



Type 431 PN 160
Plain lever H3
Open bonnet
Conventional design

Type 431, 433 PN 160

Flanged Safety Relief Valves



Type 433 PN 160
Cap H2
Closed bonnet
Conventional design

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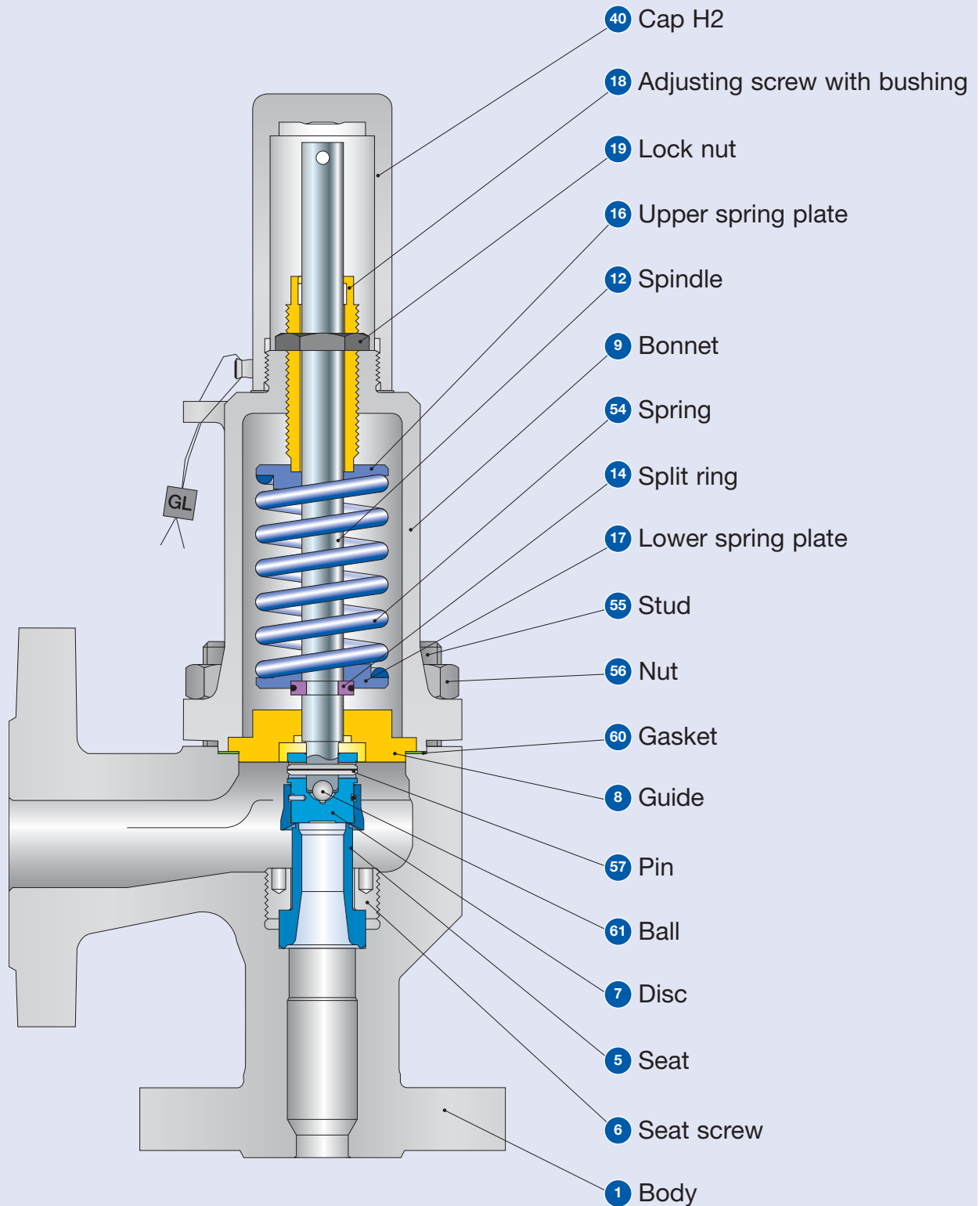
Determination of

