>0</sub> [inch]	0.91	1.46	1.81
	Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576
<b>Body material: 1.0619 (WCB)</b>				
<b>DIN Flange</b>	Inlet	<b>PN 40 or 16</b>		
	Outlet	<b>PN 16</b>		
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	1.5	1.5
<b>Min. set pressure<sup>1)</sup></b> standard bellows	p [psig] S/G/L	43.5	43.5	43.5
<b>Min. set pressure</b> low press. bellows	p [psig] S/G/L	14	16	26
<b>Maximum set pressure</b>	p [psig] S/G/L	580	580	580
<b>Max. set pressure</b> with special spring	p [psig] S/G/L	580	580	580
<b>Temperature<sup>2)</sup></b> acc. to DIN EN	min. [°F]	-121		
	max. [°F]	+842		
<b>Temperature<sup>2)</sup></b> acc. to ASME	min. [°F]	-20		
	max. [°F]	+800		

<b>Body material: 1.4408 (CF8M)</b>				
<b>DIN Flange</b>	Inlet	<b>PN 40 or 16</b>		
	Outlet	<b>PN 16</b>		
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	1.5	1.5
<b>Min. set pressure<sup>1)</sup></b> standard bellows	p [psig] S/G/L	43.5	43.5	43.5
<b>Min. set pressure</b> low press. bellows	p [psig] S/G/L	14	16	26
<b>Maximum set pressure</b>	p [psig] S/G/L	580	580	479
<b>Max. set pressure</b> with special spring	p [psig] S/G/L	580	580	537
<b>Temperature<sup>2)</sup></b> acc. to DIN EN	min. [°F]	-454		
	max. [°F]	+752		
<b>Temperature<sup>2)</sup></b> acc. to ASME	min. [°F]	-450		
	max. [°F]	+1000		

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>2)</sup> Between -10 °C and lowest temperature indicated „AD 2000-Merkblatt“ W10 shall be taken into account.

## Type 441, 442 Full nozzle ANSI

### Pressure temperature ratings

Metric Units

Valve size		1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter d <sub>0</sub> [mm]		23	29	37	46	60	92
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		416	661	1075	1662	2827	6648
<b>Body material: 1.0619 (WCB)</b>							
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL150 or CL300</b>					
	Outlet	<b>CL150</b>					
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	0.1	0.1	0.1	0.1	0.1
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	3	3	3	3	3
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.98	1.41	1.11	1.81	1.50	1.18
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	49	48	46	40 <sup>3)</sup>	40	34
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	51	48	46	40 <sup>3)</sup>	40	34
<b>Temperature acc. to DIN EN</b>	min. [°C]	-85					
	max. [°C]	+450					
<b>Temperature acc. to ASME</b>	min. [°C]	-29					
	max. [°C]	+427					

Type 441, 442 Full nozzle

<b>Body material: 1.4408 (CF8M)</b>							
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL 150 or CL 300</b>	-	<b>CL150 or CL300</b>			
	Outlet	<b>CL150</b>	-	<b>CL150</b>			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	-	0.1	0.1	0.1	0.1
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	3	-	3	3	3	3
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.98	-	1.11	1.81	1.50	1.18
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	42.5	-	27	25	27	15
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	51	-	38	40	27	25
<b>Temperature acc. to DIN EN</b>	min. [°C]	-270	-	-270			
	max. [°C]	+400	-	+400			
<b>Temperature acc. to ASME</b>	min. [°C]	-268	-	-268			
	max. [°C]	+538	-	+538			

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B 16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>3)</sup> For applications with CE marking. Maximum set pressure for ASME application 49 bar.

## Type 441, 442 Full nozzle ANSI

### Pressure temperature ratings

US Units

Valve size		1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter $d_0$ [inch]		0.91	1.14	1.46	1.81	2.36	3.62
Actual Orifice area $A_0$ [inch <sup>2</sup> ]		0.644	1.024	1.667	2.576	4.383	10.304
<b>Body material: 1.0619 (WCB)</b>							
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL150 or CL300</b>					
	Outlet	<b>CL150</b>					
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	1.5	1.5	1.5	1.5	1.5
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig] S/G/L	43.5	43.5	43.5	43.5	43.5	43.5
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L	14	20	16	26	22	17
<b>Maximum set pressure</b>	p [psig] S/G/L	711	696	667	580 <sup>3)</sup>	580	493
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	740	696	667	580 <sup>3)</sup>	580	493
<b>Temperature acc. to DIN EN</b>	min. [°F]	-121					
	max. [°F]	+842					
<b>Temperature acc. to ASME</b>	min. [°F]	-20					
	max. [°F]	+800					

Type 441, 442 Full nozzle

<b>Body material: 1.4408 (CF8M)</b>							
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL 150 or CL 300</b>	-	<b>CL150 or CL300</b>			
	Outlet	<b>CL150</b>	-	<b>CL150</b>			
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	-	1.5	1.5	1.5	1.5
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig] S/G/L	43.5	-	43.5	43.5	43.5	43.5
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L	14	-	16	26	22	17
<b>Maximum set pressure</b>	p [psig] S/G/L	616	-	392	363	392	218
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	740	-	551	580	392	
<b>Temperature acc. to DIN EN</b>	min. [°F]	-454	-	-454			
	max. [°F]	+752	-	+752			
<b>Temperature acc. to ASME</b>	min. [°F]	-450	-	-450			
	max. [°F]	+1000	-	+1000			

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

<sup>3)</sup> For applications with CE marking. Maximum set pressure for ASME application 711 psig.

## Type 441, 442 Full nozzle DIN, ANSI Flange drillings

### Type 441, 442 Full nozzle DIN

	DN <sub>i</sub>	25	40	50	
	DN <sub>o</sub>	50	65	80	
	Actual Orifice diameter d <sub>0</sub> [mm]	23	37	46	
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	416	1075	1662	
<b>Body material: 1.0619 (WCB), 1.4408 (CF8M)</b>					
<b>Inlet</b>	<b>DIN EN 1092</b>	PN 10	*	*	*
		PN 16	*	*	*
		PN 25	*	*	*
		PN 40	*	*	*
	<b>ASME B16.5</b>	CL150	H64	H64	H64
		CL300	-	-	[H65]
<b>Outlet</b>	<b>DIN EN 1092</b>	PN 10	*	*	*
		PN 16	*	*	*
		PN 25	*	(H15)	(*)
		PN 40	*	(H15)	(*)
	<b>ASME B16.5</b>	CL150	H 79	H 79	H 79
		CL300	-	-	-

### Type 441, 442 Full nozzle ANSI

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"	
Actual Orifice diameter d <sub>0</sub> [mm]	23	29	37	46	60	92	
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648	
<b>Body material: 1.0619 (WCB), 1.4408 (CF8M)</b>							
<b>Inlet</b>	<b>DIN EN 1092</b>	PN 25	Please use 441, 442 Full nozzle DIN			H47	H47
		PN 40	Please use 441, 442 Full nozzle DIN			H47	H47
	<b>ASME B16.5</b>	CL150	H64	H64	H64	H64	[H64]
		CL300	*	*	*	*	*
<b>Outlet</b>	<b>DIN EN 1092</b>	PN 10	Please use 441, 442 Full nozzle DIN			H51	H51
		PN 16	Please use 441, 442 Full nozzle DIN			H51	H51
	<b>ASME B16.5</b>	CL150	*	*	*	*	*
		CL300	-	-	-	-	-

## Type 441, 442 Full nozzle DIN, ANSI Flange facings

Indication	Standard	Inlet	Outlet	Remark						
<b>General</b>										
Flange undrilled	–	H38	H39							
Linde-V-Nut, Type V48	Linde Standard 420-08 LDeS 3313.36	–	J08	Groove: Rz 16						
Linde-V-Nut, Type V48A		–	J06	Groove: Rz 4, e.g. with hydrogen						
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	–	J12							
<b>Acc. to DIN EN 1092</b>										
<b>Flange facing</b> (see LDeS 3313.40)		PN 10 – PN 40	PN 10 – PN 40	Rz-data according to DIN EN 1092 in µm						
Raised face	Type B1	*	*	Facing: Rz = 12.5 – 50						
	Type B2	-	L38	Facing: Rz = 3.2 – 12.5						
Tongue face C <sup>1)</sup>		L56	H92	Steel flange only						
Groove face D <sup>1)</sup>		L55	H91							
Male face E		H96	H98							
Female face F		H97	H99							
O-ring male face G		J01	J02							
O-ring female face H		J03	J04							
<b>Acc. to ASME B16.5</b>										
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		RTJ- Class	Option code	RTJ- Class	Option code
1.0619, 1.4408	all	all	L52	L53	*	*	CL150, CL300	L58	CL150	H63

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled".

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

## Series 441, Series 441 Full nozzle

### Approvals

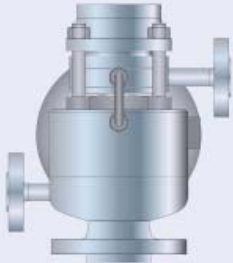
DN <sub>i</sub>	20	25	32	40	50	65	80	100	125	150	200
Valve size	–	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	–	4" x 6"	–	–	–
Actual Orifice diameter d <sub>0</sub> [mm]		23	29	37	46	60	74	92	98	125	165
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
<b>Europe</b>			<b>Coefficient of discharge K<sub>dr</sub></b>								
PED / DIN EN ISO 4126-1 12/2013	Approval No.	072020111Z0008/0/08 Rev.3									
	S/G	0.7									
	L	0.45									
<b>Germany</b>			<b>Coefficient of discharge α<sub>w</sub></b>								
PED / AD 2000-Merkblatt A2 07/2012	Approval No.	TÜV SV 576									
	S/G	0.7									
	L	0.45									
<b>United States</b>			<b>Coefficient of discharge K</b>								
ASME Sec. VIII Div. 1	Approval No.	M37044									
	S/G	0.699									
	Approval No.	M37055									
	L	0.521									
<b>Canada</b>			<b>Coefficient of discharge K</b>								
CRN	Approval No.	For current approval no. see www.leser.com									
	S/G	0.699									
	L	0.521									
<b>China</b>			<b>Coefficient of discharge α<sub>w</sub></b>								
AQSIQ	Approval No.	For current approval no. see www.leser.com									
	S/G	0.7									
	L	0.45									
<b>Eurasian Custom Union</b>			<b>Coefficient of discharge α<sub>w</sub></b>								
EAC	Approval No.	For current approval no. see www.leser.com									
	S/G	0.7									
	L	0.45									
<b>Classification societies</b>		<b>Homepage</b>									
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									
ClassNK NIPPON Kaiji Kyokai (Japan)		www.classnk.or.jp									
<p>The valid certification number is changed with every renewal.</p> <p>For a sample certificate including the valid certification number see www.leser.com</p>											



## Series 441, Series 441 Full nozzle Available options

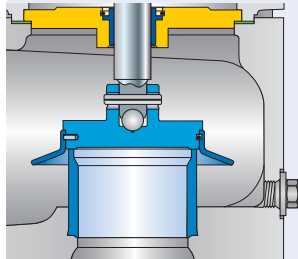
### Heating jacket

H29, H30: Couplings G  $\frac{3}{8}$ ", G  $\frac{3}{4}$ "  
H31, H32: Flanges DN 15, DN 25



### Drain hole

J18: G  $\frac{1}{4}$ "  
J19: G  $\frac{1}{2}$ "



### Open bonnet

See article number

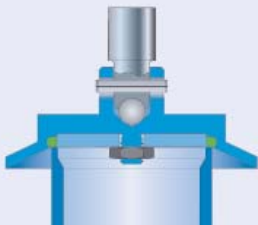


### Change of nominal diameter with welding flange

I28: DN 40, 1 1/2" – Inlet  
I29: DN 80, 3" – Outlet  
I30: DN 150, 6" – Outlet

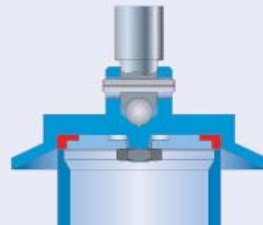
### O-ring disc

J20: FFKM "C"  
J21: CR "K"  
J22: EPDM "D"  
J23: FKM "L"



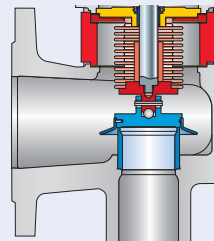
### Disc with inserted sealing plate

J44: PTFE-FDA  
J48: PCTFE  
J49: SP

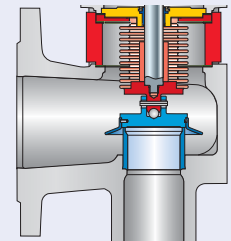


### Stainless steel bellows

J68: Open bonnet  
J78: Closed bonnet

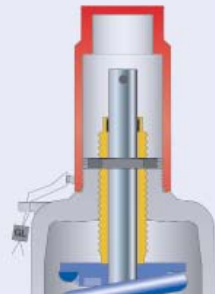


### Conversion kit for stainless steel bellows



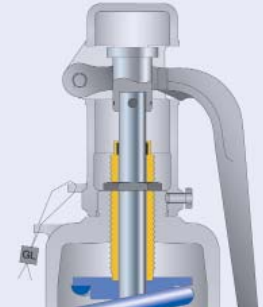
### Screwed cap H2

H2



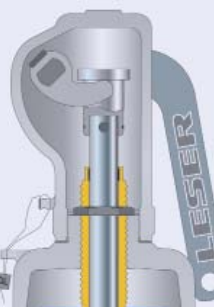
### Plain lever H3

H3



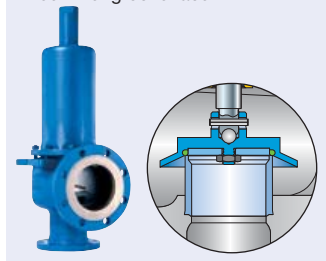
### Packed lever H4

H4



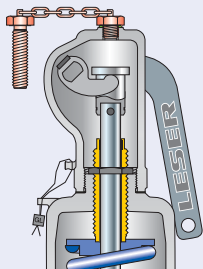
### Type 441 for industrial refrigeration

H91: Outlet groove face D  
H93: Inlet groove face D



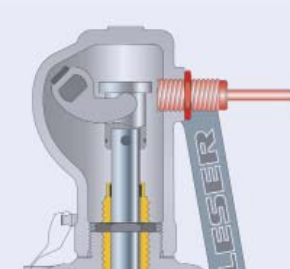
### Test gag

J69: H4  
J70: H2



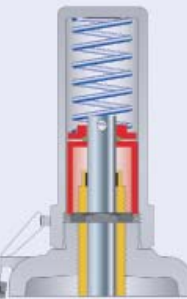
### Lift indicator

J39: Adaptor H4  
J93: Lift indicator



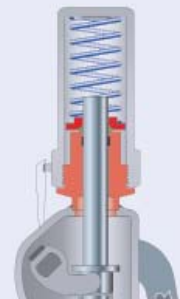
### O-ring damper H2

J65



### O-ring damper H4

J66



**Serie 441, Serie 441 Full nozzle**  
**LESER Original Spare Parts Kits**



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

**Contents**

Item	Component	Material	Quantity
7.5	Securing ring (Disc)	1.4571 / 316Ti	1
8.4	Securing ring (Guide)	1.4571 / 316Ti	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	3
61	Ball	1.4401 / 316	1
1.9	O-ring (Lifting device H4)	FKM	1

**Article numbers**

DN	20	25	32	40	50	65	80	100	125	150	200
Valve size	-	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	-	4" x 6"	-	-	-
Art. No. 5012.	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211

For further spare parts of your individually configured safety valve, please use the spare part finder [www.leser.com/en/services/spare-part-finder.html](http://www.leser.com/en/services/spare-part-finder.html)

Series 441,  
441 Full nozzle



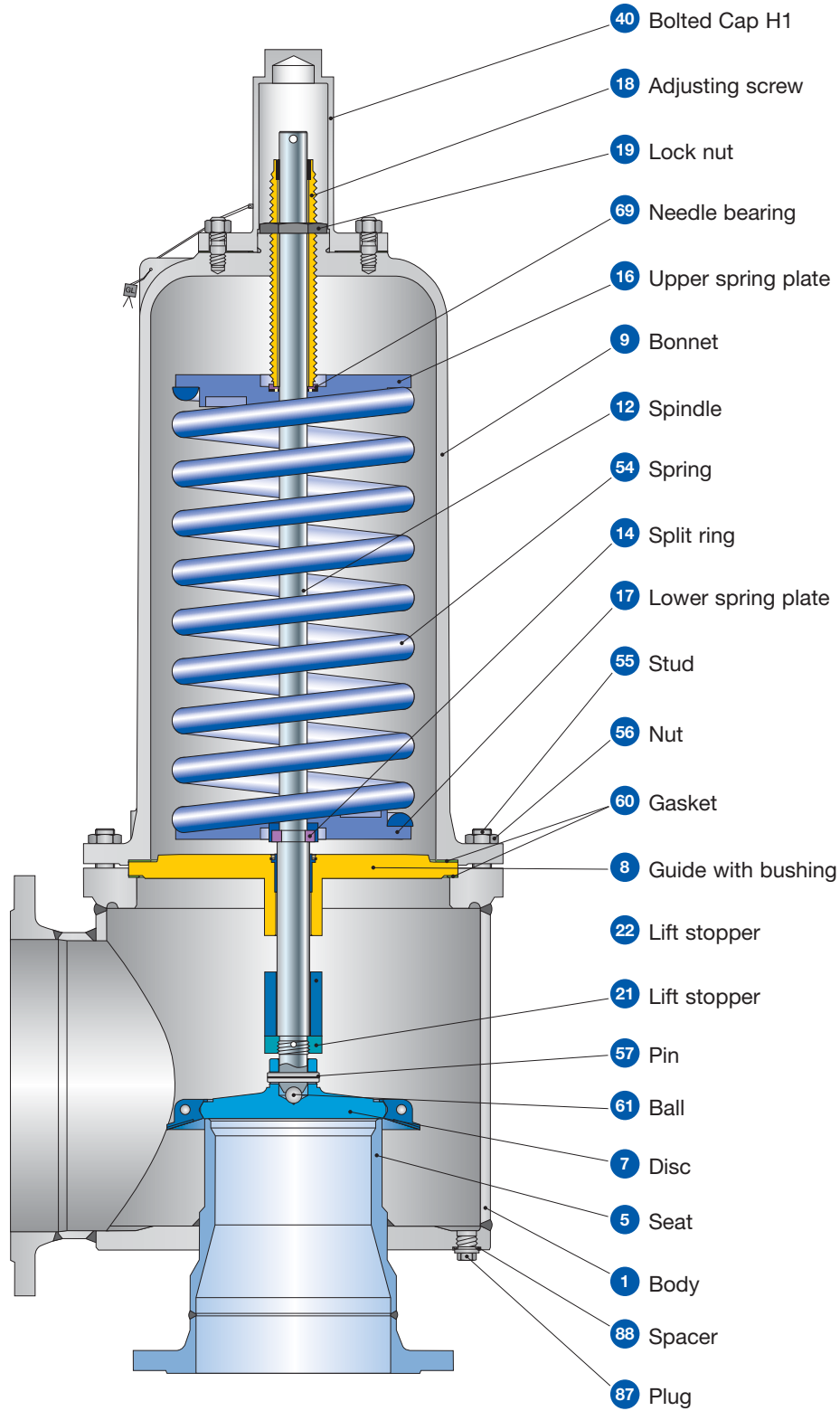
**Type 441 XXL**  
 Packed lever H4  
 Closed bonnet  
 Conventional and  
 balanced bellows design

**Type 441, 442 XXL**  
**Flanged Safety Relief Valves**

<b>Contents</b>	<b>Page</b>
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• Metric Units	59
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Type 441, 442  
XXL

**Type 441, 442 XXL**  
**Conventional design**



Type 441, 442  
 XXL

## Type 441, 442 XXL

### Conventional design

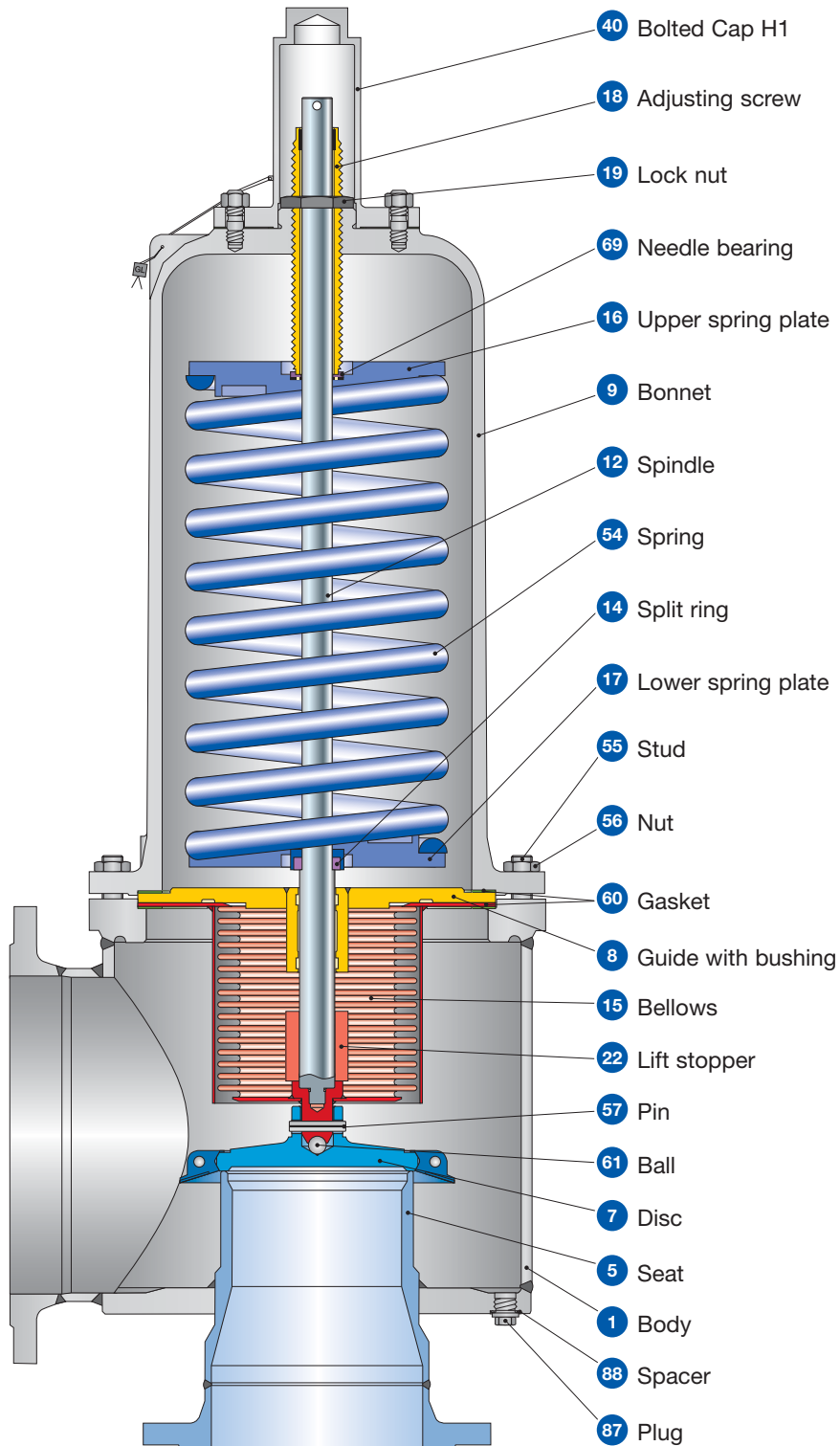
### Materials

**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.
- <sup>1)</sup> Bolted cap H1 only available for DN 200 and DN 250.

Item	Component	Type 4412 XXL / 4422 XXL		Type 4414 XXL	
1	Body	Inlet: 1.4571	Outlet: 1.0460 / 1.0425	1.4571	
		Inlet: 316Ti	Outlet: Carbon steel	316Ti	
5	Seat	1.0305 stellite, 1.0460 stellite		1.4571	
		Carbon steel, stellite		316Ti	
7	Disc	1.4404		1.4404	
		316L		316L	
8	DN 200 – 250: Guide with bushing	0.7040		1.4404	
		Ductile Gr. 60-40-18 / Chrome steel		316L	
	DN 300 – 400: Guide	1.4404		1.4404	
		316L		316L	
9	Bonnet casted	0.7043		-	
		Ductile Gr. 60-40-18		-	
	Bonnet welded	DN 200 / DN 250: 1.4404(316L) / 1.4571(316Ti) / 1.0305 (Steel)		1.4571 / 1.4404	
DN 300 / DN 400: 1.0254 / 1.4571(316Ti) / 1.0345 (Steel) The welded construction may consist of additional materials		316Ti / 316L			
12	Spindle	1.4021		1.4404	
		420		316L	
14	Split ring	1.4104		1.4404	
		Chrome steel		316L	
16 / 17	Spring plate	1.0570 or 1.4404		1.4404	
		Steel or 316L		316L	
18	Adjusting screw with bushing	1.4104 PTFE		1.4404 PTFE	
		Chrome steel PTFE		316L PTFE	
19	Lock nut	1.4404		1.4404	
		316L		316L	
21 / 22	Lift stopper	1.4404		1.4404	
		316L		316L	
40	Bolted cap H1 <sup>1)</sup>	DN 200 + DN 250: 0.7040, Flange 1.0460	DN 300 + DN 400: 1.4408	DN 200 + DN 250: 1.4404	DN 300 + DN 400: 1.4408
		Ductil Gr. 60-40-18, Flange SA 105	CF8M	316L	CF8M
54	Spring standard	1.1200, 1.8159, 1.7102		1.4310	
		Carbon steel		Stainless steel	
55	Stud	1.4401		1.4401	
		B8M		B8M	
56	Nut	1.4401		1.4401	
		8M		8M	
57	Pin	1.4310		1.4310	
		Stainless steel		Stainless steel	
60	Gasket	Graphit e/ 1.4401		Graphite / 1.4401	
		Graphite / 316		Graphite / 316	
61	Ball	1.3541		1.4401	
		Hardened stainless steel		316	
69	Needle bearing	1.4401		1.4401	
		316		316	
87 / 88	Plug / Spacer	1.4401 / 1.4571		1.4401 / 1.4571	
		316 / 316Ti		316 / 316Ti	

**Type 441, 442 XXL**  
**Balanced bellows design**



Type 441, 442  
 XXL

# Type 441, 442 XXL

## Balanced bellows design

### Materials

**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.
- <sup>1)</sup> Bolted cap H1 only available for DN 200 and DN 250.

Item	Component	Type 4412 XXL / 4422 XXL		Type 4414 XXL	
1	Body	Inlet: 1.4571	Outlet: 1.0460 / 1.0425	1.4571	
		Inlet: 316Ti	Outlet: Carbon steel	316Ti	
5	Seat DN 200 – 250	1.0305 stellite		1.4571	
		Carbon steel, stellite		316Ti	
	DN 300 – 400	1.0460 stellite		1.4571	
		Carbon steel, stellite		316Ti	
7	Disc	1.4404		1.4404	
		316L		316L	
8	Guide	1.4571		1.4571	
		316Ti		316Ti	
9	Bonnet casted	0.7043		-	
		Ductile Gr. 60-40-18		-	
	Bonnet welded	DN 200 / DN 250: 1.4404(316L) / 1.4571(316Ti) / 1.0305 (Steel)		1.4571 / 1.4404	
		DN 300 / DN 400: 1.0254 / 1.4571(316Ti) / 1.0345 (Steel) The welded construction may consist of additional materials		316Ti / 316L	
12	Spindle	1.4404		1.4404	
		316L		316L	
14	Split ring	1.4104		1.4404	
		Chrome steel		316L	
15	Bellows	1.4571		1.4571	
		316Ti		316Ti	
16 / 17	Spring plate	1.0570 or 1.4404		1.4404	
		Steel or 316L		316L	
18	Adjusting screw with bushing	1.4104 PTFE		1.4404 PTFE	
		Chrome steel PTFE		316L PTFE	
19	Lock nut	1.4404		1.4404	
		316L		316L	
22	Lift stopper	1.4404		1.4404	
		316L		316L	
40	Bolted cap H1 <sup>1)</sup>	DN 200 + DN 250: 0.7040, Flange 1.0460	DN 300 + DN 400: 1.4408	DN 200 + DN 250: 1.4404	DN 300 + DN 400: 1.4408
		Ductil Gr. 60-40-18, Flange SA 105	CF8M	316L	CF8M
54	Spring standard	1.1200, 1.8159, 1.7102		1.4310	
		Carbon steel		Stainless steel	
	Spring optional	1.4310		-	
55	Stud	1.4401		1.4401	
		B8M		B8M	
56	Nut	1.4401		1.4401	
		8M		8M	
57	Pin	1.4310		1.4310	
		Stainless steel		Stainless steel	
60	Gasket	Graphite / 1.4401		Graphite / 1.4401	
		Graphite / 316		Graphite / 316	
61	Ball	1.3541		1.4401	
		Hardened stainless steel		316	
69	Needle bearing	1.4401		1.4401	
		316		316	
87 / 88	Plug / Spacer	1.4401 / 1.4571 316 / 316Ti		1.4401 / 1.4571 316 / 316Ti	

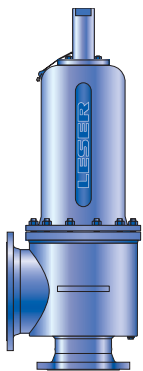
## Type 441, 442 XXL

### Article numbers

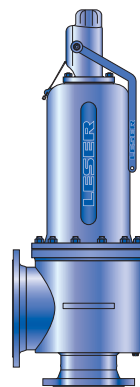
	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500	
Valve size		8" x 12"	10" x 14"	12" x 16"	16" x 20"	
Actual Orifice diameter d <sub>0</sub> [mm]		165	200	235	295	
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		21382	31416	43374	68349	
<b>Body material: 1.0460 / 1.0425 (Carbon steel)</b>						
<b>Bonnet</b>	<b>H1<sup>1)</sup></b>	Art. No. <b>4412.</b>	<b>4752</b>	<b>4762</b>	<b>4772</b>	<b>4782</b>
closed	<b>H3</b>	Art. No. <b>4412.</b>	-	-	-	-
	<b>H6<sup>1)</sup></b>	Art. No. <b>4412.</b>	<b>4754</b>	<b>4764</b>	<b>4774</b>	<b>4784</b>
open	<b>H6<sup>1)</sup></b>	Art. No. <b>4422.</b>	<b>4755</b>	<b>4765</b>	<b>4775</b>	<b>4785</b>
<b>Body material: 1.4571 (316Ti)</b>						
<b>Bonnet</b>	<b>H1<sup>1)</sup></b>	Art. No. <b>4414.</b>	<b>4792</b>	<b>4802</b>	<b>4902</b>	<b>4912</b>
closed	<b>H6<sup>1)</sup></b>	Art. No. <b>4414.</b>	<b>4794</b>	<b>4804</b>	<b>4904</b>	<b>4914</b>

<sup>1)</sup> Bolted cap H1 and bolted lifting device H6 only available for DN 200 and DN 250.  
DN 300 and DN 400 available with cap H2 and lifting device H4.

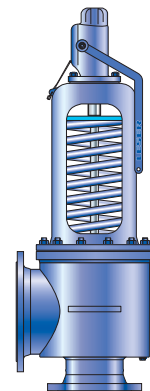
Type 441, 442  
XXL



**Type 441 XXL**  
Bolted cap H1  
Closed bonnet  
Conventional and  
balanced bellows design



**Type 441 XXL**  
Bolted lifting device H6  
Closed bonnet  
Conventional and  
balanced bellows design



**Type 441 XXL**  
Bolted lifting device H6  
Open bonnet  
Conventional and  
balanced bellows design



## Type 441, 442 XXL

### Dimensions and weights

Metric Units

	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
	Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
	Actual Orifice diameter d <sub>0</sub> [mm]	165	200	235	295
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	21382	31416	43374	68349
<b>Weight</b>					
[kg]		285	335	384	588
	with bellows	289	340	390	595
<b>Center to face</b>					
[mm]	Inlet a	305	330	330	400
	Outlet b	300	407	394 <sup>1)</sup>	477 <sup>1)</sup>
<b>Height (H6)</b>					
[mm]	Standard H max.	1473	1518	1633	1953
	Bellows H max.	1473	1518	1633	1953
<b>Support brackets</b>					
[mm]	A	470	514	640	800
	B	150	150	180	220
(drilled only on request, Option code H42)	C	Ø 18	Ø 18	Ø 24	Ø 28
	D	305	340	330	400
	E	20	20	20	20

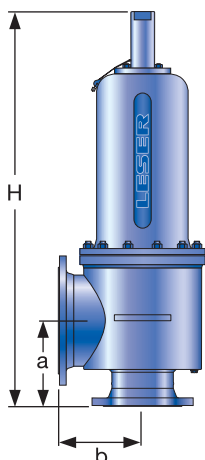
#### Body material: 1.0460 / 1.0425 (Carbon steel)

DIN Flange <sup>2)</sup>	Inlet	PN 25	PN 16
	Outlet	PN 10	PN 16

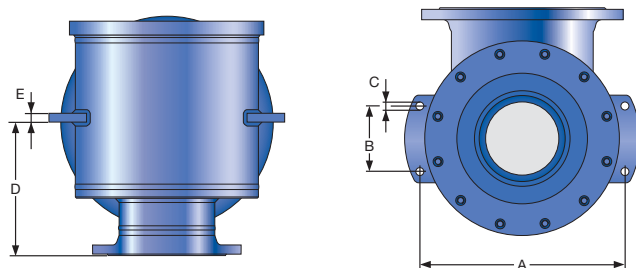
#### Body material: 1.4571 (316Ti)

DIN Flange <sup>2)</sup>	Inlet	PN 25	PN 16
	Outlet	PN 10	PN 16

- <sup>1)</sup> For pressure rating outlet higher than PN 10 centre to face dimension will change  
<sup>2)</sup> Standard flange rating. For other flange drillings and facings please refer to page 61.



Conventional and balanced bellows design



Support brackets

## Type 441, 442 XXL

### Dimensions and weights

US Units

	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size		8" x 12"	10" x 14"	12" x 16"	16" x 20"
Actual Orifice diameter d <sub>0</sub> [inch]		6.5	7.87	9.25	11.61
Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]		33.143	48.695	67.229	105.942
<b>Weight</b> [lbs]		628	739	847	1297
	with bellows	637	750	860	1312
<b>Center to face</b> [inch]	Inlet a	12	13 <sup>3</sup> / <sub>8</sub>	13 (CL300: 13 <sup>3</sup> / <sub>4</sub> )	15 <sup>3</sup> / <sub>4</sub> (CL300: 16 <sup>5</sup> / <sub>32</sub> )
	Outlet b	11 <sup>13</sup> / <sub>16</sub>	12 <sup>13</sup> / <sub>16</sub>	15 <sup>1</sup> / <sub>2</sub>	18 <sup>25</sup> / <sub>32</sub>
<b>Height (H6)</b> [inch]	Standard H max.	58	59 <sup>3</sup> / <sub>4</sub>	64 <sup>5</sup> / <sub>16</sub>	76 <sup>7</sup> / <sub>8</sub>
	Bellows H max.	58	59 <sup>3</sup> / <sub>4</sub>	64 <sup>5</sup> / <sub>16</sub>	76 <sup>7</sup> / <sub>8</sub>
<b>Support brackets</b> [inch]	A	18 <sup>1</sup> / <sub>2</sub>	20 <sup>1</sup> / <sub>4</sub>	25 <sup>3</sup> / <sub>16</sub>	31 <sup>1</sup> / <sub>2</sub>
	B	5 <sup>29</sup> / <sub>32</sub>	5 <sup>29</sup> / <sub>32</sub>	7 <sup>3</sup> / <sub>32</sub>	8 <sup>21</sup> / <sub>32</sub>
(drilled only on request, Option code H42)	C	Ø <sup>29</sup> / <sub>32</sub>	Ø <sup>23</sup> / <sub>32</sub>	Ø <sup>15</sup> / <sub>16</sub>	Ø <sup>3</sup> / <sub>32</sub>
	D	12	13 <sup>3</sup> / <sub>8</sub>	13	15 <sup>3</sup> / <sub>4</sub>
	E	<sup>25</sup> / <sub>32</sub>	<sup>25</sup> / <sub>32</sub>	<sup>25</sup> / <sub>32</sub>	<sup>25</sup> / <sub>32</sub>

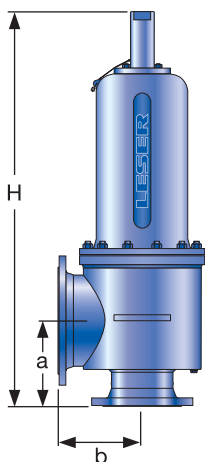
#### Body material: 1.0460 / 1.0425 (Carbon steel)

<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	CL150 or CL300
	Outlet	CL150 or CL300

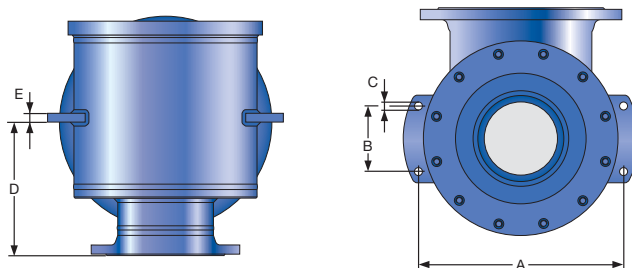
#### Body material: 1.4571 (316Ti)

<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	CL150 or CL300
	Outlet	CL150 or CL300

<sup>1)</sup> Standard flange rating. For other flange drillings and facings please refer to page 61.



Conventional and balanced bellows design



Support brackets

## Type 441, 442 XXL

### Pressure temperature ratings

Metric Units

	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
	Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
	Actual Orifice diameter d <sub>0</sub> [mm]	165	200	235	295
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	21382	31416	43374	68349
<b>Body material: 1.0460 / 1.0425 (Carbon steel)</b>					
DIN Flange	Inlet	PN 25		PN 16	
	Outlet	PN 10			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.2	0.2	0.2	0.2
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.2	0.2	0.2	0.2
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	-	-	-	-
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	20	13.4	9.25	1.25
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	25	16	16	8
<b>Temperature acc. to DIN EN</b>	min. [°C]	-85			
	max. [°C]	+420			
<b>Temperature acc. to ASME</b>	min. [°C]	-29			
	max. [°C]	+427			

<b>Body material: 1.4571 (316Ti)</b>					
DIN Flange	Inlet	PN 25		PN 16	
	Outlet	PN 10			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.2	0.2	0.2	0.2
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	0.2	0.2	0.2	0.2
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L	-	-	-	-
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	1.45	0	0	0
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	10	6	3.57	2.3
<b>Temperature acc. to DIN EN</b>	min. [°C]	-196			
	max. [°C]	+550			
<b>Temperature acc. to ASME</b>	min. [°C]	-184			
	max. [°C]	+427			

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 441, 442 XXL

### Pressure temperature ratings

US Units

	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size		8" x 12"	10" x 14"	12" x 16"	16" x 20"
Actual Orifice diameter d <sub>0</sub> [inch]		6.5	7.87	9.25	11.61
Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]		33.143	48.695	67.229	105.942

#### Body material: 1.0460 / 1.0425 (Carbon steel)

ANSI Flange Class <sup>1)</sup>	Inlet		CL150 oder CL300			
	Outlet		CL150			
<b>Minimum set pressure</b>	p [psig]	S/G/L	2.9	2.9	2.9	2.9
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig]	S/G/L	2.9	2.9	2.9	2.9
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L	-	-	-	-
<b>Maximum set pressure</b>	p [psig]	S/G/L	290	194	134	18
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	363	232	232	116
<b>Temperature acc. to DIN EN</b>	min. [°F]		-121			
	max. [°F]		+788			
<b>Temperature acc. to ASME</b>	min. [°F]		-300			
	max. [°F]		+800			

#### Body material: 1.4571 (316Ti)

ANSI Flange Class <sup>1)</sup>	Inlet		CL150 oder CL300			
	Outlet		CL150			
<b>Minimum set pressure</b>	p [psig]	S/G/L	2.9	2.9	2.9	2.9
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig]	S/G/L	2.9	2.9	2.9	2.9
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L	-	-	-	-
<b>Maximum set pressure</b>	p [psig]	S/G/L	21	0	0	0
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	145	87	52	33
<b>Temperature acc. to DIN EN</b>	min. [°F]		-321			
	max. [°F]		+1022			
<b>Temperature acc. to ASME</b>	min. [°F]		-300			
	max. [°F]		+800			

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B 16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 441, 442 XXL

### Flange drillings

	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500	
	Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"	
	Actual Orifice diameter d <sub>0</sub> [mm]	165	200	235	295	
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	21382	31416	43374	68349	
<b>Body material: 1.0460 / 1.0425 (Carbon steel), 1.4571 (316Ti)</b>						
Inlet	DIN EN 1092	PN 10	H44	H44	H44	H44
		PN 16	H45	H45	*	*
		PN 25	*	*	H46	H46
		PN 40	–	–	–	–
	ASME B16.5	CL150	H64	H64	H64	H64
		CL300	H65	–	–	–
Outlet	DIN EN 1092	PN 10	*	*	*	*
		PN 16	H51	H51	H51	H51
		PN 25	–	–	–	–
		PN 40	–	–	–	–
	ASME B16.5	CL150	H79	H79	H79	H79
		CL300	–	–	–	–

### Flange facings

Indication	Standard	Inlet	Outlet	Remark						
<b>General</b>										
Flange undrilled	–	H38	H39							
Linde-V-Nut, Form V48	Linde Standard 420-08	J07	J08	Groove: Rz 16						
Linde-V-Nut, Form V48A	LDeS 3313.36	J05	J06	Groove: Rz 4, e.g. with hydrogen						
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	J11	J12							
<b>Acc. to DIN EN 1092</b>										
		<b>Inlet</b>	<b>Outlet</b>	<b>Remark</b>						
<b>Flange facing</b> (see also LDeS 3313.40)		PN 10 – PN 40	PN 10 – PN 40	Rz-data according to DIN EN 1092 in µm						
Raised face	Type B1	*	*	Facing: Rz = 12.5 – 50						
	Type B2	L36	L38	Facing: Rz = 3.2 – 12.5						
Tongue face C <sup>1)</sup>		H94	H92	Steel flanges only						
Groove face D <sup>1)</sup>		H93	H91							
Male face E		H96	H98							
Female face F		H97	H99							
O-ring male face G		J01	J02							
O-ring female face H		J03	J04							
<b>Acc. to ASME B16.5</b>										
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-Groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		RTJ-Class	Option code	RTJ-Class	Option code
1.0619, 1.4408	all	all	L52	L53	*	*	CL150	H62	CL150	H63

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled".

