

Type 437

Normal-Feder-Sicherheitsventil Safety Relief Valve spring loaded für Dämpfe, Gase und Flüssigkeiten for steam, gases and liquids

Zusatzausrüstungen

Heizmantel
Teller mit Dichtplatte

Anschlüsse

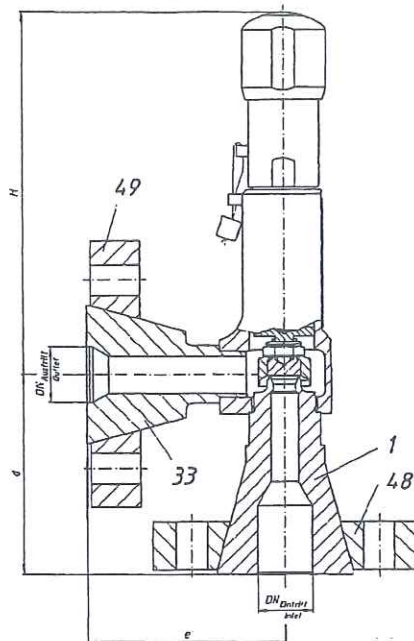
NPT Gewindeanschlüsse
Gewindemuffen
Flanschanschlüsse nach DIN/ANSI
Weitere Anschlüsse auf Anfrage

Accessories

Heating jacket
disc with sealing plate

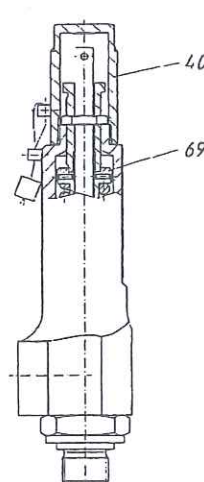
Connections

NPT screwed connections
female screwed connections
flange connections acc. to DIN/ANSI
further connections on request

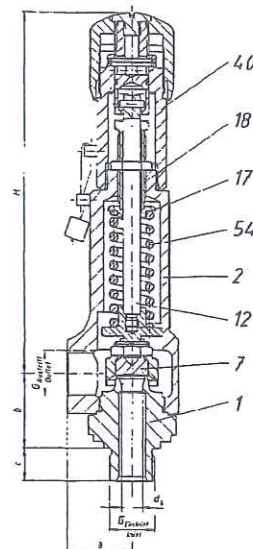


nur mit Austritt nach unten
only with outlet in direction downstairs

Type 437
mit Flanschen
with flanges
- Eintritt: Losflansch-Ausführung
Inlet: Slip on flange design
- Austritt: Losflansch
Outlet: Slip on flange



Type 437
mit gasdichter Kappe H2
with gastight cap H2



Type 437
mit Anlüftung H4, gasdicht,
Teller anlüftbar
lifting device H4, gastight,
disc liftable

Zulassungen / Approvals

EG-Bautelprüf.-/EC-type examination no. 07 202 0111 Z00080/21	Dämpfe/Gase Steam/Gases	D/G S/G	Flüssigkeiten Liquids	F L
TÜV (AD-A2, TRD 421, VdTÜV SV 100) Listennr./Approval number	980			
Ausflussziffer / Coefficient of discharge α_d Öffnungscharakteristik / Opening characteristic	6	10	6	10
	0,72	0,50	—	0,35
	Normal / Standard		Normal / Standard	
ASME/NB (ASME Sec. VIII Div. 1) Nr./No.	M 37213		M 37189	
Nennsteigung = WIP / Rated Slope = WIP	1,02 SCFM / PSIA		1,54 GPM / $\sqrt{\text{PSID}}$	
Weitere / Others siehe Seite / refer to page 2/40-41	DGR/PED	DNV	DIN GOST	ISPESL
	KISCO	UDT	GL	TMB

Eintrittskörperwerkstoff <i>Inlet body material</i>			Temperatureinsatzgrenze ¹⁾ <i>Temperature range ¹⁾</i>								Artikelnummer <i>Article number</i>			
DIN EN		ASME	DIN EN				ASME				d ₀ [mm]			
Werkstoffbezeichnung <i>Material Designation</i>	Werkstoff-Nr. <i>Material No.</i>		von <i>from</i>		bis <i>to</i>		von <i>from</i>		bis <i>to</i>		6	10		
			[°C]	[°F]	[°C]	[°F]	[°C]	[°F]	[°C]	[°F]	Long Version	Standard	Long Version	
X 14 CrMoS 17	1.4104	430F	-10	+14	+220	+428	-29	-20	+220	+428	4373	—	.260*	.261*
X 2 CrNiMo 17-12-2	1.4404 ^{1) 2)}	316L	-270	-454	+280	+536	-268	-450	+280	+536	4374	.312*	.314*	.315*

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung angeben:
2 = Kappe H2 4 = Anlüftung H4 (gasdicht)

¹⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur
ist gemäß AD-Merkblatt W10 zu verfahren.

* Please add number for the required cap or lifting device:
2 = Cap H2 4 = Lifting device H4 (gastight)

¹⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall
be taken into account.

Änderungen behalten wir uns vor.

Modifications reserved.

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

				Long Version		Standard	Long Version
Nennweite, Ventilgröße		Nominal Diameter, Valve size		d ₀	mm	6	10
Druckstufe Eintritt		Pressure rating inlet		PN		400	320
Druckstufe Austritt		Pressure rating outlet		PN		250	160
Eintritt Zapfen		Inlet male			—	G 1/2; G 3/4	
Austritt Muffe		Outlet female			—	G 1/2 ¹⁾	
Min. Ansprechdruck	4373	Min. Set pressure	4373	p	bar/barg	—	93
	4374		4374	p	bar/barg	0,1	68
Max. Ansprechdruck	4373	Max. Set pressure	4373	p	bar/barg	—	390
	4374		4374	p	bar/barg	330	320
Engster Strömungsquerschnitt		Flow area		A ₀	mm ²	28,3	78,5
Engster Strömungsdurchmesser		Flow diameter		d ₀	mm	6	10
Schenkellänge	Austritt	Centre to face dimension	outlet	a	mm	30	30
	Eintritt		inlet	b	mm	33	33
Zapfenlänge	G 1/2	Length	G 1/2	c	mm	15	
	G 3/4		G 3/4	c	mm	16	
						100	
Flanschausführung	Austritt	Flanged Version	outlet	d	mm	100	
	Eintritt		inlet	e	mm	100	
Bauhöhe	H2	Height	H2	H	mm	—	158
	H4		H4	H	mm	137	183
	H2		H2	H	mm	158	158
	H4		H4	H	mm	168	183
Gewicht		Weight		—	kg	1,4	1,4

¹⁾ Anschlüsse mit Innendurchmesser < 16 mm sind nicht zulässig!

¹⁾ Connections with inside diameter < 16 mm are not allowed!

Werkstoffe / Materials

Pos. Item	Bauteile	Parts	4373 Chromstahl/chrome steel		4374 korrosionsfest/corrosion resistant kaltzäh/cryogenic	
			Werkstoff Nr. material no.	ASME	Werkstoff Nr. material no.	ASME
1	Eintrittskörper	Body (base)	1.4104	430F	1.4404 ¹⁾	316L ¹⁾
2	Austrittsgehäuse	Outlet body	1.4104	430F	1.4404	316L
7	Teller	Disc	1.4122	420RM	1.4404 ¹⁾	316L ¹⁾
12	Spindel	Spindle	1.4021	420	1.4404	316L
16	Federteller	Spring plate	1.4104	430F	1.4404	316L
18	Druckschraube mit Buchse	Adjusting screw with bush	1.4104	430F	1.4404	316L
54	Feder	Spring	1.4310	302	1.4310	302
40	Kappe H2	Cap H2	1.0718	steel	1.4404	316L
	Anlüftung H4	Lifting device H4	1.4104	430F	1.4404	316L

¹⁾ d₀ 6 gepanzert

¹⁾ d₀ 6 stellited

Zuerkannte Ausflussziffer α_d / Coefficient of discharge α_d

Diagramm 1 $\alpha_d = f(h/d_0)$

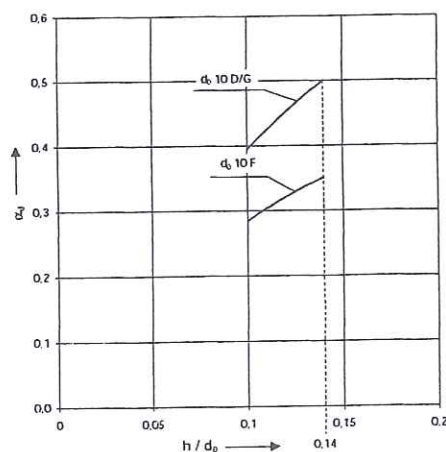
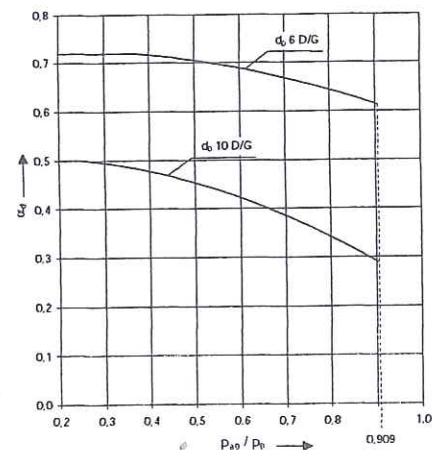


Diagramm 2 $\alpha_d = f(p_{a0}/p_0)$



Type 437

Leistungstabelle / Discharge capacities

Berechnungen aus VALVESTAR® 6.2.50			Calculations from VALVESTAR® 6.2.50		
Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421			Calculation of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421		
p	Ansprechüberdruck		Set pressure		bar g
I	Saltdampf		Saturated steam		kg/h
II	Luft 0°C und 1013 mbar		Air at 0°C and 1013 mbar		m³/h
III	Wasser bei 20°C		Water at 20°C		10³ kg/h

d _s (mm)	6			10								
p	I	II	III	I	II	III	I	II	III	I	II	III
0,1				12	14	0,63						
0,5				28	33	1,08						
1				42	51	1,47						
2				68	82	2,07						
3				94	115	2,54						
4				117	144	2,93						
5				141	174	3,28						
6				164	203	3,59						
8				209	262	4,15						
10				255	321	4,64						
15				369	468	5,68						
20				483	615	6,56						
5				596	762	7,33						
				712	909	8,03						
40				943	1203	9,27						
50				1181	1498	10,4						
60				1420	1792	11,4						
70				1670	2086	12,3						
80				1921	2380	13,1						
100				2451	2968	14,7						
150				4044	4439	18,0						
180		2759			5322	19,7						
200		3064										
250		3826										
300		4589										
330		5046										

Berechnungen aus VALVESTAR® 6.2.50			Calculations from VALVESTAR® 6.2.50		
Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10% Druckssteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Druckssteigerung berechnet.			Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10% overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure.		
p	Ansprechüberdruck		Set pressure		psig
I	Saltdampf, Abblasen gegen Atmosphären-gegendruck (14,7 psi)		Saturated Steam, valve discharging to atmospheric pressure (14,7 psi)		lb/h
II	Luft bei 60°F, Abblasen gegen Atmosphären-gegendruck (14,7 psi)		Air at 60°F, valve discharging to atmospheric pressure (14,7 psi)		SCFM
III	Wasser bei 70°F		Water at 70°F		U.S. gallons per minute

d _s (mm)	6			10								
p	I	II	III	I	II	III	I	II	III	I	II	III
15				93	33	6,55						
20				108	38	7,40						
40				168	60	10,2						
60				231	83	12,5						
80				294	105	14,5						
100				358	128	16,2						
120				421	150	17,7						
140				484	173	19,2						
160				547	195	20,5						
180				610	218	21,7						
200				673	240	22,9						
220				737	263	24,0						
240				800	285	25,1						
260				863	308	26,1						
280				926	331	27,1						
300				989	353	28,0						
350				1147	410	30,3						
400				1305	466	32,4						
450				1463	522	34,3						
500				1621	579	36,2						
550				1779	635	38,0						
600				1937	691	39,7						
650				2095	748	41,3						
700				2253	804	42,8						
750				2411	861	44,3						
800				2569	917	45,8						
850				2726	973	47,2						
900				2884	1030	48,6						
950				3042	1086	49,9						
1000				3200	1142	51,2						
1100				3516	1255	53,7						
1200				3832	1368	56,1						
1300				4148	1481	58,4						
1400				4457	1593	60,6						
1500				4802	1706	62,7						
1600				5154	1819	64,8						
1700				5512	1932	66,8						
1800				5879	2045	68,7						
1900				6254	2157	70,6						
2000				6640	2270	72,4						
2500					2834	81,0						

Type
441, 442
DN 20 - 200
DIN

Vollhub-Feder-Sicherheitsventil bis PN 40
Full Lift Safety Valve up to PN 40 spring loaded
für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

Zusatzausrüstungen

Edelstahl-Faltenbalg
Elastomer-Faltenbalg
Teller mit Weichdichtung
Lösbare Hubhilfe
Teller/Sitz gepanzert
Heizmantel
Entwässerungsbohrung
etailinformationen und weitere
satzausrüstungen siehe Teil 13

Accessories

Stainless steel bellows
Elastomer bellows
Disc with soft seal
Detachable lifting aid
Disc / Seat stellited
Heating jacket
Drain hole

For detailed information and additional
accessories refer to section 13

Zulassungen / Approvals

	Dämpfe/Gase D/G Steam/Gases S/G		Flüssigkeiten F Liquids L				
TÜV (AD-A2, TRD 421) Listennr./Approval number Ausflussziffer/ Coefficient of discharge α_d Öffnungscharakteristik/Opening characteristic	576 0,7 Vollhub/ Full lift		576 0,45 Normal/ Standard				
ASME/NB (außer/excl. DN 20) Nr./No. Ausflussziffer/ Coefficient of discharge K	37044 0,699		37055 0,521				
Weitere/ Others siehe Seite/refer to page 2/40-41	DGR/PED Kanada	BV KISCO	CBPVI LROS	DIN GOST RINA	DNV TMBEF	GL Tschechien	ISPESL UDT

Gehäusewerkstoff Body material		ASME	DN		Flanschanschlüsse ¹⁾ Flange connections ¹⁾ nach/acc. to DIN PN		Temperatureinsatzbereich °C ²⁾ Temperature range °F ²⁾ Federhaube				Type	
DIN EN			von from	bis to	Eintritt Inlet	Austritt Outlet	DIN EN		ASME		Bonnet	
Werkstoffbezeichnung Material Designation	Werkstoff-Nr. Material No.						von from	bis to	von from	bis to	von from	bis to
GG-25	0.6025	—	25	150	16	16	-10/+14	+300/+572	—		4411	4421
GGG-40.3	0.7043	SA 395	25	100	40	16	-60/-76	+350/+662	-10/+14	+350/+662	4415	4425
			125	150	16	16						
			200		25	10						
GP 240 GH	1.0619	SA 216 WCB	20	150	40	16	-85/-121	+450/+842	-29/-20	+427/+800	4412	4422
			200		25	16						
GX5CrNiMo19-11-2	1.4408	SA 351CF8M	25	150	40	16	-270/-454	+400/+752	-268/-450	+300/+572	4414	—

¹⁾ Anschlussmaße nach ANSI B16.5 150 lbs. möglich.

²⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

¹⁾ Dimensions acc. to ANSI B16.5 150 lbs. possible.

²⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

Änderungen behalten wir uns vor.

Modifications reserved.

Artikelnummern / Article Numbers

Gehäusewerkstoff / Body material				Nennweite / Nominal Diameter												
				DN	20	25	32	40	50	65	80	100	125	150	200	
Federhaube/ Bonnet	geschlossen closed	GG-25	0.6025	—	4411	.437*	.438*	.439*	.440*	.441*	.442*	.443*	.444*	.445*	.446*	-
		GGG-40.3	0.7043	SA 395	4415	-	.738*	.739*	.740*	.741*	.742*	.743*	.744*	.745*	.746*	.747*
		GP 240 GH	1.0619	SA 216 WCB	4412	.450*	.451*	.452*	.453*	.454*	.455*	.456*	.457*	.458*	.459*	.461*
		GX5 CrNiMo 19-11-2	1.4408 ¹⁾	SA 351CF8M	4414	-	.464*	.465*	.466*	.467*	.468*	.469*	.470*	.471*	.472*	-
	offen open	GG-25	0.6025	—	4421	.4375	.4385	.4395	.4405	.4415	.4425	.4435	.4445	.4455	.4465	-
		GGG-40.3	0.7043	SA 395	4425	-	.7385	.7395	.7405	.7415	.7425	.7435	.7445	-	-	.7475
		GP 240 GH	1.0619	SA 216 WCB	4422	.4505	.4515	.4525	.4535	.4545	.4555	.4565	.4575	.4585	.4595	.4615

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

- 2 = Kappe H 2
3 = Anlüftung H 3 (offen)
4 = Anlüftung H 4 (gasdicht)

- 1) H3 ist bei diesem Werkstoff nicht lieferbar.
2) Artikelnummer auf Anfrage.

Bei Bestellung bitte Artikelnummer, Ansprechdruck und Anschlüsse entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

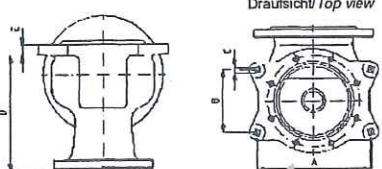
* Please add number for the required cap or lifting device:

- 2 = Cap H 2
3 = Lifting device H 3 (open)
4 = Lifting device H 4 (gastight)

- 1) H3 is not available in this material.
2) Article number on request.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

Nennweite, Ventilgröße		Nominal Diameter, Valve size		DN	-	20	20	25	32	40	50	65	80	100	125	150	200	
Nennweite, Austritt		Nominal Diameter, Outlet		DN	-	32	40	40	50	65	80	100	125	150	200	250	300	
Druckstufe Eintritt	GG	Pressure rating Inlet	CI NCI CS, SS	PN	-	16	-	16								-		
	PN			-	-	-	40								16	16	25	
	PN			-	-	40								25				
Druckstufe Austritt	GG	Pressure rating Outlet	CI NCI CS	PN	-	16	-	16								-		
	PN			-	-	-	16								10			
	PN			-	-	16								10				
Max. Ansprechdruck	GG	Max. Set pressure	CI NCI CS SS 1)	p	bar/bar g	16	-	16								-		
	p			bar/bar g	-	-	40				32	40	16	16	20			
	p			bar/bar g	-	40				32	40	28	17	20				
	p			bar/bar g	-	-	40	33	28	13,6	15	15	7	-				
Engster Strömungsquerschnitt		Flow area		A ₀	mm ²	254	254	416	661	1075	1662	2827	4301	6648	7543	12272	21382	
Engster Strömungsdurchmesser		Flow diameter		d ₀	mm	18	18	23	29	37	46	60	74	92	98	125	16"	
Schenkellänge		Centre to face dim.		a	mm	95	95	100	110	115	120	140	160	180	200	225	300	
				b	mm	85	85	105	115	140	150	170	195	220	250	285	290	
Bauhöhe	H2 GG	Height	H2 CI H3 NCI H4 CS	H	mm		217	232	315	356	403	481	558	615	615	728	1090	
	H			mm	215	218	233	325	366	413	526	603	660	660	735	1090		
	H			mm		219	234	331	372	419	529	606	663	663	735	1090		
	H2 GX	H2 SS H4	H	mm	-	-	232	315	356	403	481	558	615	615	728			
	H		mm	-	-	234	322	363	410	529	606	663	663	735				
mit Fallenbalg zus.			with bellows add.	H	mm	-	33	39	42	38	46	70	59	56	56	58		
Deckenfreiheit		Height clearance		x	mm	150	150	150	200	250	300	350	400	450	450	450	700	
Gewicht		Weight		-	kg	9	9	9	12	16	22	32	56	75	85	131	285	
Spannpratzen (Nur auf Anforderung gebohrt)		Brackets (Drilled only on request)		A	mm									277	277	320	490	
				B	mm									160	160	185	150 ²⁾	
				C	mm									ø18	ø18	ø18	ø18	
				D	mm									293	318	392	489 ³⁾	
				E	mm									21	21	28	25 ⁴⁾	

1) Höhere Ansprechdrücke durch Einsatz von Sonderfedern möglich. / Higher set pressures are possible by fitting special springs.

3) GGG/NCI: 290 mm

4) GGG/NCI: 16 mm

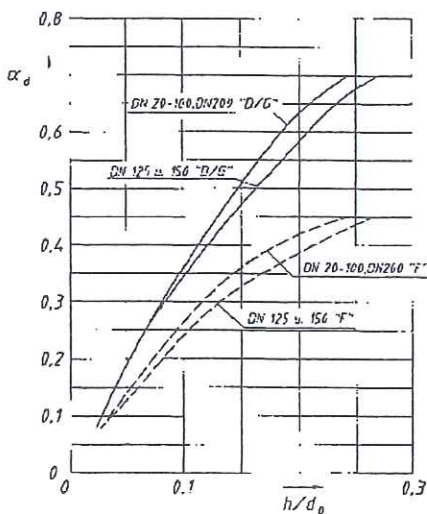
2) GS/CS: 100 mm

Werkstoffe / Materials

Pos. Item	Bauteile	Parts	4411/4421 GG CI	4415/4425 GGG NCI	4412/4422 GS CS	4414 Korrosionsfest, kaltzäh corrosion resistant, cryogenic
1	Gehäuse	Body	GG-25 0.6025	GGG-40.3 0.7043	GP 240 GH 1.0619	GX5CrNiMo 19-11-2 1.4408
5	Sitz	Seat	X2 Cr Ni Mo 17-12-2 1.4404			
7	Teller	Disc	X 39 Cr Mo 17-1 1.4122			X 2 Cr Ni Mo 17-12-2 1.4404
8	Führungsscheibe	Guide	X 14 Cr Mo S 17/C35/GGG-40 1.4104/1.0501/0.7040			X 2 Cr Ni Mo 17-12-2 1.4404
	mit Buchse	with bush	X 14 Cr Mo S 17 tenifer 1.4104 tenifer			
9	Federhaube	Bonnet	GGG-40 (GGG-40.3/GP 240 GH) 0.7040 (0.7043/1.0619)			GX5 Cr Ni Mo 19-11-2 1.4408
						X 2 Cr Ni Mo 17-12-2 1.4404
						X 6 Cr Ni Mo Ti 17-12-2 1.4571
12	Spindel	Spindle	X 20 Cr 13 1.4021			X 2 Cr Ni Mo 17-12-2 1.4404
16	Federteller	Spring plate	11 S Mn Pb 30/X 2 Cr Ni Mo 17-12-2 1.0718/1.4404			X 2 Cr Ni Mo 17-12-2 1.4404
18	Druckschraube mit Buchse	Adjusting screw with bush	X 2 Cr Ni Mo 17-12-2/X 14 Cr Mo S 17 1.4404/1.4104			X 2 Cr Ni Mo 17-12-2 1.4404
			PTFE PTFE			
54	Feder	Spring	Federstahldraht C/Spring steel wire C			X 10 Cr Ni 18 8 1.4310
			54 Si Cr 6/51 Cr V 4/X 10 Cr Ni 18 8 1.1200/1.7102/1.8159/1.4310			
			54 Cr Si 6/51 Cr V 4/X 10 Cr Ni 18 8 1.7102/1.8159/1.4310			
40	Kappe H 2	Cap H 2	11 S Mn Pb 30/GGG40.3 1.0718/0.7043			X 2 Cr Ni Mo 17-12-2 1.4404
	Anlüftung H 3	Lifting device H 3	GGG-40 0.7040			
	Anlüftung H 4	Lifting device H 4	GGG-40 0.7040			
55/ 56	Stiftschraube Mutter	Bolt nut				A 4-70/A 4 1.4401/1.4401
			Ck 35/C 35 1.1181/1.0501			
			A 4-70/A 4 1.4401/1.4401			

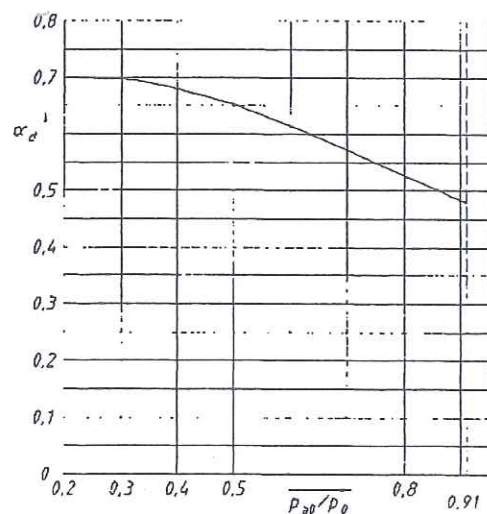
Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

Diagramm 1
 $\alpha_d = f(h/d_o)$



h = Hub (mm)
 d_o = engster Strömungsdurchmesser (mm)
 p_{ao} = Gegendruck, bar (abs.)
 p_o = Ansprechdruck, bar (abs.)

Diagramm 2
 $\alpha_d = f(p_{ao}/p_o)$



h = Lift (mm)
 d_o = Flow diameter (mm)
 p_{ao} = Back pressure, bar (abs.)
 p_o = Set pressure, bar (abs.)

Type 441, 442 DN 20-200 DIN

Leistungstabelle				Discharge Capacities			
Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421				Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421			
p	Ansprechüberdruck			Set pressure			bar g
I	Satttdampf			Saturated steam			kg/h
II	Luft bei 0°C und 1013 mbar			Air at 0°C and 1013 mbar			m³/h
III	Wasser bei 20°C			Water at 20°C			10³kg/h

DN	20			25			32			40			50			65		
d ₀ (mm)	18			23			29			37			46			60		
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
0,2	85	99	3,19	139	161	5,21	222	257	8,28	361	418	13,5	558	646	20,8	949	1099	35,4
0,5	134	157	4,51	219	257	7,37	348	409	11,7	566	665	19,1	875	1028	29,5	1489	1749	50,1
1	198	237	6,11	324	386	9,97	515	614	15,9	839	999	25,8	1296	1545	39,9	2205	2628	67,9
2	317	383	8,64	517	625	14,1	822	993	22,4	1339	1617	36,5	2069	2499	56,4	3520	4251	96,0
3	427	522	10,6	697	852	17,3	1108	1354	27,5	1804	2204	44,7	2788	3406	69,1	4744	5795	118
4	533	655	12,2	870	1069	19,9	1382	1700	31,7	2250	2768	51,6	3478	4278	79,8	5918	7278	136
5	638	788	13,7	1041	1287	22,3	1656	2047	35,5	2695	3331	57,7	4165	5149	89,2	7087	8761	152
6	743	922	15,0	1213	1505	24,4	1928	2393	38,8	3138	3895	63,2	4850	6021	97,7	8252	10243	166
7	845	1055	16,2	1380	1723	26,4	2193	2739	42,0	3570	4459	68,3	5518	6892	106	9388	11726	180
8	949	1189	17,3	1550	1941	28,2	2464	3086	44,8	4010	5023	73,0	6198	7763	113	10545	13208	192
9	1053	1322	18,3	1719	2159	29,9	2733	3432	47,6	4450	5587	77,4	6878	8635	120	11701	14691	204
10	1157	1456	19,3	1889	2377	31,5	3003	3778	50,1	4889	6150	81,6	7556	9506	126	12856	16173	215
12	1365	1722	21,2	2228	2812	34,6	3542	4471	54,9	5766	7278	89,4	8913	11249	138	15163	19138	235
14	1568	1989	22,9	2560	3248	37,3	4070	5164	59,3	6625	8405	96,6	10241	12992	149	17423	22104	254
16	1775	2256	24,4	2898	3684	39,9	4608	5856	63,4	7501	9533	103	11594	14735	160	19725	25069	271
18	1983	2523	25,9	3237	4119	42,3	5147	6549	67,3	8378	10661	110	12949	16478	169	22030	28034	288
20	2191	2790	27,3	3577	4555	44,6	5686	7242	70,9	9256	11788	115	14306	18220	178	24339	30999	304
22	2392	3057	28,7	3906	4991	46,8	6209	7934	74,4	10107	12916	121	15623	19963	187	26579	33964	318
24	2600	3324	29,9	4246	5427	48,9	6750	8627	77,7	10987	14043	126	16982	21706	195	28892	36929	333
26	2809	3590	31,1	4586	5862	50,9	7291	9320	80,9	11869	15171	132	18345	23449	203	31211	39894	346
28	3018	3857	32,3	4928	6298	52,8	7835	10012	83,9	12753	16298	137	19712	25192	211	33537	42859	359
30	3228	4124	33,5	5271	6734	54,6	8379	10705	86,8	13640	17426	141	21083	26935	219	35869	45824	372
32	3439	4391	34,6	5615	7169	56,4	8926	11398	89,7	14530	18554	146	22459	28677	226	38210	48790	384
34		4658	35,6		7605	58,2		12090	92,5		19681	151		30420	233		51755	396
36		4925	36,7		8041	59,8		12783	95,1		20809	155		32163	239		54720	407
38		5192	37,7		8476	61,5		13476	97,7		21936	159		33906	246		57685	418
40		5459	38,6		8912	63,1		14169	100		23064	163		35649	252		60650	429