coefficient of discharge K_{dr}/α_w

40

Type 431, 433 PN 160

Conventional design



Conventional design

Materials		O-ring disc	Metal disc	O-ring disc	Metal disc
Item	Component	Type 4312 / 4332	Type 4312 / 4332	Type 4334	Type 4334
1	Body	1.0619	1.0619	1.4408	1.4408
		SA 216 WCB	SA 216 WCB	SA 351 CF8M	SA 351 CF8M
5	Seat	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
6	Seat screw	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
7	Disc	1.4404	1.4122	1.4404	1.4404
		316L	Hardened stainless steel	316L	316L
8	Guide	1.4104 tenifer	1.4104, 1.0501, 1.0570	1.4404	1.4404
		Chrome steel tenifer	Chrome or stainless steel	316L	316L
9	Bonnet	0.7040	0.7040	1.4408	1.4408
		Ductile Gr. 60-40-18	Ductile Gr. 60-40-18	SA 351 CF8M	SA 351 CF8M
12	Spindle	1.4021	1.4021	1.4404	1.4404
		420	420	316L	316L
14	Split ring	1.4104	1.4104	1.4404	1.4404
		Chrome steel	Chrome steel	316L	316L
16/17	Spring plate	1.0718	1.0718	1.4404	1.4404
		Steel	Steel	316L	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4104 PTFE	1.4404 PTFE	1.4404 PTFE
		Chrome steel PTFE	Chrome steel PTFE	316L PTFE	316L PTFE
19	Lock nut	1.4104	1.4104	1.4404	1.4404
		Chrome steel	Chrome steel	316L	316L
40	Cap H2	1.0460	1.0460	1.4404	1.4404
		SA 105	SA 105	316L	316L
54	Spring, standard	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.4310	1.4310
		Steel	Steel	Stainless steel	Stainless steel
54	Spring, optional	1.4310	1.4310	-	-
		Stainless steel	Stainless steel	-	-
55	Stud	1.1181	1.1181	1.4401	1.4401
		Steel	Steel	B8M	B8M
56	Nut	1.0501	1.0501	1.4401	1.4401
		2H	2H	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	1.4401	1.4401
		Hardened stainless steel	Hardened stainless steel	316	316

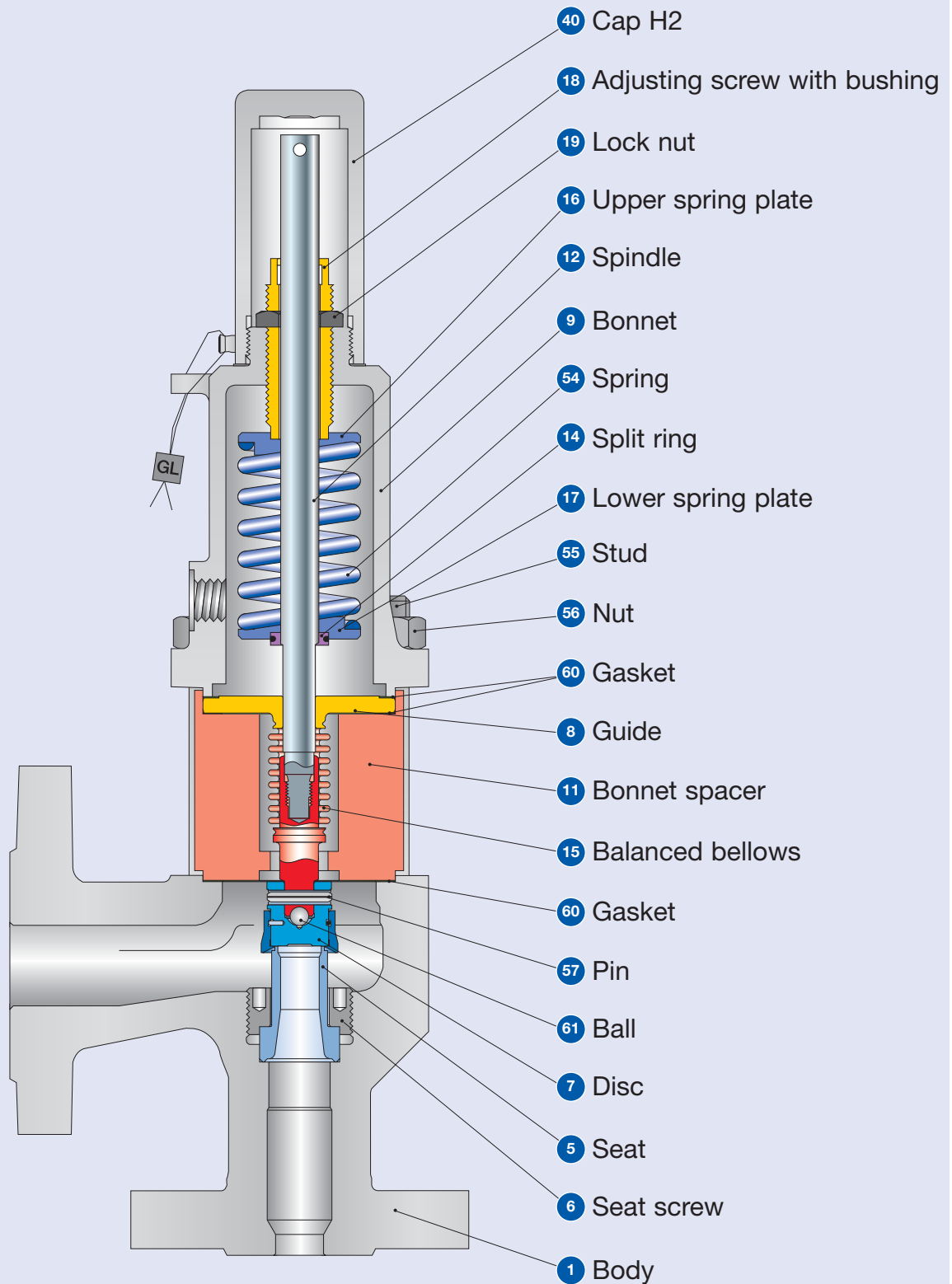
Note:

- LESER reserves the right to make changes.
- If several materials are specified LESER defines the material.
- LESER may use higher quality materials without giving prior notice.
- Each component can be constructed of another material according to the customer's specification.
- All components exposed to pressure are highlighted in bold. The material will be specified according to DIN and ASTM here.

Type 431, 433 PN 160

LESER

Balanced bellows design



Type 431, 433 PN 160

Balanced bellows design

Materials		O-ring disc	Metal disc	O-ring disc	Metal disc
Item	Component	Type 4312 / 4332	Type 4312 / 4332	Type 4334	Type 4334
1	Body	1.0619	1.0619	1.4408	1.4408
		SA 216 WCB	SA 216 WCB	SA 351 CF8M	SA 351 CF8M
5	Seat	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
6	Seat screw	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
7	Disc	1.4404	1.4122	1.4404	1.4404
		316L	Hardened stainless steel	316L	316L
8	Guide Upper connection of balanced bellows	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
9	Bonnet	0.7040	0.7040	1.4408	1.4408
		Ductile Gr. 60-40-18	Ductile Gr. 60-40-18	SA 351 CF8M	SA 351 CF8M
11	Bonnet spacer	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
12	Spindle	1.4404	1.4404	1.4404	1.4404
		316L	316L	316L	316L
14	Split ring	1.4104	1.4104	1.4404	1.4404
		Chrome steel	Chrome steel	316L	316L
15	Balanced bellows	1.4571	1.4571	1.4571	1.4571
		316Ti	316Ti	316Ti	316Ti
16/17	Spring plate	1.0718	1.0718	1.4404	1.4404
		Steel	Steel	316L	316L
18	Adjusting screw with bushing	1.4104 PTFE	1.4104 PTFE	1.4404 PTFE	1.4404 PTFE
		Chrome steel PTFE	Chrome steel PTFE	316L PTFE	316L PTFE
19	Lock nut	1.4104	1.4104	1.4404	1.4404
		Chrome steel	Chrome steel	316L	316L
40	Cap H2	1.0460	1.0460	1.4404	1.4404
		SA 105	SA 105	316L	316L
54	Spring, standard	1.1200, 1.8159, 1.7102	1.1200, 1.8159, 1.7102	1.4310	1.4310
	Spring, optional	Steel	Steel	Stainless steel	Stainless steel
55	Stud	1.4310	1.4310	–	–
		Stainless steel	Stainless steel	–	–
55	Stud	1.4401	1.4401	1.4401	1.4401
		8M	8M	B8M	B8M
56	Hex nut	1.4401	1.4401	1.4401	1.4401
		8M	8M	B8M	B8M
57	Roll 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	1.4401	1.4401
		Hardened stainless steel	Hardened stainless steel	316	316

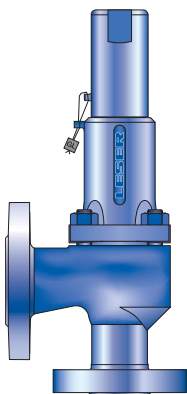
Note:

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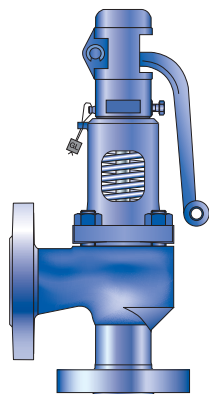
Article numbers