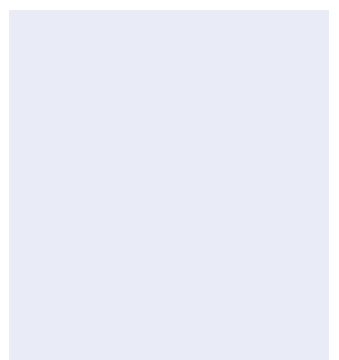
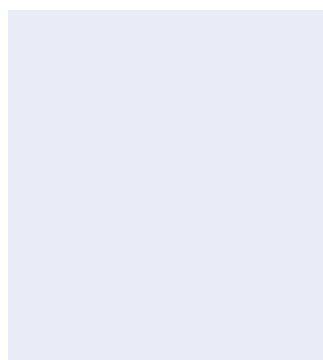
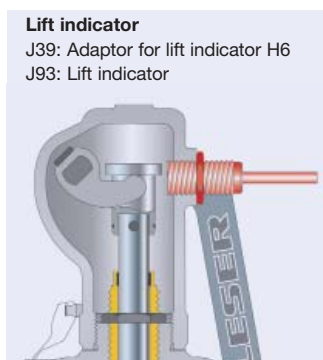
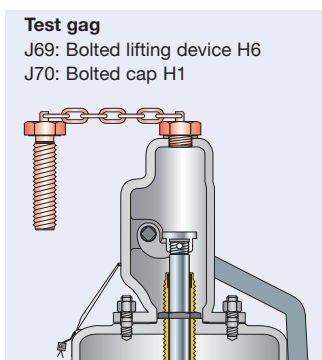
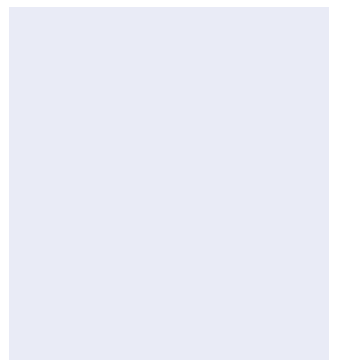
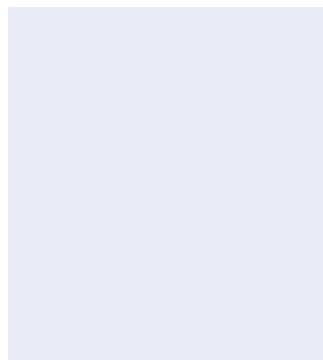
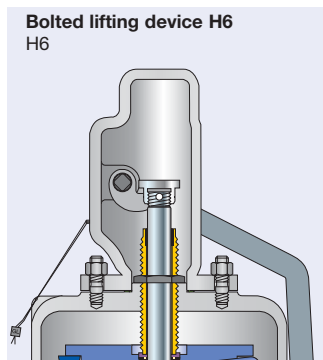
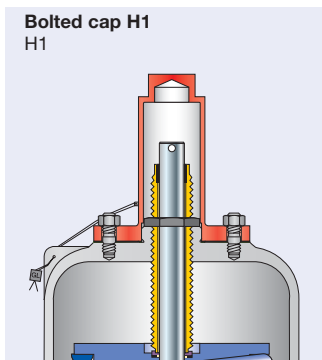
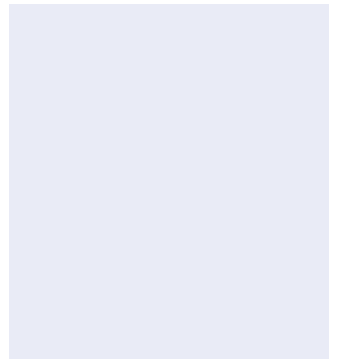
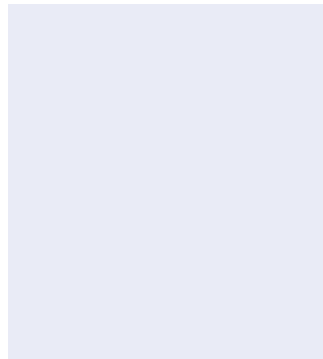
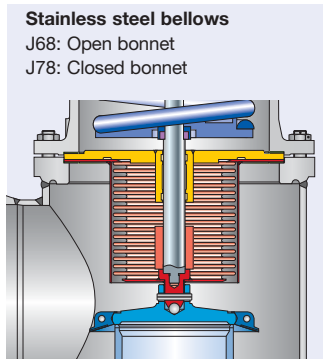
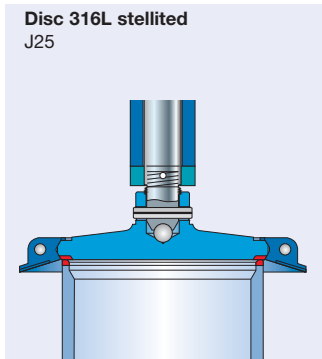
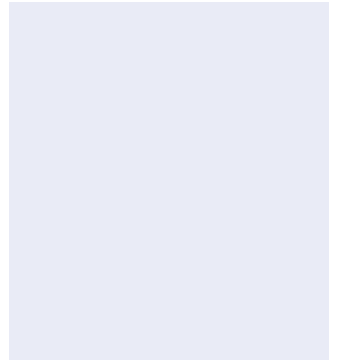
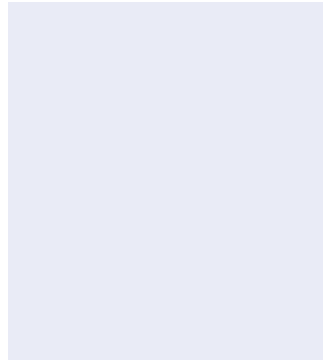
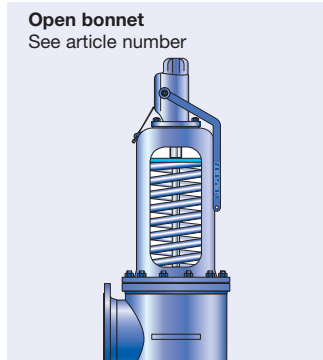
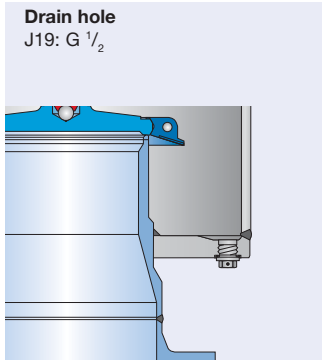
<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

## Type 441, 442 XXL Approvals

	DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
	Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
	Actual Orifice diameter d <sub>0</sub> [mm]	1665	200	235	295
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	21382	31416	43374	68349
<b>Europe</b>		<b>Coefficient of discharge K<sub>dr</sub></b>			
PED / DIN EN ISO 4126-1 12/2013	Approval No.	072020111Z0008/0/08 Rev.3			
	S/G	0.75	0.7	0.7	0.7
	L	0.56	0.52	0.52	0.52
<b>Germany</b>		<b>Coefficient of discharge α<sub>w</sub></b>			
PED / AD 2000-Merkblatt A2 07/2012	Approval No.	TÜV SV 576			
	S/G	0.75	0.7	0.7	0.7
	L	0.56	0.52	0.52	0.52
<b>United States</b>		<b>Coefficient of discharge K</b>			
ASME Sec. VIII Div. 1	Approval No.	M37044			
	S/G	0.699			
	Approval No.	M37055			
	L	0.521			
<b>Canada</b>		<b>Coefficient of discharge K</b>			
CRN	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>			
	S/G	0.699			
	L	0.521			
<b>China</b>		<b>Coefficient of discharge α<sub>w</sub></b>			
AQSIQ	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>			
	S/G	0.75	0.7	0.7	0.7
	L	0.56	0.52	0.52	0.52
<b>Eurasian Custom Union</b>		<b>Coefficient of discharge α<sub>w</sub></b>			
EAC	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>			
	S/G	0.75	0.7	0.7	0.7
	L	0.56	0.52	0.52	0.52
<b>Classification societies</b>		<b>Homepage</b>			
Bureau Veritas	BV	<a href="http://www.bureauveritas.com">www.bureauveritas.com</a>		The valid certification number is changed with every renewal.	
DNV GL		<a href="http://www.dnvgl.com">www.dnvgl.com</a>			
Lloyd' s Register EMEA	LREMEA	<a href="http://www.lr.org">www.lr.org</a>		For a sample certificate including the valid certification number see <a href="http://www.leser.com">www.leser.com</a>	
Registro Italiano Navale	RINA	<a href="http://www.rina.org">www.rina.org</a>			

**Type 441, 442 XXL**  
**Available options**



Type 441, 442  
 XXL



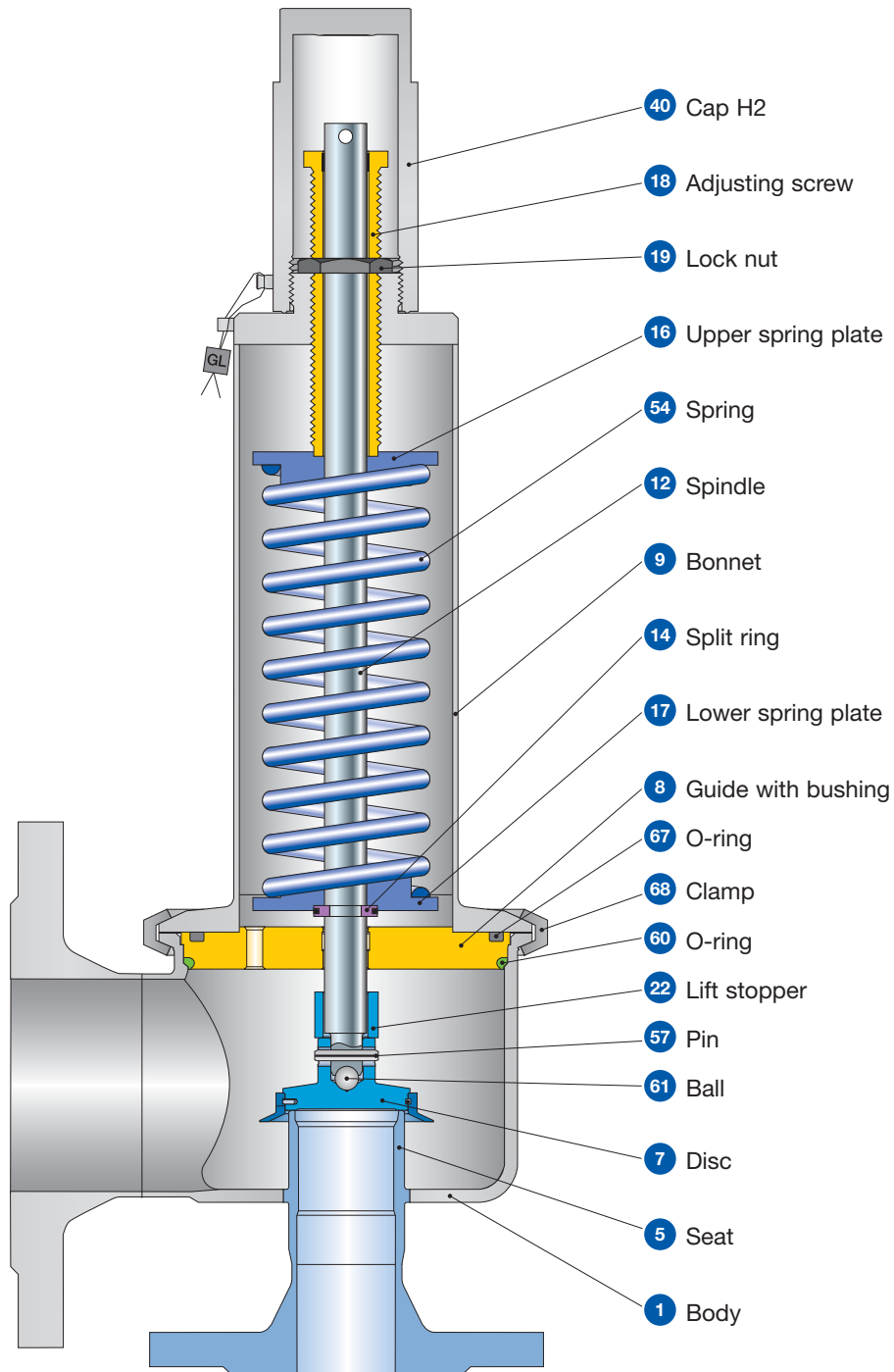
**Type 444**  
 Packed lever H4  
 Closed bonnet  
 Conventional design

**Type 444 DIN**  
**Type 444 ANSI**  
**Flanged Safety Relief Valves**

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**Type 444 DIN, 444 ANSI**  
**Conventional design**



Type 444

## Type 444 DIN, ANSI

### Conventional design

#### Materials

Item	Component	Type 4444 DIN, ANSI
1	Body	1.4404
		SA 479 316L
5	Seat	1.4404
		316L
7	Disc	1.4404
		316L
8	Guide with bushing	1.4404
		316L
		PTFE +15% glass
		PTFE +15% glass
9	Bonnet	1.4404
		SA 479 316L
12	Spindle	1.4404
		316L
14	Split ring	1.4404
		316L
16 / 17	Spring plate	1.4404
		316L
18	Adjusting screw with bushing	1.4404, PTFE + 15% glass
		316L, PTFE + 15% glass
19	Lock nut	1.4404
		316L
22	Lift stopper	1.4404
		316L
40	Cap H2	1.4404
		316L
54	Spring	1.4310
		Stainless steel
57	Pin	1.4310
		302
60	O-ring	EPDM-FDA
		EPDM-FDA
61	Ball	1.4401
		316
67	O-ring	EPDM-FDA
		EPDM-FDA
68	Clamp	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.

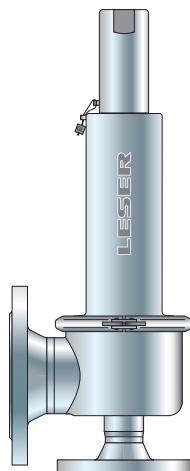
**Type 444 DIN, 444 ANSI**  
**Article numbers**

Type 444 DIN

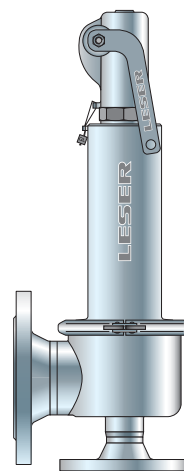
	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46	60	74	74
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301	4301
	Set pressure range S/G/L [bar <sub>g</sub> ]	See page 69				0.1 – 6.8	6.81 – 16
	Set pressure range S/G/L [psig]	See page 69				1.5 – 98.6	98.61 – 232
<b>Body material: 1.4404 (316L)</b>							
<b>Bonnet closed</b>	<b>H2</b>	Art. No. <b>4444.</b>	<b>3642</b>	<b>3662</b>	<b>3672</b>	<b>3682</b>	<b>3702</b>
	<b>H4</b>	Art. No. <b>4444.</b>	<b>3644</b>	<b>3664</b>	<b>3674</b>	<b>3684</b>	<b>3704</b>

Type 444 ANSI

	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46	60	74	74
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301	4301
	Set pressure range S/G/L [bar <sub>g</sub> ]	See page 69				0.1 – 6.8	6.81 – 16
	Set pressure range S/G/L [psig]	See page 69				1.5 – 98.6	98.61 – 232
<b>Body material: 1.4404 (316L)</b>							
<b>Bonnet closed</b>	<b>H2</b>	Art. No. <b>4444.</b>	<b>8902</b>	<b>8922</b>	<b>8932</b>	<b>8942</b>	<b>8962</b>
	<b>H4</b>	Art. No. <b>4444.</b>	<b>8904</b>	<b>8924</b>	<b>8934</b>	<b>8944</b>	<b>8964</b>



**Type 444**  
 Cap H2  
 Closed bonnet  
 Conventional design



**Type 444**  
 Packed lever H4  
 Closed bonnet  
 Conventional design

## Type 444 DIN, 444 ANSI Dimensions and weights

### Metric Units

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46	60	74	74
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301	4301
	Set pressure range S/G/L [bar <sub>g</sub> ]	See page 69				0.1 – 6.8	6.81 – 16
<b>Weight [kg]</b>		7	13	14	23	24	24
<b>Center to face [mm]</b>	Inlet a	85	110	110	125	125	125
	Outlet b	90	128	128	160	160	160
<b>Height (H4) [mm]</b>	Standard H max.	308	519	519	631	631	631

#### Body material: 1.4404 (316L)

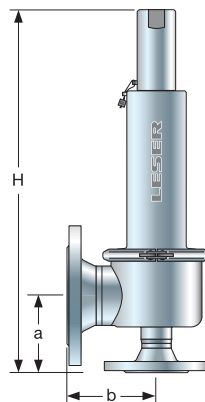
<b>DIN Flange</b>	Inlet / Outlet	PN 16
<b>ANSI Flange Class</b>	Inlet / Outlet	CL150

### US Units

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>o</sub> [inch]	0.91	1.46	1.81	2.36	2.91	2.91
	Actual Orifice area A <sub>o</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576	4.383	6.666	6.666
	Set pressure range S/G/L [psig]	See page 69				1.5 – 98.6	98.61 – 232
<b>Weight [lbs]</b>		16	29	31	51	53	53
<b>Center to face [inch]</b>	Inlet a	3 <sup>3</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>16</sub>	4 <sup>5</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>	4 <sup>15</sup> / <sub>16</sub>
	Outlet b	3 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>16</sub>	5 <sup>1</sup> / <sub>16</sub>	6 <sup>5</sup> / <sub>16</sub>	6 <sup>5</sup> / <sub>16</sub>	6 <sup>5</sup> / <sub>16</sub>
<b>Height (H4) [inch]</b>	Standard H max.	12 <sup>1</sup> / <sub>8</sub>	20 <sup>7</sup> / <sub>16</sub>	20 <sup>7</sup> / <sub>16</sub>	20 <sup>13</sup> / <sub>16</sub>	20 <sup>13</sup> / <sub>16</sub>	20 <sup>13</sup> / <sub>16</sub>

#### Body material: 1.4404 (316L)

<b>DIN Flange</b>	Inlet / Outlet	PN 16
<b>ANSI Flange Class</b>	Inlet / Outlet	CL150



Conventional design

## Type 444 DIN, 444 ANSI

### Pressure temperature ratings

#### Metric Units

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>0</sub> [mm]	23	37	46	60	74	74
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301	4301
<b>Body material: 1.4404 (316L)</b>							
<b>DIN Flange</b>	Inlet / Outlet						PN 16
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet / Outlet						CL150
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	0.1	0.1	0.1	0.1	0.1	6.81
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	16	16	16	16	6.8	16
<b>Temperature acc. to DIN EN</b>	min. [°C]						-45
	max. [°C]						+200
<b>Temperature acc. to ASME</b>	min. [°C]						-45
	max. [°C]						+200

#### US Units

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>0</sub> [inch]	0.91	1.46	1.81	2.36	2.91	2.91
	Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576	4.383	6.666	6.666
<b>Body material: 1.4404 (316L)</b>							
<b>DIN Flange</b>	Inlet / Outlet						PN 16
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet / Outlet						CL150
<b>Minimum set pressure</b>	p [psig] S/G/L	1.5	1.5	1.5	1.5	1.5	98.61
<b>Maximum set pressure</b>	p [psig] S/G/L	232	232	232	232	98.6	232
<b>Temperature acc. to DIN EN</b>	min. [°F]						-49
	max. [°F]						+392
<b>Temperature acc. to ASME</b>	min. [°F]						-49
	max. [°F]						+392

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B 16.34 apply.

## Type 444 DIN, 444 ANSI Flange drillings

	DN <sub>i</sub>	25	40	50	65	80
	DN <sub>o</sub>	50	80	80	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46	60	74
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301
<b>Body material: 1.4404 (316L)</b>						
<b>Inlet</b>	<b>DIN EN 1092</b>	PN 10	–	–	–	–
		PN 16	*	*	*	*
		PN 25	–	–	–	–
		PN 40	–	–	–	–
	<b>ASME B16.5</b>	CL150	*	*	*	*
		CL300	–	–	–	–
<b>Outlet</b>	<b>DIN EN 1092</b>	PN 10	–	–	–	–
		PN 16	*	*	*	*
		PN 25	–	–	–	–
		PN 40	–	–	–	–
	<b>ASME B16.5</b>	CL150	*	*	*	*
		CL300	–	–	–	–

## Flange facings

Indication	Standard	Inlet	Outlet	Remark						
<b>General</b>										
Flange undrilled	–	H38	H39							
Linde-V-Nut, Form V48	Linde Standard 420-08	J07	J08	Groove: Rz 16						
Linde-V-Nut, Form V48A	LDeS 3313.36	J05	J06	Groove: Rz 4, e.g. with hydrogen						
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	J11	J12							
<b>Acc. to DIN EN 1092</b>										
<b>Flange facing</b> (see also LDeS 3313.40)		PN 10 – PN 40	PN 10 – PN 40	Rz-data according to DIN EN 1092 in µm						
Raised face	Type B1	*	*	Facing: Rz = 12.5 – 50						
	Type B2	L36	L38	Facing: Rz = 3.2 – 12.5						
Tongue face C <sup>1)</sup>		H94	H92	Steel flanges only						
Groove face D <sup>1)</sup>		H93	H91							
Male face E		H96	H98							
Female face F		H97	H99							
O-ring male face G		J01	J02							
O-ring female face H		J03	J04							
<b>Acc. to ASME B16.5</b>										
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-Groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		RTJ- Class	Option code	RTJ- Class	Option code
1.4404	all	all	L52	L53	*	*	CL150	H62	CL150	H63

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled".

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

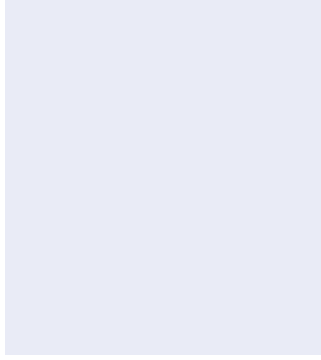
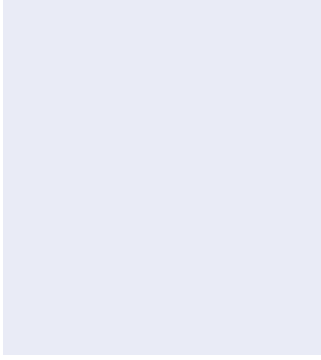
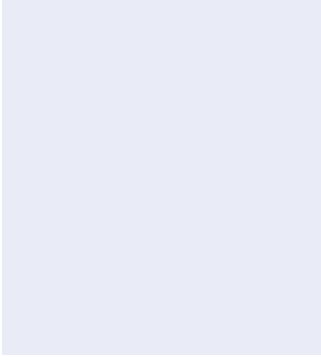
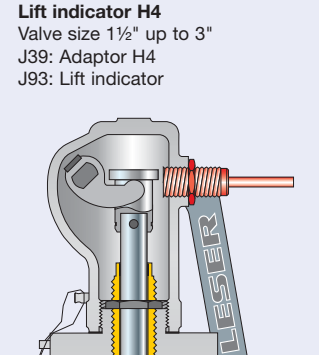
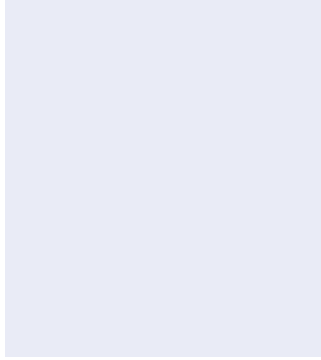
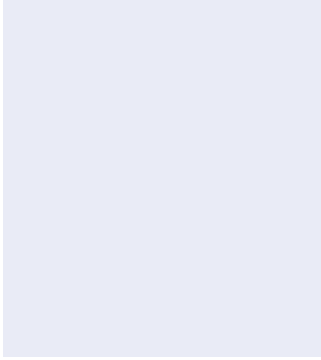
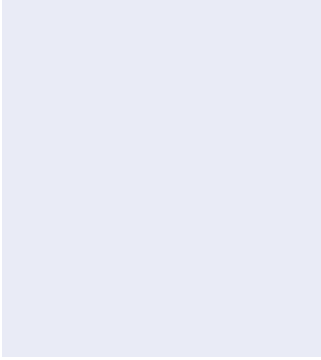
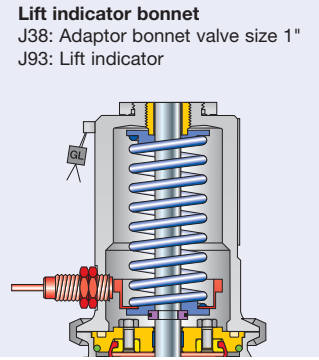
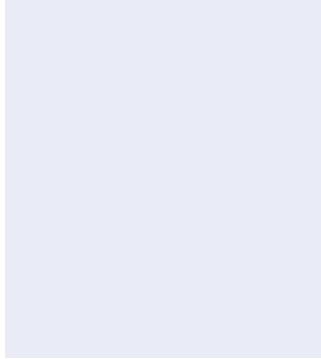
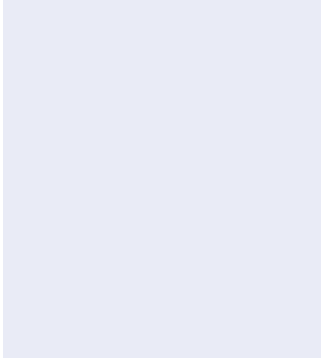
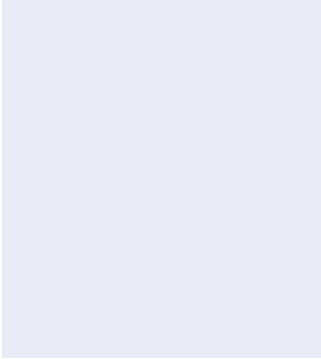
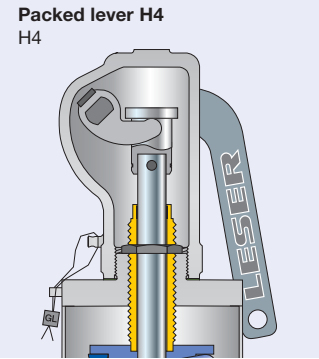
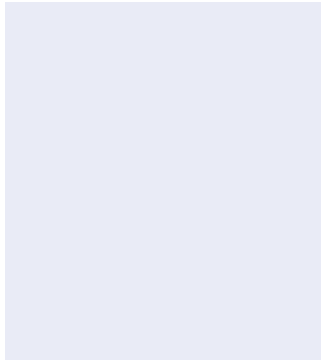
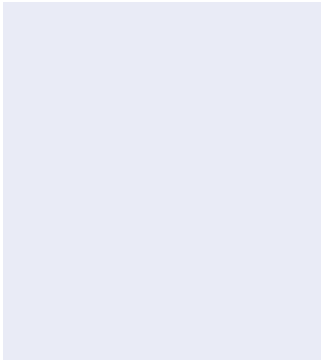
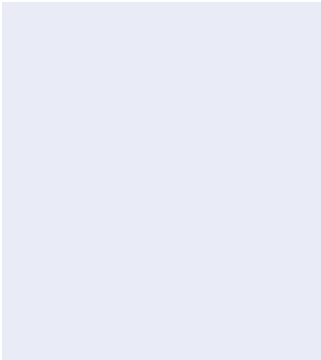
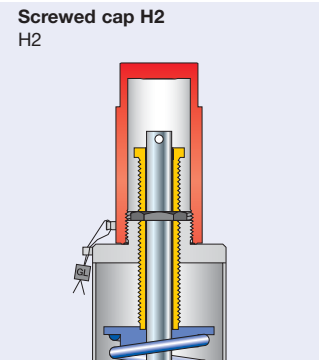
## Type 444 DIN, 444 ANSI

### Approvals

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46	60	74	74
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301	4301
	Set pressure range S/G/L [bar <sub>g</sub> ]	See page 69				0.1 – 6.8	6.81 – 16
	Set pressure range S/G/L [psig]					1.5 – 98.6	98.61 – 232
<b>Europe</b>		<b>Coefficient of discharge K<sub>dr</sub></b>					
PED / DIN EN ISO 4126-1 12/2013	Approval No.	072020111Z0008/0/08 Rev.3					
	S/G	0.7					0.55
	F	0.48					0.48
<b>Germany</b>		<b>Coefficient of discharge α<sub>w</sub></b>					
PED / AD 2000-Merkblatt A2 07/2012	Approval No.	TÜV SV 576					
	S/G	0.7					0.55
	F	0.48					0.48
<b>United States</b>		<b>Coefficient of discharge K</b>					
ASME Sec. VIII Div. 1	Approval No.	M37044					–
	S/G	0.699					–
	Approval No.	M37055					M37055
	F	0.521					0.521
<b>Canada</b>		<b>Coefficient of discharge K</b>					
CRN	Approval No.	For current approval no. see www.leser.com					
	S/G	0.699					–
	F	0.521					0.521
<b>China</b>		<b>Coefficient of discharge α<sub>w</sub></b>					
AQSIQ	Approval No.	For current approval no. see www.leser.com					
	S/G	0.7					0.55
	F	0.48					0.48
<b>Eurasian Custom Union</b>		<b>Coefficient of discharge α<sub>w</sub></b>					
EAC	Approval No.	For current approval no. see www.leser.com					
	S/G	0.7					0.55
	F	0.48					0.48
<b>Classification societies</b>							
		on request					

**Type 444 DIN, 444 ANSI**

**Available Options**



Type 444



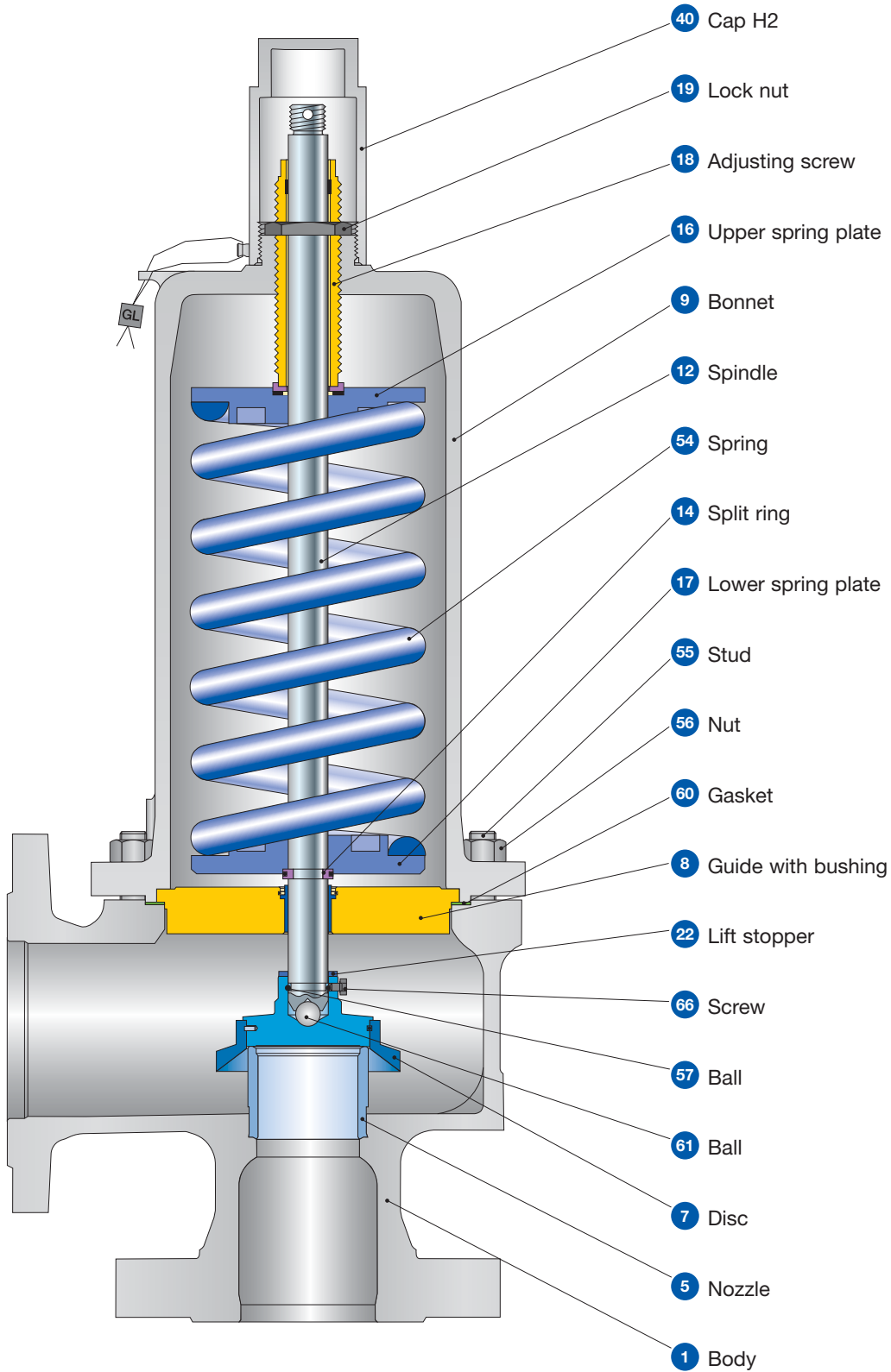


**Type 456**  
 Packed lever H4  
 Closed bonnet  
 Conventional design

**Type 455, 456**  
**Flanged Safety Relief Valves**

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**Type 455, 456**  
**Conventional design**



Type 455, 456

## Type 455, 456

### Conventional design

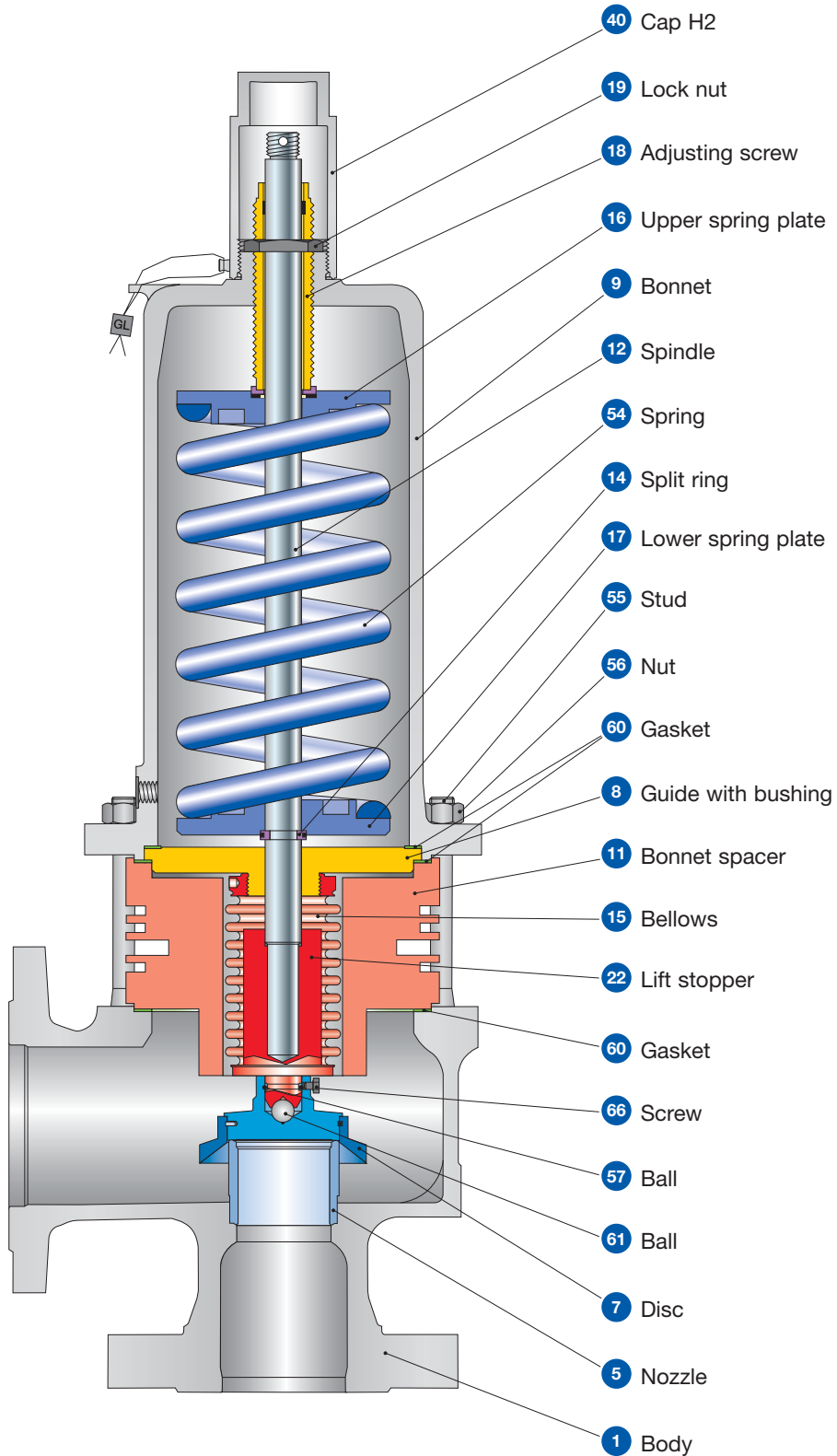
#### Materials

Item	Component	Type 4552 / 4562	Type 4564
1	Body	1.0619	1.4581
		SA 216 WCB	SA 351 CF10M
5	Seat	1.4404	1.4404
		316L	316L
7	Disc	1.4122	1.4404
		Hardened stainless steel	316L
8	Guide with bushing	1.0501, 0.7040	1.4404
		Chrome or carbon steel	316L
		1.4104 tenifer	-
		Chrome steel	-
9	Bonnet	0.7043 (Open bonnet 0.7040), 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M, SA 479 316L, 316Ti
12	Spindle	1.4404	1.4404
		316L	316L
14	Split ring	1.4104	1.4404
		Chrome steel	316L
16 / 17	Spring plate	1.0718	1.4404
		Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.4404
		Steel	316L
22	Lift stopper	1.4404	1.4404
		316L	316L
40	Cap H2	1.0460	1.4404
		SA 105	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Stainless steel
	Spring optional	1.4310	-
		Stainless steel	-
55	Stud	1.4401	1.4401
		B8M	B8M
56	Nut	1.4401	1.4401
		8M	8M
57	Ball	1.4401	1.4401
		316	316
60	Gasket	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316
61	Ball	1.3541	1.4401
		Hardened stainless steel	316
66	Screw	1.4401	1.4401
		B8M	B8M

**Please notice:**

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

**Type 455, 456**  
**Balanced bellows design**



Type 455, 456

## Type 455, 456

### Balanced bellows design

#### Materials

Item	Component	Type 4552 / 4562	Type 4564
1	Body	1.0619	1.4581
		SA 216 WCB	SA 351 CF10M
5	Nozzle	1.4404	1.4404
		316L	316L
7	Disc	1.4122	1.4404
		Hardened stainless steel	316L
8	Guide with bushing	1.0501, 0.7040	1.4404
		Chrome or carbon steel	316L
		1.4104 tenifer	-
		Chrome steel	-
9	Bonnet	0.7043 or 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18 or SA 216 WCB	SA 351 CF8M, SA 479 316L, 316Ti
11	Bonnet spacer	1.0460	1.4404
		Carbon steel	316L
12	Spindle	1.4404	1.4404
		316L	316L
14	Split ring	1.4104	1.4404
		Chrome steel	316L
15	Bellows	1.4571	1.4571
		316Ti	316Ti
16 / 17	Spring plate	1.0718	1.4404
		Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.4404
		Steel	316L
22	Lift stopper	1.4404	1.4404
		316L	316L
40	Cap H2	1.0460	1.4404
		SA 105	316L
54	Spring Standard	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Stainless steel
55	Stud	1.7709	1.4401
		B16	B8M
56	Nut	1.7258	1.4401
		7M	8M
57	Ball	1.4401	1.4401
		316	316
60	Gasket	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316	Graphite / 316
61	Ball	1.3541	1.4401
		Hardened stainless steel	316
66	Screw	1.4401	1.4401
		B8M	B8M

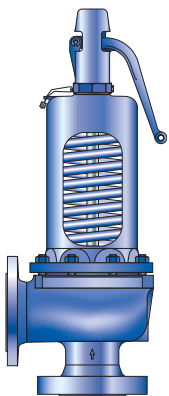
**Please notice:**

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

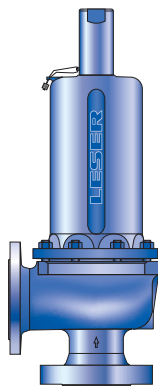
## Type 455, 456

### Article numbers

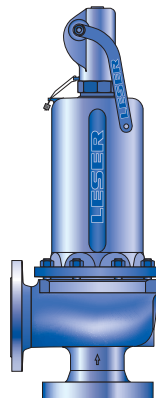
	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150	
Valve size		1" x 2"	2" x 3"	3" x 4"	4" x 6"	
Actual Orifice diameter d <sub>0</sub> [mm]		20	40	60	74	
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		314	1257	2827	4301	
<b>Body material: 1.0619 (WCB)</b>						
<b>Bonnet</b>	<b>H2</b>	Art. No. <b>4562.</b>	<b>6012</b>	<b>6022</b>	<b>6032</b>	<b>6042</b>
closed	<b>H3</b>	Art. No. <b>4562.</b>	<b>6013</b>	<b>6023</b>	<b>6033</b>	-
	<b>H4</b>	Art. No. <b>4562.</b>	<b>6014</b>	<b>6024</b>	<b>6034</b>	<b>6044</b>
open	<b>H3</b>	Art. No. <b>4552.</b>	<b>6015</b>	<b>6025</b>	<b>6035</b>	<b>6045</b>
<b>Body material: 1.4581 (CF10M)</b>						
<b>Bonnet</b>	<b>H2</b>	Art. No. <b>4564.</b>	<b>6052</b>	<b>6062</b>	<b>6072</b>	<b>6082</b>
closed	<b>H4</b>	Art. No. <b>4564.</b>	<b>6054</b>	<b>6064</b>	<b>6074</b>	<b>6084</b>



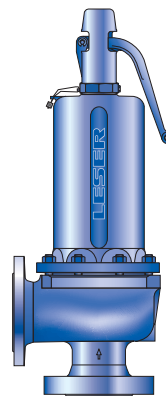
**Type 455**  
Plain lever H3  
Open bonnet  
Conventional design



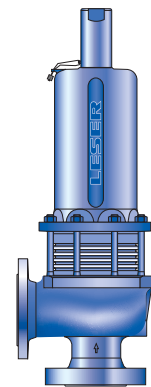
**Type 456**  
Cap H2  
Closed bonnet  
Conventional design



**Type 456**  
Packed lever H4  
Closed bonnet  
Conventional design



**Type 456**  
Plain lever H3  
Closed bonnet  
Conventional design



**Type 456**  
Cap H2  
Closed bonnet  
Balanced bellows design

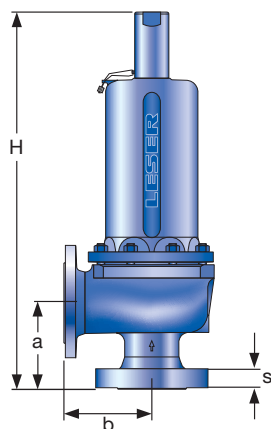
## Type 455, 456

### Dimensions and weights

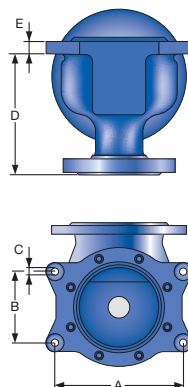
Metric Units

DN <sub>I+O</sub>		25 x 50	50 x 80	80 x 100	100 x 150
Valve size		1" x 2"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter d <sub>0</sub> [mm]		20	40	60	74
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		314	1257	2827	4301
<b>Weight</b>					
[kg]		18	43	85	154
with bellows		20	46	102	185
<b>Center to face</b>					
[mm]					
Inlet a		122	155	175	210
Outlet b (PN 40)		120	145	180	235
Outlet b (PN 63)		120	145	205	265
<b>Measure</b>					
Used to find bolt length for inlet flange [mm]		s			
		28	38	38	45
<b>Height (H4)</b>					
[mm]					
Standard H max.		493	684	807	1059
Bellows H max.		528	764	905	1150
<b>Support brackets</b>					
[mm]					
A		140	184	278	364
B		–	110	160	210
C		Ø 14	Ø 14	Ø 18	Ø 18
D		149	194	225	288
E		18	18	27	32
<b>Body material: 1.0619 (WCB)</b>					
<b>DIN Flange<sup>1)</sup></b>					
Inlet		PN 63 – 160			
Outlet		PN 40 – 63	PN 40		
<b>Body material: 1.4581 (CF10M)</b>					
<b>DIN Flange<sup>1)</sup></b>					
Inlet		PN 63 – 160			
Outlet		PN 40 – 63	PN 40		

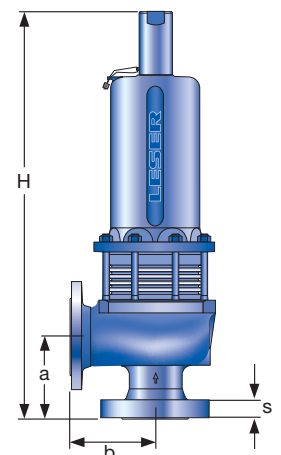
<sup>1)</sup> Standard flange rating. For other flange drillings please refer to page 83.



Conventional design



Support brackets



Balanced bellows design

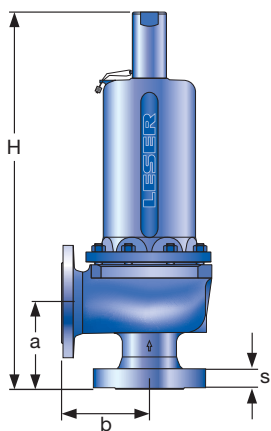
## Type 455, 456

### Dimensions and weights

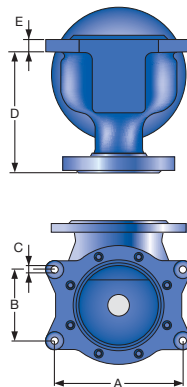
US Units

	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
Valve size		1" x 2"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter d <sub>0</sub> [inch]		0.79	1.57	2.36	2.91
Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]		0.487	1.948	4.383	6.666
<b>Weight</b> [lbs]		40	95	187	340
	with bellows	44	101	225	408
<b>Center to face</b> [inch]	Inlet a	4 <sup>13</sup> / <sub>16</sub>	6 <sup>3</sup> / <sub>32</sub>	6 <sup>7</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>4</sub>
	Outlet b (PN 40)	4 <sup>23</sup> / <sub>32</sub>	5 <sup>23</sup> / <sub>32</sub>	7 <sup>3</sup> / <sub>32</sub>	9 <sup>1</sup> / <sub>4</sub>
	Outlet b (PN 63)	4 <sup>23</sup> / <sub>32</sub>	5 <sup>23</sup> / <sub>32</sub>	8 <sup>1</sup> / <sub>16</sub>	10 <sup>7</sup> / <sub>16</sub>
<b>Measure</b> [inch]	Used to find bolt length for inlet flange s	1 <sup>3</sup> / <sub>32</sub>	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	1 <sup>25</sup> / <sub>32</sub>
<b>Height (H4)</b> [inch]	Standard H max.	19 <sup>23</sup> / <sub>32</sub>	26 <sup>15</sup> / <sub>16</sub>	31 <sup>25</sup> / <sub>32</sub>	41 <sup>11</sup> / <sub>16</sub>
	Bellows H max.	20 <sup>25</sup> / <sub>32</sub>	30 <sup>3</sup> / <sub>32</sub>	35 <sup>5</sup> / <sub>8</sub>	45 <sup>1</sup> / <sub>4</sub>
<b>Support brackets</b> [inch]	A	5 <sup>1</sup> / <sub>2</sub>	7 <sup>1</sup> / <sub>4</sub>	10 <sup>5</sup> / <sub>16</sub>	4 <sup>11</sup> / <sub>32</sub>
	B	–	4 <sup>11</sup> / <sub>32</sub>	6 <sup>5</sup> / <sub>16</sub>	8 <sup>9</sup> / <sub>32</sub>
	C	Ø <sup>9</sup> / <sub>16</sub>	Ø <sup>9</sup> / <sub>16</sub>	Ø <sup>23</sup> / <sub>32</sub>	Ø <sup>23</sup> / <sub>32</sub>
	D	5 <sup>7</sup> / <sub>8</sub>	7 <sup>5</sup> / <sub>8</sub>	8 <sup>27</sup> / <sub>32</sub>	11 <sup>11</sup> / <sub>32</sub>
	E	<sup>23</sup> / <sub>32</sub>	<sup>23</sup> / <sub>32</sub>	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>4</sub>
<b>Body material: 1.0619 (WCB)</b>					
<b>ANSI Flange</b>	Inlet	CL300 – 600			
<b>Class<sup>1)</sup></b>	Outlet	CL150 – 300			CL150
<b>Body material: 1.4581 (CF10M)</b>					
<b>ANSI Flange</b>	Inlet	CL300 – 600			
<b>Class<sup>1)</sup></b>	Outlet	CL150 – 300			CL150

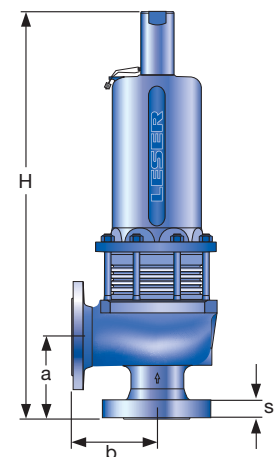
<sup>1)</sup> Standard flange rating. For other flange drillings please refer to page 83.