DN	80			100			125			150			200					
d ₀ (mm)	74			92			98			125			165					
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III			
0,2	1444	1672	53,9	2232	2584	83,3	2532	2932	94,6	4120	4770	154	7178	8311	268			
0,5	2265	2661	76,3	3502	4113	118	3973	4667	134	6464	7593	218	11263	13230	379			
1	3355	3998	103	5185	6179	160	5883	7011	181	9572	11407	295	16678	19876	513			
2	5355	6467	146	8277	9995	226	9392	11341	256	15280	18452	417	26623	32150	726			
3	7216	8816	179	11153	13626	276	12655	15461	314	20589	25154	510	35873	43828	889			
4	9002	11071	206	13913	17111	319	15787	19416	362	25685	31589	589	44753	55040	1027			
5	10780	13326	231	16662	20597	357	18906	23371	405	30758	38023	659	53593	66252	1148			
6	12552	15581	253	19401	24083	391	22014	27326	444	35815	44458	722	62404	77463	1257			
7	14281	17836	273	22073	27568	422	25046	31281	479	40748	50893	779	71000	88675	1358			
8	16041	20091	292	24794	31054	451	28133	35237	512	45770	57327	833	79750	99887	1452			
9	17799	22346	310	27510	34540	479	31216	39192	543	50786	63762	884	88489	111099	1540			
10	19555	24601	326	30225	38025	505	34296	43147	573	55797	70197	932	97221	122311	1623			
12	23065	29112	358	35650	44997	553	40452	51057	627	65812	83066	1021	114671	144734	1778			
14	26502	33622	386	40962	51968	597	46479	58967	678	75619	95936	1102	131758	167158	1921			
16	30004	38132	413	46376	58939	638	52622	66878	724	85612	108805	1178	149170	189582	2053			
18	33510	42642	438	51795	65910	677	58772	74788	768	95617	121674	1250	166603	212005	2178			
20	37023	47153	462	57224	72882	714	64932	82698	810	105639	134544	1317	184066	234429	2296			
22	40430	51663	484	62491	79853	748	70907	90608	849	115361	147413	1382	201005	256853	2408			
24	43948	56173	506	67928	86824	782	77078	98519	887	125399	160282	1443	218496	279276	2515			
26	47475	60684	526	73380	93796	814		106429	923		173152	1502						
28	51013	65194	546	78848	100767	844		114339	958		186021	1559						
30	54561	69704	565	84333	107738	874		122249	992		198891	1614						
32	58121	74214	584	89835	114710	903		130160	1024		211760	1666						
34		78725	602		121681	931		138070	1056		224629	1718						
36		83235	619		128652	957		145980	1086		237499	1768						
38		87745	636		135623	984		153890	1116		250368	1816						
40		92255	653		142595	1009		161801	1145		263238	1863						

Type 441, 442 DN 25-200 DIN

Leistungstabelle			Discharge Capacities		
Berechnungen aus VALVESTAR® 6.2.50			Calculations from VALVESTAR® 6.2.50		
Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet.			Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure.		
p	Ansprechüberdruck		Set pressure		psig
I	Sattdampf, Abblasen gegen Atmosphärendruck (14,7 psi)		Saturated Steam, valve discharging to atmospheric pressure (14,7 psi)		lb/h
II	Luft bei 60°F, Abblasen gegen Atmosphärendruck (14,7 psi)		Air at 60°F, valve discharging to atmospheric pressure (14,7 psi)		SCFM
III	Wasser bei 70°F		Water at 70°F		U.S. gallons per minute

DN	25			32			40			50			65			80		
d ₀ (mm)	23			29			37			46			60			74		
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
15	754	268	54,1	1198	427	86,0	1950	695	140	3015	1074	216	5129	1827	368	7802	2779	560
20	870	310	61,1	1383	493	97,2	2250	802	158	3478	1239	245	5918	2108	416	9002	3207	633
40	1356	483	84,6	2156	768	134	3510	1251	219	5426	1933	338	9231	3289	576	14041	5002	875
60	1866	665	104	2967	1057	165	4830	1721	268	7466	2660	414	12702	4525	705	19321	6882	1072
80	2376	847	120	3778	1346	190	6150	2191	310	9506	3386	478	16173	5762	814	24600	8763	1238
100	2886	1028	134	4589	1635	213	7470	2662	346	11546	4113	535	19643	6998	910	29880	10643	1384
120	3397	1210	146	5400	1924	233	8790	3132	379	13586	4840	586	23114	8235	997	35159	12524	1516
140	3907	1392	158	6211	2213	252	10110	3602	410	15626	5566	633	26585	9471	1077	40439	14405	1638
160	4417	1573	169	7021	2502	269	11430	4072	438	17666	6293	677	30056	10708	1151	45718	16285	1751
180	4927	1755	179	7832	2791	285	12749	4543	464	19706	7020	718	33527	11944	1221	50998	18166	1857
200	5437	1937	189	8643	3079	301	14069	5013	490	21746	7747	756	36998	13181	1287	56277	20046	1957
220	5947	2118	198	9454	3368	315	15389	5483	513	23786	8473	793	40468	14417	1350	61557	21927	2053
240	6457	2300	207	10265	3657	329	16709	5954	536	25826	9200	829	43939	15654	1410	66836	23807	2144
260	6967	2482	216	11076	3946	343	18029	6424	558	27867	9927	862	47410	16890	1467	72116	25688	2232
280	7477	2663	224	11886	4235	356	19349	6894	579	29907	10654	895	50881	18127	1523	77395	27569	2316
300	7987	2845	232	12697	4524	368	20669	7364	600	31947	11380	926	54352	19363	1576	82675	29449	2397
350	9262	3299	250	14724	5246	398	23968	8540	648	37047	13197	1001	63029	22455	1703	95874	34151	2590
400	10537	3753	267	16751	5968	425	27268	9716	692	42147	15014	1070	71706	25546	1820	109072	38852	2768
450	11812	4208	284	18778	6690	451	30568	10892	734	47247	16831	1135	80383	28637	1931	122271	43554	2936
500		4662	299		7413	475		12067	774		18648	1196		31728	2035		48255	3095
550		5116	314		8135	499		13243	812		20464	1254						

DN	100			125			150			200								
d ₀ (mm)	92			98			125			165								
p	I	II	III	I	II	III	I	II	III	I	II	III						
15	12059	4296	865	13683	4874	982	22262	7930	1598	38789	13818	2784						
20	13914	4956	978	15788	5624	1110	25686	9150	1806	44755	15943	3147						
40	21703	7731	1353	24626	8773	1535	40065	14272	2498	69810	24868	4353						
60	29863	10638	1657	33886	12071	1881	55129	19638	3059	96058	34218	5331						
80	38024	13545	1914	43145	15370	2171	70194	25004	3533	122306	43568	6155						
100	46184	16452	2140	52404	18668	2428	85258	30370	3950	148554	52918	6882						
120	54344	19359	2344	61664	21967	2659	100322	35736	4327	174802	62268	7539						
140	62505	22266	2532	70923	25265	2873	115387	41102	4673	201050	71618	8143						
160	70665	25173	2706	80183	28564	3071	130451	46468	4996	227298	80969	8705						
180	78825	28080	2871	89442	31862	3257	145515	51835	5299	253546	90319	9233						
200	86985	30987	3026	98701	35161	3433	160580	57201	5586	279794	99669	9732						
220	95146	33894	3173	107961	38459	3601	175644	62567	5858	306042	109019	10208						
240	103306	36800	3315	117220	41758	3761	190708	67933	6119	332290	118369	10661						
260	111466	39707	3450	126479	45056	3915	205773	73299	6369	358538	127719	11097						
280	119627	42614	3580	135739	48355	4062	220837	78665	6609	384786	137070	11516						
300	127787	45521	3706	144998	51653	4205				411034	146420	11920						
350	148188	52788	4003								169795	12875						
400																		
450																		
500																		
550																		

Vollhub-Feder-Sicherheitsventil #150-300

Full Lift Safety Valve #150-300 spring loaded

für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

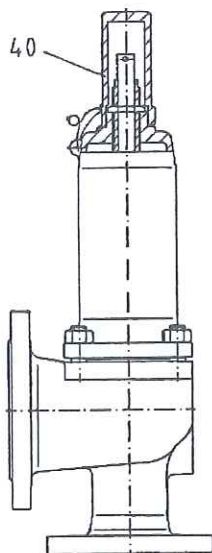
Type
441, 442
1"-4"
ANSI

Zusatzausrüstungen

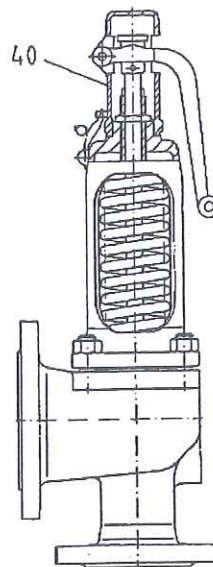
Edelstahl-Faltenbalg
Elastomer-Faltenbalg
Teller mit Weichdichtung
Lösbare Hubhilfe
Teller/Sitz gepanzert
Heizmantel
Entwässerungsbohrung
Detailinformationen und weitere
Zusatzausrüstungen siehe Teil 13

Accessories

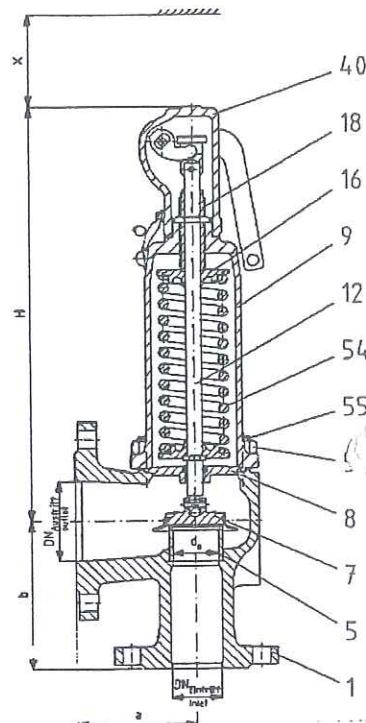
Stainless steel bellows
Elastomer bellows
Disc with soft seal
Detachable lifting aid
Disc / Seat stellited
Heating jacket
Drain hole
For detailed information and additional
accessories refer to section 13



Type 441
mit gasdichter Kappe H 2
with gastight cap H 2



Type 442
offene Federhaube mit
Anliftung H 3,
Teller anliftbar
open bonnet
lifting device H 3,
disc liftable



Type 441
geschlossene Federhaube mit
Anliftung H 4, gasdicht,
Teller anliftbar
closed bonnet
lifting device H 4, gastight,
disc liftable

Zulassungen / Approvals

	Dämpfe/Gase D/G Steam/Gases S/G	Flüssigkeiten F Liquids L
TÜV (AD-A2, TRD 421) Listennr. / Approval number Ausflussziffer / Coefficient of discharge α Öffnungscharakteristik / Opening characteristic	576 0,7 Vollhub / Full lift	576 0,45 Normal / Standard
ASME/NB Nr. / No. Ausflussziffer / Coefficient of discharge K	37044 0,699	37055 0,521
Weitere / Others siehe Seite / refer to page 2/40-41	AOTC, Det Norske Veritas, Bureau Veritas, ISPESL, Germ. Lloyd, GOST, Lloyd's Reg., TÜV Wien, UDT	

Gehäusewerkstoff Body material			DN		Flanschanschlüsse Flange connections		Temperatureinsatzbereich °C ¹⁾ Temperature range °F ¹⁾				Type Federhaube Bonnet	
DIN EN		ASME	von	bis	Eintritt Inlet	Austritt Outlet	DIN EN		ASME		geschl. closed	offen open
Werkstoffbezeichnung Material Designation	Werkstoff-Nr. Material No.		from	to			von	bis	von	bis		
GP 240 GH	1.0619	SA 216 WCB	1"	4"	#150-#300	#150	-85/-121	+450/+842	-29/-20	+427/+800	4412	4422
GX5CrNiMo19-11-2	1.4408	SA 351CF8M	1"	4"	#150-#300	#150	-270/-454	+400/+752	-268/-450	+300/+572	4414	-

¹⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

¹⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

Änderungen behalten wir uns vor.

Modifications reserved.

Artikelnummern / Article Numbers

Gehäusewerkstoff / Body material				Ventilgröße / Valve Size							
DIN EN		Werkstoff-Nr. Material No.	ASME		1 x 2	1½ x 2	1½ x 2½	2 x 3	3 x 4	4 x 6	
Federhaube / Bonnet	geschlossen closed	GP 240 GH GX5 CrNiMo 19-11-2	1.0619 1.4408 1)	SA 216 WCB SA 351CF8M	4412 4414	.481* .791*	.482* —	.483* .793*	.484* .794*	.486* .796*	.487* .797*
	offen open	GP 240 GH	1.0619	SA 216 WCB	4422	.4815	.4825	.4835	.4845	.4865	.4875

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

* Please add number for the required cap or lifting device:

- 2 = Kappe H 2
3 = Anlüftung H 3 (offen)
4 = Anlüftung H 4 (gasdicht)

- 2 = Cap H 2
3 = Lifting device H 3 (open)
4 = Lifting device H 4 (gastight)

1) H3 ist bei diesem Werkstoff nicht lieferbar.

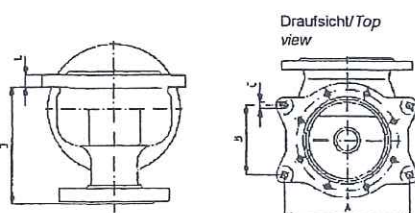
1) H3 is not available in this material.

Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

Ventilgröße		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				
Druckstufe Eintritt		Pressure rating Inlet		-	-	# 150 bzw. / resp. # 300									
Druckstufe Austritt		Pressure rating outlet		-	-	# 150									
Max. Ansprechdruck	GS	Max. Set Pressure	CS	p	psi g	740	740	740	740	570	490				
	GX		SS	p	psi g	570	—	570	410	300	330				
Max. Ansprechdruck	GS	Max. Set Pressure	CS	p	bar/bar g	50	50	50	50	40	34				
	GX		SS	p	bar/bar g	40	—	40	28	20	22				
Schenkellänge		Centre to face dim.		a	inch	4 1/2	4 3/4	4 3/4	4 7/8	6 1/2	9				
				b	inch	4 1/8	4 7/8	4 7/8	5 3/8	6 1/8	7 1/8				
				a	mm	114	121	121	124	165	229				
				b	mm	105	124	124	137	156	181				
Bauhöhe	H 2	Height	H 2	H	inch	9 1/8	12 3/8	14	15 7/8	18 15/16	24 1/4				
	H 3 GS		H 3 CS	H	inch	9 3/16	12 3/4	14 3/8	16 1/4	20 11/16	26				
	H 4		H 4	H	inch	9 3/16	13	14 5/8	16 1/2	20 13/16	26 1/16				
	H 2 GX	SS	H 2	H	inch	9 1/8	—	14	15 7/8	18 15/16	24 1/4				
	H 4		H 4	H	inch	9 3/16	—	14 5/16	16 3/16	20 13/16	26 1/16				
	mit Faltenbalg zus.		with bellows add.	H	inch	11 1/2	15 5/8	11 1/2	11 1/16	23 1/8	23 1/16				
	H 2		H 2	H	mm	232	315	356	403	481	615				
	H 3 GS		H 3 CS	H	mm	233	325	366	413	526	660				
	H 4		H 4	H	mm	234	331	372	419	529	663				
	H 2 GX	SS	H 2	H	mm	232	—	356	403	481	615				
	H 4		H 4	H	mm	234	—	363	410	529	663				
	mit Faltenbalg zus.		with bellows add.	H	mm	39	42	38	46	56	58				
Deckenfreiheit		Height clearance		x	inch	6	8	10	12	14	18				
				x	mm	150	200	250	300	350	450				
Gewicht		Weight		-	kg	10	13	16	22	33	75				
Spannpratzen (Nur auf Anforderung gebohrt)		Brackets (Drilled only on request)		A	inch						11				
				B	inch						6 1/4				
				C	inch						Ø 3/4				
				D	inch						9 7/8				
				E	inch						1				
				A	mm						280				
				B	mm						160				
				C	mm						Ø 18				
				D	mm						250				
				E	mm						25				



Type 441, 442 1"-4" ANSI

Leistungstabelle				Discharge Capacities			
Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421				Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421			
p	Ansprechüberdruck			Set pressure			bar g
I	Satttdampf			Saturated steam			kg/h
II	Luft bei 0°C und 1013 mbar			Air at 0°C and 1013 mbar			m³/h
III	Wasser bei 20°C			Water at 20°C			10³kg/h