Article numbers			O-ring disc	Metal disc
	DN _i		15	15
	DN _o		25	25
	Actual orifice diameter d ₀ [mm]		12	12
	Actual orifice area A ₀ [mm ²]		113	113
Body material: 1.0619 (WCB)				
Bonnet closed	H2	Art. No. 4332.	8572	8552
	H3	Art. No. 4332.	8573	8553
	H4	Art. No. 4332.	8574	8554
open	H3	Art. No. 4312.	8575	8555
Body material: 1.4408 (CF8M)				
Bonnet closed	H2	Art. No. 4334.	8582	8562
	H4	Art. No. 4334.	8584	8564

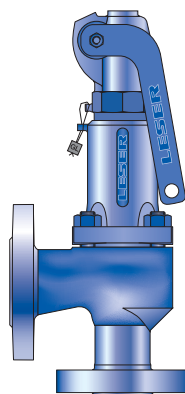
Type 431, 433 PN 160



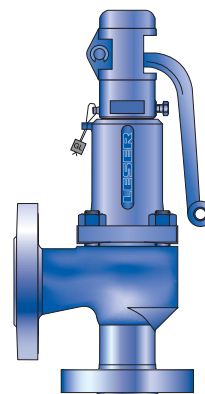
Type 433 PN 160
Cap H2
Closed bonnet
Conventional design



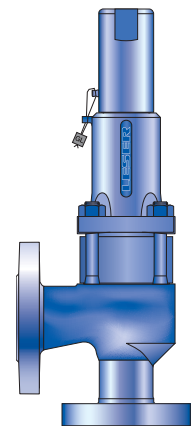
Type 431 PN 160
Plain lever H3
Open bonnet
Conventional design