Conventional design



Support brackets



Balanced bellows design



## Type 455, 456

### Pressure temperature ratings

Metric Units

	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
Valve size		1" x 2"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter d <sub>0</sub> [mm]		20	40	60	74
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		314	1257	2827	4301
<b>Body material: 1.0619 (WCB)</b>					
<b>DIN Flange</b>	Inlet	<b>PN 63 – 100</b>			
	Outlet	<b>PN 40 – 63</b>		<b>PN 40</b>	
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	2.5	2.5	2.5	2.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	13.5	2.5	10	5
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L		on request		
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	100	98	63	53
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	100	100	63	63
<b>Temperature acc. to DIN EN</b>	min. [°C]	-85			
	max. [°C]	+450			
<b>Temperature acc. to ASME</b>	min. [°C]	-29			
	max. [°C]	+427			

<b>Body material: 1.4581 (CF10M)</b>					
<b>DIN Flange</b>	Inlet	<b>PN 63 – 100</b>			
	Outlet	<b>PN 40 – 63</b>		<b>PN 40</b>	
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	2.5	2.5	2.5	2.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	13.5	2.5	10	5
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L		on request		
<b>Maximum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	100	61	35	16.9
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	100	65	43	43
<b>Temperature acc. to DIN EN</b>	min. [°C]	-85			
	max. [°C]	+450, > 450 °C → Please use Type 457/458			
<b>Temperature acc. to ASME</b>	min. [°C]	-29			
	max. [°C]	+450, > 450 °C → Please use Type 457/458			

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 455, 456

### Pressure temperature ratings

#### US Units

	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
Valve size		1" x 2"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter d <sub>0</sub> [inch]		0.79	1.57	2.36	2.91
Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]		0.487	1.948	4.383	6.666
<b>Body material: 1.0619 (WCB)</b>					
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL300 – 600</b>			
	Outlet	<b>CL150 – 300</b>		<b>CL150</b>	
<b>Minimum set pressure</b>	p [psig] S/G/L	36	36	36	36
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig] S/G/L	196	36	145	73
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L		on request		
<b>Maximum set pressure</b>	p [psig] S/G/L	1450	1421	914	769
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	1450	1450	914	914
<b>Temperature acc. to DIN EN</b>	min. [°F]	-121			
	max. [°F]	+842			
<b>Temperature acc. to ASME</b>	min. [°F]	-20			
	max. [°F]	+800			

<b>Body material: 1.4581 (CF10M)</b>					
<b>ANSI Flange Class<sup>1)</sup></b>	Inlet	<b>CL300 – 600</b>			
	Outlet	<b>CL150 – 300</b>		<b>CL150</b>	
<b>Minimum set pressure</b>	p [psig] S/G/L	36	36	36	36
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig] S/G/L	196	36	145	73
<b>Min. set pressure low press. bellows</b>	p [psig] S/G/L		on request		
<b>Maximum set pressure</b>	p [psig] S/G/L	1450	885	508	245
<b>Max. set pressure with special spring</b>	p [psig] S/G/L	1450	943	624	624
<b>Temperature acc. to DIN EN</b>	min. [°F]	-121			
	max. [°F]	+842, > 842 °F → Please use Type 457/458			
<b>Temperature acc. to ASME</b>	min. [°F]	-20			
	max. [°F]	+842, > 842 °F → Please use Type 457/458			

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 455, 456

### Flange drillings

	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150		
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"		
	Actual Orifice diameter d <sub>0</sub> [mm]	20	40	60	74		
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	314	1257	2827	4301		
<b>Body material: 1.0619 (WCB), 1.4581 (CF10M)</b>							
<b>Inlet</b>	<b>DIN EN 1092</b>	PN 16	H47	H47	H47	H47	
		PN 25	H47	H47	H47	H47	
		PN 40	H47	H47	H47	H47	
		PN 63	*	H10	H10	H10	
		PN 100	*	*	*	*	
		PN 160	*	*	*	*	
		PN 250	-	-	-	-	
		PN 320	-	-	-	-	
		PN 400	-	-	-	-	
	<b>ASME B16.5</b>	CL150	-	-	-	-	
		CL300	H65	H65	H65	H65	
		CL600	H67	H67	H67	H67	
		CL900	H69	H69	-	-	
		CL1500	H69	H69	-	-	
		CL2500	-	-	-	-	
	<b>Outlet</b>	<b>DIN EN 1092</b>	PN 10	*	*	H51	H51
			PN 16	*	*	H51	H51
PN 25			*	*	*	*	
PN 40			*	*	*	*	
PN 63			H16	H16	-	-	
<b>ASME B16.5</b>		CL150	H79	H79	H79	H79	
		CL300	H80	H80	-	-	

## Type 455, 456

### Flange facings

Indication	Standard	Inlet		Outlet		Remark				
<b>General</b>										
Flange undrilled	–	H38		H39						
Linde-V-Nut, Type V48	Linde Standard 420-08 LDeS 3313.36	J07		J08		Groove: Rz 16				
Linde-V-Nut, Type V48A		J05		J06		Groove: Rz 4, e.g. with hydrogen				
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	J11		J12						
<b>Acc. to DIN EN 1092</b>										
<b>Flange facing</b> (see LDeS 3313.40)		Inlet		Outlet		Remark				
		PN 10 – PN 40	PN 63	PN 10 – PN 40	PN 63	Rz-data according to DIN EN 1092 in µm				
Raised face	Type B1	*	–	*	–	Facing: Rz = 12.5 – 50				
	Type B2	L36	*	L38	*	Facing: Rz = 3.2 – 12.5				
Tongue face C <sup>1)</sup>		H94		H92		Steel flange only				
Groove face D <sup>1)</sup>		H93		H91						
Male face E		H96		H98						
Female face F		H97		H99						
O-ring male face G		J01		J02						
O-ring female face H		J03		J04						
<b>Acc. to ASME B16.5</b>										
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		RTJ- Class	Option code	RTJ- Class	Option code
1.0619, 1.4581	all	all	L52	L53	*	*	CL300 – 1500	H62	CL150	H63
							CL2500	–	CL300	H63

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled".

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

## Type 455, 456

### Approvals

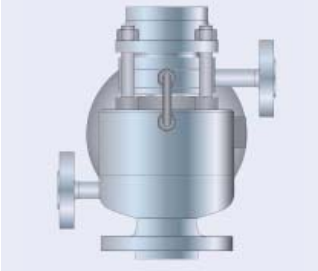
	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
	Actual Orifice diameter d <sub>0</sub> [mm]	20	40	60	74
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	314	1257	2827	4301
<b>Europe</b>		<b>Coefficient of discharge K<sub>dr</sub></b>			
PED / DIN EN ISO 4126-1 12/2013	Approval No.	072020111Z0008/0/11			
	S/G	0.8	0.8	0.75	0.8
	L	0.6	0.54	0.5	0.56
<b>Germany</b>		<b>Coefficient of discharge α<sub>w</sub></b>			
PED / AD 2000-Merkblatt A2 07/2012	Approval No.	TÜV SV 934			
	S/G	0.8	0.8	0.75	0.8
	L	0.6	0.54	0.5	0.56
<b>United States</b>		<b>Coefficient of discharge K</b>			
ASME Sec. VIII	Approval No.	M37066	M37066	M37088	M37066
	S/G	0.798	0.798	0.754	0.798
	Approval No.	M37077	M37077	M37099	M37077
	L	0.572	0.572	0.479	0.572
<b>Canada</b>		<b>Coefficient of discharge K</b>			
CRN	Approval No.	-			
	S/G	0.798	0.798	0.754	0.798
	L	0.572	0.572	0.479	0.572
<b>China</b>		<b>Coefficient of discharge α<sub>w</sub></b>			
AQSIQ	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>			
	S/G	0.8	0.8	0.75	0.8
	L	0.6	0.54	0.5	0.56
<b>Eurasian Custom Union</b>		<b>Coefficient of discharge α<sub>w</sub></b>			
EAC	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>			
	S/G	0.8	0.8	0.75	0.8
	L	0.6	0.54	0.5	0.56
<b>Classification societies</b>		on request			

## Type 455, 456

### Available Options

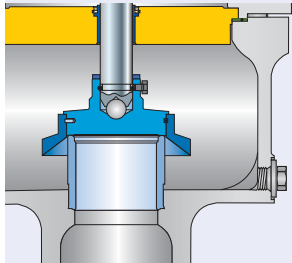
#### Heating jacket

H29, H30: Couplings G  $\frac{3}{8}$ , G  $\frac{3}{4}$   
 H31, H32: Flanges DN 15, DN 25



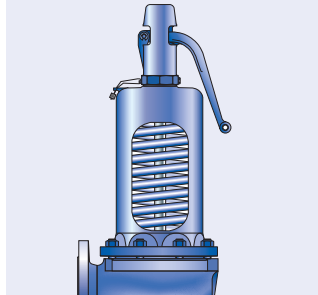
#### Drain hole

J18: G  $\frac{1}{4}$   
 J19: G  $\frac{1}{2}$



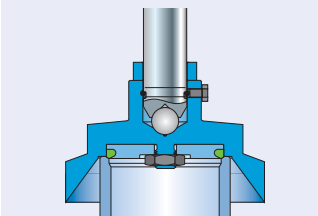
#### Open bonnet

See article number



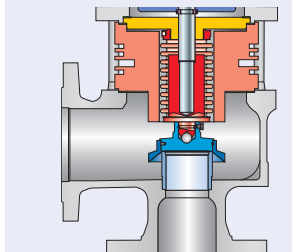
#### O-ring disc

J20: FFKM "C"  
 J21: CR "K"  
 J22: EPDM "D"  
 J23: FKM "L"

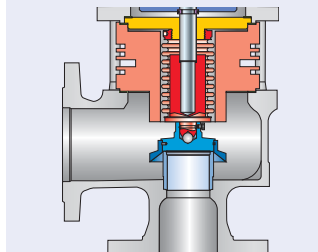


#### Stainless steel bellows

J68: Open bonnet  
 J78: Closed bonnet

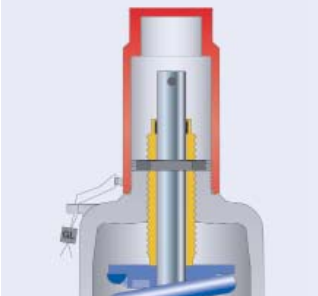


#### Conversion kit for stainless steel bellows on request



#### Screwed cap H2

H2



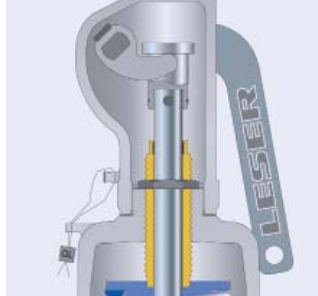
#### Plain lever H3

H3



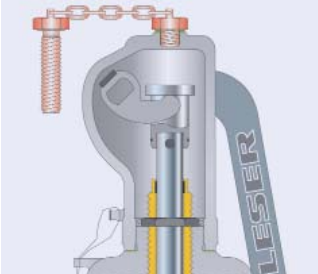
#### Packed lever H4

H4



#### Test gag

J69: H4  
 J70: H2



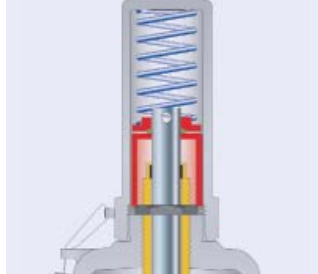
#### Lift indicator

J39: Adaptor H4  
 J93: Lift indicator



#### O-ring damper H2

J65



#### O-ring damper H4

J66



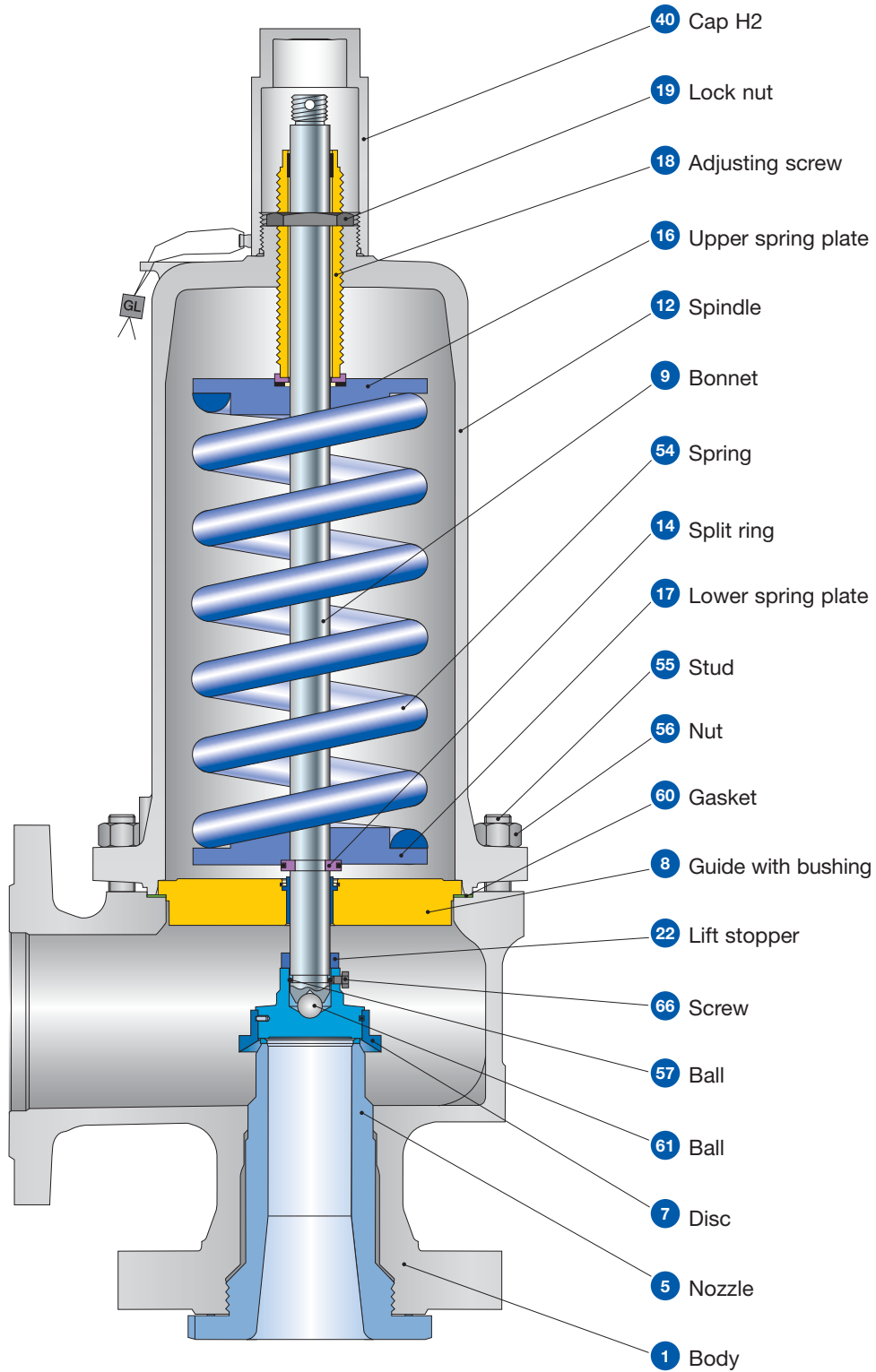


**Type 458**  
 Packed lever H4  
 Closed bonnet  
 Conventional design

**Type 457, 458**  
**Flanged Safety Relief Valves**

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**Type 457, 458**  
**Conventional design**





## Type 457, 458

### Conventional design

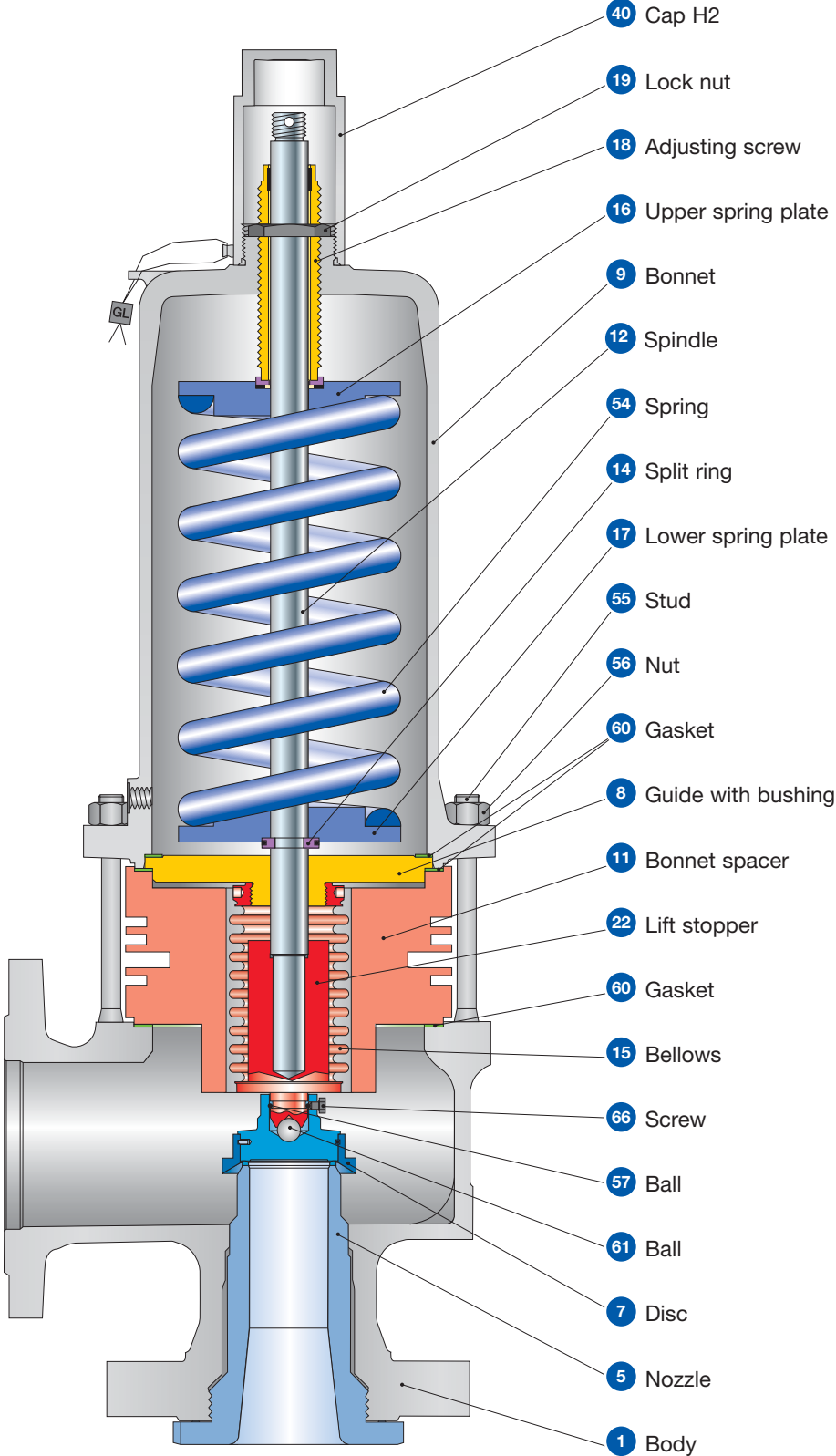
#### Materials

Item	Component	Type 4572 / 4582	Type 4577 / 4587	Type 4584
1	Body	1.0619	1.7357	1.4581
		SA 216 WCB	SA 217 WC6	SA 351 CF10M
5	Nozzle	1.4404 stellited	1.4404 stellited	1.4404 stellited
		316L stellited	316L stellited	316L stellited
7	Disc	1.4122	1.4122	1.4404
		Hardened stainless steel	Hardened stainless steel	316L
8	Guide with bushing	1.0501, 0.7040 Chrome or carbon steel	1.0501, 0.7040 Chrome or carbon steel	1.4404 316L
		1.4104 tenifer Chrome steel	1.4104 tenifer Chrome steel	–
9	Bonnet	0.7043 (Open bonnet 0.7040), 1.0619	0.7043 (Open bonnet 0.7040), 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18, SA 216 WCB	Ductile Gr. 60-40-18, SA 216 WCB	SA 351 CF8M, SA 479 316L, 316Ti
12	Spindle	1.4404	1.4404	1.4404
		316L	316L	316L
14	Split ring	1.4104	1.4104	1.4404
		Chrome steel	Chrome steel	316L
16 / 17	Spring plate	1.0718	1.0718	1.4404
		Steel	Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.0718	1.4404
		Steel	Steel	316L
22	Lift stopper	1.4404	1.4404	1.4404
		316L	316L	316L
40	Cap H2	1.0460	1.4404	1.4404
		SA 105	316L	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Carbon steel	Stainless steel
	Spring optional	1.4310	1.4310	–
		Stainless steel	Stainless steel	–
55	Stud	1.4401	1.4401	1.4401
		B8M	B8M	B8M
56	Nut	1.4401	1.4401	1.4401
		8M	8M	8M
57	Ball	1.4401	1.4401	1.4401
		316	316	316
60	Gasket	Graphite / 1.4401	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316L	Graphite / 316L	Graphite / 316L
61	Ball	1.3541	1.3541	1.4401
		Hardened stainless steel	Hardened stainless steel	316
66	Screw	1.4401	1.4401	1.4401
		B8M	B8M	B8M

**Please notice:**

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

Type 457, 458  
Balanced bellows design



## Type 457, 458

### Balanced bellows design

#### Materials

Item	Component	Type 4572 / 4582	Type 4577 / 4587	Type 4584
1	Body	1.0619	1.7357	1.4581
		SA 216 WCB	SA 217 WC6	SA 351 CF10M
5	Nozzle	1.4404 stellited	1.4404 stellited	1.4404 stellited
		316L stellited	316L stellited	316L stellited
7	Disc	1.4122	1.4122	1.4404
		Hardened stainless steel	Hardened stainless steel	316L
8	Guide with bushing	1.0501, 0.7040	1.0501, 0.7040	1.4404
		Chrome or carbon steel	Chrome or carbon steel	316L
		1.4104 tenifer Chrome steel	1.4104 tenifer Chrome steel	-
9	Bonnet	0.7043 or 1.0619	0.7043 or 1.0619	1.4408, 1.4404, 1.4571
		Ductile Gr. 60-40-18 or SA 216 WCB	Ductile Gr. 60-40-18 or SA 216 WCB	SA 351 CF8M, SA 479 316L, 316Ti
11	Bonnet spacer	1.0460	1.0460	1.4404
		Carbon steel	Carbon steel	316L
12	Spindle	1.4404	1.4404	1.4404
		316L	316L	316L
14	Split ring	1.4104	1.4104	1.4404
		Chrome steel	Chrome steel	316L
15	Bellows	1.4571	1.4571	1.4571
		316Ti	316Ti	316Ti
16 / 17	Spring plate	1.0718	1.0718	1.4404
		Steel	Steel	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4104 PTFE	1.4404 PTFE
		Chrome steel PTFE	Chrome steel PTFE	316L PTFE
19	Lock nut	1.0718	1.0718	1.4404
		Steel	Steel	316L
22	Lift stopper	1.4404	1.4404	1.4404
		316L	316L	316L
40	Cap H2	1.0460	1.4404	1.4404
		SA 105	316L	316L
54	Spring standard	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.4310
		Carbon steel	Carbon steel	Stainless steel
	Spring optional	1.4310	1.4310	-
55	Stud	1.7709	1.7709	1.4401
		B16	B16	B8M
56	Nut	1.7258	1.7258	1.4401
		7M	7M	8M
57	Ball	1.4401	1.4401	1.4401
		316	316	316
60	Gasket	Graphite / 1.4401	Graphite / 1.4401	Graphite / 1.4401
		Graphite / 316L	Graphite / 316L	Graphite / 316L
61	Ball	1.3541	1.3541	1.4401
		Hardened stainless steel	Hardened stainless steel	316
66	Screw	1.4401	1.4401	1.4401
		B8M	B8M	B8M

#### Bitte beachten:

- LESER behält sich Änderungen vor.
- LESER kann, ohne vorherige Benachrichtigung, höherwertige Materials einsetzen.
- Jedes Bauteil kann entsprechend der Kundenspezifikation in einem anderen Werkstoff ausgeführt werden.

## Type 457, 458

### Article numbers

	DN <sub>I+O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100
	Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>0</sub> [mm]	15	20	30	40	50	60
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827

Body material: 1.0619 (WCB)								
Bonnet closed	H2	Art. No. 4582.	6102	6112	6122	6132	6142	6152
	H3	Art. No. 4582.	6103	6113	6123	6133	6143	6153
	H4	Art. No. 4582.	6104	6114	6124	6134	6144	6154
open	H3	Art. No. 4572.	6105	6115	6125	6135	6145	6155

Body material: 1.7357 (WC6)								
Bonnet closed	H2	Art. No. 4587.	6302	6312	6322	6332	6342	6352
	H3	Art. No. 4587.	6303	6313	6323	6333	6343	6353
	H4	Art. No. 4587.	6304	6314	6324	6334	6344	6354
open	H3	Art. No. 4577.	6305	6315	6325	6335	6345	6355

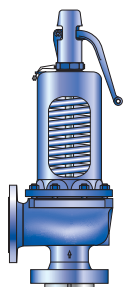
Body material: 1.4581 (CF10M)								
Bonnet closed	H2	Art. No. 4584.	6202	6212	6222	6232	6242	6252
	H4	Art. No. 4584.	6204	6214	6224	6234	6244	6254

	DN <sub>I+O</sub>	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
	Valve size	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
	Actual Orifice diameter d <sub>0</sub> [mm]	50	60	74	88	110
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	1964	2827	4301	6082	9503

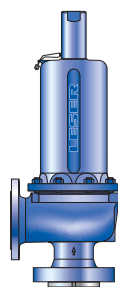
Body material: 1.0619 (WCB)							
Bonnet closed	H2	Art. No. 4582.	6162	6172	6182	6192	4602
	H3	Art. No. 4582.	-	-	-	-	-
	H4	Art. No. 4582.	6124	6174	6184	6194	4604
open	H3	Art. No. 4572.	6125	6175	6185	6195	4605

Body material: 1.7357 (WC6)							
Bonnet closed	H2	Art. No. 4587.	6362	6372	6382	6392	-
	H3	Art. No. 4587.	-	-	-	-	-
	H4	Art. No. 4587.	6364	6374	6384	6394	-
open	H3	Art. No. 4577.	6365	6375	6385	6395	-

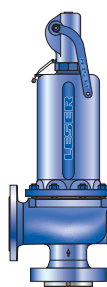
Body material: 1.4581 (CF10M)							1.4408 (CF8M)
Bonnet closed	H2	Art. No. 4584.	6262	6272	6282	6292	4732
	H4	Art. No. 4584.	6264	6274	6284	6294	4734



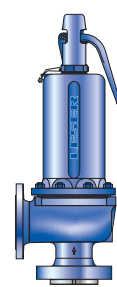
**Type 457**  
Plain lever H3  
Open bonnet  
Conventional design



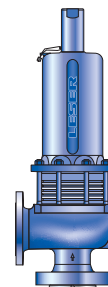
**Type 458**  
Cap H2  
Closed bonnet  
Conventional design



**Type 458**  
Packed lever H4  
Closed bonnet  
Conventional design



**Type 458**  
Plain lever H3  
Closed bonnet  
Conventional design



**Type 458**  
Cap H2  
Closed bonnet  
Balanced bellows design

## Type 457, 458

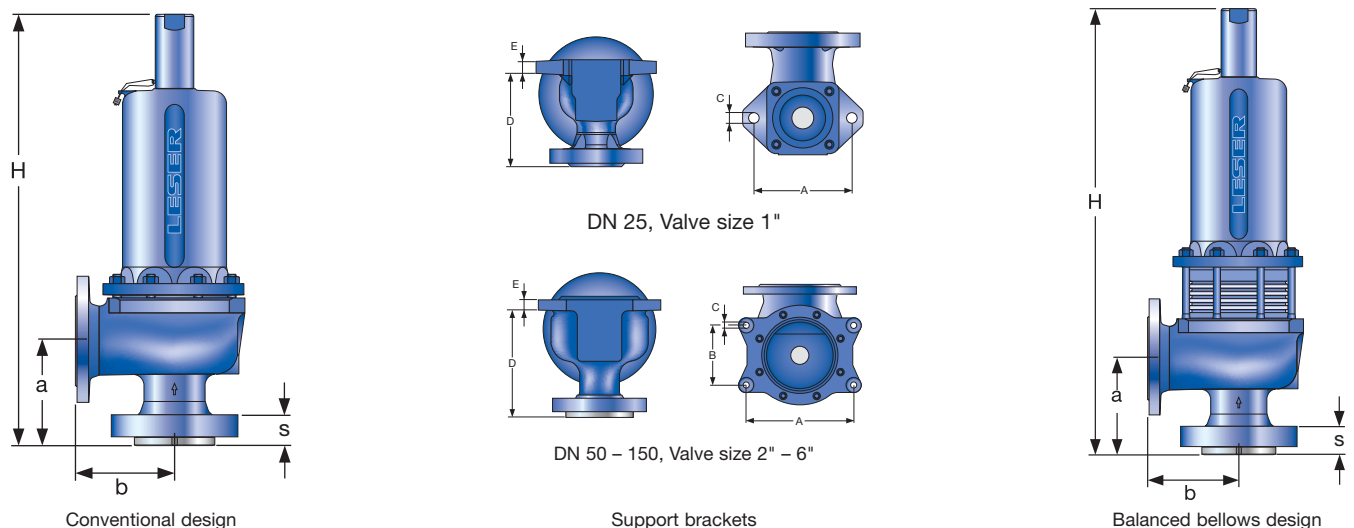
### Dimensions and weights

Metric Units

	DN <sub>ISO</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size		1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Actual Orifice diameter d <sub>0</sub> [mm]		15	20	30	40	50	60	50	60	74	88	110
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		177	314	707	1257	1964	2827	1964	2827	4301	6082	9503
<b>Weight</b> [kg]		20	20	45	45	88	88	157	157	157	157	131
	with bellows	22	22	48	48	108	108	188	188	188	188	162
<b>Center to face</b> <sup>1)</sup> [mm]	Inlet a	135	135	170	170	190	190	225	225	225	225	300
	Outlet b PN 40	120	120	145	145	180	180	235	235	235	235	225
	Outlet b PN 63	120	120	145	145	205	205	265	265	265	265	-
	Outlet b PN 160	130	130	-	-	-	-	-	-	-	-	-
<b>Measure</b> [mm]	PN 40 – 160	s	41	41	53	53	53	60	60	60	60	43
Used to find bolt length for inlet flange	PN 250	s	41	41	53	53	60	60	68	68	68	-
	PN 400	s	50	50	-	-	-	-	-	-	-	-
<b>Height (H4)</b> [mm]	Standard H max.		506	506	699	699	832	832	1079	1079	1079	1098
	Bellows H max.		541	541	779	779	930	930	1170	1170	1170	1156
<b>Support brackets</b> [mm]	A		140	140	184	184	278	278	364	364	364	320
	B		-	-	110	110	160	160	210	210	210	185
(drilled only on request, Option code H42)	C	Ø 14	Ø 14	Ø 14	Ø 14	Ø 18	Ø 18	Ø 18	Ø 18	Ø 18	Ø 18	Ø 18
	D		162	162	209	209	240	240	303	303	303	392
	E		18	18	18	18	27	27	32	32	32	28
<b>Body material: 1.0619 (WCB)</b>												
<b>DIN Flange</b> <sup>2)</sup>	Inlet		PN 63 – 250				PN 63 – 160				PN 40	
	Outlet		PN 40 – 63				PN 40				PN 16	
<b>Body material: 1.7357 (WC6)</b>												
<b>DIN Flange</b> <sup>2)</sup>	Inlet		PN 63 – 250				PN 63 – 160				-	
	Outlet		PN 40 – 63				PN 40				-	
<b>Body material: 1.4581 (CF10M)</b>												1.4408 (CF8M)
<b>DIN Flange</b> <sup>2)</sup>	Inlet		PN 63 – 250				PN 63 – 160				PN 40	
	Outlet		PN 40 – 63				PN 40				PN 16	

<sup>1)</sup> Please note: For design with welding flanges attention should be paid to differing center to face dimensions.

<sup>2)</sup> Standard flange rating. For other flange drillings please refer to page 97.



## Type 457, 458

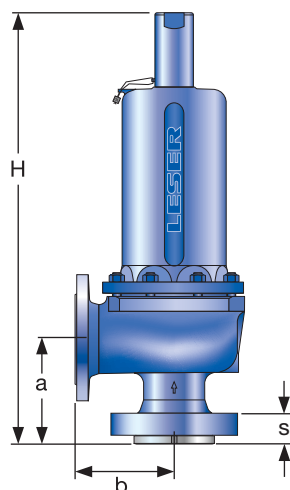
### Dimensions and weights

#### US Units

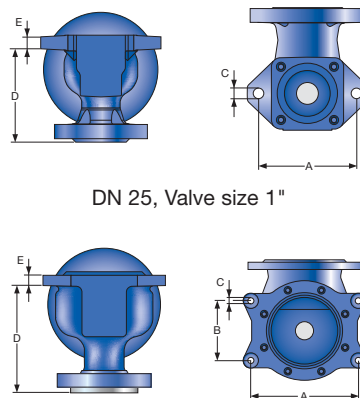
	DN <sub>I+O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
	Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
	Actual Orifice diameter d <sub>0</sub> [inch]	0.59	0.79	1.18	1.57	1.97	2.36	1.97	2.36	2.91	3.46	4.33
	Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.274	0.487	1.096	1.948	3.043	4.383	3.043	4.383	6.666	9.427	14.730
<b>Weight</b> [lbs]		44	44	99	99	194	194	346	346	346	346	289
	with bellows	49	49	106	106	238	238	415	415	415	415	357
<b>Center to face<sup>1)</sup></b> [inch]	Inlet a	5 5/16	5 5/16	6 11/16	6 11/16	7 15/32	7 15/32	8 27/32	8 27/32	8 27/32	8 27/32	11 13/16
	Outlet b CL150	4 23/32	4 23/32	5 23/32	5 23/32	7 3/32	7 3/32	9 1/4	9 1/4	9 1/4	9 1/4	8 27/32
	Outlet b CL300	4 23/32	4 23/32	5 23/32	5 23/32	-	-	-	-	-	-	-
<b>Measure</b> [inch]	CL150	s	-	-	-	-	-	-	-	-	-	1 11/16
<b>Used to find bolt length for inlet flange</b>	CL300 – 600	s	1 5/8	1 5/8	2 1/16	2 1/16	2 1/16	2 3/8	2 3/8	2 3/8	2 3/8	-
	CL300 – 1500	s	1 5/8	1 5/8	2 1/16	2 1/16	-	-	-	-	-	-
<b>Height (H4)</b> [inch]	Standard H max.	19 29/32	19 29/32	27 17/32	27 17/32	32 3/4	32 3/4	42 1/2	42 1/2	42 1/2	42 1/2	43 7/32
	Bellows H max.	21 5/16	21 5/16	30 21/32	30 21/32	36 5/8	36 5/8	46 1/16	46 1/16	46 1/16	46 1/16	45 1/2
<b>Support brackets</b> [inch]	A	5 1/2	5 1/2	7 1/4	7 1/4	10 15/16	10 15/16	4 11/32	4 11/32	4 11/32	4 11/32	12 19/32
	B	-	-	4 11/32	4 11/32	6 5/16	6 5/16	8 9/32	8 9/32	8 9/32	8 9/32	7 9/32
(drilled only on request, Option code H42)	C	Ø 9/16	Ø 9/16	Ø 9/16	Ø 9/16	Ø 23/32	Ø 23/32	Ø 23/32	Ø 23/32	Ø 23/32	Ø 23/32	Ø 23/32
	D	6 3/8	6 3/8	8 7/32	8 7/32	9 7/16	9 7/16	11 11/32	11 11/32	11 11/32	11 11/32	15 7/16
	E	23/32	23/32	23/32	23/32	1 1/16	1 1/16	1 1/4	1 1/4	1 1/4	1 1/4	1 3/32
<b>Body material: 1.0619 (WCB)</b>												
<b>ANSI Flange</b>	Inlet	CL300 – 1500					CL300 – 600					CL150
<b>Class<sup>2)</sup></b>	Outlet	CL150 – 300					CL150					CL150
<b>Body material: 1.7357 (WC6)</b>												
<b>ANSI Flange</b>	Inlet	CL300 – 1500					CL300 – 600					-
<b>Class<sup>2)</sup></b>	Outlet	CL150 – 300					CL150					-
<b>Body material: 1.4581 (CF10M)</b>												1.4408 (CF8M)
<b>ANSI Flange</b>	Inlet	CL300 – 1500					CL300 – 600					CL150
<b>Class<sup>2)</sup></b>	Outlet	CL150 – 300					CL150					CL150

<sup>1)</sup> Please note: For design with welding flanges attention should be paid to differing center to face dimensions.

<sup>2)</sup> Standard flange rating. For other flange drillings please refer to page 97.



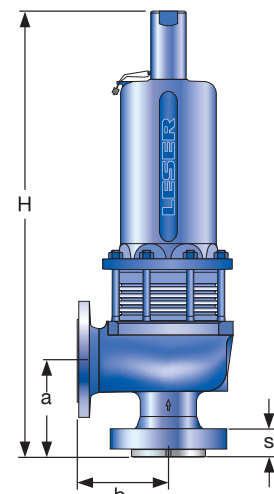
Conventional design



DN 25, Valve size 1"

DN 50 – 150, Valve size 2" – 6"

Support brackets



Balanced bellows design

## Type 457, 458

### Pressure temperature ratings

Metric Units

DN <sub>I+O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Actual Orifice diameter d <sub>0</sub> [mm]	15	20	30	40	50	60	50	60	74	88	110	
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827	1964	2827	4301	6082	9503	

#### Body material: 1.0619 (WCB)

DIN Flange		Inlet				Outlet				PN 40			
		PN 63 – 250				PN 40 – 63				PN 40			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	13.5	13.5	20	2.5	10	10	10	6	5	5	5	5
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L					on request							
<b>Maximaler set pressure</b>	p [bar <sub>g</sub> ] S/G/L	300	180	125	98	130	77	43	46	53	34	18	
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	300	180	210	114.5	160	77	160	160	77	53	40	
<b>Temperature</b>	min. [°C]							-85					
acc. to DIN EN	max. [°C]							+450					
<b>Temperature</b>	min. [°C]							-29					
acc. to ASME	max. [°C]							+427					

#### Body material: 1.7357 (WC6)

DIN Flange		Inlet				Outlet				PN 40			
		PN 63 – 250				PN 40 – 63				PN 40			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	13.5	13.5	20	2.5	10	10	10	6	5	5	5	5
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L					on request							
<b>Maximaler set pressure</b>	p [bar <sub>g</sub> ] S/G/L	300	180	125	98	130	77	43	46	53	34	–	–
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	300	180	210	114.5	160	77	160	160	77	53	–	–
<b>Temperature</b>	min. [°C]							-85					
acc. to DIN EN	max. [°C]							+550					
<b>Temperature</b>	min. [°C]							-29					
acc. to ASME	max. [°C]							+538					

#### Body material: 1.4581 (CF10M)

DIN Flange		Inlet				Outlet				PN 40			
		PN 63 – 250				PN 40 – 63				PN 40			
<b>Minimum set pressure</b>	p [bar <sub>g</sub> ] S/G/L	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
<b>Min. set pressure<sup>1)</sup> standard bellows</b>	p [bar <sub>g</sub> ] S/G/L	13.5	13.5	20	2.5	10	10	10	6	5	5	5	5
<b>Min. set pressure low press. bellows</b>	p [bar <sub>g</sub> ] S/G/L					on request							
<b>Maximaler set pressure</b>	p [bar <sub>g</sub> ] S/G/L	250	146	82	61	61	35	15.8	11	16.9	0	4.4	–
<b>Max. set pressure with special spring</b>	p [bar <sub>g</sub> ] S/G/L	250	146	130	65	104	51.5	71	55	49	32	10	–
<b>Temperature</b>	min. [°C]							-85					
acc. to DIN EN	max. [°C]							+550					
<b>Temperature</b>	min. [°C]							-29					
acc. to ASME	max. [°C]							+538					

<sup>1)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.

## Type 457, 458

### Pressure temperature ratings

#### US Units

DN <sub>r,o</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Actual Orifice diameter d <sub>0</sub> [inch]	15	20	30	40	50	60	50	60	74	88	110
Actual Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	177	314	707	1257	1964	2827	1964	2827	4301	6082	9503

#### Body material: 1.0619 (WCB)

ANSI Flange Class <sup>1)</sup>	Inlet		CL300 – 1500				CL300 – 600				CL150	
	Outlet		CL150 – 300				CL150				CL150	
<b>Minimum set pressure</b>	p [psig]	S/G/L	36	36	36	36	36	36	36	36	36	36
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig]	S/G/L	196	196	290	36	145	145	145	87	73	73
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L					on request					
<b>Maximum set pressure</b>	p [psig]	S/G/L	4350	2610	1813	1421	1885	1117	624	667	769	493
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	4350	2610	3045	1660	2320	1117	2320	2320	1117	769
<b>Temperature acc. to DIN EN</b>	min. [°F]										-121	
	max. [°F]										+842	
<b>Temperature acc. to ASME</b>	min. [°F]										-20	
	max. [°F]										+800	

#### Body material: 1.7357 (WC6)

ANSI Flange Class <sup>1)</sup>	Inlet		CL300 – 1500				CL300 – 600				–	
	Outlet		CL150 – 300				CL150				–	
<b>Minimum set pressure</b>	p [psig]	S/G/L	36	36	36	36	36	36	36	36	36	–
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig]	S/G/L	196	196	290	36	145	145	145	87	73	–
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L					on request				–	
<b>Maximum set pressure</b>	p [psig]	S/G/L	4350	2610	1813	1421	1885	1117	624	667	769	493
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	4350	2610	3045	1660	2320	1117	2320	2320	1117	769
<b>Temperature acc. to DIN EN</b>	min. [°F]										-121	
	max. [°F]										+1022	
<b>Temperature acc. to ASME</b>	min. [°F]										-20	
	max. [°F]										+1000	

#### Body material: 1.4581 (CF10M)

ANSI Flange Class <sup>1)</sup>	Inlet		CL300 – 1500				CL300 – 600				1.4408 (CF8M)	
	Outlet		CL150 – 300				CL150				CL150	
<b>Minimum set pressure</b>	p [psig]	S/G/L	36	36	36	36	36	36	36	36	36	36
<b>Min. set pressure<sup>2)</sup> standard bellows</b>	p [psig]	S/G/L	196	196	290	36	145	145	145	87	73	73
<b>Min. set pressure low press. bellows</b>	p [psig]	S/G/L					on request				–	
<b>Maximum set pressure</b>	p [psig]	S/G/L	3625	2117	1189	885	885	508	229	160	245	0
<b>Max. set pressure with special spring</b>	p [psig]	S/G/L	3625	2117	1885	943	1508	747	1030	798	711	464
<b>Temperature acc. to DIN EN</b>	min. [°F]										-121	
	max. [°F]										+1022	
<b>Temperature acc. to ASME</b>	min. [°F]										-20	
	max. [°F]										+1000	

<sup>1)</sup> For flange rating class 150 the pressure temperature ratings according to ASME ANSI B 16.34 apply.

<sup>2)</sup> Min. set pressure standard bellows = Max. set pressure low pressure bellows.



## Type 457, 458

### Flange drillings

	DN <sub>IHO</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250		
	Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"		
	Actual Orifice diameter d <sub>0</sub> [mm]	15	20	30	40	50	60	50	60	74	88	110		
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827	1694	2827	4301	6082	9503		
<b>Body material: 1.0619 (WCB), 1.7357 (WC6), 1.4581 (CF10M), 1.4408 (CF8M)</b>														
<b>Inlet</b>	<b>DIN EN 1092</b>	PN 16	H47	H47	H47	H47	H47	H47	–	–	–	–	–	
		PN 25	H47	H47	H47	H47	H47	H47	H47	H47	H47	H47	*	
		PN 40	H47	H47	H47	H47	H47	H47	H47	H47	H47	H47	*	
		PN 63	*	*	H10	H10	H10	H10	H10	H10	H10	H10	S01	
		PN 100	*	*	*	*	*	*	*	*	*	*	–	
		PN 160	*	*	*	*	*	*	*	*	*	*	*	–
		PN 250	H12	H12	H12	H12	S01	S01	S01	S01	S01	S01	S01	–
		PN 320	S01	S01	S01	S01	S01	S01	S01	S01	S01	S01	S01	–
		PN 400	S01	S01	S01	S01	S01	S01	S01	S01	S01	S01	S01	–
	<b>ASME B16.5</b>	CL150	–	–	–	–	–	–	–	–	–	–	H64	
		CL300	H65	H65	H65	H65	H65	H65	H65	H65	H65	H65	–	
		CL600	H67	H67	H67	H67	H67	H67	H67	H67	H67	H67	–	
		CL900	H69	H69	H69	H69	S01	S01	S01	S01	S01	S01	–	
		CL1500	H69	H69	H69	H69	S01	S01	S01	S01	S01	S01	–	
		CL2500	S01	S01	S01	S01	S01	S01	S01	S01	S01	S01	–	
	<b>Outlet</b>	<b>DIN EN 1092</b>	PN 10	*	*	*	*	H51	H51	H51	H51	H51	H51	H50
			PN 16	*	*	*	*	H51	H51	H51	H51	H51	H51	*
			PN 25	*	*	*	*	*	*	*	*	*	*	–
PN 40			*	*	*	*	*	*	*	*	*	*	–	
PN 63			H16	H16	H16	H16	S01	S01	S01	S01	S01	S01	–	
<b>ASME B16.5</b>		CL150	H79	H79	H79	H79	H79	H79	H79	H79	H79	H79	H79	
		CL300	H80	H80	H80	H80	S01	S01	S01	S01	S01	S01	–	

## Type 457, 458

### Flange facings

Indication	Standard	Inlet		Outlet		Remark							
<b>General</b>													
Flange undrilled	–	H38		H39									
Linde-V-Nut, Type V48	Linde Standard 420-08 LDeS 3313.36	J07		J08		Groove: Rz 16							
Linde-V-Nut, Type V48A		J05		J06		Groove: Rz 4, e.g. with hydrogen							
Lens seal form L (without sealing lens)	DIN 2696 LDeS 3313.35	J11		J12									
<b>Acc. to DIN EN 1092</b>													
<b>Flange facing</b> (see LDeS 3313.40)		Inlet		Outlet		Remark							
		PN 10 – PN 40	PN 63 – PN 400	PN 10 – PN 40	PN 63	Rz-data according to DIN EN 1092 in µm							
Raised face	Type B1	*	–	*	–	Facing: Rz = 12.5 – 50							
	Type B2	–	*	L38	*	Facing: Rz = 3.2 – 12.5							
Tongue face C <sup>1)</sup>		–		H92		Steel flange only							
Groove face D <sup>1)</sup>		L55		H91									
Male face E		–		H98									
Female face F		–		H99									
O-ring male face G		–		J02									
O-ring female face H		–		J04									
<b>Acc. to ASME B16.5</b>													
Body material	Inlet	Outlet	Smooth finish <sup>2)</sup>		Serrated finish		RTJ-groove						
			Inlet	Outlet	Inlet	Outlet	Inlet					Outlet	
			Option code	Option code	CL300	CL600	CL900	CL1500	CL2500	CL150	CL300		
All	1"	2"	L52	L53	–	*	L58	L58	L58	L58	L58	H63	H63
	2"	3"	L52	L53	–	*	L58	L58	L58	L58	L58	H63	H63
	3"	4"	L52	L53	–	*	L58	L58	L58	L58	L58	–	H63
	4"	6"	L52	L53	–	*	L58	L58	L58	L58	–	–	H63

<sup>1)</sup> LESER manufactures the groove at flanged valves by milling. If a customer demands a turned surface in the soil of the groove according to DIN EN 1092-1 an additional option code is necessary: "S01: soil of the groove drilled". Groove and tongue for PN160 flanges refer to DIN 2512 / WI 3313.32.

<sup>2)</sup> Smooth finish is not defined in the effective standards.

Note: Flange drillings and facings meet always the requirements of mentioned flange standards.  
Flange thickness and outer diameter may vary from flange standard.