DN	1 x 2			1½ x 2			1½ x 2½			2 x 3			3 x 4			4 x 6		
d _o (mm)	23			29			37			46			60			92		
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
0,2	139	161	5,21	222	257	8,28	361	418	13,5	558	646	20,8	949	1099	35,4	2232	2584	83,3
0,5	219	257	7,37	348	409	11,7	566	665	19,1	875	1028	29,5	1489	1749	50,1	3502	4113	118
1	324	386	9,97	515	614	15,9	839	999	25,8	1296	1545	39,9	2205	2628	67,9	5185	6179	160
2	517	625	14,1	822	993	22,4	1339	1617	36,5	2069	2499	56,4	3520	4251	96,0	8277	9995	226
3	697	852	17,3	1108	1354	27,5	1804	2204	44,7	2788	3406	69,1	4744	5795	118	11153	13626	276
4	870	1069	19,9	1382	1700	31,7	2250	2768	51,6	3478	4278	79,8	5918	7278	136	13913	17111	319
5	1041	1287	22,3	1656	2047	35,5	2695	3331	57,7	4165	5149	89,2	7087	8761	152	16662	20597	357
6	1213	1505	24,4	1928	2393	38,8	3138	3895	63,2	4850	6021	97,7	8252	10243	166	19401	24083	391
7	1380	1723	26,4	2193	2739	42,0	3570	4459	68,3	5518	6892	106	9388	11726	180	22073	27568	422
8	1550	1941	28,2	2464	3086	44,8	4010	5023	73,0	6198	7763	113	10545	13208	192	24794	31054	451
9	1719	2159	29,9	2733	3432	47,6	4450	5587	77,4	6878	8635	120	11701	14691	204	27510	34540	479
10	1889	2377	31,5	3003	3778	50,1	4889	6150	81,6	7556	9506	126	12856	16173	215	30225	38025	505
12	2228	2812	34,6	3542	4471	54,9	5766	7278	89,4	8913	11249	138	15163	19138	235	35650	44997	553
14	2560	3248	37,3	4070	5164	59,3	6625	8405	96,6	10241	12992	149	17423	22104	254	40962	51968	597
16	2898	3684	39,9	4608	5856	63,4	7501	9533	103	11594	14735	160	19725	25069	271	46376	58939	638
18	3237	4119	42,3	5147	6549	67,3	8378	10661	110	12949	16478	169	22030	28034	288	51795	65910	677
20	3577	4555	44,6	5686	7242	70,9	9256	11788	115	14306	18220	178	24339	30999	304	57224	72882	714
22	3906	4991	46,8	6209	7934	74,4	10107	12916	121	15623	19963	187	26579	33964	318	62491	79853	748
24	4246	5427	48,9	6750	8627	77,7	10987	14043	126	16982	21705	195	28892	36929	333	67928	86824	782
26	4586	5862	50,9	7291	9320	80,9	11869	15171	132	18345	23449	203	31211	39894	346	73380	93796	814
28	4928	6298	52,8	7835	10012	83,9	12753	16298	137	19712	25192	211	33537	42859	359	78848	100767	844
30	5271	6734	54,6	8379	10705	86,8	13640	17426	141	21083	26935	219	35869	45824	372	84333	107738	874
32	5615	7169	56,4	8926	11398	89,7	14530	18554	146	22459	28677	226	38210	48790	384	89835	114710	903
34		7605	58,2		12090	92,5		19681	151		30420	233		51755	396		121681	931
36		8041	59,8		12783	95,1		20809	155		32163	239		54720	407		128652	957
38		8476	61,5		13476	97,7		21936	159		33905	246		57685	418		135623	984
40		8912	63,1		14169	100		23064	163		35649	252		60650	429		142595	1009

Leistungstabelle				Discharge Capacities			
Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet.				Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure.			
p	Ansprechüberdruck			Set pressure			psig
I	Satttdampf, Abblasen gegen Atmosphärendruck (14,7 psi)			Saturated Steam, valve discharging to atmospheric pressure (14,7 psi)			lb/h
II	Luft bei 60°F, Abblasen gegen Atmosphärendruck (14,7 psi)			Air at 60°F, valve discharging to atmospheric pressure (14,7 psi)			SCFM
III	Wasser bei 70°F			Water at 70°F			U.S. gallons per minute

DN	1 x 2			1½ x 2			1½ x 2½			2 x 3			3 x 4			4 x 6		
d _o (mm)	23			29			37			46			60			92		
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
15	754	268	54,1	1198	427	86,0	1950	695	140	3015	1074	216	5129	1827	368	12059	4296	865
20	870	310	61,1	1383	493	97,2	2250	802	158	3478	1239	245	5918	2108	416	13914	4956	978
40	1356	483	84,6	2156	768	134	3510	1251	219	5426	1933	338	9231	3289	576	21703	7731	1353
60	1866	665	104	2967	1057	165	4830	1721	268	7466	2660	414	12702	4525	705	29863	10638	1657
80	2376	847	120	3778	1346	190	6150	2191	310	9506	3386	478	16173	5762	814	38024	13545	1914
100	2886	1028	134	4589	1635	213	7470	2662	346	11546	4113	535	19643	6998	910	46184	16452	2140
120	3397	1210	146	5400	1924	233	8790	3132	379	13586	4840	586	23114	8235	997	54344	19359	2344
140	3907	1392	158	6211	2213	252	10110	3602	410	15626	5565	633	26585	9471	1077	62505	22266	2532
160	4417	1573	169	7021	2502	269	11430	4072	438	17666	6293	677	30056	10708	1151	70865	25173	2706
180	4927	1755	179	7832	2791	285	12749	4543	464	19706	7020	718	33527	11944	1221	78825	28080	2871
200	5437	1937	189	8643	3079	301	14069	5013	490	21746	7747	756	36998	13181	1287	86985	30987	3026
220	5947	2118	198	9454	3368	315	15389	5483	513	23786	8473	793	40468	14417	1350	95146	33894	3173
240	6457	2300	207	10265	3657	329	16709	5954	536	25826	9200	829	43939	15654	1410	103306	36800	3315
260	6967	2482	216	11076	3946	343	18029	6424	558	27867	9927	862	47410	16890	1467	111466	39707	3450
280	7477	2663	224	11886	4235	356	19349	6894	579	29907	10654	895	50881	18127	1523	119627	42614	3580
300	7987	2845	232	12697	4524	368	20669	7364	600	31947	11380	926	54352	19363	1576	127787	45521	3706
350	9262	3299	250	14724	5246	398	23968	8540	648	37047	13197	1001	63029	22455	1703	148188	52788	4003
400	10537	3753	267	16751	5968	425	27268	9716	692	42147	15014	1070	71706	25546	1820			
450	11812	4208	284	18778	6690	451	30568	10892	734	47247	16831	1135	80383	28637	1931			
500		4662	299		7413	475		12067	774		18648	1196		31728	2035			
550		5116	314		8135	499		13243	812		20464	1254						
600		5570	328		8857	521		14419	848		22281	1310						
650		6025	341		9579	542		15595	882		24098	1364						
700		6479	354		10302	563		16770	916		25915	1415						

Type
441, 442
DN 200 - 400
XXL

Vollhub-Feder-Sicherheitsventil bis PN 25 (#150 - 300)

Full Lift Safety Valve up to PN 25 (#150 - 300) spring loaded

für Dämpfe, Gase und Flüssigkeiten
for steam, gases and liquids

Zusatzausrüstungen

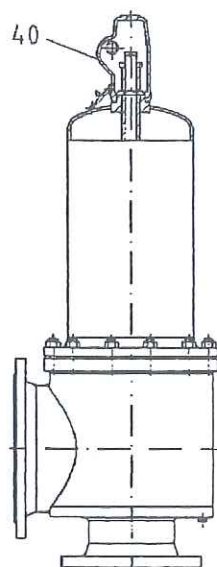
Edelstahl-Faltenbalg
Hochtemperatur-Ausrüstung
schweißende am Eintritt

Detailinformationen und weitere
Zusatzausrüstungen siehe Teil 13

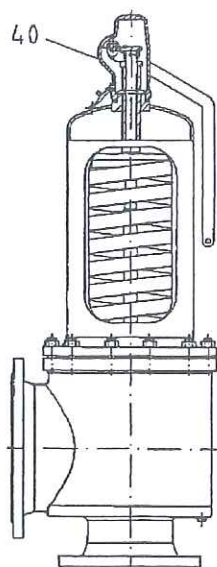
Accessories

Stainless steel bellows
High temperature equipment
Butt weld inlet

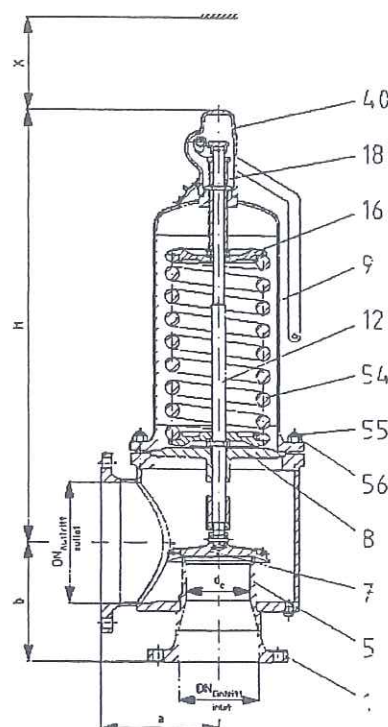
For detailed information and additional
accessories refer to section 13



Type 441
mit gasdichter Kappe H 2
with gastight cap H 2



Type 442
offene Federhaube mit
Anliftung H 3,
Teller anliftbar
open bonnet
lifting device H 3,
disc liftable



Type 441
geschlossene Federhaube mit
Anliftung H 4, gasdicht,
Teller anliftbar
closed bonnet
lifting device H 4, gastight,
disc liftable

Zulassungen / Approvals

	Dämpfe/Gase D/G Steam/Gases S/G	Flüssigkeiten F Liquids L
TÜV (AD-A2, TRD 421) Listennr./Approval number Ausflussziffer/Coefficient of discharge α_d Öffnungscharakteristik/Opening characteristic	576 DN 200 : 0,75 / DN 250-400 : 0,7 Vollhub/Full lift	576 DN 200 : 0,56 / DN 250-400 : 0,52 Normal/Standard
ASME/NB Nr./No. Ausflussziffer/Coefficient of discharge K	37044 0,699	37055 0,521
Weitere/Others siehe Seite/ refer to page 2/40-41	DGR/PED Kanada	BV KISCO
	CBPVI LROS	DIN GOST RINA
	DNV TMBEF	GL Tschechien
	ISPEL UDT	

Gehäusewerkstoff Body material		DN	Flanschanschlüsse nach Flange connections acc. to				Temperatureinsatzbereich °C ¹⁾ Temperature range °F ¹⁾				Type Federhaube Bonnet	
DIN EN	ASME		DIN PN		ANSI B 16.5		DIN EN		ASME		geschl. closed	offen open
Werkstoffbezeichnung Material Designation	Werkstoff-Nr. Material No.	von bis from to	Eintr. Inlet	Austr. Outlet	Eintr. Inlet	Austr. Outlet	von from	bis to	von from	bis to		
C 22.8/P 265 GH ²⁾	1.0460/1.0425	Carbon steel	200	400	8" 16"	25 16	-85/-121	+450/+842	-29/-20	+450/+842	4412	4422
X6 CrNiMoTi 17-12-2	1.4571	SA 316 Ti	200	400	8" 16"	25 16	-196/-321	+550/+1022	-184/-300	+300/+572	4414	-

¹⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

²⁾ Eintrittsflansch und Sitz in Edelstahlausführung auf Anfrage möglich.

¹⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

²⁾ Inlet flange and seat also in stainless steel design available.

Änderungen behalten wir uns vor.

Modifications reserved.

Artikelnummern / Article Numbers

Gehäusewerkstoff / Body material				Nennweite / Nominal Diameter									
DIN EN		Werkstoff-Nr. Material No.	ASME		200	250	300	400					
					8"	10"	12"	16"					
Federhaube / Bonnet	geschlossen closed	C 22.8/P 265 GH X 6 CrNiMoTi 17-12-2	1.0460/1.0425 1.4571	Carbon steel SA 316 Ti	4412 4414	.475* .479*	.476* .480*	.477* .490*	.478* .491*				
	offen open	C 22.8/P 265 GH	1.0460/1.0425	Carbon steel	4422	.4755	.4765	.4775	.4785				

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

2 = Kappe H2
4 = Anlüftung H4 (gasdicht)

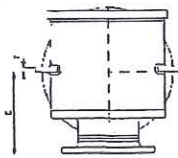
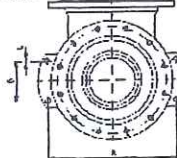
Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf. Zusatzausrüstung (siehe Teil 13) angeben.

* Please add number for the required cap or lifting device:

2 = Cap H2
4 = Lifting device H4 (gastight)

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Abmessungen, Druckbereiche, Gewichte Dimensions, Pressure Ranges, Weights

Nennweite, Ventilgröße		Nominal Diameter, Valve size		DN	-	200	250	300	400		
Nennweite, Austritt		Nominal Diameter, Outlet		DN	-	300	350	400	500		
Druckstufe Eintritt		Pressure rating Inlet		PN	-	25		16			
Druckstufe Austritt		Pressure rating Outlet		PN	-	10 ²⁾					
Nennweite, Ventilgröße		Nominal Diameter, Valve size		DN	-	8"	10"	12"	16"		
Nennweite, Austritt		Nominal Diameter, Outlet		DN	-	12"	14"	16"	20"		
Druckstufe Eintritt		Pressure rating Inlet		PN	-	#150-300					
Druckstufe Austritt		Pressure rating Outlet		PN	-	#150					
Max.	Stahl	Max.	CS	p	bar/barg	25	18,5	12	6		
Ansprechdruck	Edelstahl ¹⁾	Set pressure	SS ¹⁾	p	bar/barg	11	5	4	3		
Engster Strömungsquerschnitt		Flow area		A ₀	mm ²	21382	31416	43374	68349		
Engster Strömungsdurchmesser		Flow diameter		d ₀	mm	165	200	235	295		
Schenkellänge	Stahl, Edelstahl	Centre to face dim.	CS, SS	a	mm	300	325	394 ²⁾	477 ²⁾		
	Stahl, Edelstahl		CS, SS	b	mm	305	340	330 ³⁾	400		
Bauhöhe	H 2 Stahl, Edelstahl	Height	H 2 CS, SS	H	mm	1105	1115	1240	1490		
	H 3 Stahl		H 3 CS	H	mm	1105	1115	1240	1490		
	H 4 Stahl, Edelstahl		H 4 CS, SS	H	mm	1105	1115	1240	1490		
Deckenfreiheit		Height clearance		x	mm	700	700	850	1200		
Gewicht		Weight		-	kg	285	335	384	588		
				Brackets Draufsicht/Top view		A	mm	470	514	640	800
				B	mm	150	150	180	220		
				C	mm	Ø 18	Ø 18	Ø 24	Ø 28		
				D	mm	305	340	330	400		
				E	mm	20	20	20	20		

¹⁾ Höhere Ansprechdrücke durch Einsatz von Sonderfedern möglich.

Higher set pressures are possible by fitting special springs.