Type 433 PN 160
Packed lever H4
Closed bonnet
Conventional design



Type 433 PN 160
Plain lever H3
Closed bonnet
Conventional design

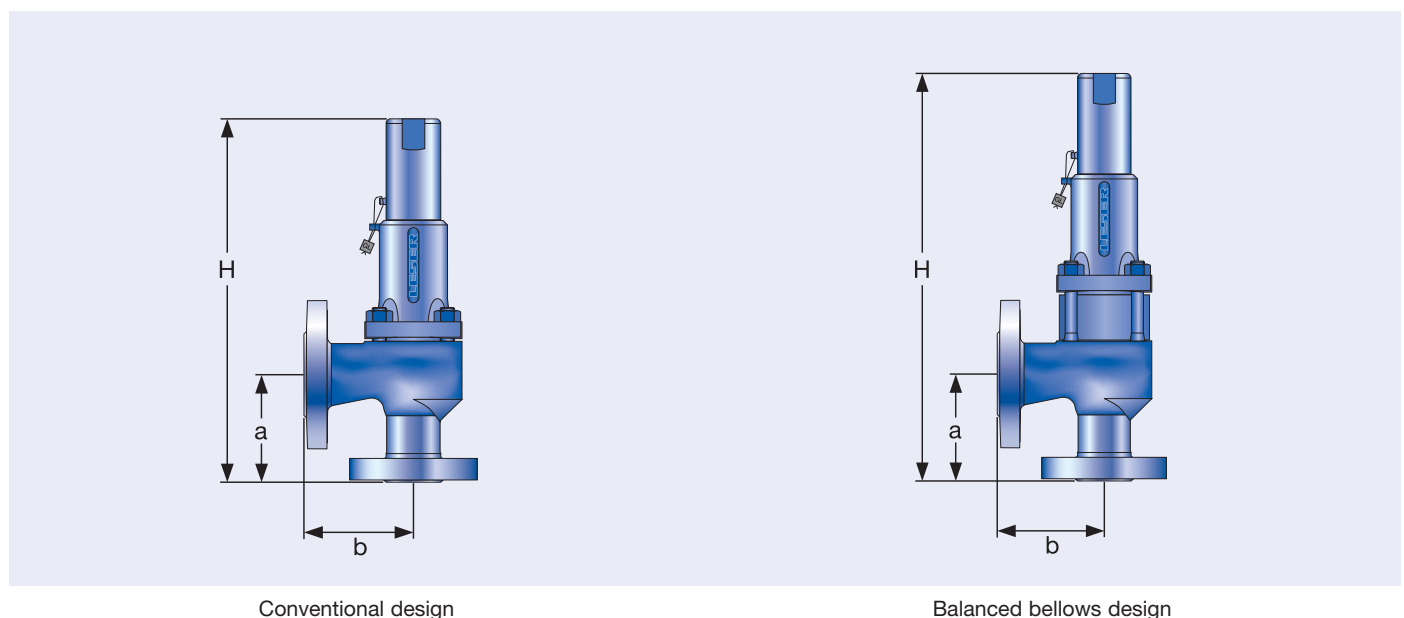


Type 433 PN 160
Cap H2
Closed bonnet
Balanced bellows design

Dimensions and weights

Metric units		
	DN _i	15
	DN _o	25
	Actual orifice diameter d _o [mm]	12
	Actual orifice area A _o [mm ²]	113
Weight		
[kg]		7
	with bellows	8.4
Centre to face		
[mm]	Inlet a	90
	Outlet b	90
Height (H4)		
[mm]	Standard H max.	307
	Bellows H max.	359
Body material: 1.0619 (WCB)		
DIN flange¹⁾	Inlet	PN 160
	Outlet	PN 40
Body material: 1.4408 (CF8M)		
DIN flange¹⁾	Inlet	PN 160
	Outlet	PN 40

¹⁾ Standard flange class. For other flange drillings, see page 35.



Pressure temperature ratings

Metric units				O-ring disc			Metal disc
	DN _i			15			15
	DN _o			25			25
	Actual orifice diameter d ₀ [mm]			12			12
	Actual orifice area A ₀ [mm ²]			113			113
Body material: 1.0619 (WCB)							
DIN flange	Inlet						PN 160
	Outlet						PN 40
Minimum set pressure	p [bar _g] S/G/L			0.3			0.3
Min. set pressure¹⁾ standard bellows	p [bar _g] S/G/L			3			3
Maximum set pressure	p [bar _g] S/G/L	"K"					
		"D"	142	"C"	85		144
		"L"					
Max. set pressure with special spring	p [bar _g] S/G/L	"K"					
		"D"	160	"C"	85		160
		"L"					
Temperature²⁾ acc. to DIN EN	min. [°C]			-45			-60
	max. [°C]			+150			+450
Body material: 1.4408 (CF8M)							
DIN flange	Inlet						PN 160
	Outlet						PN 40
Minimum set pressure	p [bar _g] S/G/L			0.3			0.3
Min. set pressure¹⁾ standard bellows	p [bar _g] S/G/L			3			3
Max. set pressure	p [bar _g] S/G/L			85			85
Max. set pressure with special spring	p [bar _g] S/G/L	"K"					
		"D"	150	"C"	85		160
		"L"					
Temperature²⁾ acc. to DIN EN	min. [°C]			-45			-270
	max. [°C]			+150			+400

¹⁾ Min. set pressure of standard bellows = max. set pressure of bellows for low set pressure.

²⁾ The temperature is limited by the soft seal material (see page 48). The values given here are valid for EPDM. Between -10°C and the lowest specified application temperature, proceed as per AD 2000-Merkblatt W10.

Flange drillings and facings

Flange drillings			
	DN _i		15
	DN _o		25
	Valve size		1/2" x 1"
	Actual orifice diameter d _o [mm]		12
	Actual orifice area A _o [mm ²]		113
Body material: 1.0619 (WCB), 1.4408 (CF8M)			
Inlet	DIN EN 1092	PN 16	H47
		PN 40	H47
		PN 63	*
		PN 160	*
ASME B 16.5	CL300	H65	
	CL600	H67	
Outlet	DIN EN 1092	PN 16	*
		PN 40	*
	ASME B16.5 ¹⁾	CL150	H79
		CL300	H80

Flange facings										
Information	Standard	Inlet	Outlet	Remark						
General										
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. for hydrogen						
Lens-shape seal form L (without lens-shape seal)	DIN 2696 LDeS 3313.35	J11	J12							
According to DIN EN 1092										
Flange facings (also see LDeS 3313.40)		Inlet	Outlet	Remark						
		PN 63 – PN 160	PN 40	Rz specification acc. to DIN EN 1092 in µm						
Raised face	Form B1	–	*	Facing: Rz = 12.5 – 50						
	Form B2	*	L38	Facing: Rz = 3.2 – 12.5						
Tongue, Form C ¹⁾		H94	H92	only for steel flange						
Groove, Form D ¹⁾		H93	H91							
Male, Form E		H96	H98							
Female, Form F		H97	H99							
O-ring Male, Form G		J01	J02							
O-ring Female, Form H		J03	J04							
According to ASME B16.5										
Body material	Inlet	Outlet	Smooth Finish ²⁾		Serrated Finish		RTJ-Groove			
			Inlet	Outlet	Inlet	Outlet	Inlet		Outlet	
			Option code		Option code		ANSI Class	Option code	ANSI Class	Option code
1.0619, 1.4408	all	all	L52	L53	*	*	150	H62	150	H63

¹⁾ 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".