## Type 457, 458

### Approvals

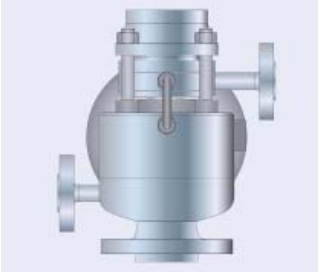
	DN <sub>vo</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	100 x 250
	Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
	Actual Orifice diameter d <sub>0</sub> [mm]	15	20	30	40	50	60	50	60	74	88	110
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827	1694	2827	4301	6082	9503
<b>Europe</b>												
<b>Coefficient of discharge K<sub>dr</sub></b>												
PED / DIN EN ISO 4126-1 12/2013	Approval No.	072020111Z0008/0/12										
	S/G	0.83	0.84	0.84	0.8	0.83	0.75	0.84	0.8	0.8	0.75	0.7
	L	0.63	0.6	0.58	0.54	0.58	0.5	0.6	0.54	0.56	0.49	0.45
<b>Germany</b>												
<b>Coefficient of discharge α<sub>w</sub></b>												
PED / AD 2000-Merkblatt A2 07/2012	Approval No.	TÜV SV 934										
	S/G	0.83	0.84	0.84	0.8	0.83	0.75	0.84	0.8	0.8	0.75	0.7
	L	0.63	0.6	0.58	0.54	0.58	0.5	0.6	0.54	0.56	0.49	0.45
<b>United States</b>												
<b>Coefficient of discharge K</b>												
ASME Sec. VIII	Approval No.	M37066	M37066	M37066	M37066	M37066	M37088	M37066	M37066	M37066	M37088	M37088
	S/G	0.798	0.798	0.798	0.798	0.798	0.754	0.798	0.798	0.798	0.754	0.754
	Approval No.	M37077	M37077	M37077	M37077	M37077	M37099	M37077	M37077	M37077	M37099	M37099
	L	0.572	0.572	0.572	0.572	0.572	0.479	0.572	0.572	0.572	0.479	0.479
<b>Canada</b>												
<b>Coefficient of discharge K</b>												
CRN	Approval No.	-										
	S/G	0.798	0.798	0.798	0.798	0.798	0.754	0.798	0.798	0.798	0.754	0.754
	L	0.572	0.572	0.572	0.572	0.572	0.479	0.572	0.572	0.572	0.479	0.479
<b>China</b>												
<b>Coefficient of discharge α<sub>w</sub></b>												
AQSIQ	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>										
	S/G	0.83	0.84	0.84	0.8	0.83	0.75	0.84	0.8	0.8	0.75	0.7
	L	0.63	0.6	0.58	0.54	0.58	0.5	0.6	0.54	0.56	0.49	0.45
<b>Eurasian Custom Union</b>												
<b>Coefficient of discharge α<sub>w</sub></b>												
EAC	Approval No.	For current approval no. see <a href="http://www.leser.com">www.leser.com</a>										
	S/G	0.83	0.84	0.84	0.8	0.83	0.75	0.84	0.8	0.8	0.75	0.7
	L	0.63	0.6	0.58	0.54	0.58	0.5	0.6	0.54	0.56	0.49	0.45
<b>Classification societies</b>												
on request												

## Type 457, 458

### Available Options

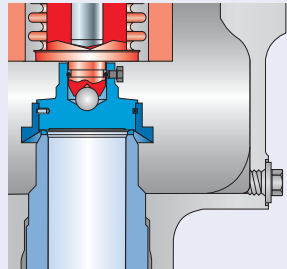
#### Heating jacket

H29, H30: Couplings G  $\frac{3}{8}$ , G  $\frac{3}{4}$   
 H31, H32: Flanges DN 15, DN 25



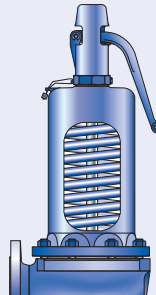
#### Drain hole

J18: G  $\frac{1}{4}$   
 J19: G  $\frac{1}{2}$



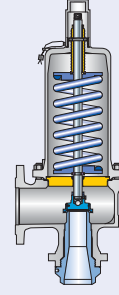
#### Open bonnet

See article number



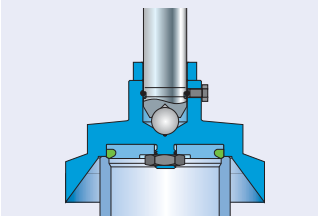
#### Butt-welded connection

S05



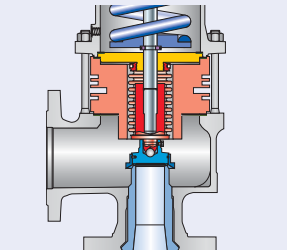
#### O-ring disc

J20: FFKM "C"  
 J21: CR "K"  
 J22: EPDM "D"  
 J23: FKM "L"



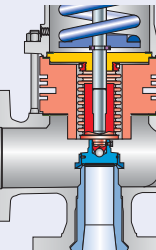
#### Stainless steel bellows

J68: Bonnet open  
 J78: Bonnet closed



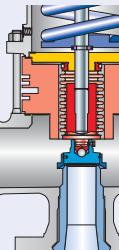
#### Conversion kit for stainless steel bellows

on request



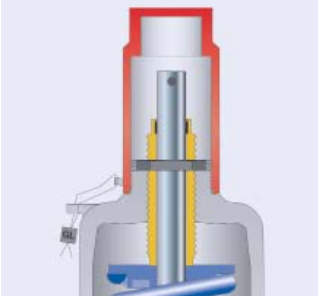
#### High temperature equipment

J88



#### Screwed cap H2

H2



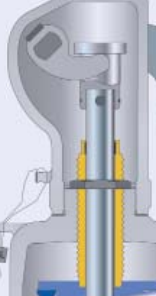
#### Plain lever H3

H3



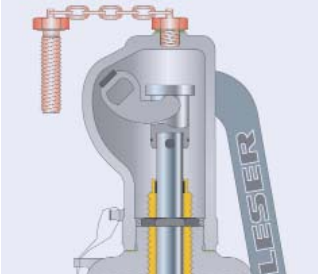
#### Packed lever H4

H4



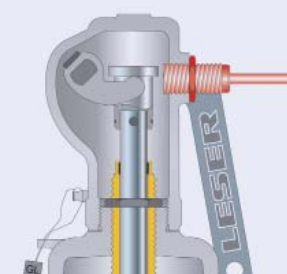
#### Test gag

J69: H4  
 J70: H2



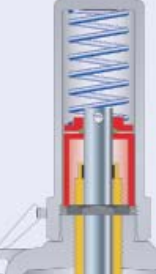
#### Lift indicator

J39: Adaptor H4  
 J93: Lift indicator



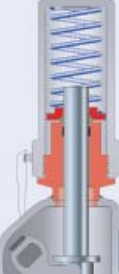
#### O-ring damper H2

J65



#### O-ring damper H4

J66



# Extension



## Contents

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### Accessories and Options

151

## Type 441, 442 XXL

### Spare parts

	DN <sub>r,o</sub>	200 x 300	250 x 350	300 x 400	400 x 500
	Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
	Actual Orifice diameter d <sub>0</sub> [mm]	165	200	235	295
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	21382	31416	43374	68349
<b>Disc (Item 7): Metal to metal seat</b>		<b>Material-No. / Art. No.</b>			
<b>Disc</b>					
detachable lifting aid	1.4571	230.1549.9000	230.1649.9000	225.7349.9000 <sup>2)</sup>	225.7449.9000 <sup>2)</sup>
<b>Bellows (Item 15): 1.4571</b>		<b>Material-No. / Art. No.</b>			
<b>Standard bellows</b>	1.4571	400.5449.0000	400.5349.0000	on request	on request
<b>Conversion kit standard<sup>1)</sup></b>		Single components	Single components	on request	on request
<b>Gasket – body / bonnet (Item 60)</b>		<b>Material-No. / Art. No.</b>			
<b>Gasket</b>	Graphite + 1.4401	500.2807.0000	500.2807.0000	500.3507.0000	500.3607.0000
<b>Ball (Item 61)</b>		<b>Material-No. / Art. No.</b>			
<b>Ball</b>	Ball Ø [mm]	18	18	18	18
	1.4404	510.0504.0000	510.0504.0000	510.0504.0000	510.0504.0000
<b>Split ring (Item 14)</b>		<b>Material-No. / Art. No.</b>			
<b>Split ring</b>	Spindle Ø [mm]	35	35	35	35
	1.4404	251.1549.0000	251.1549.0000	–	–
<b>Pin (Item 57)</b>		<b>Material-No. / Art. No.</b>			
<b>Pin</b>	1.4310	480.1405.0000	480.1405.0000	480.0605.0000	480.0605.0000

<sup>1)</sup> For pressure range see page 59-60

<sup>2)</sup> Caution: In the conventional design the lower spindle part must also be replaced. In the balanced bellows version a new bellows must be ordered together with the disc.

A conversion kit contains the following components:

Item	Component	Quantity
8	Guide	1
11	Bonnet spacer	–
12	Spindle	1
15	Bellows	1
22	Lift stopper	1
60	Gasket	3
	Installation instruction WI 3037.05	1

Refer to page 54

## Type 444 DIN, 444 ANSI

### Spare parts

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>o</sub> [mm]	23	37	46	60	74	74
	Actual Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662	2827	4301	4301
	Set pressure range S/G/L [bar <sub>g</sub> ]	See page 69				0,1 – 6,8	6,81 – 16
	Set pressure range S/G/L [psig]					1,5 – 98,6	98,61 – 232
<b>Disc (Item 7): Metal to metal seat</b>		<b>Material-No. / Art. No.</b>					
<b>Disc</b>							
detachable lifting aid	1.4404	225.4149.9000	225.4349.9000	225.4449.9000	225.4549.9000	225.4649.9000	225.4649.9000
<b>O-ring (Item 60 + 67)</b>		<b>Material-No. / Art. No.</b>					
<b>O-ring</b>	EPDM	"D"	502.0600.3041	502.1130.4041	502.1130.4041	502.1580.5041	502.1580.5041
	FKM	"L"	502.0600.3071	502.1130.4071	502.1130.4071	502.1580.5071	502.1580.5071
<b>Ball (Item 61)</b>		<b>Material-No. / Art. No.</b>					
<b>Ball</b>	Ball Ø [mm]	6	9	9	12	12	12
	1.4401	510.0104.0000	510.0204.0000	510.0204.0000	510.0304.0000	510.0304.0000	510.0304.0000
<b>Pin (Item 57)</b>		<b>Material-No. / Art. No.</b>					
<b>Pin</b>	1.4310	480.0505.0000	480.0705.0000	480.0705.0000	480.1005.0000	480.1005.0000	480.1005.0000

## Type 455, 456

### Spare parts

	DN <sub>ISO</sub>	25 x 50	50 x 80	80 x 100	100 x 150
Valve size		1" x 2"	2" x 3"	3" x 4"	4" x 6"
Actual Orifice diameter d <sub>0</sub> [mm]		20	40	60	74
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		314	1257	2827	4301
<b>Disc (Item 7): Metal to metal seat</b>		<b>Material-No. / Art. No.</b>			
<b>Disc</b>	1.4122	200.0239.9000	200.0439.9000	200.0639.9000	200.0939.9000
detachable lifting aid	1.4404	200.0269.9000	200.0469.9000	200.0669.9000	200.0969.9000
<b>Disc (Item 7): Soft seal</b>		<b>Material-No. / Art. No.</b>			
<b>Disc</b>	CR	"K"	-	-	-
	EPDM	"D"	-	-	-
	FKM	"L"	200.1149.9073	200.1349.9073	200.1549.9073
	FFKM	"C"	-	-	-
<b>O-ring (Item 7.4): Soft seal</b>		<b>Material-No. / Art. No.</b>			
<b>O-ring</b>	CR	"K"	-	-	-
	EPDM	"D"	-	-	-
	FKM	"L"	200.1149.9073	200.1349.9073	200.1549.9073
	FFKM	"C"	-	-	-
<b>Bellows (Item 15)</b>		<b>Material-No. / Art. No.</b>			
<b>Standard bellows</b>		400.5749.0000	400.5949.0000	400.6149.0000	400.6249.0000
<b>Conversion kit standard<sup>1)</sup></b>		on request	on request	on request	on request
<b>Low pressure bellows</b>		on request	on request	on request	on request
<b>Conversion kit low pressure<sup>1)</sup></b>		on request	on request	on request	on request
<b>Gasket – body / bonnet (Item 60)</b>		<b>Material-No. / Art. No.</b>			
<b>Gasket</b>	Graphite + 1.4401	500.1007.0000	500.1607.0000	500.2107.0000	500.2207.0000
Option code L68	Gylon (filled PTFE)	500.1005.0000	500.1605.0000	500.2105.0000	500.2205.0000
<b>Ball (Item 61)</b>		<b>Material-No. / Art. No.</b>			
<b>Ball</b>	Ball Ø [mm]	9	12	15	15
	1.4401	510.0204.0000	510.0304.0000	510.0404.0000	510.0404.0000
<b>Split ring (Item 14)</b>		<b>Material-No. / Art. No.</b>			
<b>Split ring</b>	Spindle Ø [mm]	16	20	24	30
	1.4404	251.0249.0000	251.0349.0000	251.0449.0000	251.0549.0000
<b>Ball (Item 57)</b>		<b>Material-No. / Art. No.</b>			
<b>Ball (15 pieces)</b>	Ball Ø [mm]	3	3	3	3
	1.4310	510.0604.0000	510.0604.0000	510.0604.0000	510.0604.0000
<b>Screw (Item 66)</b>		<b>Material-No. / Art. No.</b>			
<b>Screw</b>	1.4401	451.0114.0000	451.0114.0000	451.0114.0000	451.0114.0000

<sup>1)</sup> For pressure range see page 81-82

A conversion kit contains the following components:

Item	Component	Quantity
8	Guide	1
11	Bonnet spacer	1
12	Spindle	1
15	Bellows	1
55	Stud	4, 8 depends on valve size
60	Gasket	2, 3 depends on valve size
	Installation instruction WI 3037.05	1

Refer to page 76



## Type 457, 458

### Spare parts

	DN <sub>Ho</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100
	Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"
	Actual Orifice diameter d <sub>0</sub> [mm]	15	20	30	40	50	60
	Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827
<b>Disc (Item 7): Metal to metal seat</b>				<b>Material-No. / Art. No.</b>			
<b>Disc</b>	1.4122	200.0139.9000	200.0239.9000	200.0339.9000	200.0439.9000	200.0539.9000	200.0639.9000
detachable lifting aid	1.4404	200.0169.9000	200.0269.9000	200.0369.9000	200.0469.9000	200.0569.9000	200.0669.9000
<b>Disc (Item 7): Soft seal</b>				<b>Material-No. / Art. No.</b>			
<b>Disc</b>	CR	"K"	–	200.1149.9053	200.1249.9053	200.1349.9053	200.1449.9053
	EPDM	"D"	–	200.1149.9043	200.1249.9043	200.1349.9043	200.1449.9043
	FKM	"L"	–	200.1149.9073	200.1249.9073	200.1349.9073	200.1449.9073
	FFKM	"C"	–	200.1149.9093	200.1249.9093	200.1349.9093	200.1449.9093
<b>O-ring (Item 7.4): Soft seal</b>				<b>Material-No. / Art. No.</b>			
<b>O-ring</b>	CR	"K"	–	502.0154.3553	502.0247.5353	502.0342.5353	502.0438.5353
	EPDM	"D"	–	502.0154.3543	502.0247.5343	502.0342.5343	502.0438.5343
	FKM	"L"	–	502.0154.3573	502.0247.5373	502.0342.5373	502.0438.5373
	FFKM	"C"	–	502.0154.3593	502.0247.5393	502.0342.5393	502.0438.5393
<b>Bellows (Item 15)</b>				<b>Material-No. / Art. No.</b>			
<b>Standard bellows</b>		400.5749.0000	400.5749.0000	400.5849.0000	400.5949.0000	400.6049.0000	400.6149.0000
<b>Conversion kit standard<sup>1)</sup></b>		on request	on request	on request	on request	on request	on request
<b>Low pressure bellows</b>		on request	on request	on request	on request	on request	on request
<b>Conversion kit low pressure<sup>1)</sup></b>		on request	on request	on request	on request	on request	on request
<b>Gasket – body / bonnet (Item 60)</b>				<b>Material-No. / Art. No.</b>			
<b>Gasket</b>	Graphite + 1.4401	500.1007.0000	500.1007.0000	500.1607.0000	500.1607.0000	500.2107.0000	500.2107.0000
Option code L68	Gylon (filled PTFE)	500.1005.0000	500.1005.0000	500.1605.0000	500.1605.0000	500.2105.0000	500.2105.0000
<b>Ball (Item 61)</b>				<b>Material-No. / Art. No.</b>			
<b>Ball</b>	Ball Ø [mm]	9	9	12	12	15	15
	1.4401	510.0204.0000	510.0204.0000	510.0304.0000	510.0304.0000	510.0404.0000	510.0404.0000
<b>Split ring (Item 14)</b>				<b>Material-No. / Art. No.</b>			
<b>Split ring</b>	Spindle Ø [mm]	16	16	20	20	24	24
	1.4404	251.0249.0000	251.0249.0000	251.0349.0000	251.0349.0000	251.0449.0000	251.0449.0000
<b>Ball (Item 57)</b>				<b>Material-No. / Art. No.</b>			
<b>Ball (15 pieces)</b>	Ball Ø [mm]	3	3	3	3	3	3
	1.4310	510.0604.0000	510.0604.0000	510.0604.0000	510.0604.0000	510.0604.0000	510.0604.0000
<b>Screw (Item 66)</b>				<b>Material-No. / Art. No.</b>			
<b>Screw</b>	1.4401	451.0114.0000	451.0114.0000	451.0114.0000	451.0114.0000	451.0114.0000	451.0114.0000

<sup>1)</sup> For pressure range see page 95-96

A conversion kit contains the following components:

Item	Component	Quantity
8	Guide	1
11	Bonnet spacer	1
12	Spindle	1
15	Bellows	1
55	Stud	4, 8 depends on valve size
60	Gasket	2, 3 depends on valve size
	Installation instruction WI 3037.05	1

Refer to page 90

## Type 457, 458

### Spare parts

	DN <sub>H<sub>2</sub>O</sub>	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250	
Valve size		4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"	
Actual Orifice diameter d <sub>0</sub> [mm]		50	60	74	88	110	
Actual Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		1964	2827	4301	6082	9503	
<b>Disc (Item 7): Metal to metal seat</b>		<b>Material-No. / Art. No.</b>					
<b>Disc</b>	1.4122	200.0539.9000	200.0839.9000	200.0939.9000	200.1039.9000	220.0939.9000	
detachable lifting aid	1.4404	200.0569.9000	200.0869.9000	200.0969.9000	200.1069.9000	220.0969.9000	
<b>Disc (Item 7): Soft seal</b>		<b>Material-No. / Art. No.</b>					
<b>Disc</b>	CR	"K"	200.1449.9053	200.1749.9053	200.1849.9053	200.1949.9053	-
	EPDM	"D"	200.1449.9043	200.1749.9043	200.1849.9043	200.1949.9043	-
	FKM	"L"	200.1449.9073	200.1749.9073	200.1849.9073	200.1949.9073	-
	FFKM	"C"	200.1449.9093	200.1749.9093	200.1849.9093	200.1949.9093	-
<b>O-ring (Item 7.4): Soft seal</b>		<b>Material-No. / Art. No.</b>					
<b>O-ring</b>	CR	"K"	502.0438.5353	502.0533.5353	502.0692.5353	502.0819.5353	-
	EPDM	"D"	502.0438.4353	502.0533.5343	502.0692.5343	502.0819.5343	-
	FKM	"L"	502.0438.7353	502.0533.5373	502.0692.5373	502.0819.5373	-
	FFKM	"C"	502.0438.9353	502.0533.5393	502.0692.5393	502.0819.5393	-
<b>Bellows (Item 15)</b>		<b>Material-No. / Art. No.</b>					
<b>Standard bellows</b>		400.6049.0000	400.6149.0000	400.6249.0000	400.6249.0000	400.7849.0000	
<b>Conversion kit standard<sup>1)</sup></b>		on request	on request	on request	on request	on request	
<b>Low pressure bellows</b>		on request	on request	on request	on request	on request	
<b>Conversion kit low pressure<sup>1)</sup></b>		on request	on request	on request	on request	on request	
<b>Gasket – body / bonnet (Item 60)</b>		<b>Material-No. / Art. No.</b>					
<b>Gasket</b>	Graphite + 1.4401	500.2207.0000	500.2207.0000	500.2207.0000	500.2207.0000	500.2207.0000	
Option code L68	Gylon (filled PTFE)	500.2205.0000	500.2205.0000	500.2205.0000	500.2205.0000	500.2205.0000	
<b>Ball (Item 61)</b>		<b>Material-No. / Art. No.</b>					
<b>Ball</b>	Ball Ø [mm]	15	15	15	15	15	
	1.4401	510.0404.0000	510.0404.0000	510.0404.0000	510.0404.0000	510.0404.0000	
<b>Split ring (Item 14)</b>		<b>Material-No. / Art. No.</b>					
<b>Split ring</b>	Spindle Ø [mm]	30	30	30	30	30	
	1.4404	251.0549.0000	251.0549.0000	251.0549.0000	251.0549.0000	251.0549.0000	
<b>Ball (Item 57)</b>		<b>Material-No. / Art. No.</b>					
<b>Ball (15 pieces)</b>	Ball Ø [mm]	3	3	3	3	3	
	1.4310	510.0604.0000	510.0604.0000	510.0604.0000	510.0604.0000	510.0604.0000	
<b>Screw (Item 66)</b>		<b>Material-No. / Art. No.</b>					
<b>Screw</b>	1.4401	451.0114.0000	451.0114.0000	451.0114.0000	451.0114.0000	451.0114.0000	

<sup>1)</sup> For pressure range see page 95-96

A conversion kit contains the following components:

Item	Component	Quantity
8	Guide	1
11	Bonnet spacer	1
12	Spindle	1
15	Bellows	1
55	Stud	4, 8 depends on valve size
60	Gasket	2, 3 depends on valve size
	Installation instruction WI 3037.05	1

Refer to page 90

## Type 441, 442 DIN

### 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]

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Act. Orifice dia. d <sub>0</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
	Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
	LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.283	0.283	0.462	0.734	1.195	1.847	3.142	4.779	7.387	8.382	13.637	23.761
<b>Set pressure [bar]</b>	<b>Capacities [kg/h]</b>												
0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
0.2	86	86	140	223	363	561	954	1451	2243	2545	4140	7214	
0.5	137	137	224	356	579	895	1523	2316	3580	4062	6609	11516	
1	199	199	326	518	843	1302	2215	3370	5209	5910	9616	16755	
2	318	318	519	825	1343	2075	3531	5371	8302	9420	15326	26704	
3	428	428	699	1111	1808	2794	4754	7232	11178	12683	20635	35954	
4	534	534	871	1385	2254	3485	5928	9018	13938	15816	25731	44834	
5	639	639	1043	1658	2699	4172	7097	10796	16687	18934	30804	53673	
6	744	744	1214	1930	3142	4856	8262	12568	19426	22042	35861	62484	
7	846	846	1381	2196	3574	5525	9399	14297	22098	25074	40794	71080	
8	950	950	1551	2466	4014	6205	10556	16057	24818	28161	45816	79830	
9	1054	1054	1721	2736	4454	6884	11712	17815	27535	31244	50831	88569	
10	1158	1158	1891	3006	4893	7562	12866	19571	30250	34324	55842	97300	
12	1366	1366	2230	3545	5770	8919	15174	23081	35675	40480	65858	114751	
14	1569	1569	2562	4073	6629	10247	17433	26518	40987	46507	75664	131837	
16	1776	1776	2900	4610	7505	11600	19735	30020	46400	52650	85657	149249	
18	1984	1984	3239	5149	8382	12955	22041	33526	51820	58800	95663	166683	
20	2191	2191	3578	5688	9260	14312	24350	37039	57249	64960	105685	184145	
22	2393	2393	3907	6212	10111	15629	26590	40446	62515	70935	115407	201085	
24	2601	2601	4247	6752	10991	16988	28903	43964	67953	77106	125445	218576	
26	2810	2810	4588	7294	11873	18351	31222	47491	73405	83292			
28	3019	3019	4930	7837	12757	19718	33547	51029	78873	89496			
30	3229	3229	5272	8382	13644	21089	35880	54577	84358				
32	3440	3440	5616	8929	14534	22465	38220	58137	89860				
34	3641	3641	5945	9451	15384	23779	40455	61537	95115				
36	3853	3853	6290	10000	16278	25160	42806	65112	100641				
38	4065	4065	6637	10551	17175	26547	45165	68701	106188				
40	4278	4278	6985	11104	18076	27939	47533	72303	111756				

# Type 441, 442 DIN

## Capacities Steam

### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure.  
 Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [lb/ h]

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Act. Orifice dia. d <sub>o</sub> [inch]	0.71	0.71	0.91	1.14	1.46	1.81	2.36	2.91	3.62	3.86	4.92	6.5
	Act. Orifice area A <sub>o</sub> [inch <sup>2</sup> ]	0.394	0.394	0.644	1.024	1.667	2.576	4.383	6.666	10.304	11.691	19.021	33.142
	LEO <sub>s/G</sub> * [inch <sup>2</sup> ]	0.283	0.283	0.462	0.734	1.195	1.847	3.142	4.779	7.387	8.382	13.637	23.761
Set pressure [psig]		Capacities [lb/h]											
15				757	1204	1959	3028	5152	7837	12113	13744	22361	38962
20				873	1388	2259	3492	5941	9037	13968	15849	25785	44928
30				1105	1756	2859	4419	7519	11436	17677	20058	32632	56859
40				1360	2162	3519	5439	9254	14076	21757	24687	40165	69983
50				1615	2567	4179	6459	10989	16716	25837	29317	47697	83107
60				1870	2973	4839	7479	12725	19356	29917	33947	55229	96231
70				2125	3378	5499	8499	14460	21995	33997	38576	62761	109355
80				2380	3783	6159	9519	16196	24635	38078	43206	70293	122479
90				2635	4189	6819	10539	17931	27275	42158	47836	77825	135603
100				2890	4594	7479	11559	19666	29915	46238	52466	85357	148727
120				3400	5405	8799	13600	23137	35194	54398	61725	100422	174975
140				3910	6216	10118	15640	26608	40474	62558	70984	115486	201223
160				4420	7027	11438	17680	30079	45753	70719	80244	130550	227471
180				4930	7838	12758	19720	33550	51033	78879	89503	145615	253719
200				5440	8648	14078	21760	37020	56312	87039	98762	160679	279967
220				5950	9459	15398	23800	40491	61592	95200	108022	175743	306215
240				6460	10270	16718	25840	43962	66871	103360	117281	190808	332463
260				6970	11081	18038	27880	47433	72151	111520	126540	205872	358711
280				7480	11892	19358	29920	50904	77430	119680	135800	220936	384960
300				7990	12703	20677	31960	54375	82710	127841	145059	236001	411208
320				8500	13513	21997	34000	57845	87989	136001	154319	251065	437456
340				9010	14324	23317	36040	61316	93269	144161	163578	266129	463704
360				9520	15135	24637	38080	64787	98548	152321	172837	281194	489952
380				10030	15946	25957	40120	68258	103828	160482	182097		
400				10540	16757	27277	42161	71729	109107	168642	191356		
420				11050	17567	28597	44201	75199	114387	176802			
440				11560	18378	29917	46241	78670	119666	184963			
460				12070	19189	31236	48281	82141	124946	193123			
480				12580	20000	32556	50321	85612	130225	201283			
500				13090	20811	33876	52361	89083	135505	209443			
550				14365	22838	37176	57461	97760	148704	229844			
580				15130	24054	39156	60521	102966	156623	242085			

Please select DN 25

## Type 441, 442 DIN

### 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 [ $m_n^3/h$ ]

	20	20	25	32	40	50	65	80	100	125	150	200
DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
Act. Orifice dia. d <sub>0</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.283	0.283	0.462	0.734	1.195	1.847	3.142	4.779	7.387	8.382	13.637	23.761
Set pressure [bar]	Capacities [ $m_n^3/h$ ]											
0.1	0	0	0	0	0	0	0	0	0	0	0	0
0.2	99	99	162	258	420	649	1105	1680	2597	2947	4794	8354
0.5	161	161	263	418	680	1051	1789	2721	4206	4772	7764	13528
1	238	238	388	617	1004	1552	2641	4017	6209	7045	11461	19970
2	384	384	627	996	1622	2507	4265	6487	10026	11377	18509	32251
3	523	523	854	1357	2209	3414	5809	8836	13657	15497	25212	43930
4	656	656	1071	1703	2773	4286	7291	11091	17143	19452	31647	55142
5	790	790	1289	2050	3337	5157	8774	13346	20629	23407	38082	66354
6	923	923	1507	2396	3900	6029	10257	15601	24114	27362	44516	77565
7	1057	1057	1725	2742	4464	6900	11739	17857	27600	31317	50951	88777
8	1190	1190	1943	3089	5028	7771	13222	20112	31086	35273	57386	99989
9	1323	1323	2161	3435	5592	8643	14704	22367	34571	39228	63821	111201
10	1457	1457	2379	3781	6155	9514	16187	24622	38057	43183	70255	122413
12	1724	1724	2814	4474	7283	11257	19152	29132	45028	51093	83125	144836
14	1991	1991	3250	5167	8411	13000	22117	33642	52000	59003	95994	167260
16	2257	2257	3686	5859	9538	14743	25082	38153	58971	66914	108863	189684
18	2524	2524	4121	6552	10666	16486	28047	42663	65942	74824	121733	212107
20	2791	2791	4557	7245	11793	18228	31012	47173	72913	82734	134602	234531
22	3058	3058	4993	7938	12921	19971	33977	51683	79885	90644	147472	256954
24	3325	3325	5429	8630	14048	21714	36943	56194	86856	98555	160341	279378
26	3592	3592	5864	9323	15176	23457	39908	60704	93827	106465		
28	3859	3859	6300	10016	16304	25200	42873	65214	100799	114375		
30	4125	4125	6736	10708	17431	26942	45838	69725	107770			
32	4392	4392	7171	11401	18559	28685	48803	74235	114741			
34	4659	4659	7607	12094	19686	30428	51768	78745	121713			
36	4926	4926	8043	12786	20814	32171	54733	83255	128684			
38	5193	5193	8478	13479	21941	33914	57698	87766	135655			
40	5460	5460	8914	14172	23069	35657	60663	92276	142626			

## Type 441, 442 DIN

### Capacities – Air

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [S.C.F.M.]

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Act. Orifice dia. d <sub>o</sub> [inch]	0.71	0.71	0.91	1.14	1.46	1.81	2.36	2.91	3.62	3.86	4.92	6.5
	Act. Orifice area A <sub>o</sub> [inch <sup>2</sup> ]	0.394	0.394	0.644	1.024	1.667	2.576	4.383	6.666	10.304	11.691	19.021	33.142
	LEO <sub>S/G</sub> * [inch <sup>2</sup> ]	0.283	0.283	0.462	0.734	1.195	1.847	3.142	4.779	7.387	8.382	13.637	23.761
Set pressure [psig]	Capacities [S.C.F.M.]												
15				270	429	698	1079	1835	2792	4315	4896	7965	2780
20				311	494	805	1244	2116	3219	4976	5646	9185	3142
30				394	626	1019	1574	2679	4074	6297	7145	11624	3764
40				484	770	1254	1938	3297	5014	7750	8794	14307	4346
50				575	915	1489	2301	3915	5954	9204	10444	16990	4859
60				666	1059	1724	2664	4533	6895	10657	12093	19673	5323
70				757	1204	1959	3028	5152	7835	12111	13742	22356	5749
80				848	1348	2194	3391	5770	8775	13564	15391	25039	6146
90				939	1492	2430	3754	6388	9715	15018	17041	27722	6519
100				1029	1637	2665	4118	7006	10656	16471	18690	30406	6872
120				1211	1926	3135	4845	8243	12536	19378	21988	35772	7528
140				1393	2215	3605	5571	9479	14417	22285	25287	41138	8131
160				1574	2504	4076	6298	10716	16298	25192	28585	46504	8692
180				1756	2792	4546	7025	11952	18178	28099	31884	51870	9220
200				1938	3081	5016	7751	13189	20059	31006	35182	57236	9718
220				2120	3370	5486	8478	14425	21939	33913	38481	62602	10193
240				2301	3659	5957	9205	15662	23820	36820	41779	67968	10646
260				2483	3948	6427	9932	16898	25700	39727	45078	73334	11081
280				2665	4237	6897	10658	18135	27581	42633	48376	78701	11499
300				2846	4526	7368	11385	19371	29462	45540	51675	84067	11902
320				3028	4815	7838	12112	20608	31342	48447	54973	89433	12293
340				3210	5104	8308	12839	21844	33223	51354	58272	94799	12671
360				3391	5392	8778	13565	23081	35103	54261	61570	100165	13039
380				3573	5681	9249	14292	24317	36984	57168	64869		
400				3755	5970	9719	15019	25554	38864	60075	68167		
420				3936	6259	10189	15745	26791	40745	62982			
440				4118	6548	110660	16472	28027	42626	65889			
460				4300	6837	11130	17199	29264	44506	68796			
480				4481	7126	11600	17926	30500	46387	71703			
500				4663	7415	12070	18652	31737	48267	74610			
550				5117	8137	13246	20469	34828	52969	81877			
580				5390	8570	13952	21559	36683	55790	86237			

Please select DN 25

## Type 441, 442 DIN

### 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 [ $10^3\text{kg/h}$ ]

	20	20	25	32	40	50	65	80	100	125	150	200
DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
Act. Orifice dia. d <sub>o</sub> [mm]	18	18	23	29	37	46	60	74	92	98	125	165
Act. Orifice area A <sub>o</sub> [mm <sup>2</sup> ]	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.316	0.316	0.516	0.821	1.336	2.062	3.513	5.343	8.259	9.371	15.246	26.565
Set pressure [bar]	Capacities [ $10^3\text{kg/h}$ ]											
0.1	2.60	2.60	4.25	6.76	11.0	17.0	28.9	44.0	68.0	77.2	126	219
0.2	3.19	3.19	5.21	8.28	13.5	20.8	35.5	53.9	83.3	94.6	154	268
0.5	4.51	4.51	7.37	11.7	19.1	29.5	50.1	76.3	118	134	218	379
1	6.11	6.11	9.97	15.9	25.8	39.9	67.9	103	160	181	295	513
2	8.64	8.64	14.1	22.4	36.5	56.4	96.0	146	226	256	417	726
3	10.6	10.6	17.3	27.5	44.7	69.1	118	179	276	314	510	889
4	12.2	12.2	19.9	31.7	51.6	79.8	136	206	319	362	589	1027
5	13.7	13.7	22.3	35.5	57.7	89.2	152	231	357	405	659	1148
6	15.0	15.0	24.4	38.8	63.2	97.7	166	253	391	444	722	1257
7	16.2	16.2	26.4	42.0	68.3	106	180	273	422	479	779	1358
8	17.3	17.3	28.2	44.8	73.0	113	192	292	451	512	833	1452
9	18.3	18.3	29.9	47.6	77.4	120	204	310	479	543	884	1540
10	19.3	19.3	31.5	50.1	81.6	126	215	326	505	573	932	1623
12	21.2	21.2	34.6	54.9	89.4	138	235	358	553	627	1021	1778
14	22.9	22.9	37.3	59.3	96.6	149	254	386	597	678	1102	1921
16	24.4	24.4	39.9	63.4	103	160	272	413	638	724	1178	2053
18	25.9	25.9	42.3	67.3	110	169	288	438	677	768	1250	2178
20	27.3	27.3	44.6	70.9	115	178	304	462	714	810	1317	2296
22	28.7	28.7	46.8	74.4	121	187	318	484	748	849	1382	2408
24	29.9	29.9	48.9	77.7	126	195	333	506	782	887	1443	2515
26	31.1	31.1	50.9	80.9	132	203	346	526	814	923		
28	32.3	32.3	52.8	83.9	137	211	359	546	844	958		
30	33.5	33.5	54.6	86.8	141	219	372	565	874			
32	34.6	34.6	56.4	89.7	146	226	384	584	903			
34	35.6	35.6	58.2	92.5	151	233	396	602	931			
36	36.7	36.7	59.8	95.1	155	239	407	619	957			
38	37.7	37.7	61.5	97.7	159	246	418	636	984			
40	38.6	38.6	63.1	100	163	252	429	653	1009			

## Type 441, 442 DIN

### Capacities – Water

#### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

	DN <sub>i</sub>	20	20	25	32	40	50	65	80	100	125	150	200
	DN <sub>o</sub>	32	40	40	50	65	80	100	125	150	200	250	300
	Act. Orifice dia. d <sub>o</sub> [inch]	0.71	0.71	0.91	1.14	1.46	1.81	2.36	2.91	3.62	3.86	4.92	6.5
	Act. Orifice area A <sub>o</sub> [inch <sup>2</sup> ]	0.394	0.394	0.644	1.024	1.667	2.576	4.383	6.666	10.304	11.691	19.021	33.142
	LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.316	0.316	0.516	0.821	1.336	2.062	3.513	5.343	8.259	9.371	15.246	26.565
Set pressure [psig]		Capacities [US-G.P.M.]											
15				54.0	85.9	140	216	368	559	864	981	1595	2780
20				61.1	97.1	158	244	416	632	977	1109	1803	3142
30				73.1	116	189	293	498	757	1170	1328	2160	3764
40				84.5	134	219	338	575	874	1351	1533	2494	4346
50				94.4	150	244	378	643	977	1511	1714	2789	4859
60				103	164	268	414	704	1071	1655	1878	3055	5323
70				112	178	289	447	760	1156	1787	2028	3300	5749
80				119	190	309	478	813	1236	1911	2168	3527	6146
90				127	201	328	507	862	1311	2027	2300	3741	6519
100				134	212	346	534	909	1382	2136	2424	3944	6872
120				146	233	379	585	996	1514	2340	2656	4320	7528
140				158	251	409	632	1075	1635	2528	2868	4666	8131
160				169	269	437	676	1150	1748	2702	3066	4989	8692
180				179	285	464	717	1219	1854	2866	3252	5291	9220
200				189	300	489	755	1285	1955	3021	3428	5577	9718
220				198	315	513	792	1348	2050	3169	3596	5850	10193
240				207	329	535	827	1408	2141	3310	3756	6110	10646
260				215	342	557	861	1465	2229	3445	3909	6359	11081
280				223	355	578	894	1521	2313	3575	4057	6599	11499
300				231	368	599	925	1574	2394	3700	4199	6831	11902
320				239	380	618	955	1626	2472	3822	4337	7055	12293
340				246	391	637	985	1676	2549	3939	4470	7272	12671
360				253	403	656	1013	1724	2622	4054	4600	7483	13039
380				260	414	674	1041	1772	2694	4165	4726		
400				267	425	691	1068	1818	2764	4273	4848		
420				274	435	708	1095	1862	2833	4378			
440				280	445	725	1120	1906	2899	4481			
460				286	455	741	1146	1949	2964	4582			
480				293	465	757	1170	1991	3028	4681			
500				299	475	773	1194	2032	3091	4777			
550				313	498	811	1253	2131	3241	5010			
580				322	511	832	1286	2189	3329	5145			

Please select DN 25



## Type 441, 442 DIN

### 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 ( $K_{dr}/\alpha_w$ )

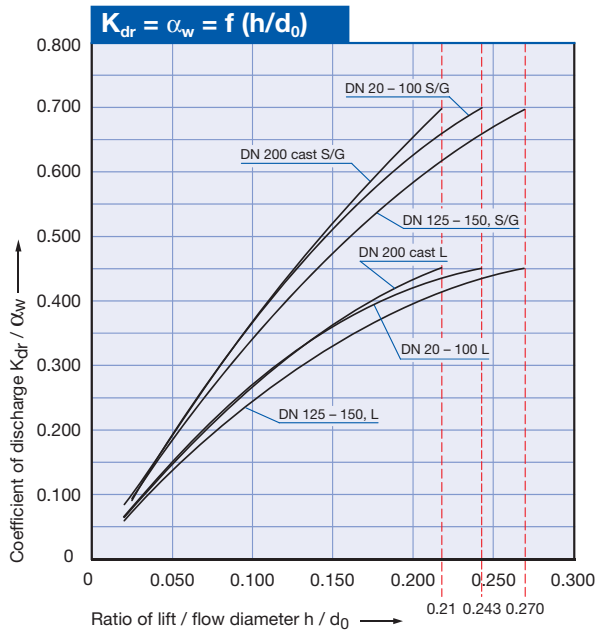
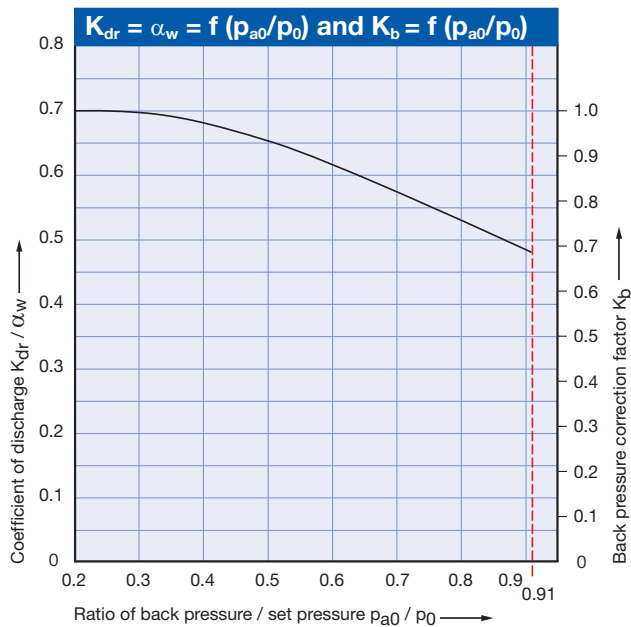


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )



#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

## Type 441, 442 ANSI 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]

Valve size	1"x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. $d_0$ [mm]	23	29	37	46	60	92
Act. Orifice area $A_0$ [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [bar]	Capacities [kg/h]					
0.1	0	0	0	0	0	0
0.2	140	223	363	561	954	2243
0.5	224	356	579	895	1523	3580
1	326	518	843	1302	2215	5209
2	519	825	1343	2075	3531	8302
3	699	1111	1808	2794	4754	11178
4	871	1385	2254	3485	5928	13938
5	1043	1658	2699	4172	7097	16687
6	1214	1930	3142	4856	8262	19426
7	1381	2196	3574	5525	9399	22098
8	1551	2466	4014	6205	10556	24818
9	1721	2736	4454	6884	11712	27535
10	1891	3006	4893	7562	12866	30250
12	2230	3545	5770	8919	15174	35675
14	2562	4073	6629	10247	17433	40987
16	2900	4610	7505	11600	19735	46400
18	3239	5149	8382	12955	22041	51820
20	3578	5688	9260	14312	24350	57249
22	3907	6212	10111	15629	26590	62515
24	4247	6752	10991	16988	28903	67953
26	4588	7294	11873	18351	31222	73405
28	4930	7837	12757	19718	33547	78873
30	5272	8382	13644	21089	35880	84358
32	5616	8929	14534	22465	38220	89860
34	5945	9451	15384	23779	40455	95115
36	6290	10000	16278	25160	42806	
38	6637	10551	17175	26547	45165	
40	6985	11104	18076	27939	47533	
42	7334	11660	18980	29337		
44	7685	12218	19888	30740		
46	8037	12778	20800	32150		
48	8391	13341		33566		
50	8747			34988		
51	8900			35600		

## US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [lb/h]

Valve size	1"x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. $d_0$ [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Act. Orifice area $A_0$ [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [psig]	Capacities [lb/h]					
15	757	1204	1959	3028	5152	12113
20	873	1388	2259	3492	5941	13968
30	1105	1756	2859	4419	7519	17677
40	1360	2162	3519	5439	9254	21757
50	1615	2567	4179	6459	10989	25837
60	1870	2973	4839	7479	12725	29917
70	2125	3378	5499	8499	14460	33997
80	2380	3783	6159	9519	16196	38078
90	2635	4189	6819	10539	17931	42158
100	2890	4594	7479	11559	19666	46238
120	3400	5405	8799	13600	23137	54398
140	3910	6216	10118	15640	26608	62558
160	4420	7027	11438	17680	30079	70719
180	4930	7838	12758	19720	33550	78879
200	5440	8648	14078	21760	37020	87039
220	5950	9459	15398	23800	40491	95200
240	6460	10270	16718	25840	43962	103360
260	6970	11081	18038	27880	47433	111520
280	7480	11892	19358	29920	50904	119680
300	7990	12703	20677	31960	54375	127841
320	8500	13513	21997	34000	57845	136001
340	9010	14324	23317	36040	61316	144161
360	9520	15135	24637	38080	64787	152321
380	10030	15946	25957	40120	68258	160482
400	10540	16757	27277	42161	71729	168642
420	11050	17567	28597	44201	75199	176802
440	11560	18378	29917	46241	78670	184963
460	12070	19189	31236	48281	82141	193123
480	12580	20000	32556	50321	85612	201283
500	13090	20811	33876	52361	89083	209443
550	14365	22838	37176	57461	97760	
600	15640	24865	40476	62561		
650	16915	26892	43775	67661		
700	18190	28919		72762		
740	19210			76842		

## Type 441, 442 ANSI

### 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 [ $m_n^3/h$ ]

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. $d_0$ [mm]	23	29	37	46	60	92
Act. Orifice area $A_0$ [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [bar]	Capacities [ $m_n^3/h$ ]					
0.1	0	0	0	0	0	0
0.2	162	258	420	649	1105	2597
0.5	263	418	680	1051	1789	4206
1	388	617	1004	1552	2641	6209
2	627	996	1622	2507	4265	10026
3	854	1357	2209	3414	5809	13657
4	1071	1703	2773	4286	7291	17143
5	1289	2050	3337	5157	8774	20629
6	1507	2396	3900	6029	10257	24114
7	1725	2742	4464	6900	11739	27600
8	1943	3089	5028	7771	13222	31086
9	2161	3435	5592	8643	14704	34571
10	2379	3781	6155	9514	16187	38057
12	2814	4474	7283	11257	19152	45028
14	3250	5167	8411	13000	22117	52000
16	3686	5859	9538	14743	25082	58971
18	4121	6552	10666	16486	28047	65942
20	4557	7245	11793	18228	31012	72913
22	4993	7938	12921	19971	33977	79885
24	5429	8630	14048	21714	36943	86856
26	5864	9323	15176	23457	39908	93827
28	6300	10016	16304	25200	42873	100799
30	6736	10708	17431	26942	45838	107770
32	7171	11401	18559	28685	48803	114741
34	7607	12094	19686	30428	51768	121713
36	8043	12786	20814	32171	54733	
38	8478	13479	21941	33914	57698	
40	8914	14172	23069	35657	60663	
42	9350	14864	24197	37399		
44	9786	15557	25324	39142		
46	10221	16250	26452	40885		
48	10657	16942		42628		
50	11093			44371		
51	11311			45242		

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [S.C.F.M.]