²⁾ Für Druckstufe Austritt höher als PN 10 abweichende Schenkellänge.

For pressure rating outlet higher than PN 10 centre to face dimension will change.

³⁾ Für Druckstufe Eintritt bei Anschluss #300 abweichende Schenkellänge.

For pressure rating inlet connection #300 centre to face dimension will change.

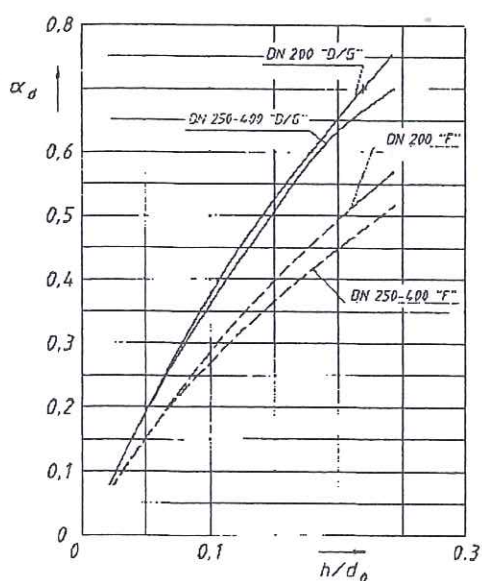
Werkstoffe / Materials

Pos. Item	Bauteile	Parts	4412/4422		4414	
			Stahl Steel		Korrosionsfest corrosion resistant	Kaltzäh cryogenic
1	Gehäuse	Body	C 22.8/ P 265 GH St 35.8	1.0460/1.0425 1.0305	X 6 Cr Ni Mo Ti 17-12-2	1.4571
5	Sitz	Seat	DN 200-250: St 35.8 gepanzert/stellited	1.0305	X 6 Cr Ni Mo Ti 17-12-2	1.4571
		DN 300-400: C 22.8 gepanzert/stellited		1.0460		
7	Teller	Disc	DN 200-250: X 39 Cr Mo 17-1X 6 Cr Ni Mo Ti 17-12-2	1.4122/1.4571	X 6 Cr Ni Mo Ti 17-12-2	1.4571
		DN 300-400: X 6 Cr Ni Mo Ti 17-12-2		1.4571		
8	Führungsscheibe mit Buchse	Guide with bush	DN 200-250: S235JRG2 X14 Cr Mo S 17 tenifer	1.0038 1.4104 tenifer	X 6 Cr Ni Mo Ti 17-12-2	1.4571
		DN 300-400: X6 Cr Ni Mo Ti 17-12-2 PTFE		1.4571 PTFE		
9	Federhaube	Bonnet	GGG-40.3	0.7043	X 6 Cr Ni Mo Ti 17-12-2	1.4571
12	Spindel	Spindle	DN 200-250: X 20 Cr 13 DN 300-400: X 2 Cr Ni Mo 17-12-2	1.4021 1.4404	X 2 Cr Ni Mo 17-12-2	1.4404
16	Federteller	Spring plate	S355J2G3	1.0570	X 6 Cr Ni Mo Ti 17-12-2	1.4571
18	Druckschraube mit Buchse	Adjusting screw with bush	X 2 Cr Ni Mo 17-12-2 PTFE	1.4404 PTFE	X 2 Cr Ni Mo 17-12-2 PTFE	1.4404 PTFE
54	Feder	Spring	54 Si Cr 6/51 Cr V 4	1.7102/1.8159	X 10 Cr Ni 18-8	1.4310
40	Kappe H 2 Anlüftung H 3 Anlüftung H 4	Cap H 2 Lifting device H 3 Lifting device H 4	GGG-40	0.7040	GX5 Cr Ni Mo 19-11-2	1.4408
55/ 56	Stiftschraube Mutter	Bolt nut	Ck 35/C 35 A 4-70/A 4	1.1181/1.0501 1.4401/1.4401	A 4-70/A 4	1.4401/1.4401

Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

Diagramm 1

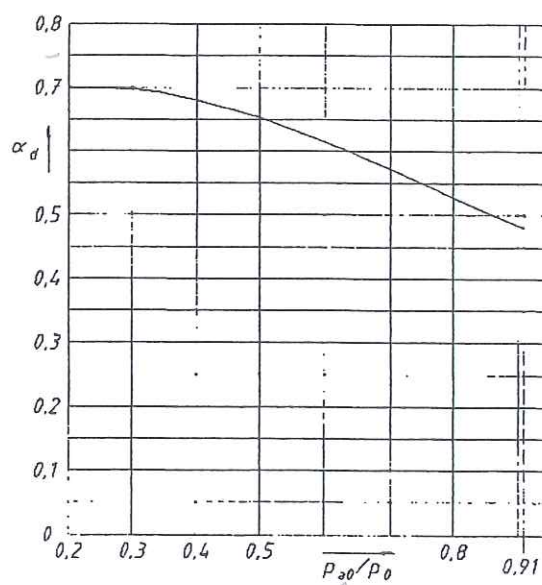
$$\alpha_d = f(h/d_o)$$



h = Hub (mm)
 d_o = engster Strömungsdurchmesser (mm)
 p_{ao} = Gegendruck, bar (abs.)
 p_o = Ansprechdruck, bar (abs.)

Diagramm 2

$$\alpha_d = f(p_{ao}/p_o)$$



h = Lift (mm)
 d_o = Flow diameter (mm)
 p_{ao} = Back pressure, bar (abs.)
 p_o = Set pressure, bar (abs.)

Type 441, 442 DN 200-400 XXL

Leistungstabelle				Discharge Capacities			
Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421				Calculations of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421			
p	Ansprechüberdruck			Set pressure			bar g
I	Sattdampf			Saturated steam			kg/h
II	Luft bei 0°C und 1013 mbar			Air at 0°C and 1013 mbar			m³/h
III	Wasser bei 20°C			Water at 20°C			10³kg/h

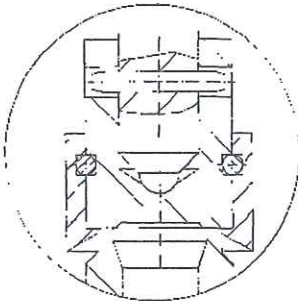
DN	200			250			300			400								
d ₀ (mm)	165			200			235			295								
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
0,2	7178	8311	334	10547	12211	455	14561	16859	628	22946	26567	990						
0,5	11263	13230	472	16548	19438	644	22847	26837	889	36002	42290	1400						
1	16678	19876	639	24504	29202	871	33830	40317	1203	53311	63532	1896						
2	26623	32150	903	39116	47236	1232	54004	65216	1702	85101	102769	2681						
3	38436	46959	1106	52707	64394	1509	72768	88904	2084	114670	140097	3284						
4	47950	58971	1278	65753	80867	1743	90781	111646	2406	143055	175935	3792						
5	57421	70984	1428	78741	97339	1949	108712	134389	2690	171311	211774	4240						
6	66861	82997	1565	91686	113812	2135	126584	157132	2947									
7	76071	95009	1690	104316	130285	2306	144021	179875	3183									
8	85447	107022	1807	117172	146758	2465	161770	202618	3403									
9	94810	119035	1916	130012	163231	2614	179497	225360	3610									
10	104165	131047	2020	142840	179704	2756												
12	122862	155073	2213	168480	212649	3019												
14	141169	179098	2390															
16	159825	203123	2555															
18	178504	227149	2710															
20	197213	251174	2857															
22	215363	275199	2996															
24	234103	299224	3129															

Leistungstabelle				Discharge Capacities			
Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10 % Drucksteigerung und der zuerkannten Ausflussziffer K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet.				Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10 % overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure.			
p	Ansprechüberdruck			Set pressure			psig
I	Sattdampf, Abblasen gegen Atmosphärendruck (14,7 psi)			Saturated Steam, valve discharging to atmospheric pressure (14,7 psi)			lb/h
II	Luft bei 60°F, Abblasen gegen Atmosphärendruck (14,7 psi)			Air at 60°F, valve discharging to atmospheric pressure (14,7 psi)			SCFM
III	Wasser bei 70°F			Water at 70°F			U.S. gallons per minute

DN	200			250			300			400								
d ₀ (mm)	165			200			235			295								
p	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
15	38789	13818	2784	56990	20301	4090	78682	28028	5647	123990	44168	8899						
20	44755	15943	3147	65755	23423	4623	90783	32339	6383	143058	50961	10059						
40	69810	24868	4353	102567	36537	6395	141606	50443	8829	223147	79490	13913						
60	96058	34218	5331	141131	50274	7832	194850	69409	10813	307049	109378	17040						
80	122306	43568	6155	179696	64012	9044	248093	88376	12486	390951	139266	19676						
100	148554	52918	6882	218261	77749	10111	301336	107342	13960									
120	174802	62268	7539	256825	91487	11076	354580	126308	15292									
140	201050	71618	8143	295390	105225	11964	407823	145275	16517									
160	227298	80969	8705	333955	118962	12790	461066	164241	17658									
180	253546	90319	9233	372519	132700	13566												
200	279794	99669	9732	411084	146437	14299												
220	306042	109019	10208	449649	160175	14997												
240	332290	118369	10661	488213	173913	15664												
260	358538	127719	11097	526778	187650	16304												
280	384786	137070	11516															
300	411034	146420	11920															
350		169795	12875															
400																		
450																		
500																		
550																		

Type 459

Type 459: Vollhub-Feder-Sicherheitsventil Type 459: Full Lift Safety Valve spring loaded



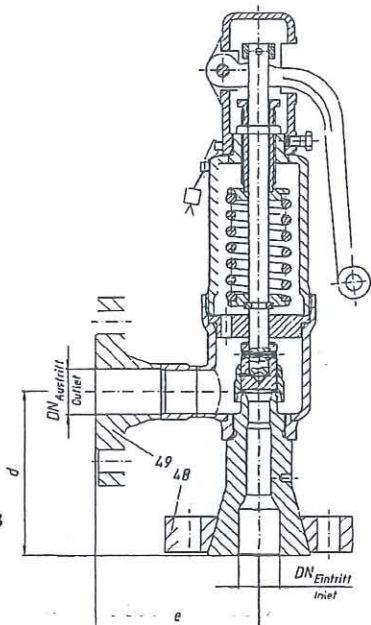
Type 459
mit Stahl-Teller
with metal disc

Zusatzausrüstungen

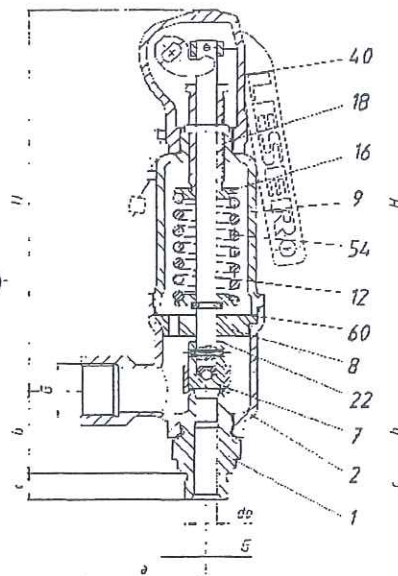
Teller mit Dichtplatte
Edelstahl-Faltenbalg
Elastomer-Faltenbalg
Heizmantel
Detailinformationen und weitere
Zusatzausrüstungen siehe Teil 13

Accessories

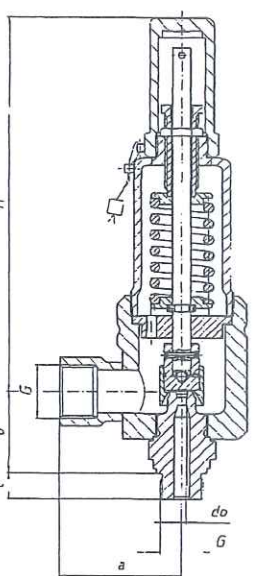
Disc with sealing plate
Stainless steel bellows
Elastomer bellows
Heating jacket
Detailed information and additional
accessories refer to section 13



Type 459
mit Flanschen, Anlüftung H3
with flanges, Lifting device H3
- Eintritt: Losflansch-Ausführung
- Inlet: Slip on flange design
- Austritt: Vorschweißflansch
- Outlet: Welding neck flange



Type 459
geschlossene Federhaube
mit Anlüftung H4
gasdicht, Teller anlüftbar
closed bonnet lifting device H4
gas tight, disc liftable



Type 459 M
mit Austrittsgehäuse
in Massivausführung
gasdichte Kappe H2
with outlet body
in compact design
with gastight cap H2

Zulassungen/Approvals

EG-Bauteilprüf./IEC-type examination no. 07 202 0111 Z00080/13	Dämpfe/Gase D/G Steam/Gases SIG				Flüssigkeiten F Liquids L						
TÜV (AD-A2, TRD 421) Listennr./Approval number d _o [mm]	909										
	6	9	13	17,5	6	9	13	17,5			
	0,81	0,83	0,81	0,79	0,7	0,61	0,53	0,52			
	Öffnungscharakteristik/Opening characteristic				Vollhub/Full lift				Normal/Standard		
ASME/NB Nr./No. Ausflussziffer/Coefficient of discharge K	M 37122 0,811				M 37101 0,566						
Weitere/Others siehe Seite/refer to page 2/40-41	GOST DGR/PED	ISPESL KISCO	UDT DNV								

Type 459

Eintrittskörperwerkstoff Body material			Temperatureinsatzbereich °C ³⁾ Temperature range °F ³⁾						Artikelnummer Article Number				
DIN EN		ASME	DIN EN		ASME				d_o [mm]				
Werkstoffbezeichnung Material Designation	Werkstoff-Nr. Material No.		von from	bis to	von from	bis to			6		9	13	17,5
									D/G	F	D/G/F		
X14 CrMoS 17	1.4104	430 F	-10/+14	+300/+572	-29/-20	+300/+572	4593	-	-	-	.250*	.251*	.252*
X2 CrNiMo 17-12-2	1.4404	316 L	-85/-121	+400/+752 ²⁾	-29/-20	+300/+572	4592	-	-	-	.247*	.248*	.249*
X2 CrNiMo 17-12-2	1.4404 ¹⁾	316 L	-200/-328 ²⁾	+400/+752 ²⁾	-184/-300	+300/+572	4594	-	-	-	.255*	.256*	.257*
X2 CrNiMo 17-12-2	1.4404 ¹⁾	316 L	-270/-454	+300/+572	-268/-450	+300/+572	4594M	.254*	.253*	-	-	-	-

* Bitte hier gewünschte Ziffer für Kappe oder Anlüftung anfügen:

2 = Kappe H2

3 = Anlüftung H3 (offen)

4 = Anlüftung H4 (gasdicht)

¹⁾ H3 ist bei diesem Werkstoff nicht lieferbar.

²⁾ DN 15 mit Austrittsgehäuse in Massivausführung von -270 °C bis +550 °C, ab +300 °C mit Edelstahl-Faltenbalg.

³⁾ Zwischen -10 °C und der niedrigsten, angegebenen Anwendungstemperatur ist gemäß AD-Merkblatt W10 zu verfahren.

Bei Bestellung bitte Artikelnummer entsprechend Bestellbeispiel im Teil 1, Ansprechdruck und ggf.

Zusatzausrüstung (siehe Teil 13) angeben.

Änderungen behalten wir uns vor.