²⁾ Smooth Finish is not defined in the effective standards.

For signs and symbols refer to page 6.

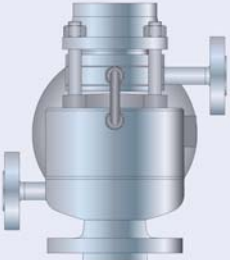
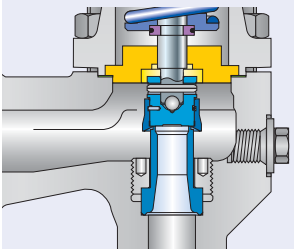
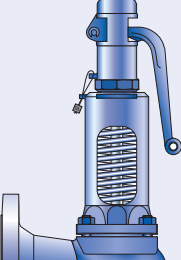
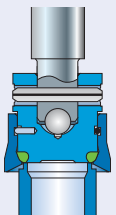
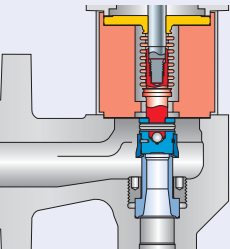
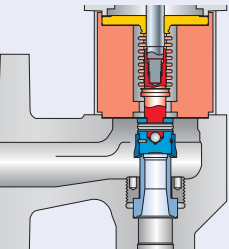
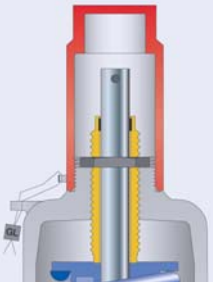
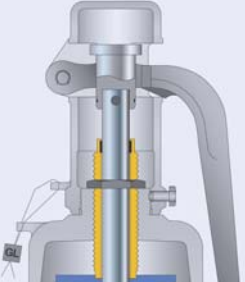
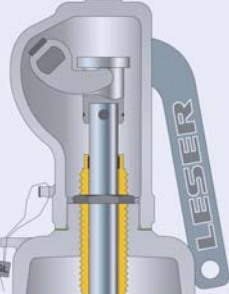
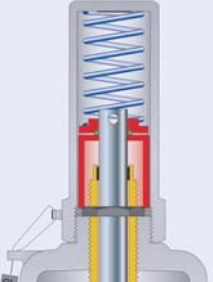
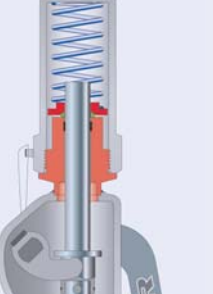
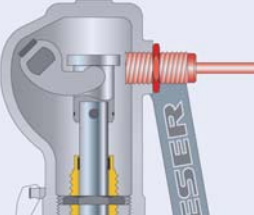
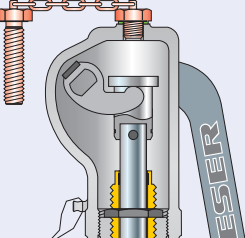
Note: Flange drillings and facings meet always the requirements of mentioned flange standards.

Flange thickness and outer diameter may vary from flange standard.

Approvals

Approvals		
	O-ring disc	Metal disc
DN _i	15	15
DN _o	25	25
Actual orifice diameter d ₀ [mm]	12	12
Actual orifice area A ₀ [mm ²]	113	113
Europe		
		Coefficient of discharge K_{dr}
PED / DIN EN ISO 4126-1 12/2013	Approval-No.	072020111Z0008/0/06
	S/G	0.59
	L	0.47
		Coefficient of discharge α_w
PED / AD 2000-Merkblatt A2 07/2012	Approval-No.	TÜV SV 577
	S/G	0.59
	L	0.47
China		
		Coefficient of discharge α_w
AQSIQ	Approval-No.	For current Approval-No. see www.leser.com
	S/G	0.59
	L	0.47
Eurasian Custom Union		
		Coefficient of discharge α_w
EAC	Approval-No.	For current Approval-No. see www.leser.com
	S/G	0.59
	L	0.47
Classification societies		
		Homepage
Bureau Veritas	BV	www.bureauveritas.com
ClassNK NIPPON Kaiji Kyokai	NK	www.classnk.or.jp
DNV GL		www.dnvgl.com
Lloyd's Register EMEA	LREMEA	www.lr.org
Registro Italiano Navale	RINA	www.rina.org
		The valid Approval-No. changes with each renewal of the approval.
		For a sample certificate including the valid certification number see www.leser.com