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. $d_0$ [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Act. Orifice area $A_0$ [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [psig]	Capacities [S.C.F.M.]					
15	270	429	698	1079	1835	4315
20	311	494	805	1244	2116	4976
30	394	626	1019	1574	2679	6297
40	484	770	1254	1938	3297	7750
50	575	915	1489	2301	3915	9204
60	666	1059	1724	2664	4533	10657
70	757	1204	1959	3028	5152	12111
80	848	1348	2194	3391	5770	13564
90	939	1492	2430	3754	6388	15018
100	1029	1637	2665	4118	7006	16471
120	1211	1926	3135	4845	8243	19378
140	1393	2215	3605	5571	9479	22285
160	1574	2504	4076	6298	10716	25192
180	1756	2792	4546	7025	11952	28099
200	1938	3081	5016	7751	13189	31006
220	2120	3370	5486	8478	14425	33913
240	2301	3659	5957	9205	15662	36820
260	2483	3948	6427	9932	16898	39727
280	2665	4237	6897	10658	18135	42633
300	2846	4526	7368	11385	19371	45540
320	3028	4815	7838	12112	20608	48447
340	3210	5104	8308	12839	21844	51354
360	3391	5392	8778	13565	23081	54261
380	3573	5681	9249	14292	24317	57168
400	3755	5970	9719	15019	25554	60075
420	3936	6259	10189	15745	26791	62982
440	4118	6548	10660	16472	28027	65889
460	4300	6837	11130	17199	29264	68796
480	4481	7126	11600	17926	30500	71703
500	4663	7415	12070	18652	31737	74610
550	5117	8137	13246	20469	34828	
600	5572	8859	14422	22286		
650	6026	9581	15598	24103		
700	6480	10303		25920		
740	6843			27373		

## Type 441, 442 ANSI 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<sup>3</sup>kg/h]

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. d <sub>0</sub> [mm]	23	29	37	46	60	92
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.516	0.821	1.336	2.065	3.513	8.259
Set pressure [bar]	Capacities [10 <sup>3</sup> kg/h]					
0.1	4.25	6.76	11.0	17.0	28.9	68.0
0.2	5.21	8.28	13.5	20.8	35.4	83.3
0.5	7.37	11.7	19.1	29.5	50.1	118
1	10.0	15.9	25.8	39.9	67.9	160
2	14.1	22.4	36.5	56.4	96.0	226
3	17.3	27.5	44.7	69.1	118	276
4	19.9	31.7	51.6	79.8	136	319
5	22.3	35.5	57.7	89.2	152	357
6	24.4	38.8	63.2	97.7	166	391
7	26.4	42.0	68.3	106	180	422
8	28.2	44.8	73.0	113	192	451
9	29.9	47.6	77.4	120	204	479
10	31.5	50.1	81.6	126	215	505
12	34.6	54.9	89.4	138	235	553
14	37.3	59.3	96.6	149	254	597
16	39.9	63.4	103	160	271	638
18	42.3	67.3	110	169	288	677
20	44.6	70.9	115	178	304	714
22	46.8	74.4	121	187	318	748
24	48.9	77.7	126	195	333	782
26	50.9	80.9	132	203	346	814
28	52.8	83.9	137	211	359	844
30	54.6	86.8	141	219	372	874
32	56.4	89.7	146	226	384	903
34	58.2	92.5	151	233	396	931
36	59.8	95.1	155	239	407	
38	61.5	97.7	159	246	418	
40	63.1	100	163	252	429	
42	64.6	103	167	259		
44	66.2	105	171	265		
46	67.6	108	175	271		
48	69.1	110		276		
50	70.5			282		
51	71.2			285		

## US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. d <sub>0</sub> [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.516	0.821	1.336	2.065	3.513	8.259
Set pressure [psig]	Capacities [US-G.P.M.]					
15	54.0	85.9	140	216	368	864
20	61.1	97.1	158	244	416	977
30	73.1	116	189	293	498	1170
40	84.5	134	219	338	575	1351
50	94.4	150	244	378	643	1511
60	103	164	268	414	704	1655
70	112	178	289	447	760	1787
80	119	190	309	478	813	1911
90	127	201	328	507	862	2027
100	134	212	346	534	909	2136
120	146	233	379	585	996	2340
140	158	251	409	632	1075	2528
160	169	269	437	676	1150	2702
180	179	285	464	717	1219	2866
200	189	300	489	755	1285	3021
220	198	315	513	792	1348	3169
240	207	329	535	827	1408	3310
260	215	342	557	861	1465	3445
280	223	355	578	894	1521	3575
300	231	368	599	925	1574	3700
320	239	380	618	955	1626	3822
340	246	391	637	985	1676	3939
360	253	403	656	1013	1724	4054
380	260	414	674	1041	1772	4165
400	267	425	691	1068	1818	4273
420	274	435	708	1095	1862	4378
440	280	445	725	1120	1906	4481
460	286	455	741	1146	1949	4582
480	293	465	757	1170	1991	4681
500	299	475	773	1194	2032	4777
550	313	498	811	1253	2131	
600	327	520	847	1308		
650	340	541	881	1362		
700	353	562		1413		
740	363			1453		

## Type 441, 442 ANSI

### 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 ( $K_{dr}/\alpha_w$ )

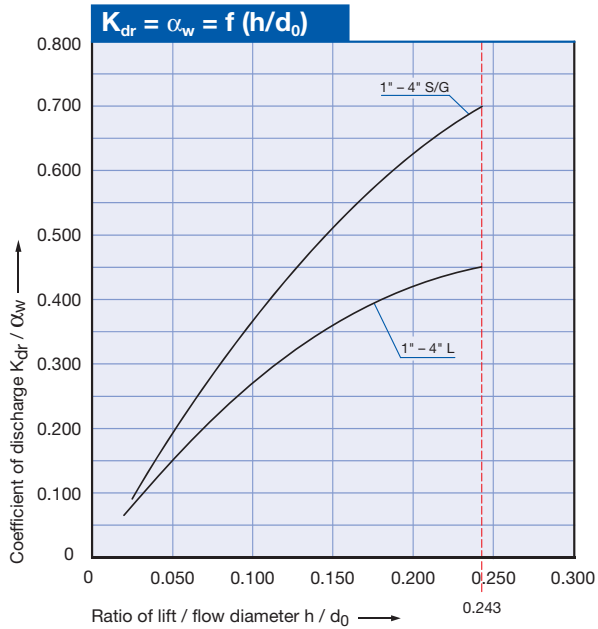
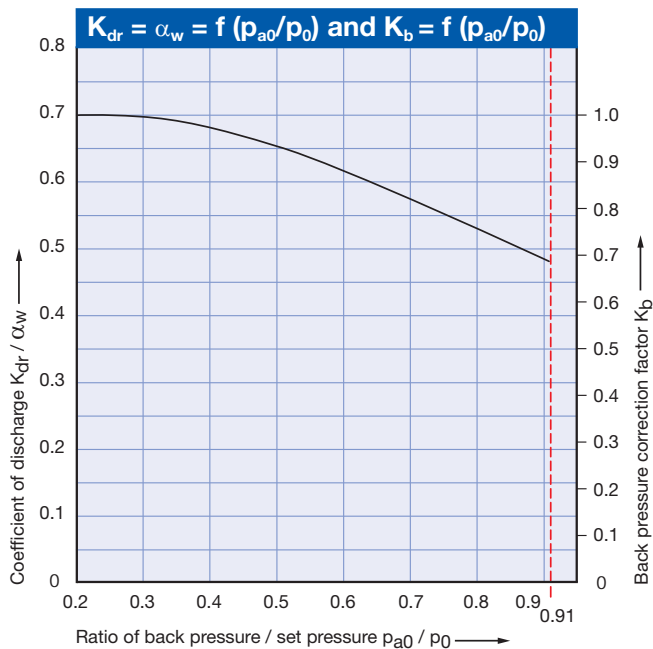


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )



#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

## Type 441, 442 Full nozzle DIN 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]

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	40	65	80
Act. Orifice dia.	d <sub>o</sub> [mm]	23	37	46
Act. Orifice area	A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662
	LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	1.195	1.847
Set pressure [bar]	Capacities [kg/h]			
0.1	0	0	0	
0.2	140	363	561	
0.5	224	579	895	
1	326	843	1302	
2	519	1343	2075	
3	699	1808	2794	
4	871	2254	3485	
5	1043	2699	4172	
6	1214	3142	4856	
7	1381	3574	5525	
8	1551	4014	6205	
9	1721	4454	6884	
10	1891	4893	7562	
12	2230	5770	8919	
14	2562	6629	10247	
16	2900	7505	11600	
18	3239	8382	12955	
20	3578	9260	14312	
22	3907	10111	15629	
24	4247	10991	16988	
26	4588	11873	18351	
28	4930	12757	19718	
30	5272	13644	21089	
32	5616	14534	22465	
34	5945	15384	23779	
36	6290	16278	25160	
38	6637	17175	26547	
40	6985	18076	27939	

### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [lb/h]

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	40	65	80
Act. Orifice dia.	d <sub>o</sub> [inch]	0.91	1.46	1.81
Act. Orifice area	A <sub>o</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576
	LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	1.195	1.847
Set pressure [psig]	Capacities [lb/h]			
15	757	1959	3028	
20	873	2259	3492	
30	1105	2859	4419	
40	1360	3519	5439	
50	1615	4179	6459	
60	1870	4839	7479	
70	2125	5499	8499	
80	2380	6159	9519	
90	2635	6819	10539	
100	2890	7479	11559	
120	3400	8799	13600	
140	3910	10118	15640	
160	4420	11438	17680	
180	4930	12758	19720	
200	5440	14078	21760	
220	5950	15398	23800	
240	6460	16718	25840	
260	6970	18038	27880	
280	7480	19358	29920	
300	7990	20677	31960	
320	8500	21997	34000	
340	9010	23317	36040	
360	9520	24637	38080	
380	10030	25957	40120	
400	10540	27277	42161	
420	11050	28597	44201	
440	11560	29917	46241	
460	12070	31236	48281	
480	12580	32556	50321	
500	13090	33876	52361	
550	14365	37176	57461	
580	15130	39156	60521	

## Type 441, 442 Full nozzle DIN

### 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 [ $m_n^3/h$ ]

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	40	65	80
Act. Orifice dia.	d <sub>o</sub> [mm]	23	37	46
Act. Orifice area	A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662
	LEO <sub>S/G</sub> <sup>*</sup> [inch <sup>2</sup> ]	0.462	1.195	1.847
Set pressure [bar]	Capacities [ $m_n^3/h$ ]			
0.1	0	0	0	
0.2	162	420	649	
0.5	263	680	1051	
1	388	1004	1552	
2	627	1622	2507	
3	854	2209	3414	
4	1071	2773	4286	
5	1289	3337	5157	
6	1507	3900	6029	
7	1725	4464	6900	
8	1943	5028	7771	
9	2161	5592	8643	
10	2379	6155	9514	
12	2814	7283	11257	
14	3250	8411	13000	
16	3686	9538	14743	
18	4121	10666	16486	
20	4557	11793	18228	
22	4993	12921	19971	
24	5429	14048	21714	
26	5864	15176	23457	
28	6300	16304	25200	
30	6736	17431	26942	
32	7171	18559	28685	
34	7607	19686	30428	
36	8043	20814	32171	
38	8478	21941	33914	
40	8914	23069	35657	

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [S.C.F.M.]

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	40	65	80
Act. Orifice dia.	d <sub>o</sub> [inch]	0.91	1.46	1.81
Act. Orifice area	A <sub>o</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576
	LEO <sub>S/G</sub> <sup>*</sup> [inch <sup>2</sup> ]	0.462	1.195	1.847
Set pressure [psig]	Capacities [S.C.F.M.]			
15	270	698	1079	
20	311	805	1244	
30	394	1019	1574	
40	484	1254	1938	
50	575	1489	2301	
60	666	1724	2664	
70	757	1959	3028	
80	848	2194	3391	
90	939	2430	3754	
100	1029	2665	4118	
120	1211	3135	4845	
140	1393	3605	5571	
160	1574	4076	6298	
180	1756	4546	7025	
200	1938	5016	7751	
220	2120	5486	8478	
240	2301	5957	9205	
260	2483	6427	9932	
280	2665	6897	10658	
300	2846	7368	11385	
320	3028	7838	12112	
340	3210	8308	12839	
360	3391	8778	13565	
380	3573	9249	14292	
400	3755	9719	15019	
420	3936	10189	15745	
440	4118	10660	16472	
460	4300	11130	17199	
480	4481	11600	17926	
500	4663	12070	18652	
550	5117	13246	20469	
580	5390	13952	21559	

## Type 441, 442 Full nozzle DIN 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<sup>3</sup>kg/h]

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	40	65	80
Act. Orifice dia.	d <sub>o</sub> [mm]	23	37	46
Act. Orifice area	A <sub>o</sub> [mm <sup>2</sup> ]	416	1075	1662
	LEO <sub>L</sub> <sup>*</sup> [inch <sup>2</sup> ]	0.516	1.336	2.062
Set pressure [bar]	Capacities [10 <sup>3</sup> kg/h]			
0.1	4.25	11.0	17.0	
0.2	5.21	13.5	20.8	
0.5	7.37	19.1	29.5	
1	9.97	25.8	39.9	
2	14.1	36.5	56.4	
3	17.3	44.7	69.1	
4	19.9	51.6	79.8	
5	22.3	57.7	89.2	
6	24.4	63.2	97.7	
7	26.4	68.3	106	
8	28.2	73.0	113	
9	29.9	77.4	120	
10	31.5	81.6	126	
12	34.6	89.4	138	
14	37.3	96.6	149	
16	39.3	103	160	
18	42.3	110	169	
20	44.6	115	178	
22	46.8	121	187	
24	48.9	126	195	
26	50.9	132	203	
28	52.8	137	211	
30	54.6	141	219	
32	56.4	146	226	
34	58.2	151	233	
36	59.8	155	239	
38	61.5	159	246	
40	63.1	163	252	

### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

	DN <sub>i</sub>	25	40	50
	DN <sub>o</sub>	40	65	80
Act. Orifice dia.	d <sub>o</sub> [inch]	0.91	1.46	1.81
Act. Orifice area	A <sub>o</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576
	LEO <sub>L</sub> <sup>*</sup> [inch <sup>2</sup> ]	0.516	1.336	2.062
Set pressure [psig]	Capacities [US-G.P.M.]			
15	54.0	140	216	
20	61.1	158	244	
30	73.1	189	293	
40	84.5	219	338	
50	94.4	244	378	
60	103	268	414	
70	112	289	447	
80	119	309	478	
90	127	328	507	
100	134	346	534	
120	146	379	585	
140	158	409	632	
160	169	437	676	
180	179	464	717	
200	189	489	755	
220	198	513	792	
240	207	535	827	
260	215	557	861	
280	223	578	894	
300	231	599	925	
320	239	618	955	
340	246	637	985	
360	253	656	1013	
380	260	674	1041	
400	267	691	1068	
420	274	708	1095	
440	280	725	1120	
460	286	741	1146	
480	293	757	1170	
500	299	773	1194	
550	313	811	1253	
580	322	832	1286	



## Type 441, 442 Full nozzle ANSI

### 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]

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. $d_0$ [mm]	23	29	37	46	60	92
Act. Orifice area $A_0$ [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [bar]	Capacities [kg/h]					
0.1	0	0	0	0	0	0
0.2	140	223	363	561	954	2243
0.5	224	356	579	895	1523	3580
1	326	518	843	1302	2215	5209
2	519	825	1343	2075	3531	8302
3	699	1111	1808	2794	4754	11178
4	871	1385	2254	3485	5928	13938
5	1043	1658	2699	4172	7097	16687
6	1214	1930	3142	4856	8262	19426
7	1381	2196	3574	5525	9399	22098
8	1551	2466	4014	6205	10556	24818
9	1721	2736	4454	6884	11712	27535
10	1891	3006	4893	7562	12866	30250
12	2230	3545	5770	8919	15174	35675
14	2562	4073	6629	10247	17433	40987
16	2900	4610	7505	11600	19735	46400
18	3239	5149	8382	12955	22041	51820
20	3578	5688	9260	14312	24350	57249
22	3907	6212	10111	15629	26590	62515
24	4247	6752	10991	16988	28903	67953
26	4588	7294	11873	18351	31222	73405
28	4930	7837	12757	19718	33547	78873
30	5272	8382	13644	21089	35880	84358
32	5616	8929	14534	22465	38220	89860
34	5945	9451	15384	23779	40455	95115
36	6290	10000	16278	25160	42806	
38	6637	10551	17175	26547	45165	
40	6985	11104	18076	27939		
42	7334	11660	18980	29337		
44	7685	12218	19888	30740		
46	8037	12778	20800	32150		
48	8391	13341		33566		
51	8747			34988		
	8900			35600		

#### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [lb/h]

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. $d_0$ [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Act. Orifice area $A_0$ [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [psig]	Capacities [lb/h]					
15	757	1204	1959	3028	5152	12113
20	873	1388	2259	3492	5941	13968
30	1105	1756	2859	4419	7519	17677
40	1360	2162	3519	5439	9254	21757
50	1615	2567	4179	6459	10989	25837
60	1870	2973	4839	7479	12725	29917
70	2125	3378	5499	8499	14460	33997
80	2380	3783	6159	9519	16196	38078
90	2635	4189	6819	10539	17931	42158
100	2890	4594	7479	11559	19666	46238
120	3400	5405	8799	13600	23137	54398
140	3910	6216	10118	15640	26608	62558
160	4420	7027	11438	17680	30079	70719
180	4930	7838	12758	19720	33550	78879
200	5440	8648	14078	21760	37020	87039
220	5950	9459	15398	23800	40491	95200
240	6460	10270	16718	25840	43962	103360
260	6970	11081	18038	27880	47433	111520
280	7480	11892	19358	29920	50904	119680
300	7990	12703	20677	31960	54375	127841
320	8500	13513	21997	34000	57845	136001
340	9010	14324	23317	36040	61316	144161
360	9520	15135	24637	38080	64787	152321
380	10030	15946	25957	40120	68258	160482
400	10540	16757	27277	42161	71729	168642
420	11050	17567	28597	44201	75199	176802
440	11560	18378	29917	46241	78670	184963
460	12070	19189	31236	48281	82141	193123
480	12580	20000	32556	50321	85612	201283
500	13090	20811	33876	52361	89083	209443
550	14365	22838	37176	57461	97760	
600	15640	24865	40476	62561		
650	16915	26892	43775	67661		
700	18190	28919		72762		
740	19210			76842		

## Type 441, 442 Full nozzle ANSI

### 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 [ $m_n^3/h$ ]

Valve size		1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	$d_0$ [mm]	23	29	37	46	60	92
Act. Orifice area	$A_0$ [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
	$LEO_{S/G}^*)$ [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [bar]	Capacities [ $m_n^3/h$ ]						
0.1	0	0	0	0	0	0	0
0.2	162	258	420	649	1105	2597	
0.5	263	418	680	1051	1789	4206	
1	388	617	1004	1552	2641	6209	
2	627	996	1622	2507	4265	10026	
3	854	1357	2209	3414	5809	13657	
4	1071	1703	2773	4286	7291	17143	
5	1289	2050	3337	5157	8774	20629	
6	1507	2396	3900	6029	10257	24114	
7	1725	2742	4464	6900	11739	27600	
8	1943	3089	5028	7771	13222	31086	
9	2161	3435	5592	8643	14704	34571	
10	2379	3781	6155	9514	16187	38057	
12	2814	4474	7283	11257	19152	45028	
14	3250	5167	8411	13000	22117	52000	
16	3686	5859	9538	14743	25082	58971	
18	4121	6552	10666	16486	28047	65942	
20	4557	7245	11793	18228	31012	72913	
22	4993	7938	12921	19971	33977	79885	
24	5429	8630	14048	21714	36943	86856	
26	5864	9323	15176	23457	39908	93827	
28	6300	10016	16304	25200	42873	100799	
30	6736	10708	17431	26942	45838	107770	
32	7171	11401	18559	28685	48803	114741	
34	7607	12094	19686	30428	51768	121713	
36	8043	12786	20814	32171	54733		
38	8478	13479	21941	33914	57698		
40	8914	14172	23069	35657	60663		
42	9350	14864	24197	37399			
44	9786	15557	25324	39142			
46	10221	16250	26452	40885			
48	10657	16942		42628			
50	11093			44371			
51	11311			45242			

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

#### ASME Section VIII [S.C.F.M.]

Valve size		1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	$d_0$ [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Act. Orifice area	$A_0$ [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
	$LEO_{S/G}^*)$ [inch <sup>2</sup> ]	0.462	0.734	1.195	1.847	3.142	7.387
Set pressure [psig]	Capacities [S.C.F.M.]						
15	270	429	698	1079	1835	4315	
20	311	494	805	1244	2116	4976	
30	394	626	1019	1574	2679	6297	
40	484	770	1254	1938	3297	7750	
50	575	915	1489	2301	3915	9204	
60	666	1059	1724	2664	4533	10657	
70	757	1204	1959	3028	5152	12111	
80	848	1348	2194	3391	5770	13564	
90	939	1492	2430	3754	6388	15018	
100	1029	1637	2665	4118	7006	16471	
120	1211	1926	3135	4845	8243	19378	
140	1393	2215	3605	5571	9479	22285	
160	1574	2504	4076	6298	10716	25192	
180	1756	2792	4546	7025	11952	28099	
200	1938	3081	5016	7751	13189	31006	
220	2120	3370	5486	8478	14425	33913	
240	2301	3659	5957	9205	15662	36820	
260	2483	3948	6427	9932	16898	39727	
280	2665	4237	6897	10658	18135	42633	
300	2846	4526	7368	11385	19371	45540	
320	3028	4815	7838	12112	20608	48447	
340	3210	5104	8308	12839	21844	51354	
360	3391	5392	8778	13565	23081	54261	
380	3573	5681	9249	14292	24317	57168	
400	3755	5970	9719	15019	25554	60075	
420	3936	6259	10189	15745	26791	62982	
440	4118	6548	10660	16472	28027	65889	
460	4300	6837	11130	17199	29264	68796	
480	4481	7126	11600	17926	30500	71703	
500	4663	7415	12070	18652	31737	74610	
550	5117	8137	13246	20469	34828		
600	5572	8859	14422	22286			
650	6026	9581	15598	24103			
700	6480	10303		25920			
740	6843			27373			

## Type 441, 442 Full nozzle ANSI

### 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<sup>3</sup>kg/h]

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. d <sub>0</sub> [mm]	23	29	37	46	60	92
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.516	0.821	1.336	2.065	3.513	8.259
Set pressure [bar]	Capacities [10 <sup>3</sup> kg/h]					
0.1	4.25	6.76	11.0	17.0	28.9	68.0
0.2	5.21	8.28	13.5	20.8	35.4	83.3
0.5	7.37	11.7	19.1	29.5	50.1	118
1	10.0	15.9	25.8	39.9	67.9	160
2	14.1	22.4	36.5	56.4	96.0	226
3	17.3	27.5	44.7	69.1	118	276
4	19.9	31.7	51.6	79.8	136	319
5	22.3	35.5	57.7	89.2	152	357
6	24.4	38.8	63.2	97.7	166	391
7	26.4	42.0	68.3	106	180	422
8	28.2	44.8	73.0	113	192	451
9	29.9	47.6	77.4	120	204	479
10	31.5	50.1	81.6	126	215	505
12	34.6	54.9	89.4	138	235	553
14	37.3	59.3	96.6	149	254	597
16	39.9	63.4	103	160	271	638
18	42.3	67.3	110	169	288	677
20	44.6	70.9	115	178	304	714
22	46.8	74.4	121	187	318	748
24	48.9	77.7	126	195	333	782
26	50.9	80.9	132	203	346	814
28	52.8	83.9	137	211	359	844
30	54.6	86.8	141	219	372	874
32	56.4	89.7	146	226	384	903
34	58.2	92.5	151	233	396	931
36	59.8	95.1	155	239	407	
38	61.5	97.7	159	246	418	
40	63.1	100	163	252	429	
42	64.6	103	167	259		
44	66.2	105	171	265		
46	67.6	108	175	271		
48	69.1	110		276		
50	70.5			282		
51	71.2			285		

#### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

Valve size	1" x 2"	1½" x 2"	1½" x 2½"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia. d <sub>0</sub> [inch]	0.91	1.14	1.46	1.81	2.36	3.62
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.644	1.024	1.667	2.576	4.383	10.304
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.516	0.821	1.336	2.065	3.513	8.259
Set pressure [psig]	Capacities [US-G.P.M.]					
15	54.0	85.9	140	216	368	864
20	61.1	97.1	158	244	416	977
30	73.1	116	189	293	498	1170
40	84.5	134	219	338	575	1351
50	94.4	150	244	378	643	1511
60	103	164	268	414	704	1655
70	112	178	289	447	760	1787
80	119	190	309	478	813	1911
90	127	201	328	507	862	2027
100	134	212	346	534	909	2136
120	146	233	379	585	996	2340
140	158	251	409	632	1075	2528
160	169	269	437	676	1150	2702
180	179	285	464	717	1219	2866
200	189	300	489	755	1285	3021
220	198	315	513	792	1348	3169
240	207	329	535	827	1408	3310
260	215	342	557	861	1465	3445
280	223	355	578	894	1521	3575
300	231	368	599	925	1574	3700
320	239	380	618	955	1626	3822
340	246	391	637	985	1676	3939
360	253	403	656	1013	1724	4054
380	260	414	674	1041	1772	4165
400	267	425	691	1068	1818	4273
420	274	435	708	1095	1862	4378
440	280	445	725	1120	1906	4481
460	286	455	741	1146	1949	4582
480	293	465	757	1170	1991	4681
500	299	475	773	1194	2032	4777
550	313	498	811	1253	2131	
600	327	520	847	1308		
650	340	541	881	1362		
700	353	562		1413		
740	363			1453		

## Type 441, 442 Full nozzle DIN, ANSI 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 ( $K_{dr}/\alpha_w$ )

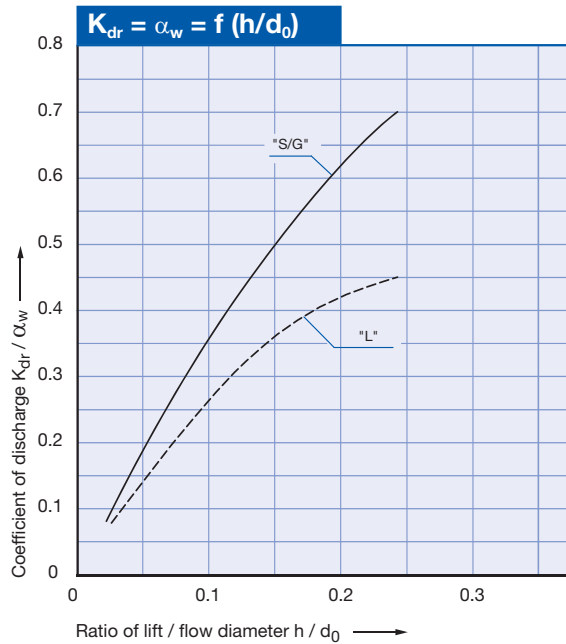
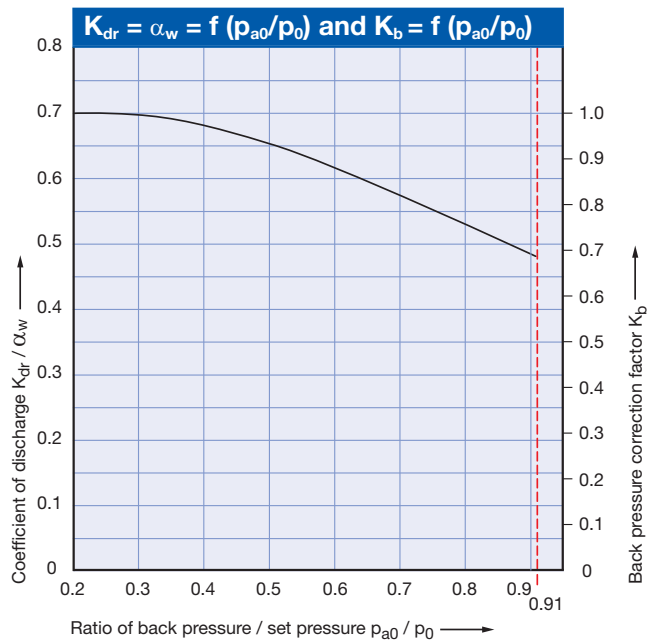


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$   
in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )



### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

## Type 441, 442 XXL 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]

DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
Act. Orifice dia. $d_0$ [mm]	165	200	235	295
Act. Orifice area $A_0$ [mm <sup>2</sup> ]	21382	31416	43374	68349
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	23.761	34.910	48.198	75.952
Set pressure [bar]	Capacities [kg/h]			
<b>0.1</b>	0	0	0	0
<b>0.2</b>	7214	0	14633	0
<b>0.5</b>	11516	16920	23360	36811
<b>1</b>	16755	24617	33986	53556
<b>2</b>	26704	39234	54168	85359
<b>3</b>	35954	52826	72932	114929
<b>4</b>	48036	65872	90944	143312
<b>5</b>	57507	78859	108875	171568
<b>6</b>	66947	91804	126747	199731
<b>7</b>	76157	104433	144183	
<b>8</b>	85532	117289	161932	
<b>9</b>	94895	130128	179658	
<b>10</b>	104250	142957	197370	
<b>12</b>	122947	168596	232768	
<b>14</b>	141254	193700		
<b>16</b>	159910	219283		
<b>18</b>	178589	244897		
<b>20</b>	197298			
<b>22</b>	197298			
<b>24</b>	234188			

### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

#### ASME Section VIII [lb/h]

DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
Act. Orifice dia. $d_0$ [inch]	6.5	7.87	9.25	11.61
Act. Orifice area $A_0$ [inch <sup>2</sup> ]	33.14	48.69	67.23	105.94
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	23.761	34.910	48.198	75.952
Set pressure [psig]	Capacities [lb/h]			
<b>15</b>	38962	57245	79034	124543
<b>20</b>	44928	66009	91134	143612
<b>30</b>	56859	83539	115336	181749
<b>40</b>	69983	102821	141958	223700
<b>50</b>	83107	122104	168579	265652
<b>60</b>	96231	141386	195201	307603
<b>70</b>	109355	160668	221823	349554
<b>80</b>	122479	179951	248444	391505
<b>90</b>	135603	199233	275066	
<b>100</b>	148727	218515	301688	
<b>120</b>	174975	257080	354931	
<b>140</b>	201223	295645	408174	
<b>160</b>	227471	334209	461418	
<b>180</b>	253719	372774		
<b>200</b>	279967	411338		
<b>220</b>	306215	449903		
<b>240</b>	332463	488468		
<b>260</b>	358711	527032		
<b>280</b>	384960			
<b>300</b>	411208			
<b>320</b>	437456			
<b>340</b>	463704			
<b>360</b>	489952			

## Type 441, 442 XXL

### 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 [ $m_n^3/h$ ]

DN <sub>r,o</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
Act. Orifice dia. $d_0$ [mm]	165	200	235	295
Act. Orifice area $A_0$ [mm <sup>2</sup> ]	21382	31416	43374	68349
LEO <sub>S/G</sub> <sup>*)</sup> [inch <sup>2</sup> ]	23.761	34.910	48.198	75.952
Set pressure [bar]	Capacities [ $m_n^3/h$ ]			
<b>0.1</b>	0	0	0	0
<b>0.2</b>	8354	0	16945	0
<b>0.5</b>	13528	19876	27441	43242
<b>1</b>	19970	29341	40509	63835
<b>2</b>	32251	47384	65420	103090
<b>3</b>	43930	64544	89110	140423
<b>4</b>	59080	81016	111853	176261
<b>5</b>	71093	97489	134596	212100
<b>6</b>	83106	113962	157339	247939
<b>7</b>	95118	130435	180082	
<b>8</b>	107131	146908	202824	
<b>9</b>	119144	163381	225567	
<b>10</b>	119144	163381	225567	
<b>12</b>	155182	212799	293796	
<b>14</b>	179207	245745		
<b>16</b>	203232	278690		
<b>18</b>	227258	311636		
<b>20</b>	251283			
<b>22</b>	275308			
<b>24</b>	299334			

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

#### ASME Section VIII [S.C.F.M.]

DN <sub>r,o</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
Act. Orifice dia. $d_0$ [inch]	6.5	7.87	9.25	11.61
Act. Orifice area $A_0$ [inch <sup>2</sup> ]	33.14	48.69	67.23	105.94
LEO <sub>S/G</sub> <sup>*)</sup> [inch <sup>2</sup> ]	23.761	34.910	48.198	75.952
Set pressure [psig]	Capacities [S.C.F.M.]			
<b>15</b>	13879	20392	28153	44365
<b>20</b>	16004	23514	32464	51158
<b>30</b>	20254	29758	41085	64743
<b>40</b>	24929	36627	50568	79687
<b>50</b>	29604	43496	60051	94631
<b>60</b>	34280	50365	69534	109575
<b>70</b>	38955	57234	79018	124519
<b>80</b>	43630	64102	88501	139463
<b>90</b>	48305	70971	97984	
<b>100</b>	52980	77840	107467	
<b>120</b>	62330	91578	126433	
<b>140</b>	71680	105315	145400	
<b>160</b>	81030	119053	164366	
<b>180</b>	90380	132791		
<b>200</b>	99731	146528		
<b>220</b>	109081	160266		
<b>240</b>	118431	174003		
<b>260</b>	127781	187741		
<b>280</b>	137131			
<b>300</b>	146481			
<b>320</b>	155831			
<b>340</b>	165182			
<b>360</b>	174532			

## Type 441, 442 XXL 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 [ $10^3\text{kg/h}$ ]

DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
Act. Orifice dia. $d_o$ [mm]	165	200	235	295
Act. Orifice area $A_o$ [mm <sup>2</sup> ]	21382	31416	43374	68349
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	26.565	39.031	53.887	84.916
Set pressure [bar]	Capacities [ $10^3\text{kg/h}$ ]			
<b>0.1</b>	272	372	513	808
<b>0.2</b>	334	455	628	990
<b>0.5</b>	472	644	889	1400
<b>1</b>	639	871	1203	1896
<b>2</b>	903	1232	1702	2681
<b>3</b>	1106	1509	2084	3284
<b>4</b>	1278	1743	2406	3792
<b>5</b>	1428	1949	2690	4240
<b>6</b>	1565	2135	2947	4644
<b>7</b>	1690	2306	3183	
<b>8</b>	1807	2465	3403	
<b>9</b>	1916	2614	3610	
<b>10</b>	2020	2756	3805	
<b>12</b>	2213	3019	4168	
<b>14</b>	2390	3261		
<b>16</b>	2555	3486		
<b>18</b>	2710	3697		
<b>20</b>	2857			
<b>22</b>	2996			
<b>24</b>	3129			

### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

DN <sub>I+O</sub>	200 x 300	250 x 350	300 x 400	400 x 500
Valve size	8" x 12"	10" x 14"	12" x 16"	16" x 20"
Act. Orifice dia. $d_o$ [inch]	6.5	7.87	9.25	11.61
Act. Orifice area $A_o$ [inch <sup>2</sup> ]	33.14	48.69	67.23	105.94
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	26.565	39.031	53.887	84.916
Set pressure [psig]	Capacities [US-G.P.M.]			
<b>15</b>	2780	4084	5639	8886
<b>20</b>	3142	4617	6374	10044
<b>30</b>	3764	5530	7635	12031
<b>40</b>	4346	6386	8816	13893
<b>50</b>	4859	7139	9857	15532
<b>60</b>	5323	7821	10797	17015
<b>70</b>	5749	8447	11662	18378
<b>80</b>	6146	9031	12468	19647
<b>90</b>	6519	9578	13224	
<b>100</b>	6872	10096	13939	
<b>120</b>	7528	11060	15270	
<b>140</b>	8131	11946	16493	
<b>160</b>	8692	12771	17632	
<b>180</b>	9220	13546		
<b>200</b>	9718	14279		
<b>220</b>	10193	14975		
<b>240</b>	10646	15641		
<b>260</b>	11081	16280		
<b>280</b>	11499			
<b>300</b>	11902			
<b>320</b>	12293			
<b>340</b>	12671			
<b>360</b>	13039			

## Type 441, 442 XXL

### 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 ( $K_{dr}/\alpha_w$ )

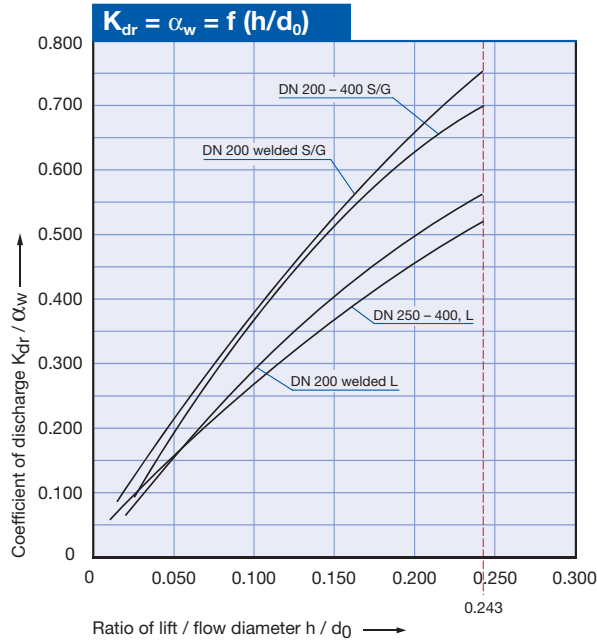
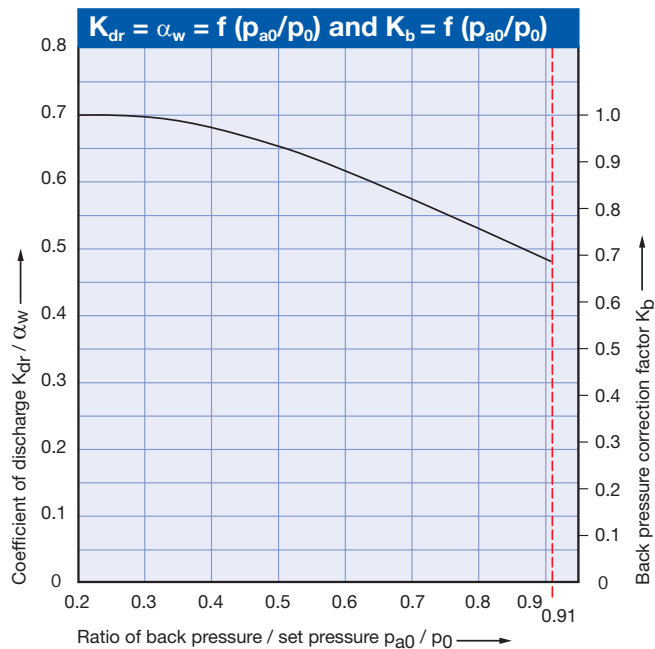


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )



#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ration of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3



## Type 444 DIN, 444 ANSI

### 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]

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
Act. Orifice dia. d <sub>0</sub> [mm]		23	37	46	60	74	74
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		416	1075	1662	2827	4301	4301
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]		0.462	1.195	1.847	3.142	4.779	4.779
Set pressure S/G [bar <sub>g</sub> ]						0.1 – 6.8	6.81 – 16
Set pressure [bar]	Capacities [kg/h]						
<b>0.1</b>	112	274	405	720	1093		
<b>0.2</b>	144	353	524	927	1417		
<b>0.5</b>	223	546	822	1434	2221		
<b>1</b>	324	790	1209	2086	3262		
<b>2</b>	529	1285	2002	3413	5377		
<b>3</b>	699	1761	2770	4695	7237		
<b>4</b>	872	2256	3487	5932	9023		
<b>5</b>	1043	2700	4174	7101	10801		
<b>6</b>	1215	3143	4858	8266	12573		
<b>7</b>	1382	3575	5526	9402		11237	
<b>8</b>	1552	4015	6206	10559		12619	
<b>9</b>	1721	4455	6885	11714		14000	
<b>10</b>	1891	4894	7564	12868		15380	
<b>12</b>	2230	5772	8922	15179		18141	
<b>14</b>	2562	6631	10249	17437		20840	
<b>16</b>	2901	7507	11603	19740		23593	

#### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

#### ASME Section VIII [lb/h]

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
Act. Orifice dia. d <sub>0</sub> [inch]		0.91	1.46	1.81	2.36	2.91	2.91
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]		0.644	1.667	2.576	4.383	6.666	6.666
LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]		0.462	1.195	1.847	3.142	4.779	4.779
Set pressure S/G [psig]						1.5 – 98.6	98.61 – 232
Set pressure [psig]	Capacities [lb/h]						
<b>15</b>	758	1962	3032	5159	7847		
<b>20</b>	874	2262	3496	5948	9047		
<b>30</b>	1106	2862	4423	7525	11447		
<b>40</b>	1361	3522	5443	9261	14087		
<b>50</b>	1616	4182	6463	10996	16726		
<b>60</b>	1871	4842	7483	12732	19366		
<b>70</b>	2126	5501	8503	14467	22006		
<b>80</b>	2381	6161	9523	16202	24646		
<b>90</b>	2636	6821	10543	17938	27285		
<b>100</b>	2891	7481	11563	19673	29925		
<b>120</b>	3401	8801	13604	23144		35205	
<b>140</b>	3911	10121	15644	26615		40484	
<b>160</b>	4421	11441	17684	30086		45764	
<b>180</b>	4931	12761	19724	33557		51043	
<b>200</b>	5441	14081	21764	37027		56323	
<b>220</b>	5951	15401	23804	40498		61602	
<b>230</b>	6206	16060	24824	42234		64242	

## Type 444 DIN, 444 ANSI

### 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 [ $m_n^3/h$ ]

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
Act. Orifice dia.	d <sub>o</sub> [mm]	23	37	46	60	74	74
Act. Orifice area	A <sub>o</sub> [mm <sup>2</sup> ]	416	661	1075	1662	2827	6648
	LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	1.195	1.847	3.142	4.779	4.779
	Set pressure S/G [bar <sub>g</sub> ]					0.1 – 6.8	6.81 – 16
Set pressure [bar]	Capacities [ $m_n^3/h$ ]						
<b>0.1</b>	129	316	466	829	1257		
<b>0.2</b>	167	409	607	1073	1640		
<b>0.5</b>	262	640	964	1683	2607		
<b>1</b>	386	941	1440	2484	3884		
<b>2</b>	639	1551	2416	4119	6489		
<b>3</b>	853	2150	3382	5732	8835		
<b>4</b>	1071	2772	4284	7289	11088		
<b>5</b>	1289	3335	5155	8771	13341		
<b>6</b>	1506	3899	6026	10252	15594		
<b>7</b>	1724	4462	6897	11733		14023	
<b>8</b>	1942	5025	7767	13214		15793	
<b>9</b>	2159	5588	8638	14696		17564	
<b>10</b>	2377	6152	9509	16177		19334	
<b>12</b>	2812	7278	11250	19140		22875	
<b>14</b>	3248	8405	12991	22102		26416	
<b>16</b>	3683	9532	14733	25065		29956	

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [S.C.F.M.]