* Please add number for the required cap or lifting device:

2 = Cap H2

3 = Lifting device H3 (open)

4 = Lifting device H4 (gas tight)

¹⁾ H3 is not available in this material.

²⁾ DN 15 with outlet body in compact design from -454 °F to +1022 °F, above +572 °F with stainless steel bellows.

³⁾ Between -10 °C and lowest temperature indicated "AD-Merkblatt" W10 shall be taken into account.

In event of order please state article number corresponding to the example for ordering in section 1, set pressure and if necessary, accessories (refer to section 13).

Modifications reserved.

Type 459

Werkstoffe / Materials

Pos. Item	Bauteile	Parts	4593 Chromstahl Chrome steel	4592 Stahl Steel	4594 Korrosionsfest/kaltzäh corrosion resistant/cryogenic
1	Eintrittskörper	Body (Base)	X 14 Cr Mo S 17 1.4104		X 2 Cr Ni Mo 17-12-2 1.4404 ¹⁾
2	Austrittsgehäuse	Outlet body	GGG-40.3 0.7043		X 2 Cr Ni Mo 17-12-2 1.4404 ²⁾
7	Teller	Disc	X 39 Cr Mo 17-1 1.4122		X 2 Cr Ni Mo 17-12-2 1.4404
8	Führungsscheibe	Guide	X 14 Cr Mo S 17 tenifer 1.4104		X 2 Cr Ni Mo 17-12-2 1.4404
9	Federhaube	Bonnet	GGG-40.3 0.7043	C22.8 1.0460	X 2 Cr Ni Mo 17-12-2 1.4404
12	Spindel	Spindle	X 20 Cr 13 1.4021		X 2 Cr Ni Mo 17-12-2 1.4404
16	Federteller	Spring plate	11 S Mn Pb 30 1.0718		X 2 Cr Ni Mo 17-12-2 1.4404
18	Druckschraube mit Buchse	Adjusting screw with bush	X 14 Cr Mo S 17 1.4104 PTFE PTFE		X 2 Cr Ni Mo 17-12-2 tenifer 1.4404 tenifer PTFE PTFE
54	Feder	Spring	Federstahldraht C/Spring steel wire C 54 Si Cr 6/X 10 Cr Ni 18-8 1.1200/1.7102/1.4310 54 Cr Si 6/X 10 Cr Ni 18-8 1.7102/1.4310		X 10 Cr Ni 18-8 1.4310
40	Kappe H 2	Cap H 2	11 S Mn Pb 30 1.0718		X 2 Cr Ni Mo 17-12-2 1.4404
	Anlüftung H 3	Lifting device H 3	GGG-40 0.7040		
	Anlüftung H 4	Lifting device H 4	GGG-40 0.7040		GX5 Cr Ni Mo 19-11-2 1.4408
48	Eintrittsflansch	Inlet flange	Pos. 1; 2; 48; 49 siehe Type 4594		X 2 Cr Ni Mo 17-12-2 1.4404
49	Austrittsflansch	Outlet flange			X 2 Cr Ni Mo 17-12-2 1.4404

¹⁾ Bei Type 4592/4594 und Ansprechdruck ab 250 bar und generell bei DN 10 Dichtfläche gepanzert.
For Type 4592/4594 and set pressures above than 250 bar g and for DN 10 in general sealing surfaces strengthened.

²⁾ Massivausführung in X2 CrNiMo 17-12-2/1.4404 oder Sonderwerkstoffen generell bei DN 10, ab 250 bar oder tiefer als -200 °C unter Berücksichtigung der im AD-Merkblatt W 10 festgelegten Beanspruchungsfälle.
Compact design in X2 CrNiMo 17-12-2/1.4404 or special materials for DN 10 in general, above 250 bar g or below -328 °F in accordance with AD-Merkblatt W 10.

Type 459 Leistungstabelle / Discharge capacities

Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend DIN 3320, AD2000-Merkblatt A2, TRD 421				Calculation of mass flow according to DIN 3320, AD2000-Merkblatt A2, TRD 421			
p	Ansprechüberdruck			Set pressure			bar g
I	Saltdampf			Saturated steam			kg/h
II	Luft 0°C und 1013 mbar			Air at 0°C and 1013 mbar			m³/h
III	Wasser bei 20°C			Water at 20°C			10³kg/h

DN	10			15			15			20		
d ₀ (mm)	6			9			13			17,5		
p	I	II	III	I	II	III	I	II	III	I	II	III
0,2							52	61	1,96	82	95	3,48
0,5							82	96	2,77	133	157	4,93
1							119	142	3,75	199	237	6,67
2				93	112	2,93	189	229	5,31	326	393	9,44
3				127	155	3,59	258	315	6,50	455	556	11,6
4				158	194	4,14	321	395	7,51	568	699	13,3
5				189	234	4,63	385	476	8,39	680	841	14,9
6				220	273	5,07	448	556	9,19	792	983	16,3
8				281	352	5,86	573	717	10,6	1012	1268	18,9
10	148	242	3,34	343	431	6,55	698	879	11,9	1234	1553	21,1
15	215	273	4,09	496	629	8,02	1009	1281	14,5	1783	2264	25,8
20	282	359	4,72	649	827	9,26	1322	1684	16,8	2337	2976	29,8
25	348	444	5,28	802	1025	10,4	1632	2087	18,8	2885	3688	33,4
30	415	530	5,78	957	1223	11,3	1948	2489	20,6	3444	4399	36,5
40	550	702	6,68	1268	1618	13,1	2581	3295	23,7	4562	5823	42,2
50	689	873	7,47	1588	2014	14,6	3233	4100	26,5	5714	7246	47,2
60	828	1045	8,18	1910	2409	16,0	3889	4905	29,1	6873	8670	51,7
80	1120	1388	9,44	2582	3200	18,5	5258	6516	33,6	9293	11516	59,7
100	1430	1731	10,6	3296	3991	20,7	6711	8127	37,5	11861	14363	66,7
150	2358	2589	12,9	5438	5969	25,4	11072	12153	46,0			
200		3447	14,9		7946	29,3		16180	53,1			
250		4304	16,7		9924	32,7		20248	59,5			
300		5162	18,3		11902	35,9		24283	65,1			
350		6020	19,8		13879	38,7						
400		6878	21,1		15857	41,4						
500		8593	23,6									
630		10823	26,5									
700		12024	27,9									

Berechnungen aus VALVESTAR® 6.2.50				Calculations from VALVESTAR® 6.2.50			
Berechnung entsprechend ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 mit 10% Drucksteigerung und der zuerkannten Ausflusszahl K. Leistungen unterhalb 30 psig sind mit 3 psi Drucksteigerung berechnet.				Calculation of mass flow according to ASME Boiler and Pressure Vessel Code, Sec. VIII, Div. 1 at 10% overpressure and with certified coefficient of discharge K. Capacities below 30 psig are calculated including 3 psi overpressure.			
p	Ansprechüberdruck			Set pressure			psig
I	Saltdampf, Abblasen gegen Atmosphärendruck (14,7 psi)			Saturated Steam, valve discharging to atmospheric pressure (14,7 psi)			lb/h
II	Luft bei 60°F, Abblasen gegen Atmosphärendruck (14,7 psi)			Air at 60°F, valve discharging to atmospheric pressure (14,7 psi)			SCFM
III	Wasser bei 70°C			Water at 70°F			U.S. gallons per minute

DN	10			15			15			20		
d ₀ mm	1/2"			3/4"			3/4"			1"		
p	I	II	III	I	II	III	I	II	III	I	II	III
15	60	21	4,02	134	48	9,03	279	100	18,8	506	180	34,0
20	69	25	4,54	154	55	10,2	322	115	21,2	584	208	38,5
40	107	38	6,28	241	86	14,1	503	179	29,4	911	325	53,2
60	147	53	7,69	332	119	17,3	692	247	36,0	1254	447	65,2
80	188	67	8,88	422	151	20,0	881	314	41,6	1596	569	75,3
100	228	82	9,93	513	183	22,3	1070	382	46,5	1939	691	84,1
120	268	96	10,9	603	216	24,5	1259	449	50,9	2281	813	92,2
140	308	110	11,7	694	248	26,4	1448	516	55,0	2624	935	100
160	349	125	12,6	785	281	28,2	1637	584	58,8	2967	1057	106
180	389	139	13,3	875	313	30,0	1826	651	62,3	3309	1179	113
200	429	154	14,0	966	345	31,6	2015	719	65,7	3652	1301	119
220	470	168	14,7	1056	378	33,1	2204	786	68,9	3994	1424	125
240	510	182	15,4	1147	410	34,6	2393	854	72,0	4337	1546	130
260	550	197	16,0	1238	443	36,0	2582	921	74,9	4679	1668	136
280	590	211	16,6	1328	475	37,4	2771	988	77,8	5022	1790	141
300	631	226	17,2	1419	507	38,7	2960	1056	80,5	5365	1912	146
350	731	262	18,6	1645	588	41,8	3433	1224	86,9	6221	2217	157
400	832	298	19,9	1872	669	44,7	3906	1393	92,9	7077	2522	168
450	933	334	21,1	2098	750	47,4	4378	1562	98,6	7934	2828	178
500	1033	370	22,2	2325	831	49,9	4851	1730	104	8790	3133	188
550	1134	406	23,3	2551	912	52,4	5323	1899	109	9647	3438	197
600	1235	442	24,3	2778	994	54,7	5796	2067	114	10503	3743	206
650	1335	478	25,3	3004	1075	56,9	6269	2236	118	11359	4048	215
700	1436	514	26,3	3231	1156	59,1	6741	2404	123	12216	4354	223
750	1537	550	27,2	3458	1237	61,2	7214	2573	127	13072	4659	230
800	1637	586	28,1	3684	1318	63,2	7686	2742	131	13929	4964	238
850	1738	622	28,9	3911	1399	65,1	8159	2910	135	14785	5269	245
900	1839	658	29,8	4137	1480	67,0	8632	3079	139	15642	5575	252
950	1939	694	30,6	4364	1561	68,8	9104	3247	143	16498	5880	259
1000	2040	730	31,4	4590	1642	70,6	9577	3416	147	17354	6185	266
1100	2241	802	32,9	5043	1804	74,1	10522	3753	154	19067	6795	279
1200	2443	874	34,4	5496	1966	77,4	11467	4090	161	20780	7406	291
1300	2644	946	35,8	5949	2128	80,5	12412	4427	168	22493	8016	303
1400	2841	1018	37,1	6393	2290	83,6	13359	4764	174	24172	8627	315
1500	3061	1090	38,4	6888	2452	86,5	14371	5102	180			
1600	3285	1162	39,7	7392	2614	89,3	15423	5439	186			
1700	3514	1234	40,9	7906	2776	92,1	16496	5776	192			
1800	3747	1306	42,1	8432	2938	94,7	17592	6113	197			
1900	3987	1378	43,3	8970	3100	97,3	18716	6450	203			
2000	4233	1450	44,4	9524	3262	100	19871	6787	208			
2500		1810	49,6		4072	112		8473	232			
3000		2170	54,4		4882	122						
3500		2530	58,7		5692	132						
4000		2890	62,8		6502	141						
4500		3250	66,6		7312	150						
5000		3610	70,2		8123	158						
5500		3970	73,6		8933	166						
6000		4330	76,9		9743	173						

Type 459

Abmessungen, Druckbereiche, Gewichte / Dimensions, Pressure Ranges, Weights

Nennweite, Ventilgröße	Nominal Diameter, Valve size	d_o	mm	6	9	13	17,5
Eintritt Zapfen	Inlet male	G	-	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1
Austritt Muffe	Outlet female	G	-	1	1	1	$1\frac{1}{2}$
Max. Ansprechdruck	Max. Set pressure	P	bar/bar g	630	11	200	100
Engster Strömungsquerschnitt	Flow area	A_o	mm ²	28,2	63,6	133	241
Engster Strömungsdurchmesser	Flow diameter	d_o	mm	6	9	13	17,5
Schenkellänge	Centre to face dim.	a	mm	75	75	75	75
		b	mm	50	50	50	54
Zapfenlänge	Length	c	mm	16	16	16	18
Bauhöhe	H2	Height	H2	H	mm	-	228
	H3 Chromstahl		H3 CrS	H	mm	-	228
	H4		H4	H	mm	-	230
	H2		H2	H	mm	228	228
	H4 Edelstahl		H4 SS	H	mm	230	230
	mit Fallenbalg zus.		with bellows add	H	mm	-	45
Deckenfreiheit	Height clearance	x	mm	150	150	150	150
Gewicht	Weight	-	kg	2,6	2,6	2,6	3

Abmessungen bei Flanschausführung / Dimensions for Flanged Version

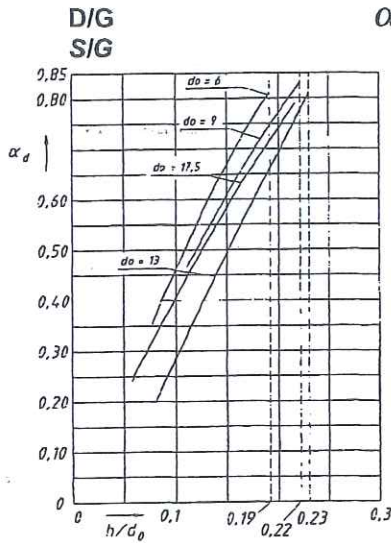
Nennweite, Ventilgröße	Nominal Diameter, Valve size	DN	-	15	20
Eintrittsflansch	Inlet flange	DN	-	25	
	ANSI	Size	-	1"	
Austrittsflansch	Outlet flange	DN	-	25	40
	ANSI	Size	-	1"	$1\frac{1}{2}$ "
Druckstufe	Pressure rating	PN	-	40-400	40-160
Eintritt	Inlet	Class	-	300-2500	300-600
Druckstufe	Pressure rating	PN	-	40	
Austritt	Outlet	Class	-	150-300	
Schenkellänge	DIN und ANSI RF	d	mm	100	110
	ANSI Class 300-1500 RTJ	d	mm	107	116
	ANSI Class 2500 RTJ	d	mm	114	
	DIN und ANSI RF und RTJ	e	mm	100	
	Centre to face dim.				

Type	Eintrittskörperwerkstoff Body material	P bar/bar g
459	X 2 CrNiMo 17-12-2	1.4404 400
	X 14 CrMoS 17	1.4104 250

Zuerkannte Ausflussziffer α_d / Coefficient of Discharge α_d

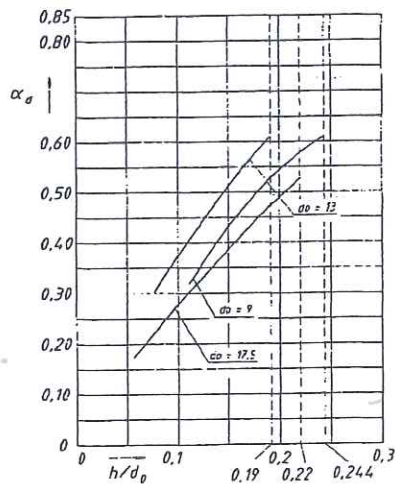
Diagramm 1

$$\alpha_d = f(h/d_o)$$



h = Hub (mm)
 d_o = engster Strömungsdurchmesser (mm)
 p_{ao} = Gegendruck, bar (abs.)
 p_o = Ansprechdruck, bar (abs.)