Available options

<p>Heating jacket H29, H30: Coupling G 3/8, G 3/4 H31, H32: Flange DN15, DN25</p> 	<p>Drain hole J18: G 1/4 J19: G 1/2</p> 	<p>Open bonnet See Article numbers</p> 	
<p>O-ring disc J20: FFKM "C" J21: CR "K" J22: EPDM "D" J23: FKM "L"</p> 	<p>Balanced bellows J68: Open bonnet J78: Closed bonnet</p> 	<p>Conversion kit for balanced bellows</p> 	
<p>Screwed cap H2 H2</p> 	<p>Plain lever H3 H3</p> 	<p>Packed lever H4 H4</p> 	
<p>O-ring damper H2 J65</p> 	<p>O-ring damper H4 J66</p> 	<p>Lift indicator J39: Adaptor H4 J93: Lift indicator</p> 	<p>Test gag J69: H4 J70: H2</p> 

Spare parts

Spare parts		O-ring disc	Metal disc
	DN _i	15	15
	DN _o	25	25
	Actual orifice diameter d ₀ [mm]	12	12
	Actual orifice area A ₀ [mm ²]	113	113
Disc (item 7): Metal seat		Material-No. / Art. No.	
Disc	1.4122	–	230.9339.9000
Detachable lifting aid	1.4404	–	230.9349.9000
Disc (item 7): Soft seal		Material-No. / Art. No.	
Disc	CR “K”	230.2949.9053	–
	EPDM “D”	230.2949.9042	–
	FKM “L”	230.2949.9073	–
	FFKM “C”	230.2949.9091	–
O-ring (item 7.4): Soft seal		Material-No. / Art. No.	
O-ring	CR “K”	502.0107.2653	–
	EPDM “D”	502.0107.2642	–
	FKM “L”	502.0107.2673	–
	FFKM “C”	502.0107.2691	–
Bellows (item 15): 1.4571		Material-No. / Art. No.	
Standard bellows		400.6349.0000	400.6349.0000
Conversion kit, standard ¹⁾		Please specify application conditions	
Low pressure bellows		–	–
Conversion kit low pressure ¹⁾		–	–
Gasket – body / bonnet (item 60)		Material-No. / Art. No.	
Gasket	Graphite + 1.4401	500.0407.0000	500.0407.0000
Option code L68 Gylon (PTFE compliance)		500.0405.0000	500.0405.0000
Ball (item 61)		Material-No. / Art. No.	
Ball	Ball Ø [mm]	6	6
	1.4404	510.0104.0000	510.0104.0000
Split ring (item 14)		Material-No. / Art. No.	
Split ring	Spindle Ø [mm]	12	12
	1.4404	251.0149.0000	251.0149.0000
Pin (item 57)		Material-No. / Art. No.	
Pin	1.4310	480.0505.0000	480.0505.0000
O-ring damper		Material-No. / Art. No.	
	Conversion kit H2	5021.1060	5021.1060
	Conversion kit H4	5021.1064	5021.1064

Item	Components	No.
8	Guide; upper connection of balanced bellows	1
11	Bonnet spacer	1
12	Spindle	1
15	Bellows	1
55	Stud	4
60	Gasket	2
	Instruction guide WI 3037.05	1

Refer to page 30.

Capacities

Calculation of the capacity for steam, gases, and liquids acc. to AD 2000-Merkblatt A2 with 10% overpressure.
Capacities at 1 bar and lower are calculated at 0.1 bar overpressure.