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
Act. Orifice dia.	d <sub>o</sub> [inch]	0.91	1.46	1.81	2.36	2.91	2.91
Act. Orifice area	A <sub>o</sub> [inch <sup>2</sup> ]	0.644	1.667	2.576	4.383	6.666	6.666
	LEO <sub>S/G</sub> *) [inch <sup>2</sup> ]	0.462	1.195	1.847	3.142	4.779	4.779
	Set pressure S/G [psig]					1.5 – 98.6	98.61 – 232
Set pressure [psig]	Capacities [S.C.F.M.]						
<b>15</b>	269	697	1077	1832	2786		
<b>20</b>	310	803	1241	2112	3212		
<b>30</b>	393	1016	1571	2672	4064		
<b>40</b>	483	1250	1933	3288	5002		
<b>50</b>	574	1485	2295	3904	5939		
<b>60</b>	664	1719	2657	4521	6876		
<b>70</b>	755	1953	3019	5137	7814		
<b>80</b>	845	2188	3381	5753	8751		
<b>90</b>	936	2422	3744	6369	9688		
<b>100</b>	1026	2656	4106	6985	10625		
<b>120</b>	1208	3125	4830	8218		12500	
<b>140</b>	1389	3594	5555	9450		14375	
<b>160</b>	1570	4062	6279	10682		16249	
<b>180</b>	1751	4531	7003	11915		18124	
<b>200</b>	1932	5000	7728	13147		19998	
<b>220</b>	2113	5468	8452	14380		21873	
<b>230</b>	2204	5703	8814	14996		22810	

## Type 444 DIN, 444 ANSI

### 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<sup>3</sup>kg/h]

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
Act. Orifice dia. d <sub>0</sub> [mm]		23	37	46	60	74	74
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]		416	1075	1662	2827	4301	4301
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]		0.516	1.336	2.065	3.513	5.343	5.343
Set pressure L [bar <sub>g</sub> ]						0.1 – 6.8	6.81 – 16
Set pressure [bar]	Capacities [10 <sup>3</sup> kg/h]						
<b>0.1</b>	4.54	11.8	18.2	30.9	47		
<b>0.2</b>	5.56	14.4	22.2	37.8	57.6		
<b>0.5</b>	7.87	20.4	31.5	53.5	81.4		
<b>1</b>	10.6	27.6	42.6	72.5	110		
<b>2</b>	15.1	39	60.2	102	156		
<b>3</b>	18.4	47.7	73.8	126	191		
<b>4</b>	21.3	55.1	85.2	145	220		
<b>5</b>	23.8	61.6	95.3	162	246		
<b>6</b>	26.1	67.5	104	178	270		
<b>7</b>	28.2	72.9	113	192		292	
<b>8</b>	30.1	77.9	120	205		312	
<b>9</b>	31.9	82.7	128	217		331	
<b>10</b>	33.7	87.2	135	229		349	
<b>12</b>	36.9	95.5	148	251		382	
<b>14</b>	39.8	103	159	271		412	
<b>16</b>	42.6	110	170	290		441	

#### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

	DN <sub>i</sub>	25	40	50	65	80	80
	DN <sub>o</sub>	50	80	80	100	100	100
	Valve size	1" x 2"	1½" x 3"	2" x 3"	2½" x 4"	3" x 4"	3" x 4"
Act. Orifice dia. d <sub>0</sub> [inch]		0.91	1.46	1.81	2.36	2.91	2.91
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]		0.644	1.667	2.576	4.383	6.666	6.666
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]		0.516	1.336	2.065	3.513	5.343	5.343
Set pressure L [psig]						1.5 – 98.6	98.61 – 232
Set pressure [psig]	Capacities [US-G.P.M.]						
<b>15</b>	54.1	140	216	368	560		
<b>20</b>	61.1	158	245	416	633		
<b>30</b>	73.2	190	293	498	758		
<b>40</b>	84.6	219	338	576	875		
<b>50</b>	94.6	245	378	643	979		
<b>60</b>	104	268	414	705	1072		
<b>70</b>	112	290	447	761	1158		
<b>80</b>	120	310	478	814	1238		
<b>90</b>	127	328	507	863	1313		
<b>100</b>	134	346	535	910	1384		
<b>120</b>	146	379	586	997		1516	
<b>140</b>	158	409	633	1077		1638	
<b>160</b>	169	438	677	1151		1751	
<b>180</b>	179	464	718	1221		1857	
<b>200</b>	189	489	756	1287		1958	
<b>220</b>	198	513	793	1350		2053	
<b>230</b>	203	525	811	1380		2099	

## Type 444 DIN, 444 ANSI

### 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 ( $K_{dr}/\alpha_w$ )

#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ration of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

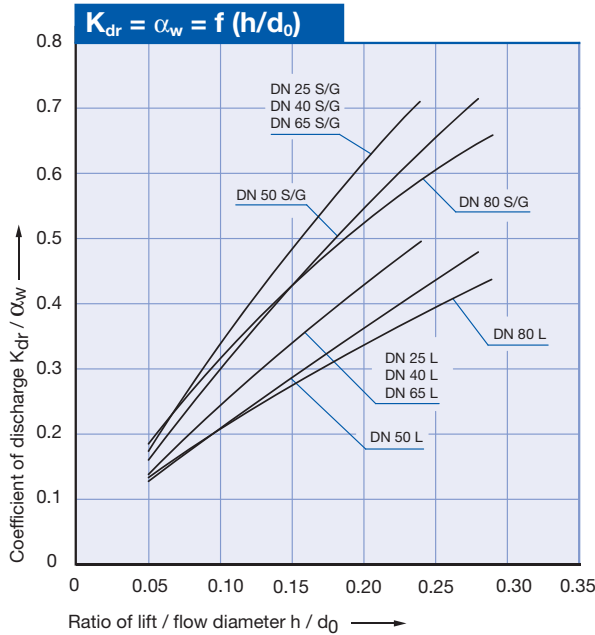
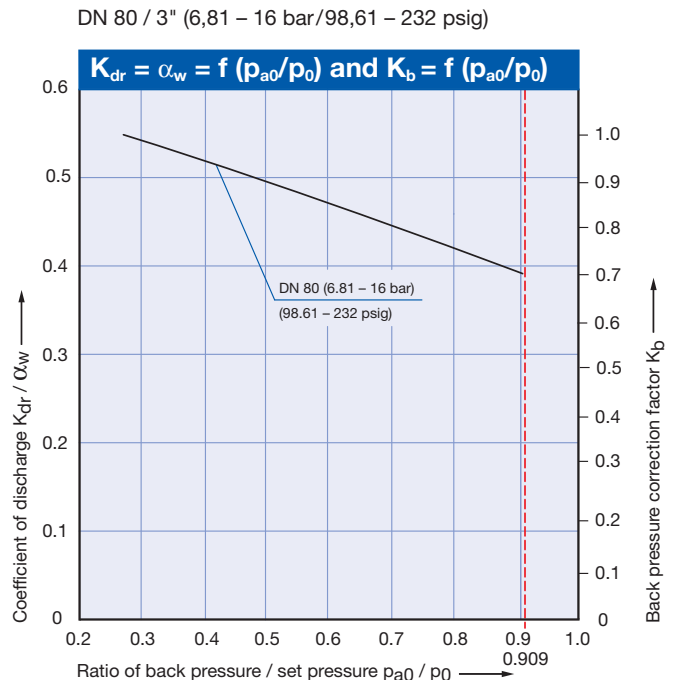
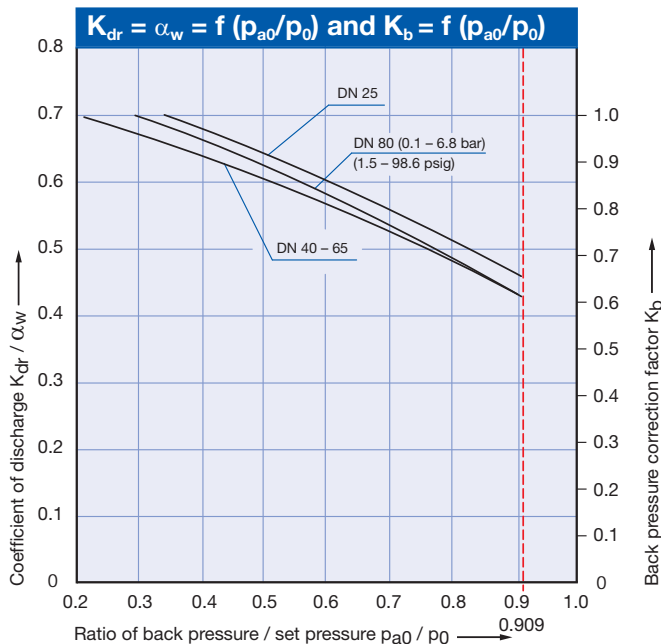


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )



## Type 455, 456

### 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]

	DN <sub>H<sub>2</sub>O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	d <sub>0</sub> [mm]	20	40	60	74
Act. Orifice area	A <sub>0</sub> [mm <sup>2</sup> ]	314	1257	2827	4301
	LEO <sub>S/G</sub> * [inch <sup>2</sup> ]	0.399	1.594	3.389	5.456
Set pressure [bar]	Capacities [kg/h]				
2.5	509	2036	4403	7149	
3	589	2385	5094	8265	
4	743	3011	6352	10306	
5	901	3605	7604	12338	
6	1049	4197	8853	14363	
7	1194	4774	10070	16339	
8	1340	5362	11310	18351	
9	1487	5949	12548	20360	
10	1634	6535	13785	22367	
12	1927	7707	16257	26378	
14	2214	8855	18678	30306	
16	2506	10024	21145	34308	
18	2799	11195	23615	38316	
20	3092	12368	26089	42330	
22	3376	13506	28489	46224	
24	3670	14681	30967	50245	
26	3965	15859	33452	54276	
28	4260	17040	35943	58319	
30	4556	18225	38443	62374	
32	4853	19414	40950	66443	
34	5137	20549	43345	70328	
36	5436	21743	45863	74414	
38	5735	22941	48391	78515	
40	6036	24144	50929	82632	
50	7559	30235	63777	103480	
60	9091	36366	76709	124462	
70	10686	42745			
80	12293	49171			
90	13983	55932			
100	15689	62756			

#### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure. Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

#### ASME Section VIII [lb/h]

	DN <sub>H<sub>2</sub>O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	d <sub>0</sub> [inch]	0.79	1.57	2.36	2.91
Act. Orifice area	A <sub>0</sub> [inch <sup>2</sup> ]	0.487	1.948	4.383	6.666
	LEO <sub>S/G</sub> * [inch <sup>2</sup> ]	0.399	1.594	3.389	5.456
Set pressure [psig]	Capacities [lb/h]				
15	654	2614	5557	8947	
20	754	3014	6408	10317	
30	954	3815	8110	13056	
40	1174	4695	9982	16070	
50	1394	5576	11854	19083	
60	1614	6456	13726	22097	
70	1834	7337	15598	25111	
80	2054	8217	17470	28124	
90	2275	9098	19342	31138	
100	2495	9979	21214	34152	
120	2935	11740	24958	40179	
140	3375	13501	28702	46206	
160	3815	15262	32446	52233	
180	4256	17023	36189	58261	
200	4696	18784	39933	64288	
220	5136	20545	43677	70315	
240	5577	22306	47421	76342	
260	6017	24067	51165	82370	
280	6457	25828	54909	88397	
300	6897	27589	58653	94424	
320	7338	29350	62397	100451	
340	7778	31111	66141	106478	
360	8218	32872	69885	112506	
380	8658	34633	73629	118533	
400	9099	36395	77373	124560	
500	11300	45200	96092	154696	
600	13501	54005	114812	184833	
700	15703	62810	133531	214969	
800	17904	71616	152251	245105	
900	20105	80421	170970	275241	
1000	22307	89226			
1100	24508	98032			
1200	26709	106837			
1300	28911	115642			
1400	31068	124273			
1450	32265	129061			

## Type 455, 456

### 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 [ $m_n^3/h$ ]

	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	d <sub>0</sub> [mm]	20	40	60	74
Act. Orifice area	A <sub>0</sub> [mm <sup>2</sup> ]	314	1257	2827	4301
	LEO <sub>S/G</sub> * [inch <sup>2</sup> ]	0.399	1.594	3.389	5.456
Set pressure [bar]	Capacities [ $m_n^3/h$ ]				
2.5	619	2478	5357	8700	
3	719	2914	6224	10098	
4	914	3704	7812	12676	
5	1114	4457	9401	15253	
6	1302	5210	10989	17830	
7	1491	5963	12578	20407	
8	1679	6716	14166	22985	
9	1867	7469	15755	25562	
10	2055	8222	17343	28139	
12	2432	9728	20520	33294	
14	2809	11234	23697	38449	
16	3185	12740	26874	43603	
18	3562	14246	30051	48758	
20	3938	15752	33228	53912	
22	4315	17258	36404	59067	
24	4691	18764	39581	64221	
26	5068	20271	42758	69376	
28	5444	21777	45935	74531	
30	5821	23283	49112	79685	
32	6197	24789	52289	84840	
34	6574	26295	55466	89994	
36	6950	27801	58643	95149	
38	7327	29307	61820	100304	
40	7703	30813	64997	105458	
50	9586	38344	80881	131231	
60	11469	45874	96766	157004	
70	13351	53404			
80	15234	60935			
90	17116	68465			
100	18999	75996			

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

#### ASME Section VIII [S.C.F.M.]

	DN <sub>I+O</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	d <sub>0</sub> [inch]	0.79	1.57	2.36	2.91
Act. Orifice area	A <sub>0</sub> [inch <sup>2</sup> ]	0.487	1.948	4.383	6.666
	LEO <sub>S/G</sub> * [inch <sup>2</sup> ]	0.399	1.594	3.389	5.456
Set pressure [psig]	Capacities [S.C.F.M.]				
15	233	931	1980	3187	
20	268	1074	2283	3675	
30	340	1359	2889	4651	
40	418	1673	3556	5724	
50	497	1986	4223	6798	
60	575	2300	4890	7871	
70	653	2614	5557	8945	
80	732	2928	6224	10018	
90	810	3241	6891	11091	
100	889	3555	7558	12165	
120	1046	4182	8891	14312	
140	1202	4810	10225	16459	
160	1359	5437	11559	18606	
180	1516	6065	12893	20753	
200	1673	6692	14227	22900	
220	1830	7319	15560	25047	
240	1987	7947	16894	27193	
260	2144	8574	18228	29340	
280	2300	9202	19562	31487	
300	2457	9829	20896	33634	
320	2614	10456	22229	35781	
340	2771	11084	23563	37928	
360	2928	11711	24897	40075	
380	3085	12338	26231	42222	
400	3241	12966	27565	44369	
500	4026	16103	34234	55104	
600	4810	19240	40903	65838	
700	5594	22377	47572	76573	
800	6378	25514	54241	87307	
900	7163	28651	60910	98042	
1000	7947	31788	67579	108777	
1100	8731	34925	74248	119511	
1200	9515	38062	80917	130246	
1300	10300	41199	87586	140981	
1400	11084	44336	94255	151715	
1450	11476	45904	97589	157083	

## Type 455, 456 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 [ $10^3\text{kg/h}$ ]

	DN <sub>i+o</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	d <sub>o</sub> [mm]	20	40	60	74
Act. Orifice area	A <sub>o</sub> [mm <sup>2</sup> ]	314	1257	2827	4301
	LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.399	1.594	3.389	5.456
Set pressure [bar]		Capacities [ $10^3\text{kg/h}$ ]			
	<b>2.5</b>	15.9	57.2	119	203
	<b>3</b>	17.4	62.7	131	223
	<b>4</b>	20.1	72.4	151	257
	<b>5</b>	22.5	80.9	169	287
	<b>6</b>	24.6	88.7	185	315
	<b>7</b>	26.6	95.8	200	340
	<b>8</b>	28.4	102	213	363
	<b>9</b>	30.2	109	226	385
	<b>10</b>	31.8	114	238	406
	<b>12</b>	34.8	125	261	445
	<b>14</b>	37.6	135	282	481
	<b>16</b>	40.2	145	302	514
	<b>18</b>	42.7	154	320	545
	<b>20</b>	45	162	337	575
	<b>22</b>	47.2	170	354	603
	<b>24</b>	49.3	177	369	629
	<b>26</b>	51.3	185	385	655
	<b>28</b>	53.2	192	399	680
	<b>30</b>	55.1	198	413	704
	<b>32</b>	56.9	205	427	727
	<b>34</b>	58.6	211	440	749
	<b>36</b>	60.3	217	452	771
	<b>38</b>	62	223	465	792
	<b>40</b>	63.6	229	477	813
	<b>50</b>	71.1	256	533	909
	<b>60</b>	77.9	280	584	995
	<b>70</b>	84.1	303		
	<b>80</b>	89.9	324		
	<b>90</b>	95.4	343		
	<b>100</b>	101	362		

### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10% overpressure at 21 °C (70 °F). Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

	DN <sub>i+o</sub>	25 x 50	50 x 80	80 x 100	100 x 150
	Valve size	1" x 2"	2" x 3"	3" x 4"	4" x 6"
Act. Orifice dia.	d <sub>o</sub> [inch]	0.79	1.57	2.36	2.91
Act. Orifice area	A <sub>o</sub> [inch <sup>2</sup> ]	0.487	1.948	4.383	6.666
	LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.399	1.594	3.389	5.456
Set pressure [psig]		Capacities [US-G.P.M.]			
	<b>15</b>	44.8	179	338	614
	<b>20</b>	50.7	203	382	694
	<b>30</b>	60.7	243	458	831
	<b>40</b>	70.1	280	528	960
	<b>50</b>	78.4	314	591	1073
	<b>60</b>	85.9	343	647	1175
	<b>70</b>	92.8	371	699	1270
	<b>80</b>	99.2	397	747	1357
	<b>90</b>	105	421	793	1440
	<b>100</b>	111	443	836	1517
	<b>120</b>	121	486	915	1662
	<b>140</b>	131	525	989	1795
	<b>160</b>	140	561	1057	1919
	<b>180</b>	149	595	1121	2036
	<b>200</b>	157	627	1182	2146
	<b>220</b>	164	658	1239	2251
	<b>240</b>	172	687	1294	2351
	<b>260</b>	179	715	1347	2447
	<b>280</b>	186	742	1398	2539
	<b>300</b>	192	768	1447	2628
	<b>320</b>	198	793	1495	2714
	<b>340</b>	204	818	1541	2798
	<b>360</b>	210	841	1585	2879
	<b>380</b>	216	864	1629	2958
	<b>400</b>	222	887	1671	3035
	<b>500</b>	248	992	1868	3393
	<b>600</b>	272	1086	2047	3717
	<b>700</b>	293	1173	2211	4015
	<b>800</b>	314	1254	2363	4292
	<b>900</b>	333	1330	2507	4552
	<b>1000</b>	351	1402	2642	4799
	<b>1100</b>	368	1471	2771	5033
	<b>1200</b>	384	1536	2894	5257
	<b>1300</b>	400	1599	3012	5471
	<b>1400</b>	415	1659	3126	5678
	<b>1450</b>	422	1689	3182	5778

**Type 455, 456**

**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 ( $K_{dr}/\alpha_w$ )

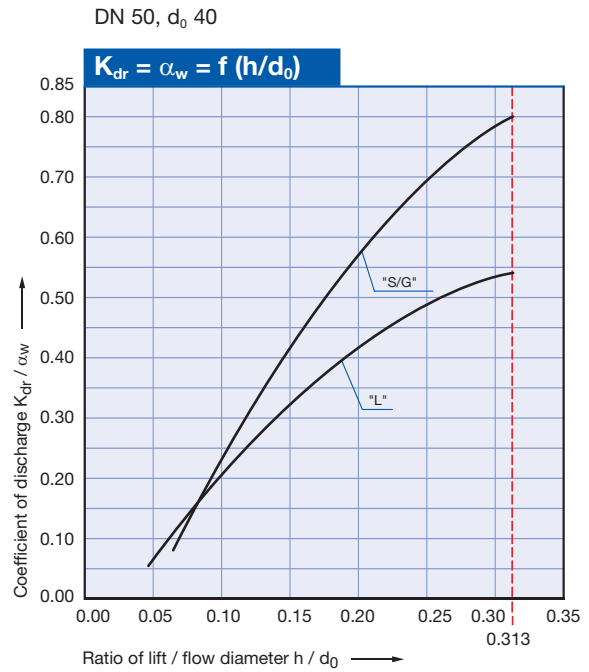
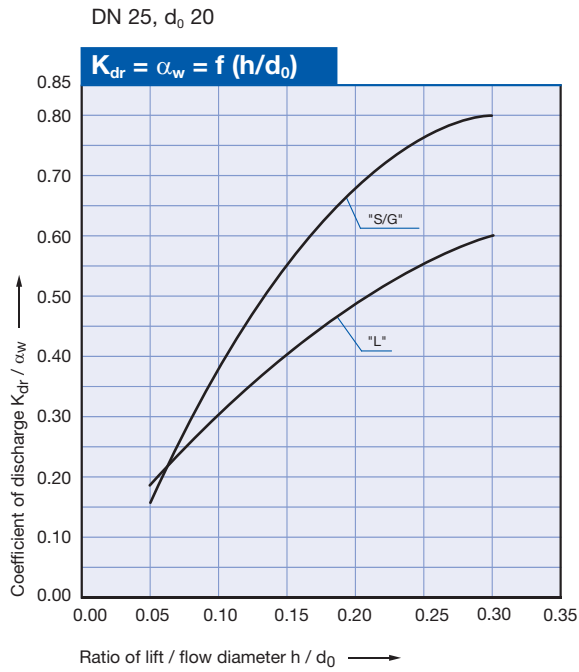
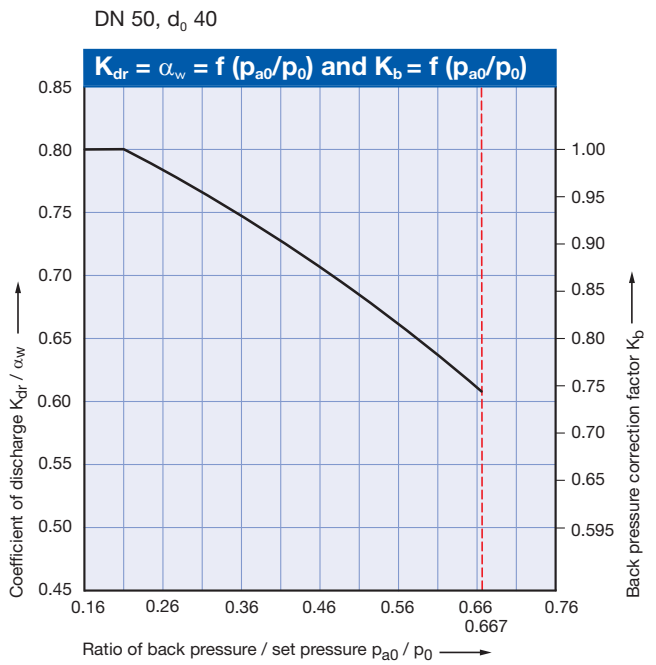
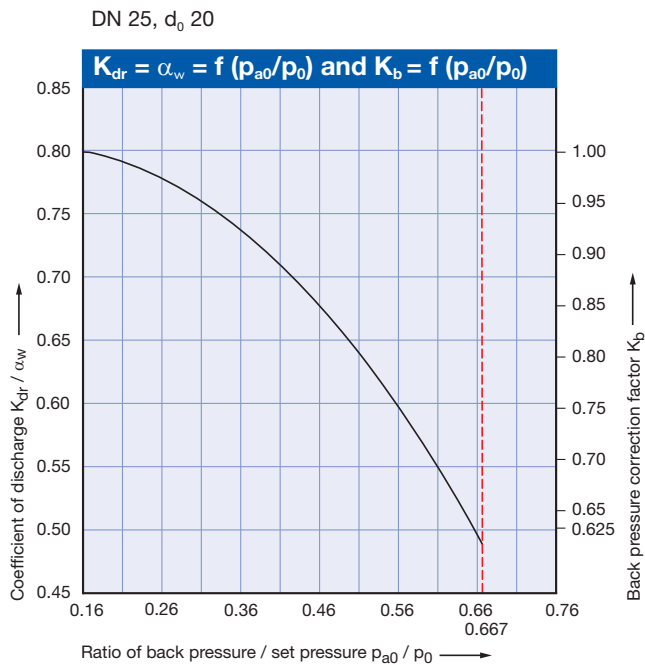


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )





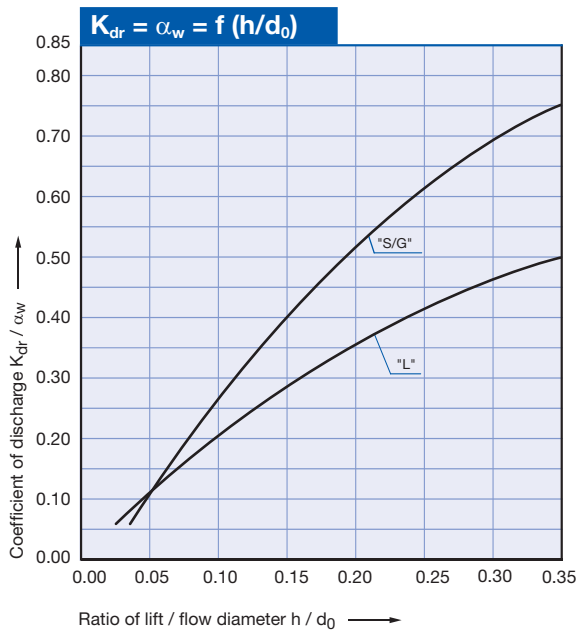
## Type 455, 456

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

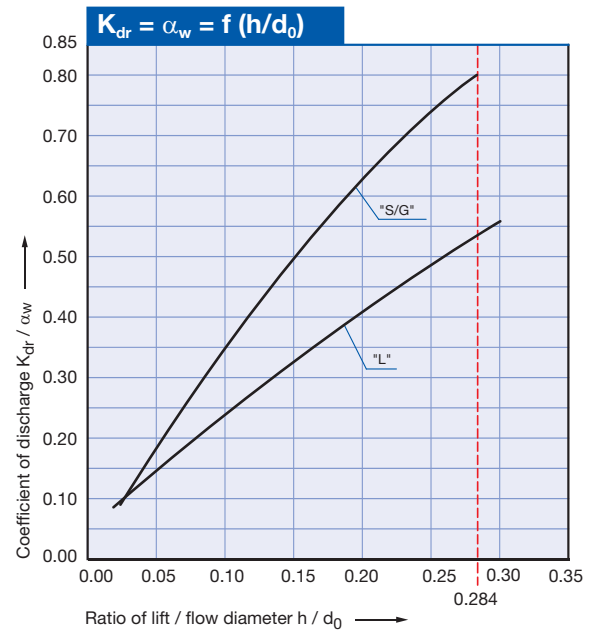
#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

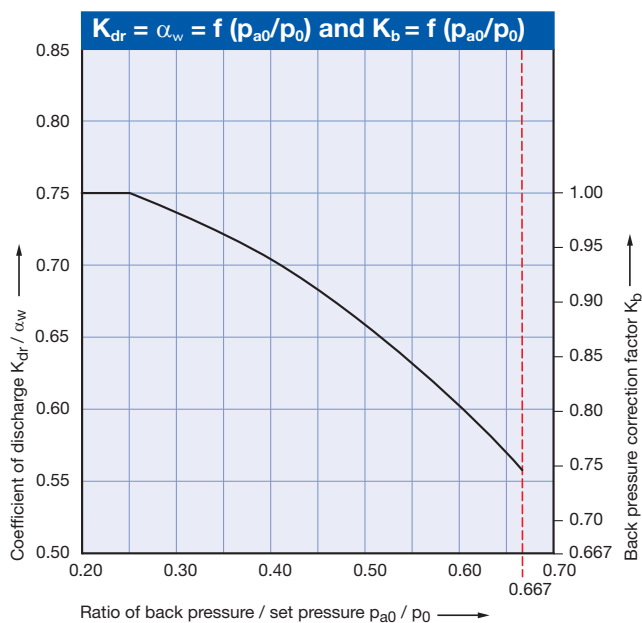
DN 80,  $d_0$  60



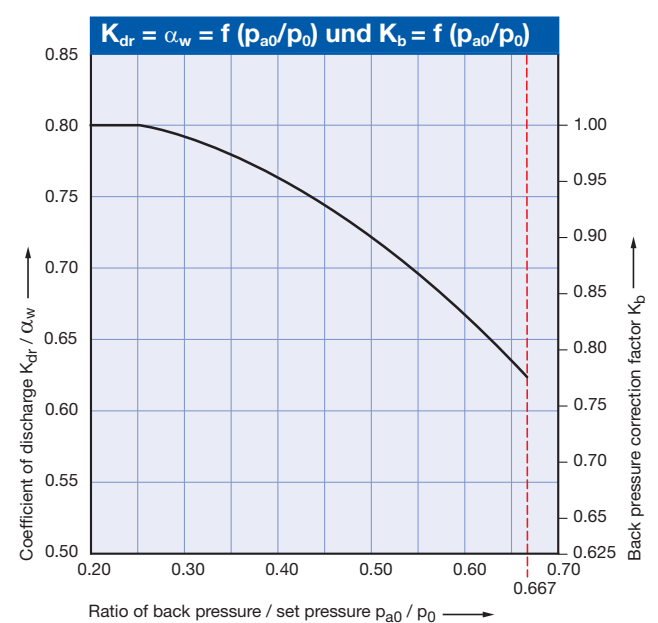
DN 100,  $d_0$  74



DN 80,  $d_0$  60



DN 100,  $d_0$  74



## Type 457, 458

### 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]

DN <sub>I+O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Act. Orifice dia. d <sub>0</sub> [mm]	15	20	30	40	50	60	50	60	74	88	110
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827	1694	2827	4301	6082	9503
LEO <sub>SG</sub> *) [inch <sup>2</sup> ]	0.224	0.399	0.897	1.594	2.491	3.389	2.491	3.587	5.456	7.29	11.391
Set pressure [bar]	Capacities [kg/h]										
2.5	305	535	1205	2036	3429	4403	3388	4641	7149	9470	13998
3	352	619	1409	2385	3915	5094	3915	5366	8265	10958	15980
4	439	781	1779	3011	4882	6352	4940	6775	10306	13664	19926
5	526	946	2129	3605	5844	7604	5914	8111	12338	16358	23855
6	612	1102	2479	4197	6803	8853	6885	9443	14363	19043	27771
7	697	1253	2820	4774	7739	10070	7832	10742	16339	21662	31591
8	782	1407	3167	5362	8692	11310	8797	12064	18351	24329	35480
9	868	1562	3513	5949	9643	12548	9760	13385	20360	26992	39364
10	953	1715	3860	6535	10594	13785	10722	14704	22367	29653	43244
12	1124	2023	4552	7707	12494	16257	12645	17341	26378	34972	51000
14	1292	2324	5230	8855	14355	18678	14527	19923	30306	40179	58594
16	1463	2631	5921	10024	16250	21145	16446	22555	34308	45486	66333
18	1633	2939	6612	11195	18149	23615	18367	25189	38316	50799	74081
20	1804	3247	7305	12368	20050	26089	20291	27828	42330	56120	81842
22	1970	3545	7977	13506	21894	28489	22158	30388	46224	61283	89371
24	2142	3854	8671	14681	23799	30967	24085	33031	50245	66614	97145
26	2314	4163	9366	15859	25708	33452	26018	35682	54276	71958	104939
28	2486	4473	10064	17040	27623	35943	27956	38340	58319	77318	112756
30	2659	4784	10764	18225	29544	38443	29900	41006	62374	82695	120596
32	2832	5096	11466	19414	31471	40950	31850	43680	66443	88089	128463
34	2998	5394	12137	20549	33311	43345	33713	46235	70328	93240	135975
36	3172	5707	12842	21743	35247	45863	35671	48921	74414	98657	143875
38	3347	6022	13549	22941	37189	48391	37637	51617	78515	104094	151804
40	3523	6338	14260	24144	39140	50929	39611	54324	82632	109553	159765
50	4411	7937	17858	30235	49014	63777	49605	68029	103480	137192	
60	5306	9546	21479	36366	58952	76709	59663	81823	124462		
70	6236	11221	25246	42745	69294	90166	70129	96177	146296		
80	7174	12907	29042	49171	79711		80671	110634			
90	8160	14682	33035	55932	90670		91763	125846			
100	9156	16473	37065	62756	101733		102959	141201			
120	11326	20378	45850		125844		127361	174666			
140	13773	24781	55758		153039		154882	212410			
160	16604	29873	67215		184485		186707	256056			
180	20171	36291	81656								
200	24970		101082								
220	26183										
240	27342										
260	28455										
280	29525										
300	30558										

# Type 457, 458

## Capacities – Steam

### US Units

Capacities for saturated steam according to ASME Section VIII (UV), based on set pressure plus 10% overpressure.  
 Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [lb/h]

DN <sub>in</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Act. Orifice dia. d <sub>0</sub> [inch]	0.59	0.79	1.18	1.57	1.97	2.36	1.97	2.36	2.91	3.46	4.33
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.274	0.487	1.096	1.948	3.043	4.383	3.043	4.383	6.666	9.427	14.730
LEO <sub>SG</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.224	0.399	0.897	1.594	2.491	3.389	2.491	3.587	5.456	7.29	11.391
Set pressure [psig]	Capacities [lb/h]										
40	660	1174	2641	4695	7336	9982	7336	10565	16070	21472	33551
50	784	1394	3136	5576	8712	11854	8712	12546	19083	25499	39843
60	908	1614	3632	6456	10088	13726	10088	14527	22097	29526	46134
70	1032	1834	4127	7337	11464	15598	11464	16508	25111	33553	52426
80	1156	2054	4622	8217	12840	17470	12840	18489	28124	37580	58718
90	1279	2275	5118	9098	14216	19342	14216	20471	31138	41606	65010
100	1403	2495	5613	9979	15591	21214	15591	22452	34152	45633	71302
120	1651	2935	6604	11740	18343	24958	18343	26414	40179	53687	83886
140	1899	3375	7594	13501	21095	28702	21095	30377	46206	61740	96469
160	2146	3815	8585	15262	23846	32446	23846	34339	52233	69794	109053
180	2394	4256	9575	17023	26598	36189	26598	38301	58261	77848	121637
200	2641	4696	10566	18784	29350	39933	29350	42264	64288	85901	134221
220	2889	5136	11557	20545	32101	43677	32101	46226	70315	93955	146804
240	3137	5577	12547	22306	34853	47421	34853	50188	76342	102008	159388
260	3384	6017	13538	24067	37605	51165	37605	54151	82370	110062	171972
280	3632	6457	14528	25828	40356	54909	40356	58113	88397	118115	184555
300	3880	6897	15519	27589	43108	58653	43108	62076	94424	126169	197139
320	4127	7338	16510	29350	45860	62397	45860	66038	100451	134223	209723
340	4375	7778	17500	31111	48611	66141	48611	70000	106478	142276	222307
360	4623	8218	18491	32872	51363	69885	51363	73963	112506	150330	234890
380	4870	8658	19481	34633	54115	73629	54115	77925	118533	158383	247474
400	5118	9099	20472	36395	56866	77373	56866	81888	124560	166437	260058
500	6356	11300	25425	45200	70625	96092	70625	101700	154696	206705	322976
600	7594	13501	30378	54005	84383	114812	84383	121512	184833	246973	
700	8833	15703	35331	62810	98141	133531	98141	141324	214969	287241	
800	10071	17904	40284	71616	111900	152251	111900	161136	245105		
900	11309	20105	45237	80421	125658	170970	125658	180948	275241		
1000	12547	22307	50190	89226	139416	189690	139416	200759	305377		
1100	13786	24508	55143	98032	153175	208410	153175	220571	335514		
1200	15024	26709	60096	106837	166933		166933	240383			
1300	16262	28911	65049	115642	180691		180691	260195			
1400	17476	31068	69903	124273	194176		194176	279614			
1500	18829	33473	75314	133892	209206		209206	301256			
2000	26033	46281	104132		289256		289256	416528			
2500	34450	61245	137802								
3000	37312		149250								
3500	43504										
4000	49695										
4350	54029										

## Type 457, 458

### 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 [ $m_n^3/h$ ]

DN <sub>I/O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Act. Orifice dia. $d_o$ [mm]	15	20	30	40	50	60	50	60	74	88	110	
Act. Orifice area $A_o$ [mm <sup>2</sup> ]	177	314	707	1257	1964	2827	1694	2827	4301	6082	9503	
LEO <sub>SG</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.224	0.399	0.897	1.594	2.491	3.389	2.491	3.587	5.456	7.29	11.391	
Set pressure [bar]	Capacities [ $m_n^3/h$ ]											
2.5	371	652	1466	2478	4173	5357	4122	5647	8700	11524	17033	
3	430	756	1722	2914	4783	6224	4783	6556	10098	13388	19524	
4	540	961	2187	3704	6004	7812	6076	8333	12676	16805	24507	
5	650	1170	2632	4457	7225	9401	7312	10027	15253	20222	29490	
6	760	1368	3077	5210	8445	10989	8547	11722	17830	23639	34474	
7	870	1565	3522	5963	9666	12578	9783	13416	20407	27056	39457	
8	980	1763	3967	6716	10887	14166	11018	15111	22985	30473	44440	
9	1090	1961	4411	7469	12108	15755	12254	16805	25562	33890	49423	
10	1200	2158	4856	8222	13328	17343	13489	18499	28139	37307	54406	
12	1419	2554	5746	9728	15770	20520	15960	21888	33294	44141	64372	
14	1639	2949	6635	11234	18211	23697	18431	25277	38449	50974	74338	
16	1859	3344	7525	12740	20653	26874	20902	28665	43603	57808	84304	
18	2079	3740	8414	14246	23094	30051	23373	32054	48758	64642	94270	
20	2298	4135	9304	15752	25536	33228	25844	35443	53912	71476	104236	
22	2518	4530	10193	17258	27977	36404	28315	38831	59067	78310	114202	
24	2738	4926	11083	18764	30419	39581	30785	42220	64221	85144	124168	
26	2957	5321	11972	20271	32860	42758	33256	45609	69376	91978	134134	
28	3177	5716	12862	21777	35302	45935	35727	48997	74531	98812	144100	
30	3397	6112	13751	23283	37744	49112	38198	52386	79685	105645	154066	
32	3617	6507	14641	24789	40185	52289	40669	55775	84840	112479	164032	
34	3836	6902	15530	26295	42627	55466	43140	59164	89994	119313	173998	
36	4056	7298	16420	27801	45068	58643	45611	62552	95149	126147	183964	
38	4276	7693	17310	29307	47510	61820	48082	65941	100304	132981	193930	
40	4496	8088	18199	30813	49951	64997	50553	69330	105458	139815	203897	
50	5594	10065	22647	38344	62159	80881	62907	86273	131231	173984		
60	6693	12042	27094	45874	74366	96766	75262	103217	157004			
70	7792	14019	31542	53404	86574	112650	87617	120160	182777			
80	8890	15995	35990	60935	98781		99971	137104				
90	9989	17972	40437	68465	110989		112326	154047				
100	11088	19949	44885	75996	123196		124681	170991				
120	13285	23902	53780		147611		149390	204877				
140	15482	27856	62676		172026		174099	238764				
160	17680	31809	71571		196442		198808	272651				
180	19877	35763	80466									
200	22074		89362									
220	24272											
240	26469											
260	28667											
280	30864											
300	33061											

## Type 457, 458

### Capacities – Air

#### US Units

Capacities for air according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 16 °C (60 °F).  
 Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

ASME Section VIII [S.C.F.M.]

DN <sub>I+O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Act. Orifice dia. d <sub>0</sub> [inch]	0.59	0.79	1.18	1.57	1.97	2.36	1.97	2.36	2.91	3.46	4.33
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.274	0.487	1.096	1.948	3.043	4.383	3.043	4.383	6.666	9.427	14.730
LEO <sub>S/G</sub> * [inch <sup>2</sup> ]	0.224	0.399	0.897	1.594	2.491	3.389	2.491	3.587	5.456	7.29	11.391
Set pressure [psig]	Capacities [S.C.F.M.]										
40	235	418	941	1673	2613	3556	2613	3764	5724	7649	11951
50	279	497	1118	1986	3103	4223	3103	4470	6798	9083	14193
60	324	575	1294	2300	3593	4890	3593	5175	7871	10517	16434
70	368	653	1471	2614	4083	5557	4083	5881	8945	11952	18675
80	412	732	1647	2928	4573	6224	4573	6587	10018	13386	20916
90	456	810	1824	3241	5063	6891	5063	7293	11091	14821	23158
100	500	889	2000	3555	5553	7558	5553	7999	12165	16255	25399
120	588	1046	2353	4182	6533	8891	6533	9410	14312	19124	29881
140	677	1202	2706	4810	7513	10225	7513	10822	16459	21993	34364
160	765	1359	3059	5437	8493	11559	8493	12234	18606	24861	38847
180	853	1516	3412	6065	9473	12893	9473	13645	20753	27730	43329
200	941	1673	3765	6692	10454	14227	10454	15057	22900	30599	47812
220	1030	1830	4118	7319	11434	15560	11434	16468	25047	33468	52294
240	1118	1987	4471	7947	12414	16894	12414	17880	27193	36336	56777
260	1206	2144	4824	8574	13394	18228	13394	19292	29340	39205	61259
280	1294	2300	5177	9202	14374	19562	14374	20703	31487	42074	65742
300	1383	2457	5530	9829	15354	20896	15354	22115	33634	44943	70224
320	1471	2614	5883	10456	16334	22229	16334	23527	35781	47811	74707
340	1559	2771	6236	11084	17314	23563	17314	24938	37928	50680	79189
360	1647	2928	6589	11711	18294	24897	18294	26350	40075	53549	83672
380	1736	3085	6942	12338	19274	26231	19274	27762	42222	56418	88154
400	1824	3241	7295	12966	20254	27565	20254	29173	44369	59286	92637
500	2265	4026	9060	16103	25155	34234	25155	36231	55104	73630	115050
600	2706	4810	10825	19240	30055	40903	30055	43290	65838	87974	
700	3147	5594	12590	22377	34955	47572	34955	50348	76573	102318	
800	3589	6378	14355	25514	39855	54241	39855	57406	87307		
900	4030	7163	16120	28651	44756	60910	44756	64464	98042		
1000	4471	7947	17885	31788	49656	67579	49656	71522	108777		
1100	4912	8731	19650	34925	54556	74248	54556	78581	119511		
1200	5354	9515	21415	38062	59457		59457	85639			
1300	5795	10300	23180	41199	64357		64357	92697			
1400	6236	11084	24945	44336	69257		69257	99755			
1500	6677	11868	26709	47473	74158		74158	106813			
2000	8884	15789	35534		98659		98659	142104			
2500	11090	19711	44359								
3000	13296		53184								
3500	15502										
4000	17708										
4350	19253										

## Type 457, 458

### 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<sup>3</sup>kg/h]

DN <sub>I+O</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Act. Orifice dia. d <sub>0</sub> [mm]	15	20	30	40	50	60	50	60	74	88	110
Act. Orifice area A <sub>0</sub> [mm <sup>2</sup> ]	177	314	707	1257	1964	2827	1694	2827	4301	6082	9503
LEO <sub>L*</sub> [inch <sup>2</sup> ]	0.241	0.429	0.964	1.714	2.678	3.230	2.678	3.857	5.866	6.947	10.855
Set pressure [bar]	Capacities [10 <sup>3</sup> kg/h]										
2.5	9.39	15.9	34.6	57.2	96.1	119	99.4	129	203	251	361
3	10.3	17.4	37.9	62.7	105	131	109	141	223	275	395
4	11.9	20.1	43.7	72.4	122	151	126	163	257	318	456
5	13.3	22.5	48.9	80.9	136	169	141	182	287	355	510
6	14.5	24.6	53.6	88.7	149	185	154	200	315	389	559
7	15.7	26.6	57.9	95.8	161	200	166	215	340	421	604
8	16.8	28.4	61.9	102	172	213	178	230	363	450	645
9	17.8	30.2	65.6	109	182	226	189	244	385	477	684
10	18.8	31.8	69.2	114	192	238	199	258	406	503	721
12	20.6	34.8	75.8	125	210	261	218	282	445	551	790
14	22.2	37.6	81.8	135	227	282	235	305	481	595	854
16	23.8	40.2	87.5	145	243	302	251	326	514	636	913
18	25.2	42.7	92.8	154	258	320	267	346	545	675	968
20	26.6	45	97.8	162	272	337	281	364	575	711	1020
22	27.9	47.2	103	170	285	354	295	382	603	746	1070
24	29.1	49.3	107	177	298	369	308	399	629	779	1118
26	30.3	51.3	112	185	310	385	320	415	655	811	1163
28	31.4	53.2	116	192	321	399	333	431	680	841	1207
30	32.5	55.1	120	198	333	413	344	446	704	871	1250
32	33.6	56.9	124	205	344	427	356	461	727	899	1291
34	34.6	58.6	128	211	354	440	366	475	749	927	1330
36	35.6	60.3	131	217	365	452	377	489	771	954	1369
38	36.6	62	135	223	374	465	387	502	792	980	1406
40	37.6	63.6	138	229	384	477	397	515	813	1005	1443
50	42.0	71.1	155	256	430	533	444	576	909	1124	
60	46.0	77.9	169	280	471	584	487	631	995		
70	49.7	84.1	183	303	508	631	526	681	1075		
80	53.1	89.9	196	324	543		562	729			
90	56.3	95.4	207	343	576		596	773			
100	59.4	101	219	362	608		628	814			
120	65.1	110	240		666		688	892			
140	70.3	119	259		719		744	964			
160	75.1	127	277		768		795	1030			
180	79.7	135	293								
200	84.0		309								
220	88.1										
240	92.0										
260	95.8										
280	99.4										
300	103										

## Type 457, 458

### Capacities – Water

#### US Units

Capacities for water according to ASME Section VIII (UV), based on set pressure plus 10 % overpressure at 21 °C (70 °F).  
 Capacities at 2.07 bar (30 psig) and below are based on 0.207 bar (3 psig) overpressure.