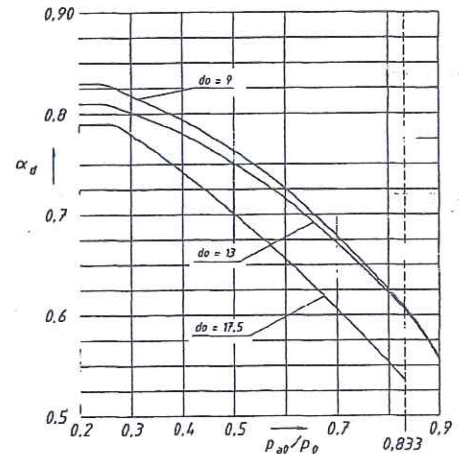
FIL



h = Lift (mm)
 d_o = Flow diameter (mm)
 p_{ao} = Back pressure, bar (abs.)
 p_o = Set pressure, bar (abs.)

Diagramm 2

$$\alpha_d = f(p_{ao}/p_o)$$

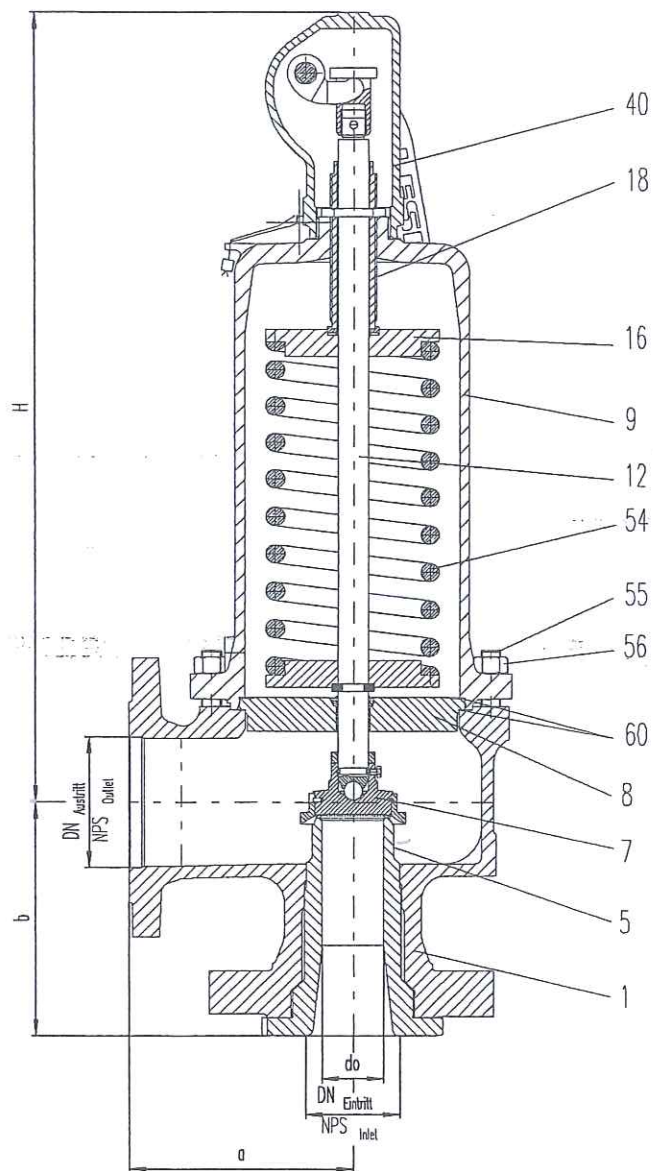


Betriebsanleitung
Ausgabe August 2003

Operating instructions
August 2003 edition

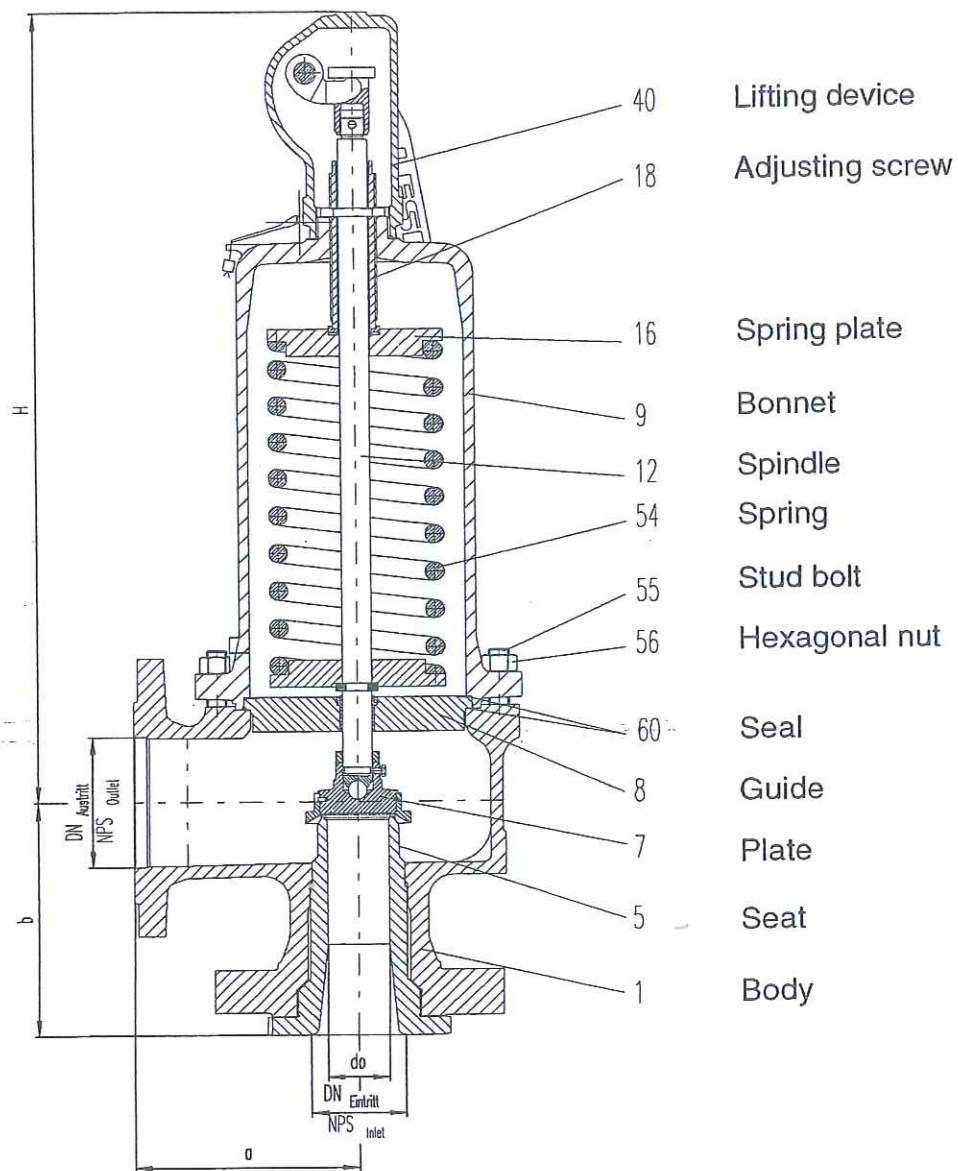
Instructions de service
Edition août 2003

Instrucciones de servicio
Edición agosto 2003



LESER

The Safety Valve



1 Contents

1 Contents	19
2 General	19
3 Testing/marketing	19
4 Pressure	20
5 Function of a safety valve	20
6 Functional tightness of a safety valve	21
7 Medium	21
8 Temperatures of the medium and ambient temperatures	22
9 Choice of spring	22
10 Safety valves with bellows	23
11 Safety valves with blow-down ring	23
12 Safety valves built into installations	23
12.1 Open bonnet	23
12.2 Regular lifting operation	23
12.3 Forces acting on the safety valve	23
12.4 Connections	24
12.5 Direction of safety valves	24
12.6 Flow-through	24
12.7 Condensation	24
12.8 Transfer of vibrations from the installation	25
12.9 Discharge pipe	25
12.10 Unfavourable environmental conditions	25
12.11 Leaks caused by foreign bodies	25
12.12 Protection during storage and transport	25
12.13 Corrosion protection	26
12.14 Maintenance	26
12.15 Identification of safety valves	26
12.16 Lever safety valves	26
13 Setting instructions for spring loaded safety valves	26
13.1 Lifting device H3	26
13.2 Lifting device H4	26
13.3 Spring replacement	26
14 Handling	27
15 Supplementary loading system	28
16 Combined Safety Valve and Bursting Disc	28
17 Unexpected conditions	29
18 Product overview	29
19 Assembly instructions	29
20 Disclaimer	29

2 General

The following general notes refer to directly loaded and controlled safety valves (with supplementary loading system).

To fulfill its function all components of a safety valve are manufactured to great precision. Only this precision allows correct functioning. Safety valves must therefore be handled with care. Failure could endanger people, animals and installations. Even with a correctly functioning safety valve hazards may occur. This has to be taken into account.

The following risks could ensue:

- a.) The safety valve does not work correctly or is dimensioned incorrectly: the pressure equipment bursts. Hazard caused by the bursting itself and by the hot, poisonous and aggressive medium.
- b.) The safety valve operates correctly; medium escapes: there is a risk of hot, poisonous and aggressive medium.
- c.) The safety valves leaks: there is a risk of hot, poisonous and aggressive medium.
- d.) Other dangers caused by handling the safety valves e.g., risk of injury from sharp edges, heavy weight, ...

In order to minimise the risks of these hazards, the operating instructions must be adhered to at all times and given priority over the recommendations below. The operating instructions have been developed by practical experience and from the requirements stipulated in the regulations.

Sets of rules and standards:

- Pressure Vessel and Steam Boiler Ordinance
- TRD 421, 721
- TRB 403, 801 No. 45
- AD 2000-Merkblätter A2 and A4
- DIN EN ISO 4126
- Pressure Equipment Directive 97/23/EC
- ASME Code Section II and VIII
- API 526, 520, 527
- Others.

LESER is in possession of the appropriate product-related certificates to prove that the sets of rules and standards are fulfilled and that safety is therefore guaranteed.

LESER is certified according to DIN EN ISO 9001 (Quality Management System), DIN EN ISO 14001 (Environmental Management System) and Module D of the Pressure Equipment Directive (quality assurance in production). This ensures that all requirements for quality and environment are complied with.

3 Testing/marketing

After setting and testing, each safety valve is sealed by LESER or by the expert of an official acceptance organisation at the customer's request (such as TÜV, Germanischer Lloyd, ...).

If the marking of the safety valve is applied on the valve body by means of a marking stamp, the safety valve must not be damaged by such stamping. Deformation of the valve may cause leakage or destruction of the safety valve. Thin-walled valve bodies should not be stamped.

Safety valves have a name plate showing the following data:

- Date of order
- Technical data
- Test pressure
- VdTÜV type test approval number
- CE-marking and identification number of the notified body.

For safety valves without type test approval, only order data and technical data are included.

Further marks required are either moulded into the casting, or, for safety valves with threaded connections, punched in. Safety valves with a heating jacket have a separate name plate for the heating jacket.

If technical changes are made, always check whether the identification has to be adjusted. Modifications on valves or identifications may only be carried out by trained personnel (refer to section 12.14).

4 Pressure

Definitions:

- a) Test pressure: the pressure that the safety valve is set to at LESER's. The outlet side of the safety valve is open to atmospheric pressure.
- b) Set pressure: the predetermined pressure at which a safety valve under operating conditions commences to open.
- c) Opening pressure: the pressure at which the safety valve discharges the certified flowing capacity (this may also be given as the difference from the set pressure in per cent → opening pressure difference).
- d) Reseating pressure: the value of the inlet static pressure at which the disc re-establishes contact with the seat or at which the lift becomes zero.
- e) Operating pressure: the pressure at which the plant operates.
- f) Built-up back pressure: the pressure existing at the outlet of a safety valve caused by flow through the valve and the discharge system.
- g) Superimposed back pressure: the pressure existing at the outlet of a safety valve at the time when the device is required to operate.
- h) Back pressure: the total of built up and superimposed back pressure.

Pressure shall be stated as overpressure [bar g or psig] above atmospheric pressure.

Unless stated otherwise, the pressure specified by the customer is set with atmospheric pressure acting on the outlet side (test pressure = set pressure).

If there is pressure on the outlet side (superimposed back pressure), a force is produced, which acts on the rear side of the disc. This increases the set pressure by exactly the value of this pressure. If the superimposed back pressure is constant, it is possible to adjust the differential pressure by reducing the value of the test pressure by the value of the back pressure (test pressure \neq set pressure). If there is no superimposed back pressure, the set pressure will drop. The back pressure intended must not be exceeded because then it would also exceed the set pressure.

The maximum pressure that a safety valve may be operated at regardless of the test pressure depends on a number of factors. Among these are:

- Materials
- Medium temperature
- Design pressure
- Flange classes
- Others.

These should be taken into consideration when selecting a safety valve.

The value of the operating pressure must permanently be lower than the reseating pressure difference plus 5%. Otherwise LESER cannot guarantee that the valve will close securely after opening (exception: if the valve is fitted with a supplementary loading system, refer to section 15).

5 Function of a safety valve

A performance certificate is required to ensure that the required mass flow is discharged by the safety valve if necessary.

Pipes leading to the safety valve have to be fitted so that large hydrodynamic losses are prevented. The edges at the pipe inlet should be at least chamfered, but preferably rounded. The notes on dimensioning given in the regulations, standards and manufacturer's information sheets must be adhered to.

Safety valves may only be disabled by means of shut-off valves provided that the pressurised equipment is protected against excessive pressure by other safety devices or that the plant or equipment is shut down altogether.

Safety valves are guaranteed to work perfectly, if the built-up back pressure on the outlet side does not exceed 15% of the test pressure minus the superimposed back pressure (if available).

Built-up and superimposed back pressures may be compensated by an amount not exceeding

35% of the set pressure by using stainless steel bellows specially designed for this, which compensates the force acting on the rear side of the disc. Function and set pressure remain constant. If it is not clear whether the bellows compensate for pressure, LESER should be contacted. The application limits of the bellows for pressure and temperature must not be exceeded (refer to section 10).

If discharge lines are fitted with equipment, which prevents the ingress of rainwater or foreign bodies, such equipment must not obstruct or restrict the outlets of the safety valve.

The blow-off pipe should be dimensioned using the maximum back pressure and the appropriate temperature. It should be installed in a pipe run, which is free from restrictions and turbulences and should not be opposite other branches, to ensure that it does not impair the functioning of the valve or damage it. The capacity and functioning of safety valves must also be ensured in applications, where blow-off systems fulfill several functions.

During blowing-off, reaction forces act on the safety valve itself, the pipes connected to it and the fixed mounts. The size of the reaction force is particularly important for the dimensioning of the fixed mounts.

The following points have to be taken into consideration:

- Static, dynamic or thermal loads exerted by the pipe leading to or from the safety valve must not act on the valve.
- Safety valves must be fixed as specified in the drawing. Omitting or removing mounts can result in damage because this results in excessively large forces or tensions.
- Also refer to section 12.3.

6 Functional tightness of a safety valve

One has to expect a slight leakiness with all safety valves fitted with metal seals. People, environment and installations must not be endangered by the escaping medium.

Safety valves with soft seals seal are much more reliable than those with metal soft seals. LESER offers a range of elastomer materials for different applications. The elastomers must match the medium and its pressure and temperature.