Metric units		AD 2000-Merkblatt A2					
		O-ring disc	Metal disc	O-ring disc	Metal disc	O-ring disc	Metal disc
DN		15	15	15	15	15	15
DN ₀		25	25	25	25	25	25
Actual orifice diameter d ₀ [mm]		12	12	12	12	12	12
Actual orifice area A ₀ [mm ²]		113	113	113	113	113	113
LEO _{S/G/L} ^(*) [inch ²]		0.106	0.111	0.106	0.111	0.127	0.129
Set pressure	Capacities		Capacities		Capacities		
[bar]	Steam saturated [kg/h]		Air 0°C and 1013 mbar [m ³ /h]		Water 20°C [10 ³ kg/h]		
0.2							
0.5	52	55	64	67	2.09	2.14	
1	74	78	93	93	2.84	2.90	
2	118	125	151	151	4.01	4.10	
3	161	168	206	206	4.91	5.02	
4	200	210	246	258	5.67	5.79	
5		251	296	311	6.34	6.48	
6		293	346	363	6.95	7.09	
7		333	396	416	7.50	7.66	
8		374	446	468	8.02	8.19	
9		415	496	521	8.51	8.69	
10		456	546	573	8.97	9.16	
12		538	646	679	9.82	10.0	
14		618	746	784	10.6	10.8	
16		699	846	889	11.3	11.6	
18		781	946	994	12.0	12.3	
20		863	1046	1099	12.7	13.0	
22		942	1146	1204	13.3	13.6	
24		1024	1245	1309	13.9	14.2	
26		1106	1345	1414	14.5	14.8	
28		1189	1445	1519	15.0	15.3	
30		1271	1545	1624	15.5	15.9	
32		1354	1645	1729	16.0	16.4	
34		1433	1745	1834	16.5	16.9	
36		1517	1845	1939	17.0	17.4	
38		1600	1945	2044	17.5	17.9	
40		1684	2045	2149	17.9	18.3	
50		2109	2545	2674	20.1	20.5	
60		2537	3045	3200	22.0	22.4	
70		2981	3545	3725	23.7	24.2	
80		3430	4045	4250	25.4	25.9	
90		3901	4544	4775	26.9	27.5	
100			5044	5301	28.4	29.0	
120			6044	6351	31.1	31.7	
140			7044	7402	33.6	34.3	
160			8043	8452	35.9	36.6	

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

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

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

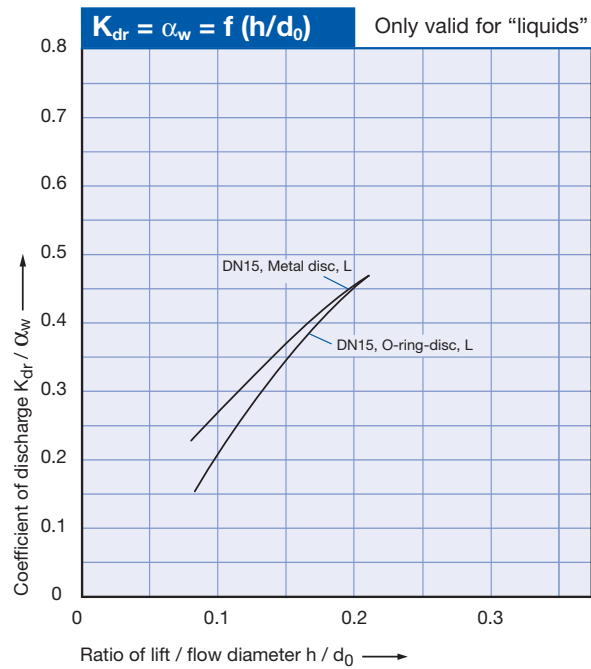
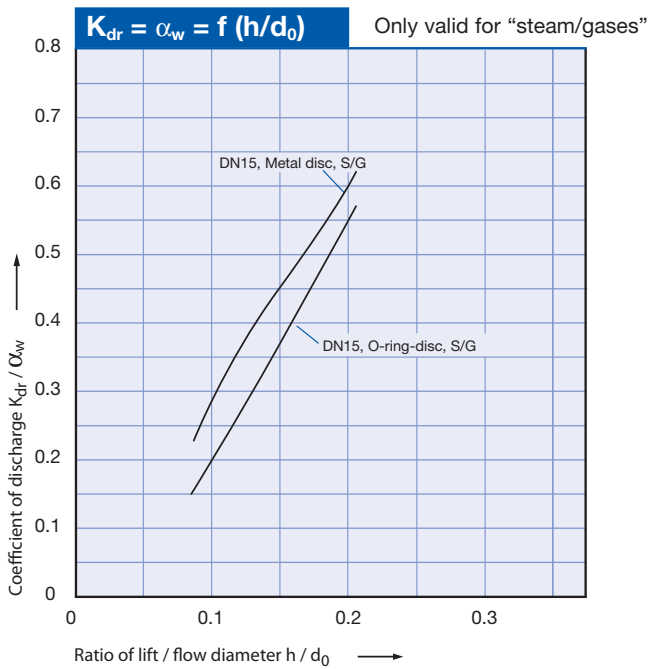


Diagram for evaluation of coefficient of discharge (K_{dr}/α_w) or K_b in reference to the ratio of back pressure / set pressure (p_{a0}/p₀)