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

DN <sub>h-o</sub>	25 x 50	25 x 50	50 x 80	50 x 80	80 x 100	80 x 100	100 x 150	100 x 150	100 x 150	100 x 150	150 x 250
Valve size	1" x 2"	1" x 2"	2" x 3"	2" x 3"	3" x 4"	3" x 4"	4" x 6"	4" x 6"	4" x 6"	4" x 6"	6" x 10"
Act. Orifice dia. d <sub>0</sub> [inch]	0.59	0.79	1.18	1.57	1.97	2.36	1.97	2.36	2.91	3.46	4.33
Act. Orifice area A <sub>0</sub> [inch <sup>2</sup> ]	0.274	0.487	1.096	1.948	3.043	4.383	3.043	4.383	6.666	9.427	14.730
LEO <sub>L</sub> <sup>*)</sup> [inch <sup>2</sup> ]	0.241	0.429	0.964	1.714	2.678	3.230	2.678	3.857	5.866	6.947	10.855
Set pressure [psig]	Capacities [US-G.P.M.]										
40	39.4	70.1	158	280	438	528	438	631	960	1137	1776
50	44.1	78.4	176	314	490	591	490	706	1073	1271	1986
60	48.3	85.9	193	343	537	647	537	773	1175	1392	2175
70	52.2	92.8	209	371	580	699	580	835	1270	1504	2349
80	55.8	99.2	223	397	620	747	620	892	1357	1607	2511
90	59.2	105	237	421	657	793	657	947	1440	1705	2664
100	62.4	111	249	443	693	836	693	998	1517	1797	2808
120	68.3	121	273	486	759	915	759	1093	1662	1969	3076
140	73.8	131	295	525	820	989	820	1181	1795	2126	3322
160	78.9	140	316	561	876	1057	876	1262	1919	2273	3552
180	83.7	149	335	595	929	1121	929	1339	2036	2411	3767
200	88.2	157	353	627	980	1182	980	1411	2146	2541	3971
220	92.5	164	370	658	1027	1239	1027	1480	2251	2665	4165
240	96.6	172	387	687	1073	1294	1073	1546	2351	2784	4350
260	101	179	402	715	1117	1347	1117	1609	2447	2898	4528
280	104	186	417	742	1159	1398	1159	1670	2539	3007	4699
300	108	192	432	768	1200	1447	1200	1728	2628	3113	4863
320	112	198	446	793	1239	1495	1239	1785	2714	3215	5023
340	115	204	460	818	1277	1541	1277	1840	2798	3314	5178
360	118	210	473	841	1314	1585	1314	1893	2879	3410	5328
380	122	216	486	864	1350	1629	1350	1945	2958	3503	5474
400	125	222	499	887	1385	1671	1385	1995	3035	3594	5616
500	139	248	558	992	1549	1868	1549	2231	3393	4018	6279
600	153	272	611	1086	1697	2047	1697	2444	3717	4402	
700	165	293	660	1173	1833	2211	1833	2640	4015	4755	
800	176	314	706	1254	1959	2363	1959	2822	4292		
900	187	333	748	1330	2078	2507	2078	2993	4552		
1000	197	351	789	1402	2191	2642	2191	3155	4799		
1100	207	368	827	1471	2297	2771	2297	3309	5033		
1200	216	384	864	1536	2400	2900	2400	3456			
1300	225	400	900	1599	2498	3017	2498	3597			
1400	233	415	934	1659	2592	3123	2592	3733			
1500	242	429	966	1717	2683	3219	2683	3864			
2000	279	496	1116	3098	3098	4462					
2500	312	554	1247								
3000	342	1367									
3500	369										
4000	394										
4350	411										

**Type 457, 458**

**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 ( $K_{dr}/\alpha_w$ )

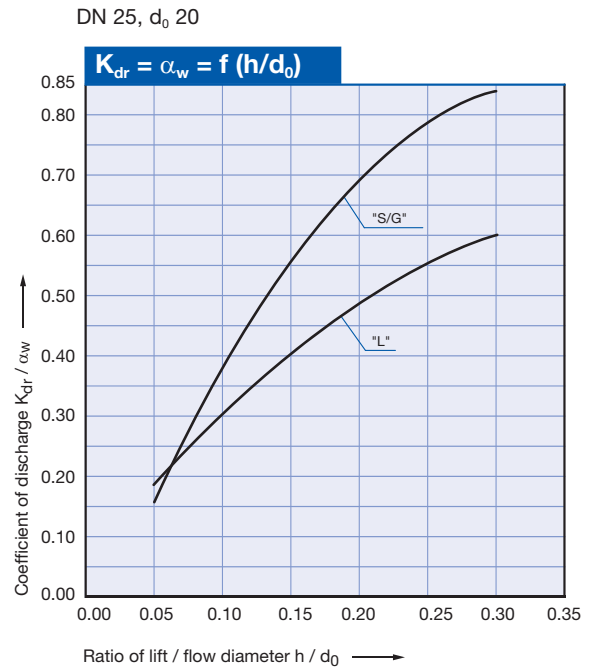
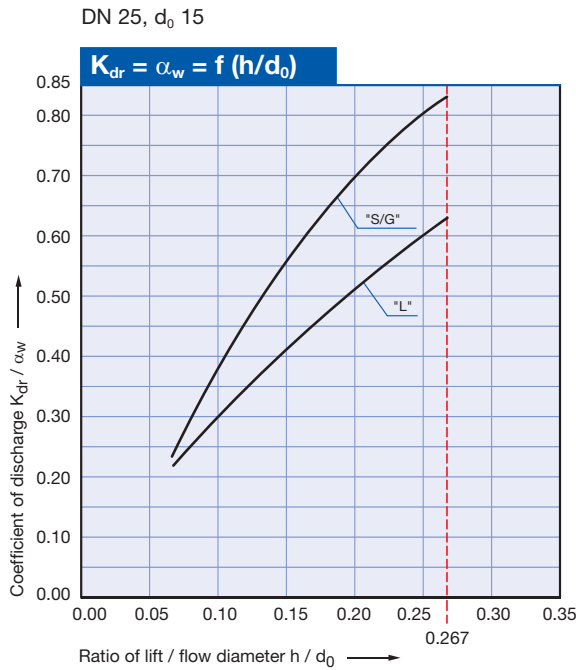
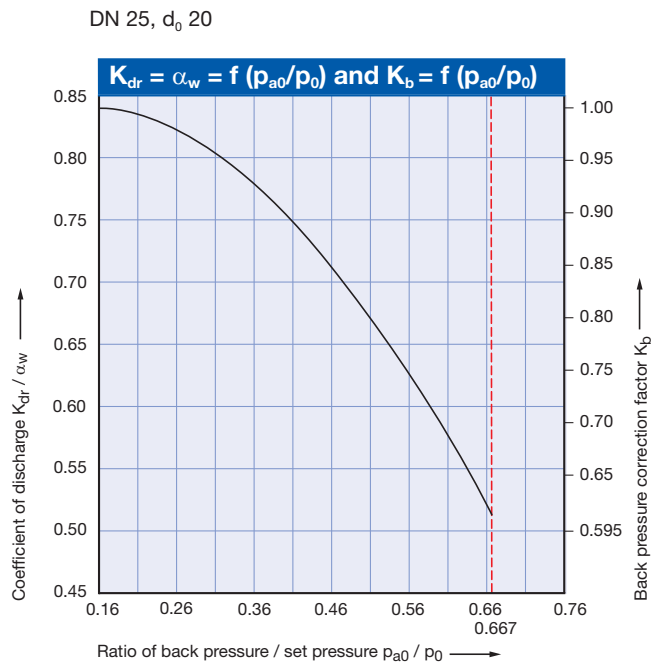
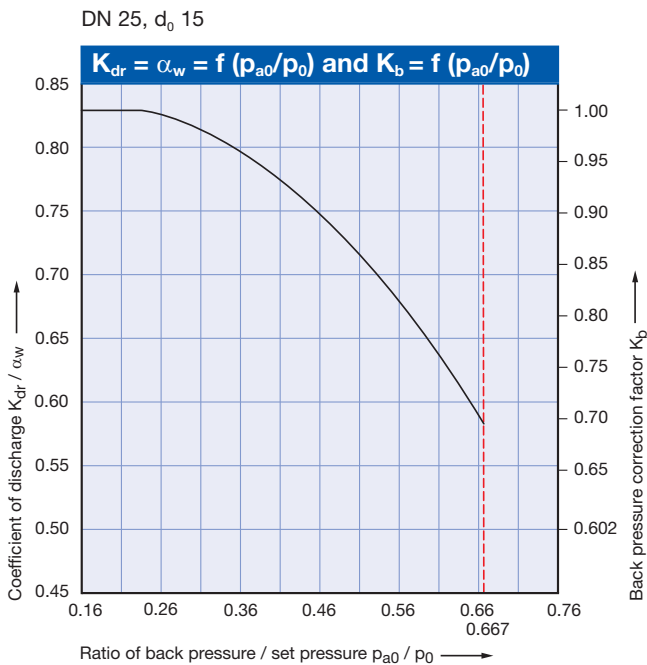


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )





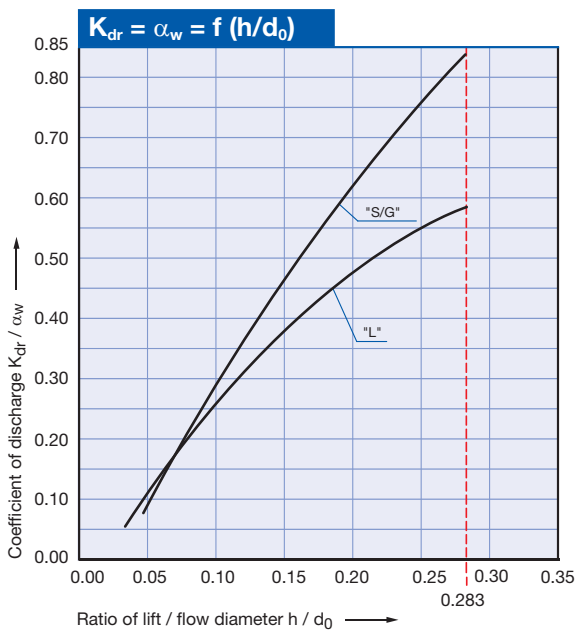
## Type 457, 458

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

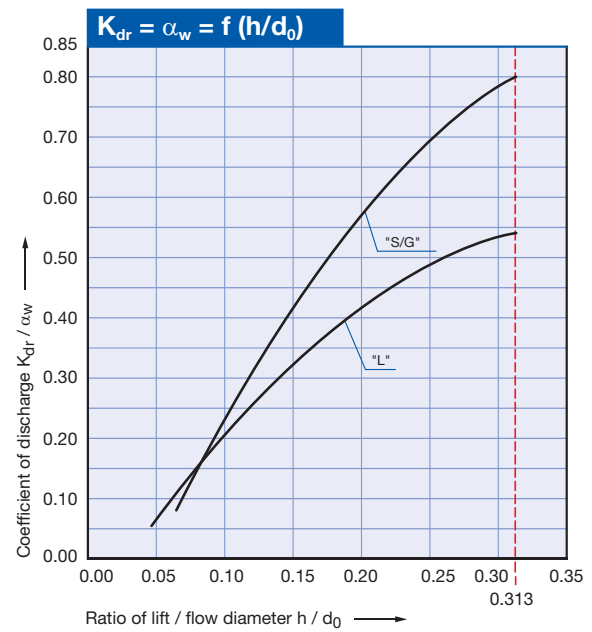
#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

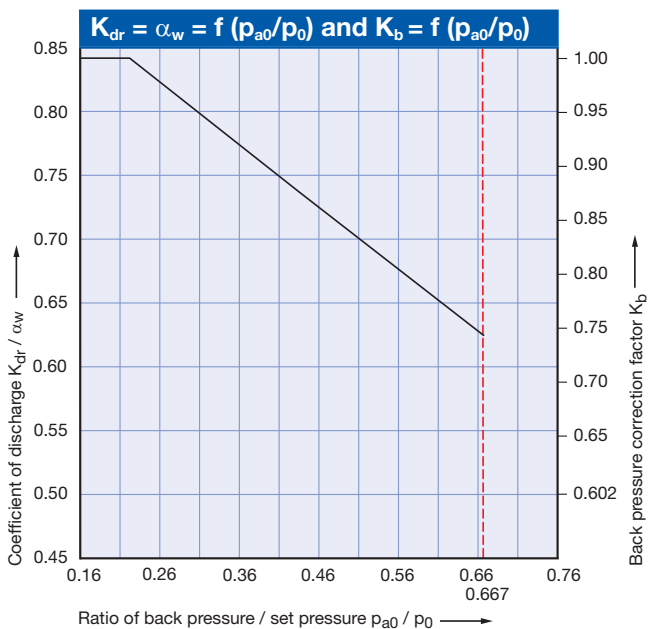
DN 50,  $d_0$  30



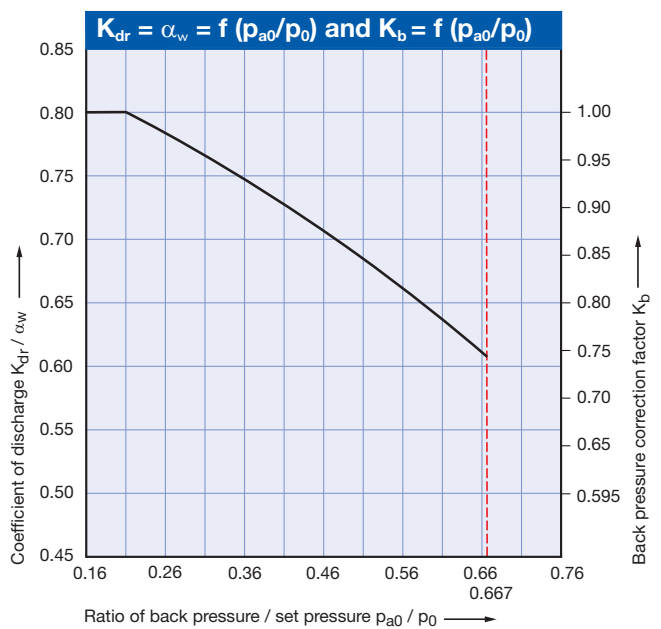
DN 50,  $d_0$  40



DN 50,  $d_0$  30



DN 50,  $d_0$  40

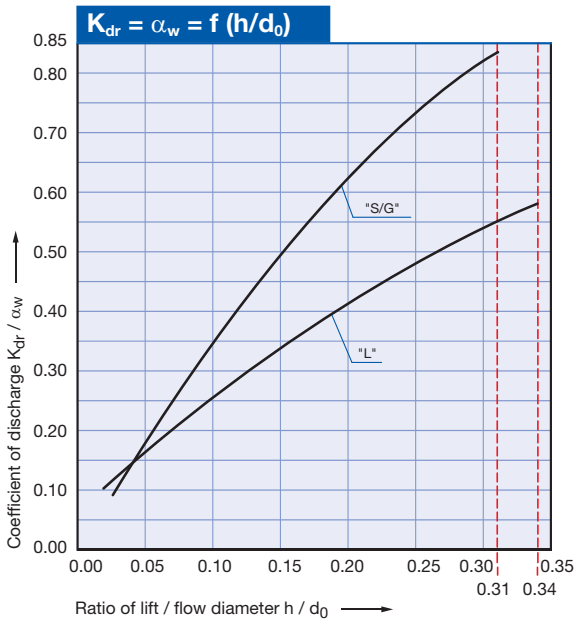


**Type 457, 458**

**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 ( $K_{dr}/\alpha_w$ )

DN 80,  $d_0$  50



DN 80,  $d_0$  60

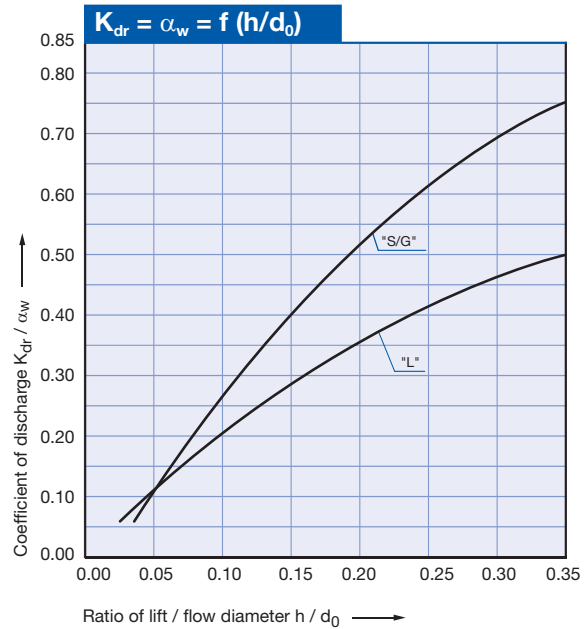
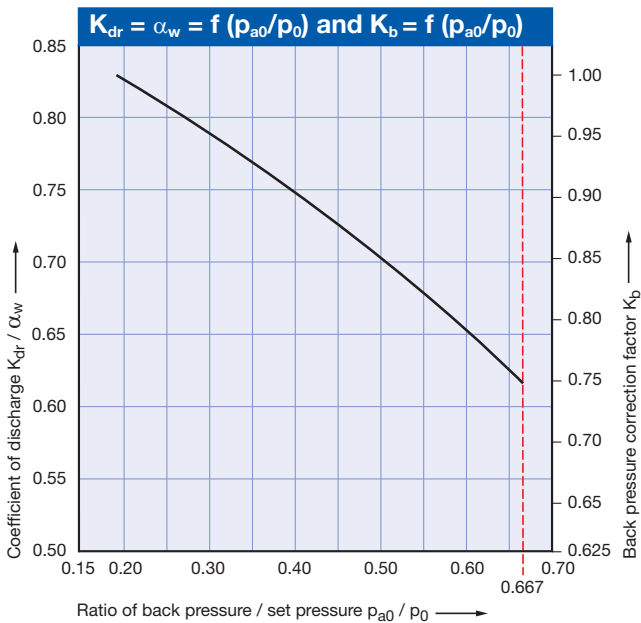
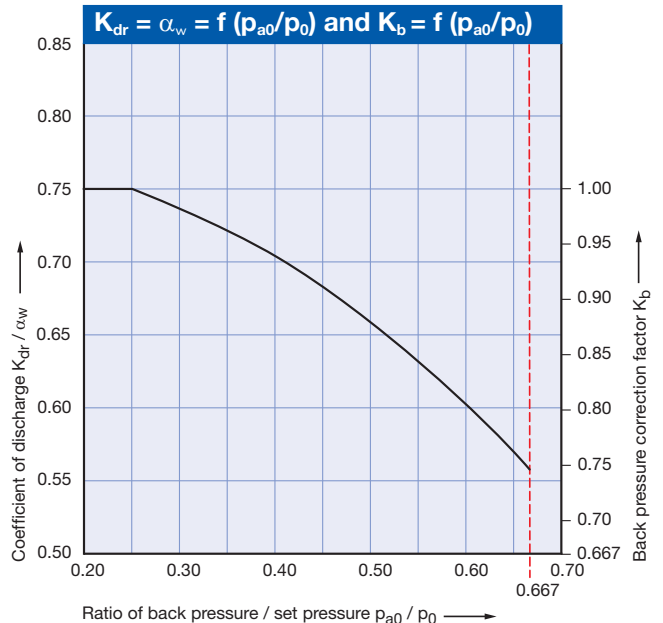


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )

DN 80,  $d_0$  50



DN 80,  $d_0$  60



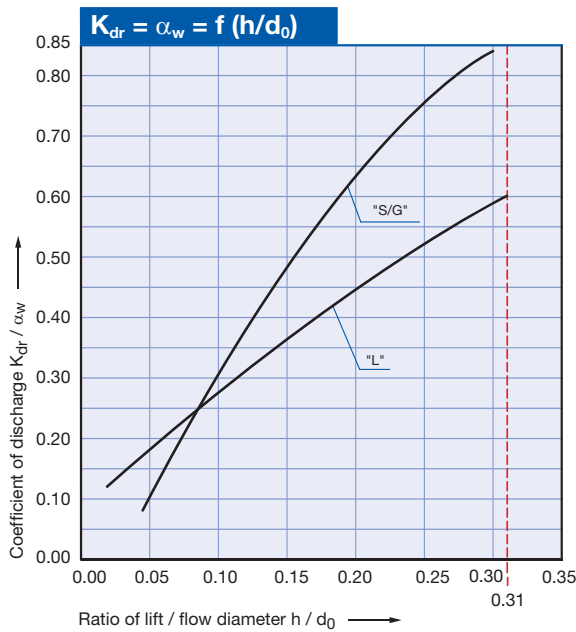
## Type 457, 458

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

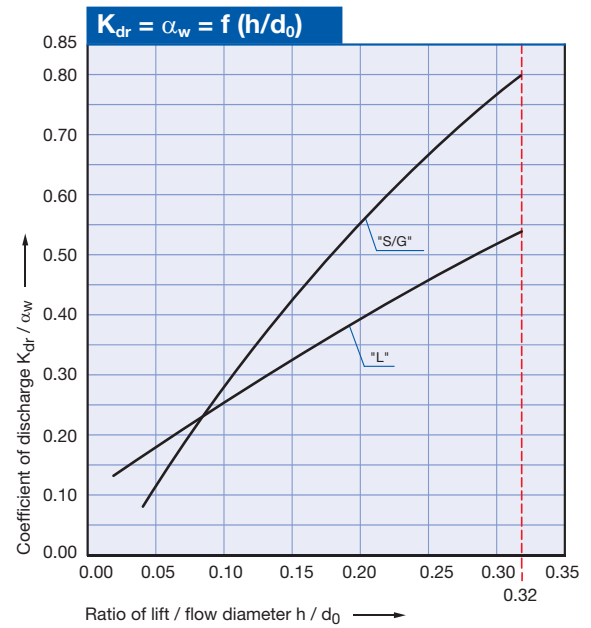
#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3

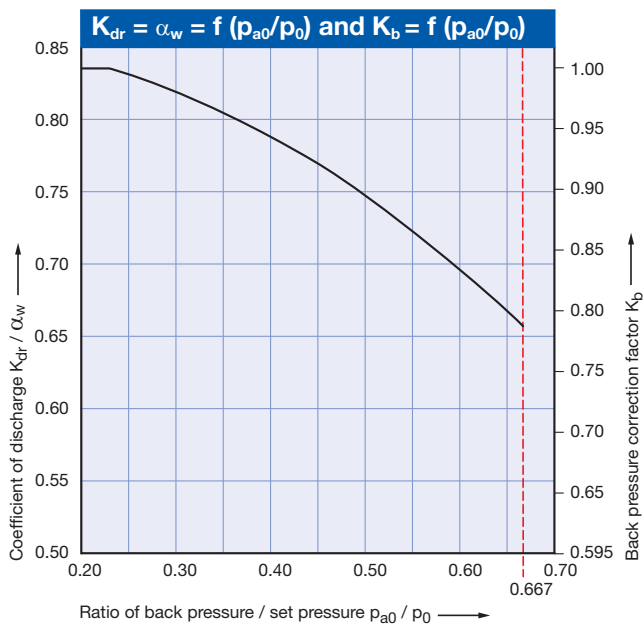
DN 100,  $d_0$  50



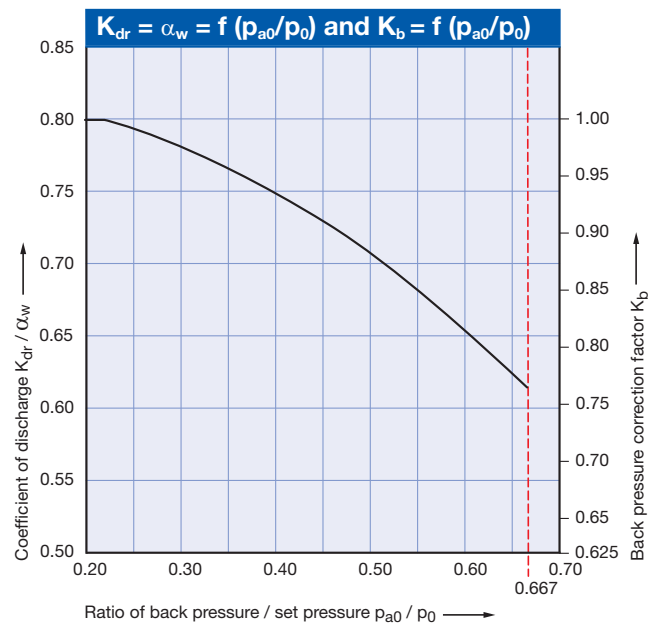
DN 100,  $d_0$  60



DN 100,  $d_0$  50



DN 100,  $d_0$  60



**Type 457, 458**

**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 ( $K_{dr}/\alpha_w$ )

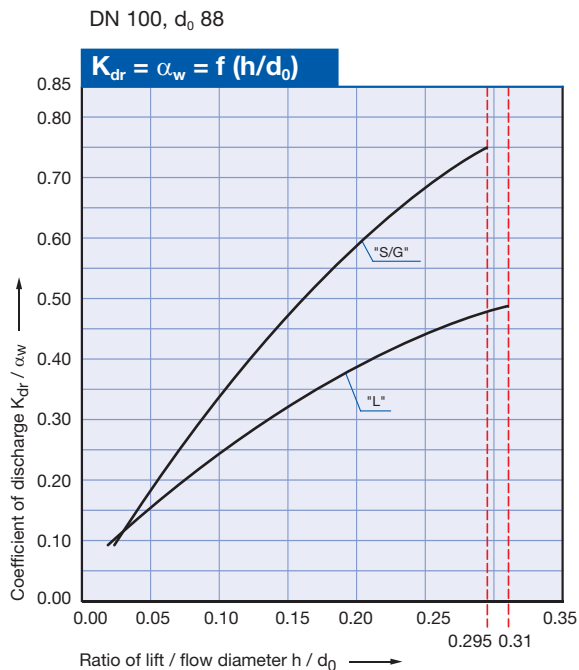
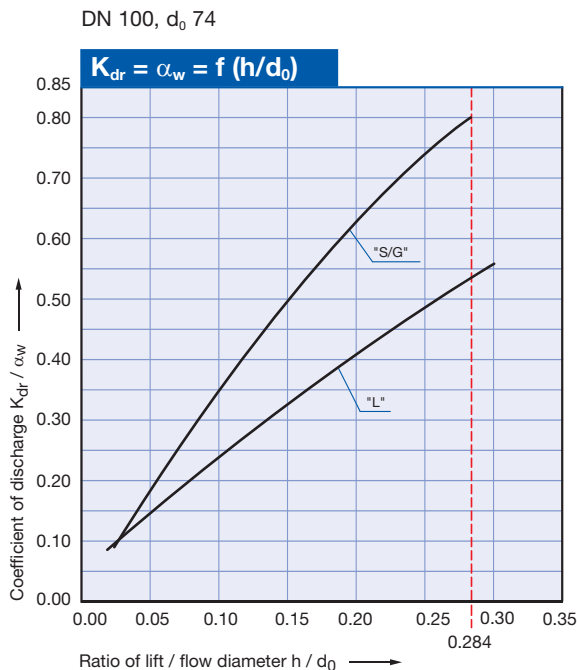
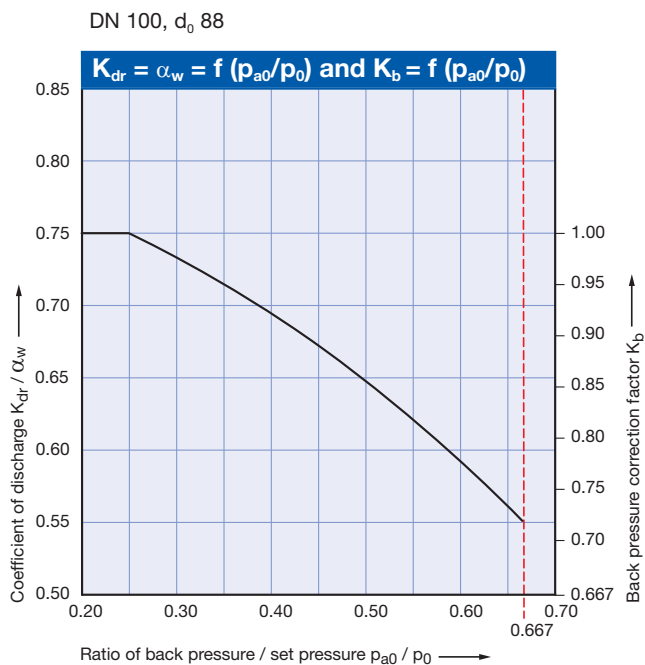
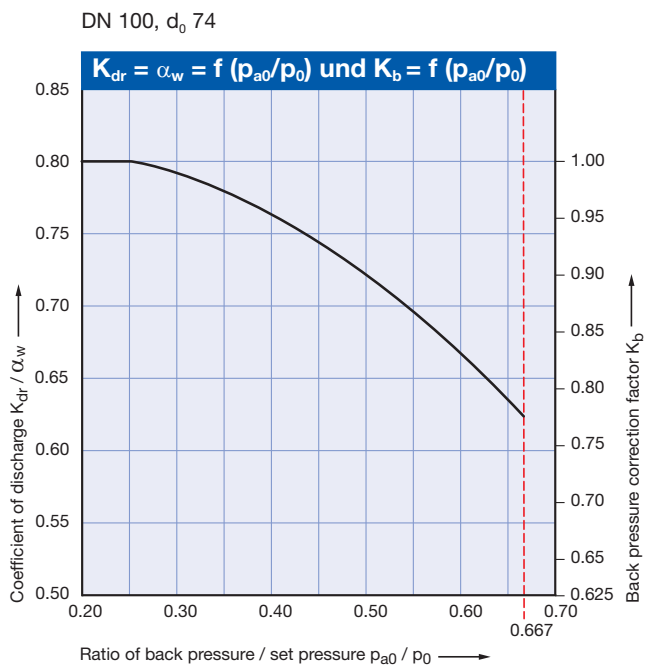


Diagram for evaluation of coefficient of discharge ( $K_{dr}/\alpha_w$ ) or  $K_b$  in reference to the ratio of back pressure / set pressure ( $p_{a0}/p_0$ )

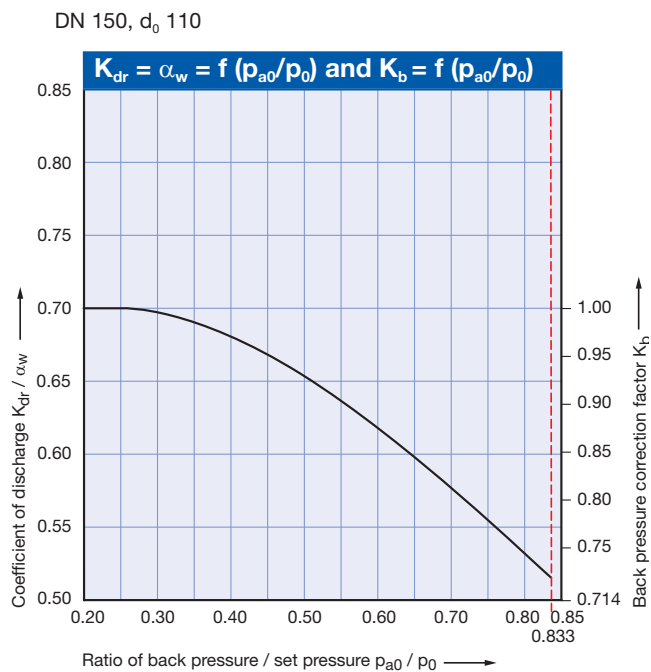
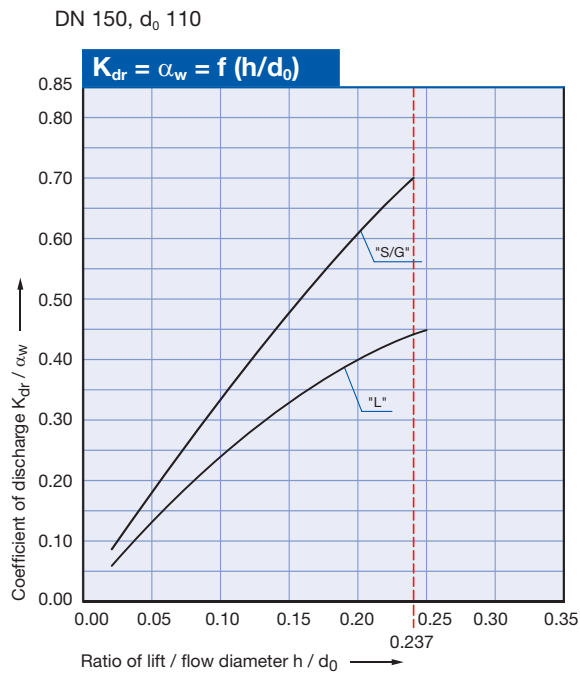


## Type 457, 458

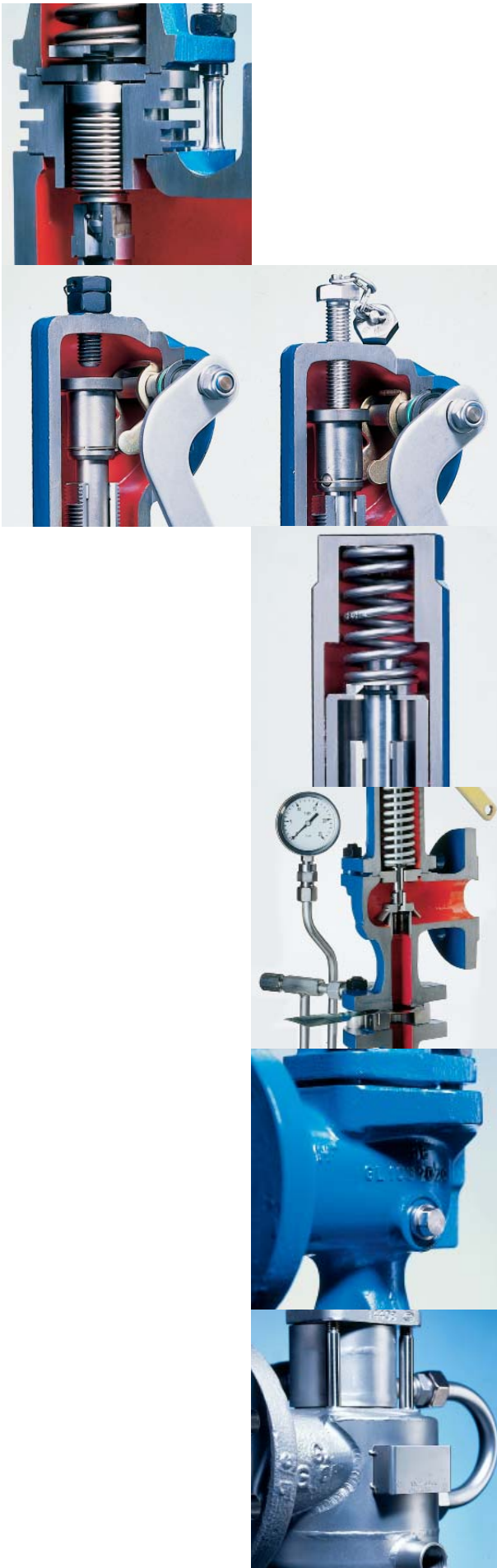
### Determination of coefficient of discharge in case of lift restriction or back pressure

#### Legend

$h$	= 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 <sub>a</sub> ]
$p_0$	= Set pressure [bar <sub>a</sub> ]
$p_{a0}/p_0$	= Ratio of back pressure / set pressure
$K_{dr}$	= Coefficient of discharge acc. to DIN EN ISO 4126-1
$\alpha_w$	= Coefficient of discharge acc. to AD 2000-Merkblatt A2
$K_b$	= Back pressure correction factor acc. to API 520 topic 5.3





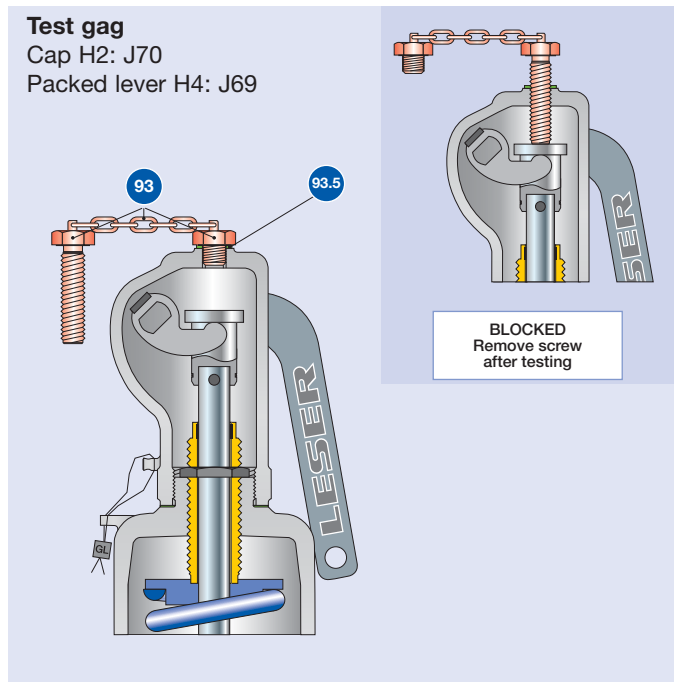
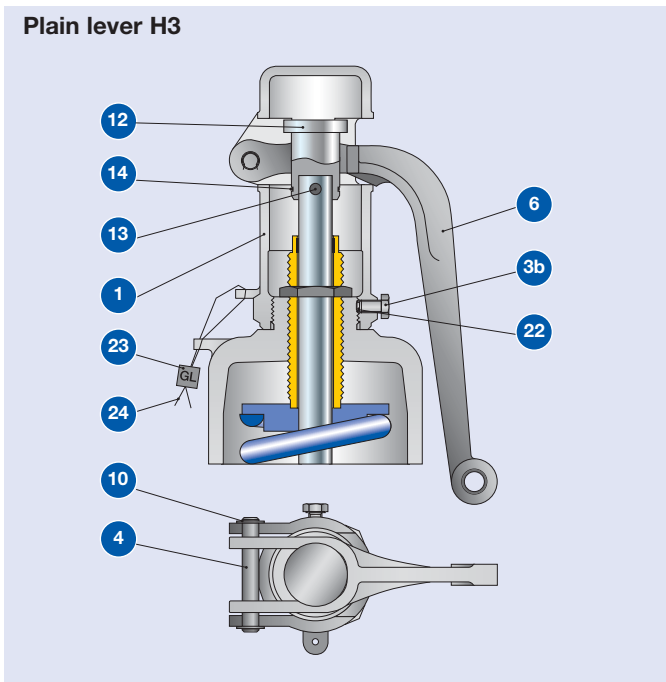
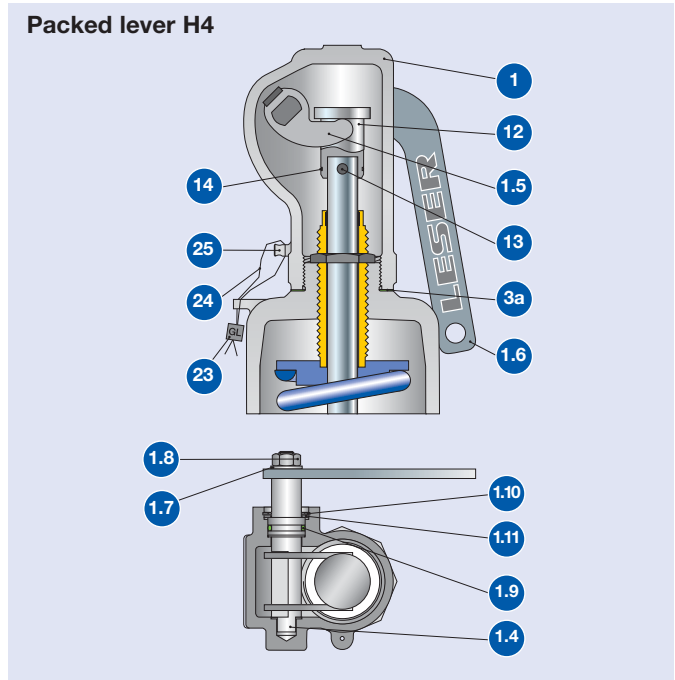
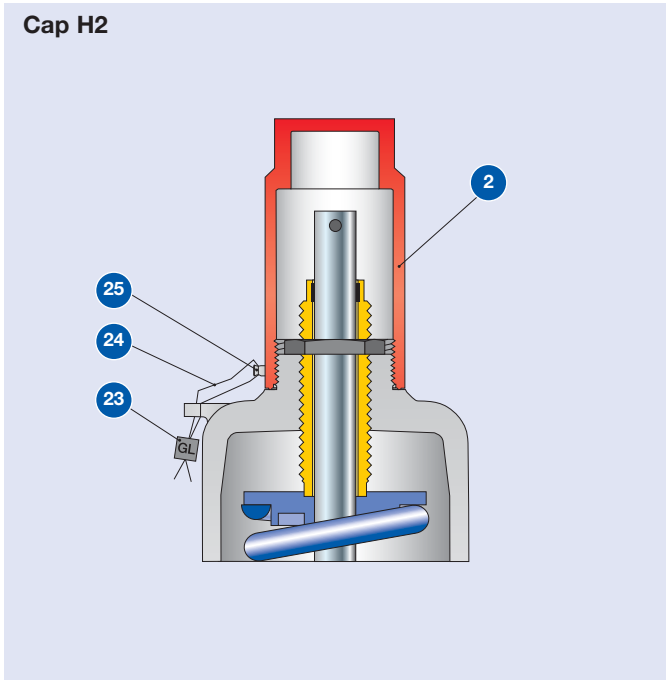


**Accessories and Options**  
**High Performance**

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**Accessories and Options**

**Caps and levers – subassembly item 40**



**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 to:**

- perform the pressure test in a system without disassembling the safety valve
- be able to make an adjustment to each individual valve in systems with multiple safety valves

The test gag must be removed after testing, otherwise the safety valve will not protect the system against impermissible overpressure.



## Accessories and Options

### 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	–	–	–
		–	B8M	–	–	–
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	–	304
1.7	Washer	–	–	1.4401	–	1.4301
		–	–	316	–	304
1.8	Nut	–	–	A2/Poly	–	1.4401
		–	–	2H	–	8M
1.9	O-ring	–	–	FKM	–	–
		–	–	FKM	–	–
1.9	Bushing	–	–	–	–	Graphite
		–	–	–	–	Graphite
10/1.10	Retaining clip	–	Carbon steel	Carbon steel	–	–
		–	Carbon steel	Carbon steel	–	–
1.10	Nut	–	–	–	–	1.4104
		–	–	–	–	Chrome steel
1.10	Packing gland	–	–	–	–	1.4404
		–	–	–	–	316L
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	–	1.4401
		–	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
25	Sealing nose	1.4435	–	–	1.4435	1.4435
		316L	–	–	316L	316L
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

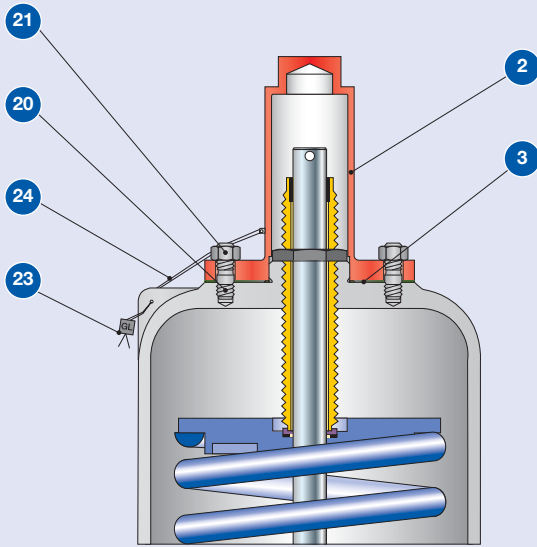
**Please notice:**

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

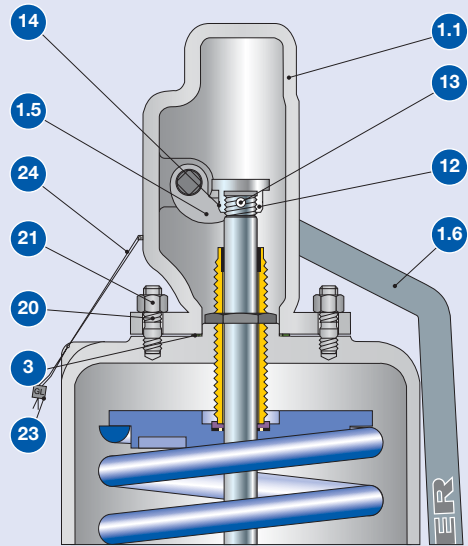
**Accessories and Options**

**Caps and levers bolted – subassembly item 40**

**Bolted cap H1**

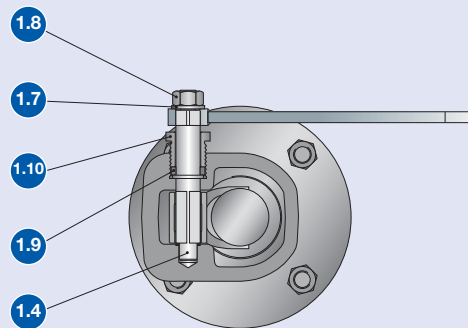
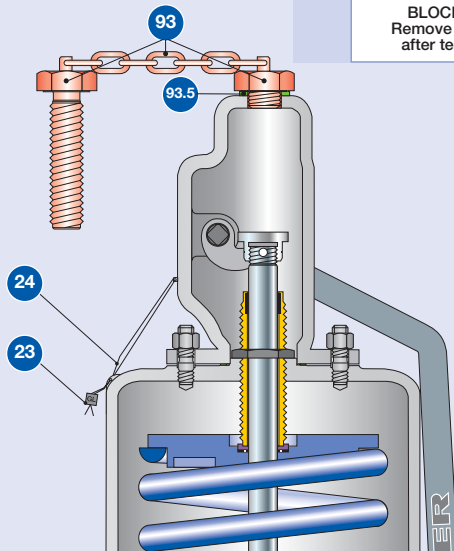
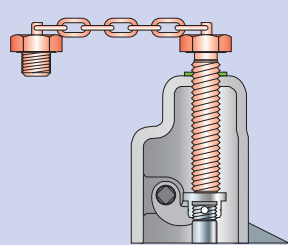


**Bolted lifting device H6**



**Test gag**

Bolted cap H1: J70  
Bolted lifting device H6: J69



Discription of the test gag please refer to page 152.

## Accessories and Options

### Caps and levers bolted – subassembly item 40

#### Materials

Item	Component	Steel		Stainless steel	
		Bolted cap H1	Bolted lifting device H6	Bolted cap H1	Bolted lifting device H6
1.1	Lever cover	–	0.7040	–	1.4408
		–	Gr. 60-40-18	–	CF8M
1.4	Shaft/bolt	–	1.0718	–	1.4404
		–	Carbon steel	–	316L
1.5	Lifting fork	–	1.4408	–	1.4408
		–	CF8M	–	CF8M
1.6	Lever	–	1.0036	–	1.4571
		–	Carbon steel	–	316Ti
1.7	Washer	–	Steel	–	1.4401
		–	Steel	–	316
1.8	Nut	–	1.0501	–	1.4401
		–	2H	–	8M
1.9	Bushing	–	Graphite	–	Graphite
		–	Graphite	–	Graphite
1.10	Packing gland	–	1.4104	–	1.4404
		–	Chrome steel	–	316L
2	Cap	0.7040	–	1.4408	–
		Gr. 60-40-18	–	CF8M	–
3	Gasket	Graphite / 1.4401	Graphite / 1.4401	1.4571	1.4571
		Graphite / 316L	Graphite / 316L	316Ti	316Ti
12	Spindle cap	–	1.0718	–	1.4404
		–	Carbon steel	–	316L
13	Pin	–	Steel	–	A4
		–	Steel	–	8M
14	Retaining clip	–	1.4571	–	1.4571
		–	316Ti	–	316Ti
20	Stud	1.1181	1.1181	1.4401	1.4401
		Steel	Steel	B8M	B8M
21	Nut	1.0501	1.0501	1.4401	1.4401
		2H	2H	8M	8M
23	Seal	Plastic	Plastic	Plastic	Plastic
		Plastic	Plastic	Plastic	Plastic
24	Seal wire	1.4541	1.4541	1.4541	1.4541
		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.

## 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

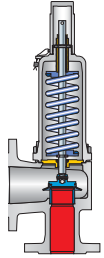
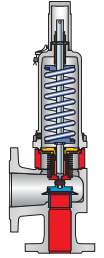
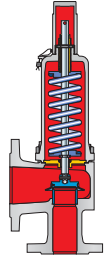
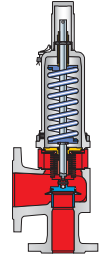
1 Scope: This part of NACE MR0175/ISO 15156 describes general principles and gives requirements and recommendations for the selection and qualification of metallic materials for service in equipment used in oil and gas production and in natural gas sweetening plants in H<sub>2</sub>S-containing environments, 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 H<sub>2</sub>S 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

## NACE-Compliant Safety Valves

	Level 1		Level 2	
<b>Part definition</b>	Contact with the medium in closed position		Contact with the medium in opened position	
<b>Contact surfaces</b>	Conventional	Balanced bellows	Conventional	Balanced bellows
				
<b>Safety valve operation</b>	closed		opened	
<b>Parts concerned</b>	Body, seat, nozzle, disc	Body, seat, nozzle, disc	all	Body, seat, nozzle, 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	Body material	Design	Part	Material	Option code	Material	Option code
4412 DIN, ANSI 4412 Full nozzle DIN 4412 Full nozzle ANSI 4562 4582	1.0619 (WCB)	Conventional	Disc	1.4404 / 316L stellite	L44 / J25	1.4404 / 316L stellite	L44 / J25
			Spring	No adjustment required		Please select balanced bellows design, as Inconel spring is not available	–
4587	1.7357 (WC6)	Balanced bellows	Disc	1.4404 / 316L	L44 / J25	1.4404 / 316L	L44 / J25
4412 XXL <sup>1)</sup>	1.0460/ 1.0425 (Steel)		Balanced bellows	1.4571 / 316Ti	J78	1.4571 / 316Ti	J78
4414 DIN 4414 ANSI 4414 Full nozzle DIN 4414 Full nozzle ANSI	1.4408 (CF8M)	Conventional	Spring	No adjustment required		Please select balanced bellows design, as Inconel spring is not available	–
4414 XXL <sup>1)</sup>	1.4571 (316Ti)	Balanced bellows	Balanced bellows	1.4571 / 316Ti	J78	1.4571 / 316Ti	J78
4584	1.4581 (CF10M)	Conventional	Spring	No adjustment required		Please select balanced bellows design, as Inconel spring is not available	–
			Disc	1.4404 / 316L stellite	L44 / J25	1.4404 / 316L stellite	L44 / J25
		Balanced bellows	Balanced bellows	1.4571 / 316Ti	J78	1.4571 / 316Ti	J78

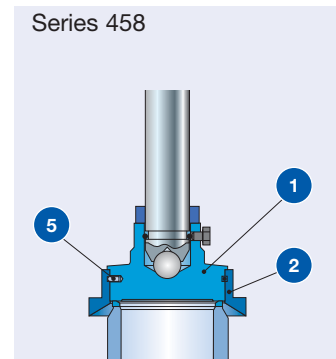
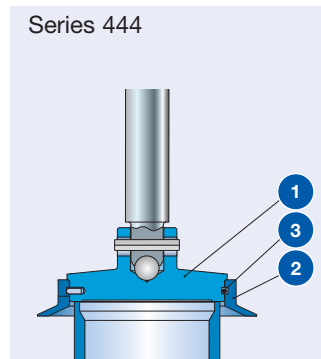
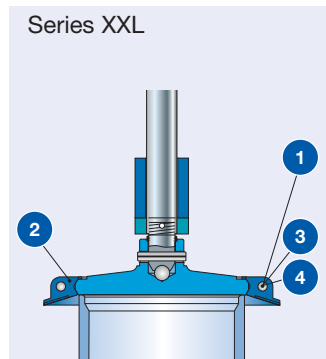
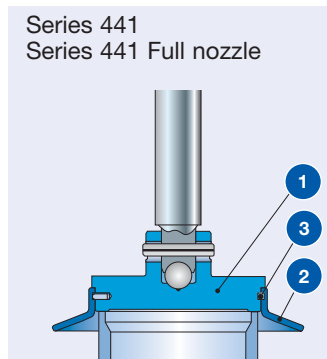
<sup>1)</sup> NACE MR0103 – 2012 (Option code N77) not available.

## Accessories and Options

### Metal seat – seat / nozzle, item 5 and disc subassembly item 7

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.

The detachable lifting aid is standard with High Performance safety valves. The benefit of the detachable lifting aid is the easy re-lapping of the disc sealing surface on one disc. This makes it possible to have fast maintenance of the safety valve on site.

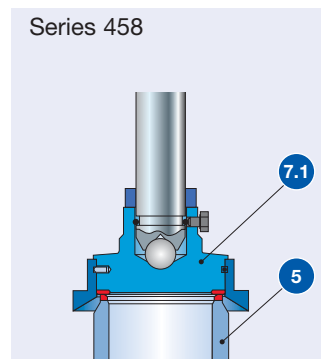
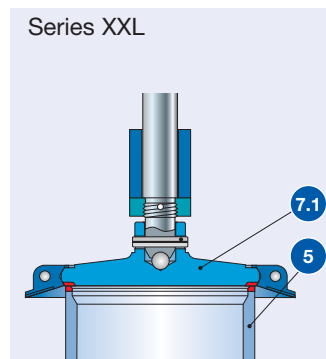
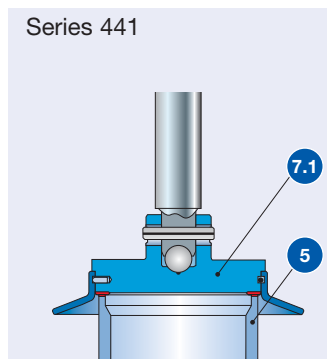


#### Stellited sealing surface

The sealing surfaces of stainless steel discs and seats / nozzles can be stellited by weld cladding. Stellite is a cobalt-chrome non-ferrous alloy with increased hardness, corrosion resistance, and abrasion resistance even at high temperatures.

LESER recommends stellited sealing surfaces for High Performance safety valves (seat / nozzle and disc (1.4404 / 316L)) in the following applications:

- for high-pressure applications with highly stressed sealing surfaces
- for high-temperature applications in order to prevent permanent deformation of the sealing surface as a consequence of the material properties of the seat and disc
- use with abrasive media in order to increase the abrasion resistance of the sealing surface



#### Hardness metal seat

Material		Hardness of the sealing surface		
EN	ASME	Value according to standard or manufacturer specification		Mean value LESER bearing material
EN 10088-3, 1.4122 hardened	Chrome steel, hardened	≥ 40 HRC	LDs 4325.01 hardening process	42 – 46 HRC
EN 10272, 1.4404	SA 479 316L	≤ 215 HBW	EN 10272 Table 7	16 – 19 HRC <sup>1)</sup>
EN 10272, 1.4404 stellited	SA 479 316L stellited	≥ 35 HRC	Manufacturer specification	40 HRC

HBW: BRINELL hardness acc. to DIN EN ISO 6506-1 / HRC: ROCKWELL hardness acc. to DIN EN ISO 6508-1

<sup>1)</sup> Rockwell hardnesses less than 20 HRC are not approved by the standard. LESER gives these values for better comparability.

## Accessories and Options

### Metal seat – seat / nozzle, item 5 and disc subassembly item 7

Materials

#### Standard- and corrosive service

Disc – Subassembly item 7

Item	Component	Steel	Stainless steel
<b>Series 441, 441 Full nozzle</b>			
1	Disc	1.4122 hardened	1.4404
		Hardened stainless steel	316L
2	Lifting aid	1.4408	1.4408
		CF8M	CF8M
3	Circlip	1.4571	1.4571
		316Ti	316Ti
<b>Series XXL</b>			
1	Disc	1.4404, 1.4571	1.4404, 1.4571
		316L, 316Ti	316L, 316Ti
2	Lifting aid	1.4581, 1.4571	1.4581, 1.4571
		CF10M, 316Ti	CF10M, 316Ti
5	Screw	1.4401	1.4401
		B8M	B8M
6	Nut	1.4401	1.4401
		8M	8M
7	Washer	1.4401	1.4401
		Stainless steel	Stainless steel
<b>Series 444</b>			
1	Disc	–	1.4404
		–	316L
2	Lifting aid	–	1.4404
		–	316L
3	Securing ring (DN 25 / 1" only)	–	1.4571
		–	316Ti
3	Rollpin	–	1.4310
		–	Stainless steel
<b>Series 458</b>			
1	Disc	1.4122 hardened	1.4404
		Hardened stainless steel	316L
2	Lifting aid	1.4404	1.4404
		316L	316L
3	Securing ring	1.4571	1.4571
		316Ti	316Ti

Seat / nozzle item 5

Item	Component	Steel	Stainless steel
<b>All series</b>			
5	Seat / nozzle	refer to respective master bill of materials	

#### Stellited sealing surfaces

Seat / nozzle item 5, disc item 7

Item	Component	Option code	
<b>Series 441, XXL, 458</b>			
7.1	Disc	J25	1.4404 stellited, 1.4571 stellited
			316L stellited, 316Ti stellited
5	Seat / nozzle	L61 / L62	1.4404 stellited, 1.0305 stellited, 1.4571 stellited
			316L stellited, carbon steel stellited, 316Ti stellited

# Accessories and Options

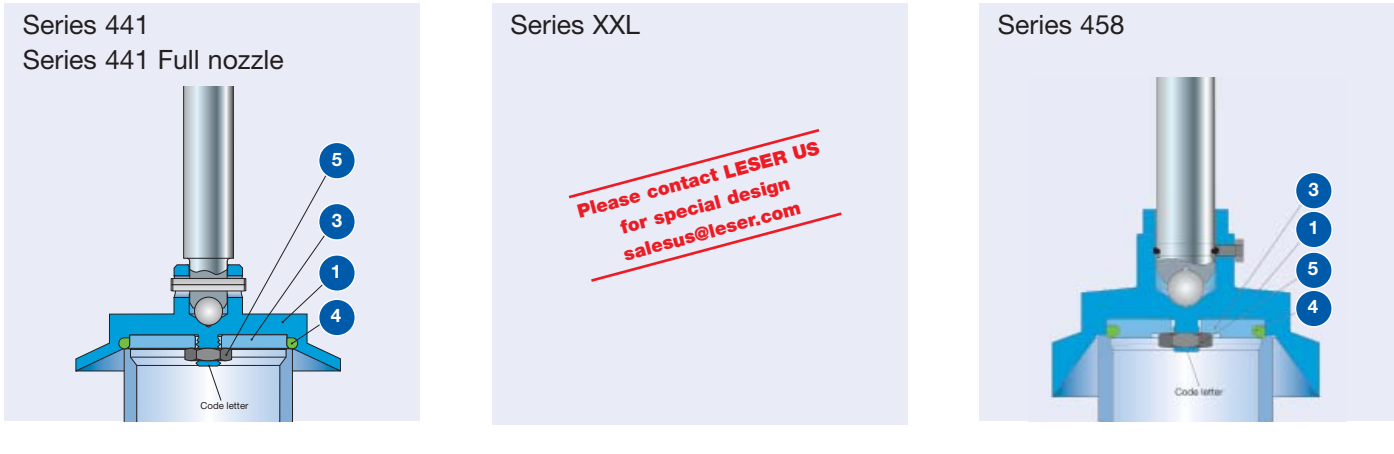
## Soft seal disc – Subassembly item 7

LESER soft seal solutions allow for superior tightness.

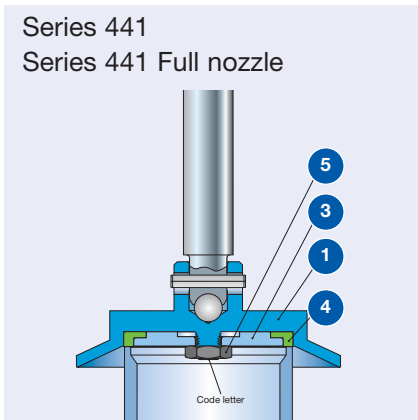
### Features and Benefits

- two different designs with O-ring or sealing plate (Series 441 and 441 Full nozzle) 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

### O-ring disc / Option codes J20 – J23, J30



### Disc with sealing plate / Option codes J44, J48, J49



For temperature limits, medium resistance and option codes please refer to the soft seal selection table, page 162. Materials for soft seal discs see page 161.



## Accessories and Options

### Soft seal disc – Subassembly item 7

#### Materials

O-ring disc / Option codes J20 – J23, J30

Item	Component	Steel	Stainless steel
1	Disc with lifting aid	1.4404	1.4404
		316L	316L
3	Retainer	1.4404	1.4404
		316L	316L
4	O-ring	See soft seal selection table page 162	See soft seal selection table page 162
5	Nut	1.4401	1.4401
		8M	8M

Disc with sealing plate / Option codes J44, J48, J49

Item	Component	Steel	Stainless steel
<b>Series 441, 441 Full nozzle</b>			
1	Disc with lifting aid	1.4404	1.4404
		316L	316L
3	Retainer	1.4404	1.4404
		316L	316L
4	Sealing plate	See soft seal selection table page 162	See soft seal selection table page 162
5	Nut	1.4401	1.4401
		8M	8M

## Accessories and Options

### Soft seal

#### Soft seal selection

Abbreviation ASTM 14	Trade name (Designation)	Code letter <sup>1)</sup>	Option- code	T <sub>min</sub>		T <sub>max</sub>		Application <sup>2)</sup>
				[°C]	[°F]	[°C]	[°F]	
<b>O-ring</b>								
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
<b>Sealing plate</b>								
SP	VESPEL SP-1® <sup>3)</sup> (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.					

<sup>1)</sup> The code letters are stamped on the disc (Item 1)

<sup>2)</sup> 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.

<sup>3)</sup> Only for DN 25, 1" x 2".

## Accessories and Options

### Soft seal disc – subassembly item 7

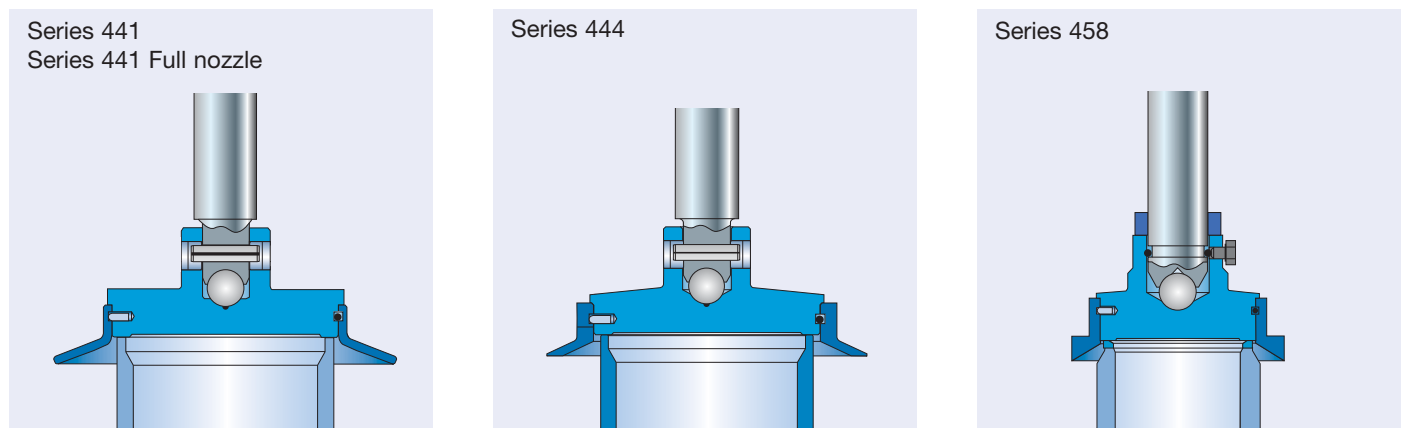
Set pressure and size limits

Materials	Pressure range				DIN Valve size		
	min.		max.				
	[bar]	[psig]	[bar]	[psig]			
<b>Series 441, 441 Full nozzle</b>							
CR	"K"	J21				DN 20 – 150 1" – 6"	
NBR	"N"	J30					
EPDM	"D"	J22	0,1	1,5	51		740
FKM	"L"	J23					
FFKM	"C"	J20					
SP	"T"	J49	10	150	51	740	DN 25 / 1"
PCTFE	"G"	J48	1	15	51	740	DN 25 – 125 / 1" – 5"
PTFE	"A"	J44	1	15	10	145	DN 25 – 125 / 1" – 5"
<b>Series 458</b>							
			–	–	–	–	DN 25 / 1", d <sub>0</sub> 15
			4	9	105	225	DN 25 / 1", d <sub>0</sub> 20
			8,6	19	102	225	DN 50 / 2", d <sub>0</sub> 30
CR	"K"	J21	3,5	8	102	225	DN 50 / 2", d <sub>0</sub> 40
NBR	"N"	J30	4	9	77	170	DN 80 / 3", d <sub>0</sub> 50
EPDM	"D"	J22	5	11	77	170	DN 80 / 3", d <sub>0</sub> 60
FKM	"L"	J23	4	9	77	170	DN 100 / 4", d <sub>0</sub> 50
FFKM	"C"	J20	5	11	77	170	DN 100 / 4", d <sub>0</sub> 60
			2,5	6	60	132	DN 100 / 4", d <sub>0</sub> 74
			2,5	6	51	112	DN 100 / 4", d <sub>0</sub> 88
			2,5	6	40	88	DN 150 / 6", d <sub>0</sub> 110

### Bull race disc

To prevent damages to the sealing surfaces from frequent disassembly, in particular for safety valves with short or regular service intervals, the disc can be supplied in a bull race construction as a custom design.

For Series 458 a bull race disc is standard.



### Availability

Type	441, 442 DIN 441, 442 ANSI	441, 442 XXL	444 DIN 444 ANSI	441 FN DIN 441 FN ANSI 442 FN DIN 442 FN ANSI	455/456	457/458
<b>Disc</b>	<b>Option code</b>					
Bull race disc	J24	J24	J24	J24	*	*

## Accessories and Options

### Balanced bellows – subassembly item 15

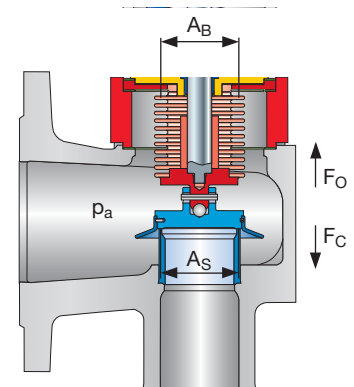
Balanced bellows are generally used for two applications:

- 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	$F_C = F_O$

### Sealing the bonnet from the outlet chamber

LESER's balanced bellows seal the spring chamber to the blow-off chamber. That way, they protect the guides, moving parts, and the spring against media-related affects such as dirt, corrosion, impurities, and also temperature.

Series	441, 441 Full nozzle	XXL	458
<b>Design</b>			
<b>Bonnet spacer</b>	*	–	*
<b>Bellows housing</b>	–	*	*

The shield protects the bellows against flow turbulence when blowing off the valve. Vibrations in the bellows are reduced. This guarantees a longer service life of the bellows.

<b>Control thread</b>	DIN ISO 228-1, G 1/4	*	*	*
	ASME B1.20.1 NPT 1/2"	✓	✓	✓

To check the effectiveness of the bellows, an inspection connection G 1/4 is inserted into the bonnet as per DIN ISO 228-1. For safe discharge, especially of aggressive, toxic media, a discharge pipe G 1/4 can be installed if necessary.

Option code				
<b>Bonnet open</b>	Standard bellows	J68	J68	J68
	Low pressure bellows	J68, J63	J68, J63	J68, J63
	Special materials	S15 + material name	S15 + material name	S15 + material name
<b>Bonnet closed</b>	Standard bellows	J78	J78	J78
	Low pressure bellows	J78, J63	J78, J63	J78, J63
	Special materials	S15 + material name	S15 + material name	S15 + material name
	Control thread NPT 1/2"	J95	J95	J95

The following information can be found on the respective pages of the selected valve:

- dimensions and weights, see “Dimensions and weights” table
- set pressure, see “Pressure temperature ratings” table
- temperature ranges, see “Pressure temperature ratings” table

## Accessories and Options

### Balanced bellows – subassembly item 15

#### Materials

Item	Component	Series 441, 441 Full nozzle	Series XXL	Series 458
15.1	Lower adaptor	1.4404	1.4404	1.4404
		316L	316L	316L
15.2	Upper adaptor	1.4404	1.4571	1.4404
		316L	316Ti	316L
15.3	Bellows	1.4571	1.4571	1.4571
		316Ti	316Ti	316Ti
15.5	Housing	–	1.4571	see item 11
		–	316Ti	see item 11
11	Bonnet spacer	1.4404	–	1.0460 or 1.4404
		316L	–	Carbon steel or 316L
55	Studs	1.4401	1.4401	1.4401
		B8M	B8M	B8M
60	Gaskets	Graphite / 1.4401	–	Graphite / 1.4401
		Graphite / 316	–	Graphite / 316

#### Special bellows materials

Material	Option code	Series 441, 441 Full nozzle	Series XXL	Series 458
Hastelloy®	J81	✓	✓	✓
Inconel®	J82	✓	✓	✓
Further	-	on request		

### Balanced bellows conversion kits

With the LESER bellows conversion kits, conventional construction safety valves can be converted to a balanced bellows design quickly and easily. The conversion kits contains all the components needed for the conversion as well as a conversion guide.

#### Conversion kits

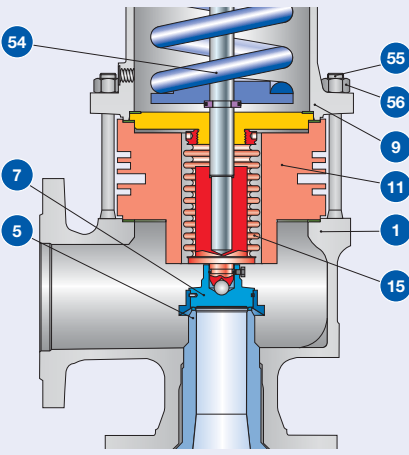
Item	Component	Quantity	Materials
8	Guide	1	1.4404
			316L
11	Bonnet spacer	1	1.4404
			316L
12	Spindle	1	1.4404
			316L
15	Bellows	1	1.4571
			316Ti
55	Stud	4, 8, 12 depends on valve size	1.4401
			B8M
60	Gasket	2, 3 depends on valve size	Graphite / 1.4401
			Graphite / 316
-	Installation instruction WI 3037.05	1	

## Accessories and Options

### High temperature equipment

For fluid temperatures higher than 400 °C / 752 °F high temperature equipment is necessary to protect the inner parts and the spring against inadmissible influence of temperature. The maximum inlet temperature is 550 °C / 1022 °F. The equipment

shown is only fitted in Type 457 / 458. For all other Types an open bonnet and a stainless steel bellows is necessary for fluid temperatures exceeding 400 °C / 752 °F up to max. 450 °C / 842 °F.

<b>Design Series 458</b>			
<b>Option code</b>		J88	
<b>Operating conditions</b>			
<b>Temperature limits</b>	°C	> 400 fluid temperature	
	°F	> 752 fluid temperature	
	max. °C	550 inlet temperature	
	max. °F	1022 inlet temperature	

### Materials

Item	Component	
1	Body	1.7357
		WC6
5	Nozzle	1.4404
		316L
7	Disc	1.4404 stellited
		316L stellited
9	Bonnet open	1.0619
		WCB
11	Cooling spool	1.4404
		316L
15	Bellows	1.4571
		316L
54	Spring	1.7102, 1.8159
		High temperature alloy steel
55	Studs	1.7709
		B16
56	Nuts	1.7258
		7M

## Accessories and Options

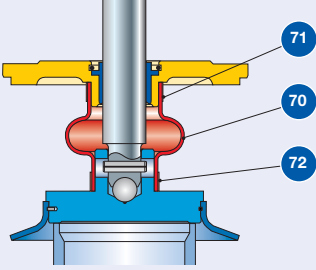
### Elastomer bellows

#### Application

Elastomer bellows reliably seal the bonnet from the outlet chamber, protecting the guides, moving parts and the spring from problems associated with the media, such as dirt, corrosion or impurities, which can cause the valve to fail. The elastomer bellows is a cost effective alternative to the stainless steel bellows.

The range of application for the elastomer bellows is limited by:

- chemical resistance of the bellows
- fluid temperature
- set pressure
- back pressure

<b>Design</b>	
<b>Bellows design</b>	The bellows simple, compact, single wall design allows it to be used in small relieving spaces. Its one-piece construction also allows to be easily replaced and extends its service life.
<b>Flexibility</b>	The bending of the elastomer bellows provides maximum flexibility for spindle movement and reduces wear.
<b>Bonnet vent</b>	A control bore Ø 10 mm / 0.4 inch is designed in the bonnet to vent and to monitor the tightness of the bellows.
<b>Design height</b>	No alteration.

#### Materials

Valve size		DN 20 – 65	DN 80 – 150	DN 20 – 150
		1" – 3"	4"	1" – 4"
Option code		J79	J79	DN 20 – 50: J87 DN 65 – 150: J87+S70
Item	Component			
70	Elastomer bellows	70 EPDM 281	55 EPDM 259	45 NBR 670
		70 EPDM 281	55 EPDM 259	45 NBR 670
71	Hose clamp	1.4301	1.4301	1.4301
		304	304	304
72	Hose clamp	1.4301	1.4301	1.4301
		304	304	304

#### Operating conditions

<b>Temperature limits</b>	[°C]	-50 up to +130	-50 up to +130	-25 up to +100
	[°F]	-58 up to +266	-58 up to +266	-13 up to +212
<b>Set pressure</b>	max. [bar <sub>g</sub> ]	10		
	max. [psig]	145		
<b>Built-up back pressure</b>	[bar <sub>g</sub> ]	up to 3		
	[psig]	up to 43.5		

## Accessories and Options

### Heating jacket

#### Application and construction

To protect systems with viscous, crystallising or sticky media, LESER offers a heating jacket.

The heating jacket has a welded design and covers the angle type body such that it allows the hot media (steam, oil, and so on) to flow through the created space. In order to protect the spindle and moving parts against sticking, a safety valve with a balanced bellows construction should be chosen for the heating jacket construction. For safety valves with balanced bellows, the bonnet spacer needed to accommodate the bellows is equipped with an additional heating jacket. Both heating jackets are joined by a threaded pipe bend.

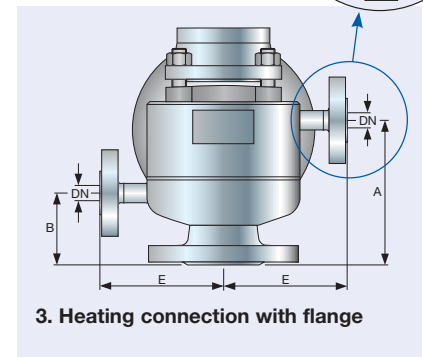
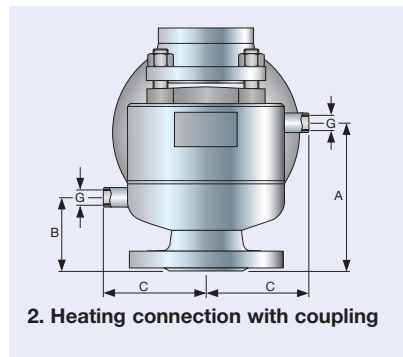
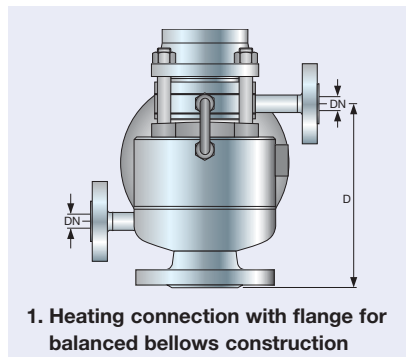
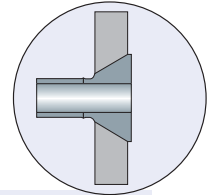
If there is no danger of the medium setting in the blowoff chamber of the valve, then the balanced bellows don't have to be used. The position of the heating connections is shown in figures 1 to 3.

#### Specification for the heating jacket

The operating data of the heating jacket is placed on an additional heating jacket rating plate on the heating jacket.

#### Slip-on flange

Heating connections with flanges are designed for better orientation than slip-on flanges



#### Heating jacket

	DN <sub>i</sub>	25	32	40	50	65	80	100	125	150	200	≥ 250	
Valve size inlet		1"	1 1/2"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	≥ 10"	
Actual Orifice diameter d <sub>0</sub> [mm]		23	29	37	46	60	74	92	98	125	165	≥ 200	
<b>Materials</b>													
<b>Body</b>	Series 441					1.4408	1.4408	1.4408	1.4408	1.4408			
	Series 441 Full nozzle	1.4408	1.4408	1.4408	1.4408	optional 1.0619	optional 1.0619	optional 1.0619	optional 1.0619	optional 1.0619	1.0619	-	
	Series XXL	-	-	-	-	-	-	-	-	-	1.0460 1.0425	1.0460 1.0425	
	Series 458	1.4581	1.4581	1.4581	1.4581	optional 1.0619	optional 1.0619	optional 1.0619	optional 1.0619	optional 1.0619	-	-	
<b>Heating jacket</b>								1.4541 321					
<b>Connections</b>													
<b>Slip on flange DIN</b>	<b>Option code</b>	DN 15, PN 25	1.4571, 1.4404					-					
			316Ti, 316L					-					
<b>Slip on flange ANSI B16.5</b>	<b>Option code</b>	1/2", CL150	1.4404					-					
			316L					-					
<b>Couplings DIN 2986</b>	<b>Option code</b>	G 3/8	1.4571					-					
			316Ti					-					
<b>Heating jacket spacer</b>	<b>Option code</b>	G 3/4	-					1.4571					
			-					316Ti					
<b>Heating jacket spacer</b>	<b>Option code</b>	H 33	-					1.4404					
			-					316L					



## Accessories and Options

### Heating jacket

#### Metric Units

DN <sub>i</sub>	25	32	40	50	65	80	100	125	150	200	≥ 250	
Valve size inlet	1"	1 1/2"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	≥ 10"	
Actual Orifice diameter d <sub>0</sub> [mm]	23	29	37	46	60	74	92	98	125	165	≥ 200	
<b>Series 441, Series 441 Full nozzle, Series XXL</b>						<b>Dimensions</b>						
[mm]	A	115	130	160	160	200	165	160	170	390	on request	on request
	B	70	70	75	80	90	80	80	125	125	on request	on request
	C	95	95	110	110	135	145	145	162	162	on request	on request
	D	152	170	198	220	255	300	300	370	445	on request	on request
	E	121	121	121	136	161	176	176	200	200	on request	on request
	Slip on flange DN	15	15	15	15	15	25	25	25	25	25	25
[inch]	Couplings G	3/8	3/8	3/8	3/8	3/8	3/4	3/4	3/4	3/4	3/4	3/4
<b>Operating conditions</b>						<b>Operating pressure [bar]</b>						
<b>Operating temperature</b>	20 °C	25	25	25	25	15	15	15	15	12	12	on request
	300 °C	18	18	18	18	11	11	11	11	9	9	on request
<b>Series 458</b>						<b>Dimensions</b>						
[mm]	A	130	–	–	170	–	on request	on request	–	–	–	–
	B	88	–	–	112	–	on request	on request	–	–	–	–
	C	96	–	–	123	–	on request	on request	–	–	–	–
	D	185	–	–	251	–	on request	on request	–	–	–	–
	E	122	–	–	149	–	on request	on request	–	–	–	–
	Slip on flange DN	15	–	–	15	–	on request	on request	–	–	–	–
[inch]	Couplings G	3/8	–	–	3/8	–	on request	on request	–	–	–	–
<b>Operating conditions</b>						<b>Operating pressure [bar]</b>						
<b>Operating temperature</b>	20 °C	25	–	–	15	–	15	12	–	–	–	–
	300 °C	18	–	–	11	–	11	9	–	–	–	–

#### US Units

DN <sub>i</sub>	25	32	40	50	65	80	100	125	150	200	≥ 250	
Valve size inlet	1"	1 1/2"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	≥ 10"	
Actual Orifice diameter d <sub>0</sub> [inch]	23	29	37	46	60	74	92	98	125	165	≥ 200	
<b>Series 441, Series 441 Full nozzle, Series XXL</b>						<b>Dimensions</b>						
[inch]	A	4 1/2	5 1/8	6 5/16	6 5/16	7 7/8	6 1/2	6 5/16	6 11/16	15 3/8	on request	on request
	B	2 3/4	2 3/4	3	3 1/8	3 1/2	3 1/8	4 1/2	5	5	on request	on request
	C	3 3/4	3 3/4	4 5/16	4 5/16	5 5/16	5 11/16	6 3/8	6 3/8	6 3/8	on request	on request
	D	6	6 11/16	7 13/16	8 11/16	10 1/16	11 3/4	13 3/8	14 5/8	17 1/2	on request	on request
	E	4 3/4	4 3/4	4 3/4	5 3/8	6 3/8	6 15/16	7 7/8	7 7/8	7 7/8	on request	on request
	Slip on flange DN	1/2	1/2	1/2	1/2	1/2	1	1	1	1	1	1
[inch]	Couplings G	3/8	3/8	3/8	3/8	3/8	3/4	3/4	3/4	3/4	3/4	3/4
<b>Operating conditions</b>						<b>Operating pressure [psig]</b>						
<b>Operating temperature</b>	68 °F	363	363	363	363	217	217	217	217	174	174	on request
	572 °F	261	261	261	261	160	160	160	160	131	131	on request
<b>Series 458</b>						<b>Dimensions</b>						
[inch]	A	130	–	–	170	–	on request	on request	–	–	–	–
	B	88	–	–	112	–	on request	on request	–	–	–	–
	C	96	–	–	123	–	on request	on request	–	–	–	–
	D	185	–	–	251	–	on request	on request	–	–	–	–
	E	122	–	–	149	–	on request	on request	–	–	–	–
	Slip on flange DN	1/2	–	–	1/2	–	on request	on request	–	–	–	–
[inch]	Couplings G	3/8	–	–	3/8	–	on request	on request	–	–	–	–
<b>Operating conditions</b>						<b>Operating pressure [psig]</b>						
<b>Operating temperature</b>	68 °F	363	–	–	217	–	217	174	–	–	–	–
	572 °F	261	–	–	160	–	160	131	–	–	–	–

**Accessories and Options**

**O-ring damper – subassembly item 40**  
Specification

The O-ring damper successfully prevents or reduces the vibrations of the moving parts of a safety valve.

**Background:**

In each safety valve, the moving parts – the disc, spindle, bottom spring plate and spring – form a so-called spring-mass-system. As in all spring-mass-systems, the components can be stimulated to start vibrating under unfavourable conditions (e.g. loss of inlet pressure). Vibrations can also be triggered by external units and then transferred to the safety valve via the mechanical connection or the medium. In the event of resonances, the safety valve opens and closes in an uncontrolled way at a high frequency and can't discharge the accorded mass flow.

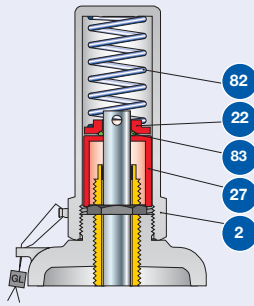
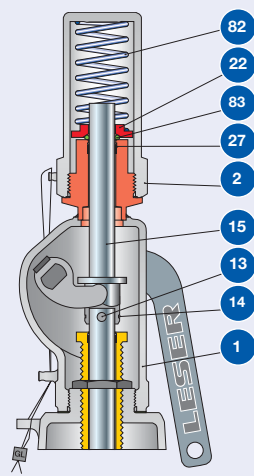
In general, there are two types of uncontrolled vibrations (definition as per ASME PTC 25-2001, Chapter 2.7):

**Chatter:** “Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disc contacts the seat.” The reasons for chatter may include, among other things, too high inlet pressure loss, inadmissible back pressure, or operation in partial load ranges.

**Flutter:** “Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disc does not contact the seat.” The causes of flutter with small and difficult to measure amplitudes are vibrations coming from external sources. Possible external sources are piston compressors or pumps. The vibration can be transferred to the safety valve mechanically via the connections or through the medium.

Based on extensive experience with safety valves, LESER developed the o-ring damper on its certified test benches. The o-ring damper prevents the vibration of moving parts or reduces them to a non-critical frequency and amplitude. Nevertheless, the safety valve operates within the limits of the rules and regulations and standards. Through a special design, the o-ring damper can be used for any type of vibrations.

LESER offers the o-ring damper integrated in the cap H2 and as a modified lifting device H4. For applications with friction-reducing media, e.g. oil, a balanced bellows design is provided to protect the o-ring damper against the medium.

	Cap H2	Packed lever H4
<b>Design</b>		
<b>Option code</b>	Conventional design Balanced bellows design	J65 J65, J78
<b>O-ring temperature range</b>		
		-20 °C – +180 °C -4 °F – +356 °F

## Accessories and Options

### O-ring damper – subassembly item 40

#### Availability

Cap H2 and Packed lever H4	
Valve size	Pressure range
<b>Series 441</b>	
DN 25 – DN 50	0.5 – 40 bar
1" – 2"	7.25 – 580 psig
DN 65	0.26 – 40 bar
2 1/2"	3.77 – 580 psig
DN 80	0.60 – 22.5 bar
3"	8.70 – 326 psig
DN 100	1.17 – 19.2 bar
4"	17 – 278 psig
<b>Series 458</b>	
DN 25, d <sub>0</sub> 20	30 – 90 bar
1", d <sub>0</sub> 20	435 – 1305 psig
DN 50, d <sub>0</sub> 40	32 – 67 bar
2", d <sub>0</sub> 40	464 – 971 psig

LESER guarantees perfect operation of the O-ring damper through extensive testing on the certified test benches. If an O-ring damper is needed for a pressure level that is not given in the table, then further tests are necessary. This leads to longer delivery times. Please contact [sales@leser.com](mailto:sales@leser.com).

#### Materials

Item	Component	Cap H2	Packed lever H4
1	Lever cover	–	1.4408
		–	CF8M
2	Cap H2	1.4404	1.4404
		316L	316L
13	Cylindrical pin	–	1.4401
		–	B8M
14	Securing ring	–	1.4571
		–	316Ti
15	Spindle	–	1.4404
		–	316L
22	Clamping ring	1.4404	1.4404
		316L	316L
27	Bush	1.4404	–
		316L	–
27	Nozzle	–	PFTE 15% glass
		–	PFTE 15% glass
82	Spring	1.4310	1.4310
		Stainless steel	Stainless steel
83	O-ring	FKM	FKM
		FKM	FKM

## Accessories and Options

### Lift indicator

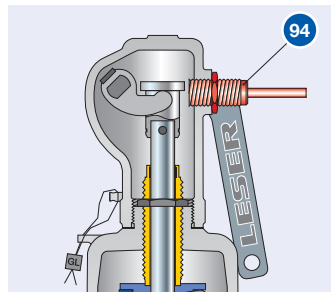
The lift indicator is used in the process technology to monitor the operating condition of a safety valve. Depending on the type of valve, LESER equips the packed lever H4 or the bonnets with the receptacle for the lift indicator. For safety valves with lift indicators, the opening of the valve during opening or the lifting operation is signalled as of a specific lift (min. 1mm / 0.04 inch).

LESER uses inductive DC lift indicators with two-wire technology Type DIN EN 60947-5-6 (NAMUR). The indicators are approved for use in explosion-prone areas of Zone 0 (Ex II 1 D Ex iaD 20 T6). Other indicators that meet customer specifications can be used.

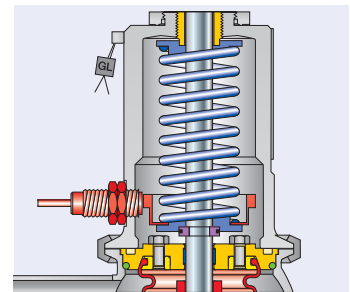
Technical data for lift indicators can be found on the manufacturer's homepage: [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

### Gastight construction on request!

For installation instructions for lift indicators, see WI 3323.02.



Packed lever H4 or bolted lifting device H6

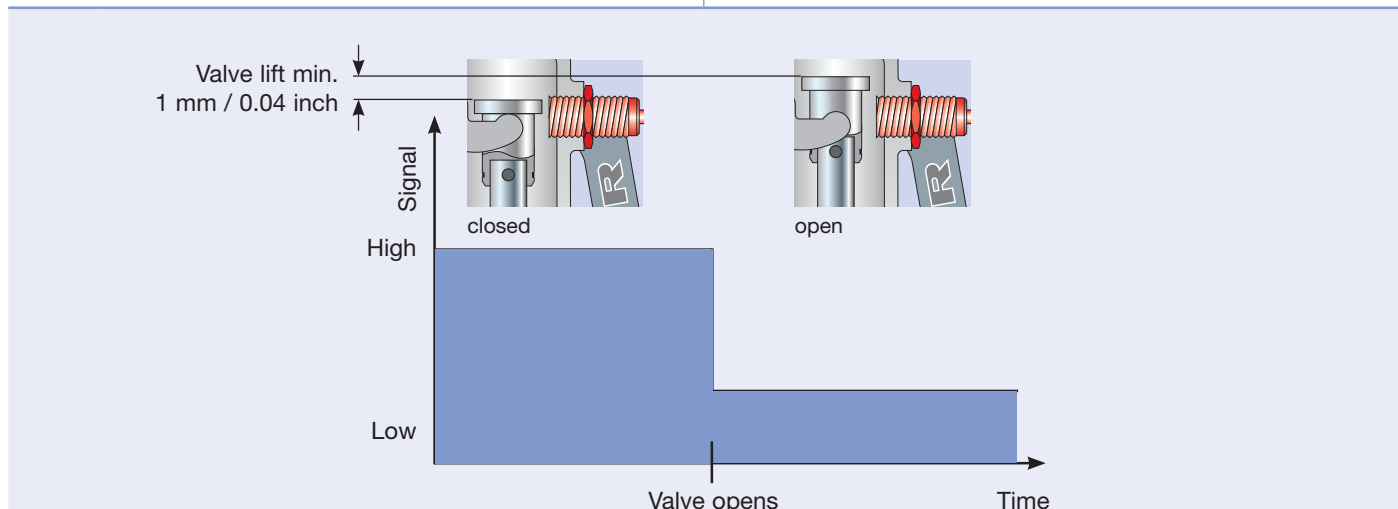
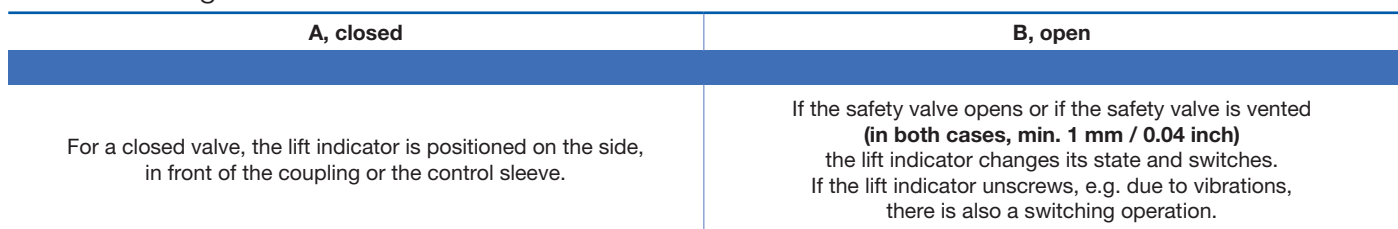


Type 444 DN 25 / 1": Bonnet with receptacle for lift indicator

### Specification

Item	Component	Option code
9	Bonnet with receptacle for lift indicator	J38
40	Packed lever H4 with receptacle for lift indicator M18 x 1 [mm]	J39
94	Lift indicator M18 x 1, used type = PEPPERL+FUCHS NJ5-18GK-N	J93

### Functional diagram



## Accessories and Options

### Lift restriction

The Lift restriction is used to adjust the safety valve to the required discharge mass flow and does not affect the operation of the safety valve. A lift stopper must meet the requirements of the following codes and standards.

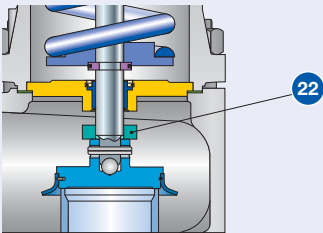
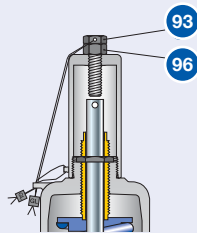
#### Requirements

Code / Standards	EN ISO 4126-1, Section 5.1.3	ASME Code case 1945-4	AD 2000-Merkblatt A2, Section 10.3
<b>Lift</b>	≥ 30% of the full lift not less than 1.0 mm / 1/16 inch	≥ 30% of the full lift not less than 2.0 mm / 1/8 inch	≥ 30% of the full lift not less than 1.0 mm / 1/16 inch
<b>Coefficient of discharge</b>	–	–	$\alpha_w [S/G] \geq 0.08$
	–	–	$\alpha_w [L] \geq 0.05$
<b>Name plate marking</b>	Identification of the reduced coefficient of discharge	– Capacity replaced by “Limited capacity” – Limited lift = ___ mm	Identification of the reduced coefficient of discharge
<b>Design according to EN ISO 4126-1</b>	For valves with a lift stopper to adapt to the required discharge mass flow, this device must not have an adverse effect on the operation of the valve. If it is adjustable, the lift stopper device must be setup such that the adjustable part can be mechanically secured and sealed. The lift stopper device must be installed and sealed by the manufacturer.		

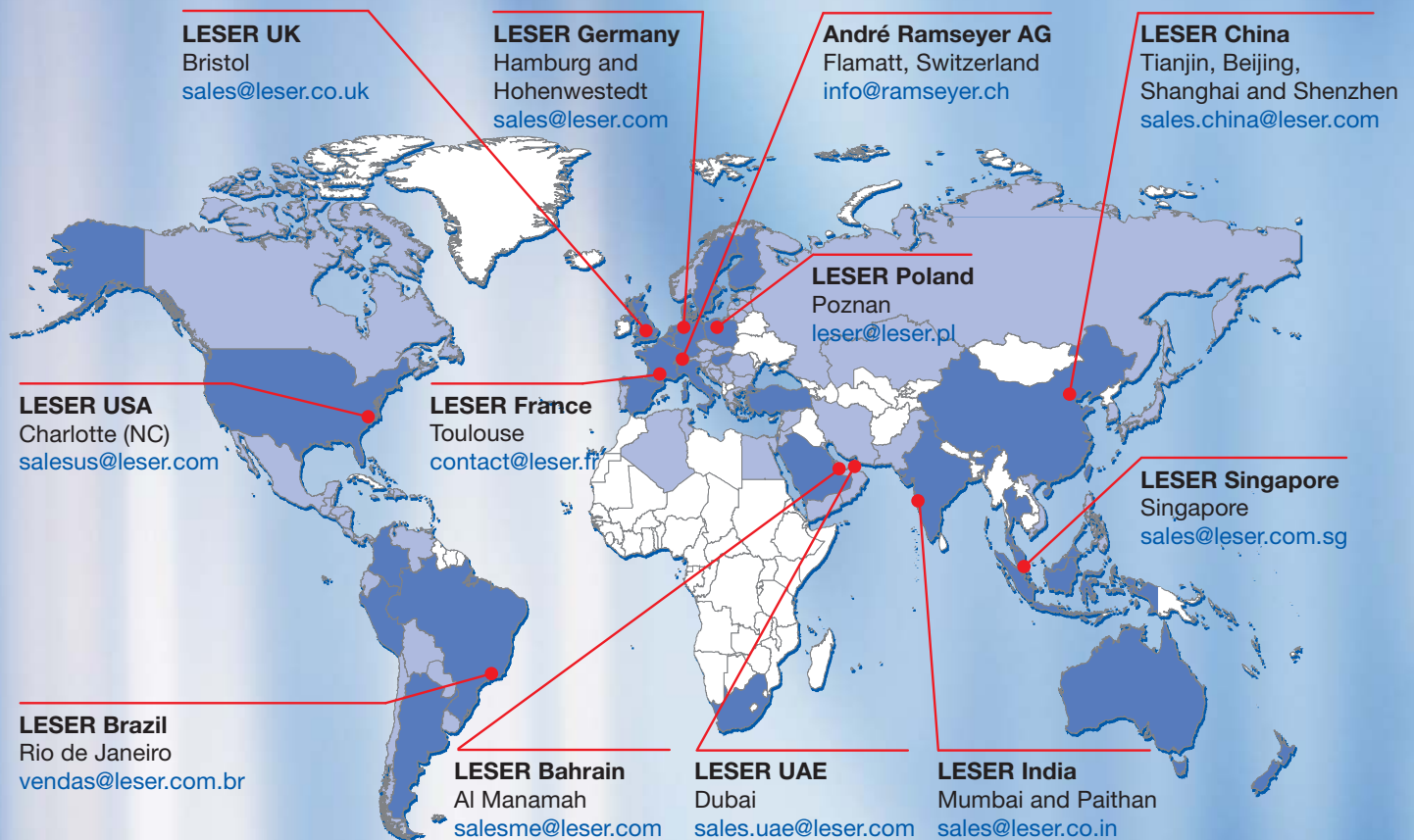
Determining of the restricted lift can be done by using:

- the “Diagram for evaluation of ratio of lift / flow diameter (h/d<sub>0</sub>) in reference to the coefficient of discharge (K<sub>dr</sub> / α<sub>w</sub>)”
- LESER sizing program VALVESTAR®
- LESER sizing VALVESTAR® Web see [www.valvestar.com](http://www.valvestar.com)

#### Design

	Lift restriction by bush	Lift restriction by gag
		
<b>Option code</b>	J51	Cap H2 or H1: J52 Packed lever H4 or H6: J50
<b>Availability</b>		
<b>Series 441</b>	✓	✓
<b>Series 444</b>	✓	✓
<b>Series XXL</b>	✓	✓
<b>Series 441 Full nozzle</b>	✓	✓
<b>Series 458</b>	✓	✓
<b>Materials</b>		
<b>Item</b>	<b>Component</b>	
<b>22</b>	Bush	1.4404
		316L
<b>93</b>	Stud	1.4401
		B8M
<b>96</b>	Nut	1.4401
		8M

# LESER worldwide



- LESER representatives
- LESER stock and local assembly

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