All LESER products are inspected for damage and leaks. In order to prevent damage during transport all products have their flange faces,

sealing lips and pipe threads protected before

being packed for shipment. This protection should be removed before assembly (refer to section 12.12).

Before installing the valve in the plant or pipeline system it should be inspected for damage. Once installed, the valve should be checked for leakage while the plant or pipeline system is operating.

Sealing surfaces are machined with great precision. A tight seal is achieved, for instance, by hardening, tempering, precision-grinding and lapping. This makes safety valves vulnerable to impact damage; they may, for example, develop leaks as a result of vibrations.

The following notes are to be observed:

- During transport, installation and operation safety valves must be protected from vibrations.
- Safety valves must be transported with care, e.g., the lever must never be used as a carrying handle and the safety valve must not be dropped.

The force between the seat and the disc falls as a function of rising operating pressure. Therefore the probability of leaks also rises if the operating pressure is close to the set pressure (refer to section 4). Damaged or contaminated sealing surfaces in particular tend to develop leaks.

7 Medium

Any moving parts have to be protected from abrasive/corrosive media to avoid the risk of jamming, seizing or sticking. This can be done by servicing the valve each time it has opened or by using stainless steel/elastomer bellows. The limits of application for the bellows have to be observed.

The possibility of leaking sealing surfaces caused by abrasive media must be considered. Dangerous media must not be allowed to enter the environment. In case of doubt the safety valve should be replaced after opening.

Soft sealing discs can compensate for minor damage to the seat. In every case the limits of application and medium consistency for the elastomer material have to be observed.

The strength of components (e.g. body, spindle, spring) may be reduced by abrasion. This may lead to leaking or to the bursting of pressure equipment. If abrasive media are used, maintenance intervals should be shortened.

Sealing surfaces must not stick together. This can be prevented by:

- Regular lifting operation (refer to section 12.2)
- Heating or cooling to prevent the seat from sticking
- Other measures which prevent sticking.

Corrosion damage to body parts and inner parts cannot always be spotted easily. Therefore the user must make sure that the medium does not attack or corrode the materials the safety valve is made from. If this possibility cannot be excluded, monitoring and servicing have to be adapted to this situation accordingly. Special materials can be selected on request.

Lubricants based on mineral oils are used as an aid during installation. These fluids can contaminate the medium unless special precautions are taken.

The following points have to be observed:

- Lubricants/auxiliary fluids can reach the medium and contaminate it or cause a chemical reaction.
- Lubricants can be washed out and make the dismantling of the safety valve more difficult.
- Safety valves can be designed as oil and grease-free types. For these types of valves all residues containing mineral oil are removed from the valve surfaces and special lubricants are used.
- Bellows prevent contact between medium and lubricant.

8 Temperatures of the medium and ambient temperatures

Minimum and maximum temperatures are given for LESER safety valves. They always refer to the temperature of the medium, which may simultaneously be the ambient temperature. Therefore, the ambient temperature has to be taken into consideration under extreme climatic conditions such as are found in Scandinavia.

It is necessary to observe the effect of temperatures of the medium on the maximum permitted pressure. If expansion limits drop at higher temperatures or if the medium tends to be brittle at low temperatures, the maximum permitted temperatures must be lowered. Please observe the specifications/regulations in the appropriate sets of rules and the manufacturer's specifications.

If the safety valve is supposed to be thermally insulated, the bonnet and the cooling zones (if there are any) must not be covered to protect the springs from becoming overheated.

To set a safety valve for a particular pressure at a higher ambient temperature, a correction factor should be used to allow for the increased temperature. This eliminates the necessity of adjusting the setting while the medium is at the higher temperature (procedure: Cold differential test pressure according to LESER work standard LWN 001.78).

During the operation of safety valves, medium can freeze, which prevents opening and closing. This can happen if the temperature falls below the freezing point of the medium. In case of media, which congeal at low temperatures, the viscosity may drop significantly. If the medium contains freezing vapours, the risk of icing-up is increased by the expansion of gases as this causes the temperature to fall further. If there is danger of icing, measures must be taken to ensure that the safety valve works correctly.

Contact with hot or dangerously cold safety valve surfaces must be prevented by appropriate protective measures.

9 Choice of spring

The springs used by LESER are designed for defined pressure ranges. The test pressure is always the basis for selecting the spring (refer to section 4). The functioning of the springs is ensured if the spring is designed and used in conformity with the sets of rules.

When dismantling the valves, the springs must not be mixed up as the functioning will be impaired, if the wrong spring is installed. In extreme cases the spring will be fully compressed (the coils touch each other) and the safety valve does not work.

When changing the test pressure the user must check whether the spring/springs can be used at the new pressure. This can be done by using current LESER spring tables (LWN 060.xx). If they are not available please contact LESER. If the spring is not suitable for the new test pressure it must be replaced by a suitable spring. If the test pressure of a safety valve is altered, the whole safety valve and its dimensioning must be checked for suitability.

LESER springs bear clear identification marks. Springs which can no longer be identified or damaged springs must not be used.

Springs must not be reused if it cannot be estimated how many load changes they have been subjected to. This applies in particular to the springs of safety valves which have been exposed to vibrations, as in this case the actual

number of load changes is practically impossible to estimate.

The springs used in LESER safety valves have been matched to the materials used in these valves. In unfavourable cases, there may be factors leading to increased temperature or corrosion that make the following actions necessary:

Temperature effects:

As spring temperatures depend on many external conditions, no general temperature of the medium can be specified as the limit of application. It has to be evaluated in every single case, which of the following measures need to be taken:

- Using spring materials that are heat resistant or tough at subzero temperatures
- Providing the test pressure with a correction factor to compensate for a drop of set pressure at higher temperatures (refer to section 8 for cold adjustment)
- By using highly heat-resistant materials in conjunction with cooling zones, open bonnets and bellows, the effect of the temperature on the spring is reduced.

Corrosion effects:

- Medium may enter into the spring chamber if safety valves do not have bellows. Corrosive/abrasive media reduce the fatigue strength. This should be taken into consideration when selecting, sizing and servicing safety valves.
- Spring materials with increased corrosion resistance may be used (e.g., stainless steel, Hastelloy, ...)

10 Safety valves with bellows

The pressure and temperature application limits of bellows must be complied with.

Defective bellows are recognisable by the medium leaking out of the open bonnet or the vent hole. Hazards from leaking medium must be prevented.

Measures against leaking medium:

- Equipping the valve with an inspection manometer and a drip container.
- In the case of open bonnets, the leaking of the medium cannot be prevented if the bellows are defective. Hazards have to be prevented, (e.g., by a sufficient safety distance, protection equipment or by using only non-hazardous media).

Defective bellows must be replaced immediately in order to ensure the correct function of the safety valve.

Stainless steel bellows for which the number of permitted load changes has been exceeded, or is unknown, must be replaced. As a rule bellows should be replaced whenever the valve is dismantled.

Moisture or dirt must not be allowed to enter the bonnet via the vent hole. Appropriate protective measures (e.g., connections, pipes,...) must be taken.

11 Safety valves with blow-down ring

Safety valves with blow-down ring, like type 526, are always delivered with the blow-down ring in the lowest position. That is, that the blow-down ring is screwed into the nozzle, until the lower stop is reached. The blow-down ring is arrested with a lock screw, which is sealed. The position of the blow-down ring must not be changed.

12 Safety valves built into installations

12.1 Open bonnet

For open bonnets or lever valves, appropriate measures must be taken to avoid contact with movable parts (e.g., the spring) as otherwise there is a danger of jamming. Medium can leak out of the open bonnets or open spindle guides of lever safety valves. The user must ensure that leaking medium cannot cause hazards. A sufficient safety distance has to be observed.

12.2 Regular lifting operation

Safety valves must be vented regularly in order to check their function and to remove residues. They can be opened if at least an operating pressure of $\geq 75\%$ of the set pressure is reached. Exceptions can only be allowed if the functioning is checked regularly in a different way, e.g., by appropriate short maintenance intervals. The valid regulations for the application of safety valves have to be adhered to.

After lifting, the lever must move freely, i.e. the lifting fork in the lifting device must not act on the spindle cap.

12.3 Forces acting on the safety valve

Safety valves must not be subjected to excessive static, dynamic or thermal stresses. These can be caused by:

- Installation under tension (static)
- Reaction forces when blowing off (static)
- Vibrations (dynamic)
- Temperature expansion (thermal)



The following precautions should be taken:

- The system must be able to expand
- Pipe runs must not be fixed in a way that they are under tension.
- The safety valve brackets should be used for attaching the valve securely to the plant.
- Vibration of the safety valve and plant should be prevented.

12.4 Connections

The connections/seals between the safety valve and the plant shall be of sufficient size. They also have to be designed in accordance with the sets of rules to prevent the connection from failing (also refer to sections 4 and 8).

The user is responsible for the correct fitting of seals for pipes leading into the valve and pipes for blowing-off or other connections to the safety valves. Therefore LESER will not accept any liability for these.

For correct installation the user should ensure that the flange sealing surfaces are not damaged during installation.

12.5 Direction of safety valves

Confirmation by the TÜV Nord:

Directly-loaded safety valves are to be installed in accordance with AD 2000-Merkblatt A2 "upright with respect to the flow direction".

In addition AD 2000-Merkblatt A2 requires that "safety valves must correspond to the state-of-the-art and be suitable for the purpose for which they are deployed".

Under the following conditions it is possible to deviate from the upright installation direction, and in our view it is also permissible.

E.g., the safety valves have been granted type approval for non-upright installation and a note to this effect is found in the VdTÜV-Merkblatt.

If adequate experience of installing safety valves in a direction other than upright is available over an extended period, this type of installation is permissible if agreed between operator, manufacturer and the technical inspector, who authorises the installation. If applicable, additional measures may need to be taken with regard to this installation.

Therefore safety valves may, according to the information provided above, be installed in directions other than the one specified in AD 2000-Merkblatt A2.

If the conditions mentioned above have been fulfilled, the following points have to be

observed when installing the valve in a direction other than upright:

- Drainage has to be fitted to drain medium or condensation from components which are important for the function of the valve.
- Servicing procedures should be modified, e.g., the functioning of the drainage system must be ensured.
- LESER must be informed about the type of installation in order to be able to agree to a direction deviating from upright.

12.6 Flow-through

The flow direction must be observed during installation. It can be recognised by the following features:

- Flow direction arrow on the body
- Diagrams in the
 - Complete Catalogue
 - Operating instructions
 - Data sheets and
 - Assembly instructions.

12.7 Condensation

Medium or condensation must be drained from the outlet chamber of the safety valve or such components, which are important to the functioning of the valve (spring, bellows etc.).

The following points should be noted:

- Drainage should always be carried out via the blow-off pipe, which should be installed sloping downwards so that it can drain itself (figure 3).
- Directly downstream of the safety valve there must be no upward bend as in this case correct drainage would not be possible (figure 4).
- The blow-off pipe must be provided with a sufficiently large condensation drainage pipe, which must be attached to the lowest point of the pipe. For pipes larger than nominal diameter 40 mm the drainage pipe must have a nominal diameter of at least 20 mm. (In case of steam applications even larger diameters may be necessary. In such cases the regulations must be observed).
- LESER safety valves are not provided with a drain hole as the drainage must be executed via the blow-off pipe. Exceptions: Certain regulations require drainage holes (e.g., on ships with variable orientation in the water and a pipe slope). Safety valves which are intended for such purposes are equipped with a drainage hole. Such designs are only manufactured if they are specifically ordered.

- It is possible to drill a drain hole later at the place intended for this purpose.
Caution: swarf can cause damage which may lead to leaks or to the failure of safety valves.
- Drainage pipes must be installed sloping downwards; these pipes must have no restrictions such as locally reduced diameters. There must be an unobstructed view of the drain outlet; any risks resulting from leaking medium must be prevented. (e.g., by fitting condensation traps, drip container, filters, etc.)
- Unused drainage holes must be closed.

12.8 Transfer of vibrations from the installation

Any vibrations which might be transferred to the safety valve must be prevented. If this is not possible the safety valve must be decoupled from the installation, e.g., via bellows, pipe bends, ...

Pressure variations or surges in the medium also may lead to dangerous vibrations of the safety valve. This also has to be prevented.

If the transfer of vibrations cannot be prevented, damping systems can be built in, e.g., o-ring dampers.

12.9 Discharge pipe

When a safety valve blows off, in addition to the general hazards from the medium, the following hazards have to be expected (refer to section 2):

- High flow rates
- High temperatures
- Noise emissions

In this context the following points should be noted:

- For steam or gases the blow-off pipe should point upwards in order to allow blowing off without danger.
- For liquids the blow-off pipe should point downwards so that the medium can completely drain out of the blow-off chamber.
- The outlet flange of safety valves or blow-off pipes must be directed so that no danger is caused by the medium blowing off. The following options are available:
 - Blowing off into a container
 - Safety valve and blowing-off pipes without direct access
 - Design with silencer.

12.10 Unfavourable environmental conditions

All LESER safety valves which may corrode are coated with a protective coating during manufacture which protects the safety valve during storage and transport. In corrosive environments a further corrosion protection is required (refer to section 12.13). For extreme conditions, LESER recommends stainless steel safety valves. The supplementary loading system must not be given a protective coating!

External media (e.g., rain water or dirt/dust) must not enter the blowing-off pipe or come in contact with functional components (e.g., guides with open bonnets) have to be avoided. By analogy, the statements made in section 7 apply.

Simple preventive measures are possible:

- Protection of the blow-off chamber from extraneous media and dirt
- Protection of the parts important to operating from external media and dirt.

12.11 Leaks caused by foreign bodies

Foreign bodies must not remain in the installation (e.g., welding beads, sealing material such as hemp tape, PTFE tape, screws, etc.). One option for avoiding foreign bodies in the system is to flush it before commissioning.

If leaks are caused by contamination between the sealing surfaces, the safety valve can be vented to clean the surfaces. If this does not stop the leak, one of the sealing surfaces is probably damaged. In this case the safety valve has to be serviced.

12.12 Protection during storage and transport

All protective devices for transport and handling have to be removed before installing the safety valve.

After installation, the protection for the lever must be removed from the bonnet as otherwise the safety valve cannot be vented. The lever must move freely, i.e. it must be in its initial position and the coupling at the spindle must not be connected to the lever.

In the case of lever safety valves, the wooden wedge, which protects the sealing surfaces from damage during transport, has to be removed.



12.13 Corrosion protection

Moving parts and parts important to the operating of the valve must not be impaired in their motion, e.g. the blowing-off chamber. The spindle guide must not be varnished.

The supplementary loading system must not be coated with protective paint (refer also to section 15).

12.14 Maintenance

Safety valves may only be serviced by skilled staff.

Maintenance intervals cannot be specified by LESER as they depend on many factors:

- Corrosive, aggressive and abrasive media lead to rapid wear and require shorter maintenance intervals
- Frequent operating requires shorter maintenance intervals
- Maintenance intervals have to be agreed between the operator, the inspector and the manufacturer. Inspections must be carried out at the time of the regular external and internal checks of the pressure equipment.

12.15 Identification of safety valves

Before assembling safety valves the documentation must be checked in order to ensure that the correct valve has been selected for the assembly.

12.16 Lever safety valves

The set pressure of lever safety valves is defined by the mass and the position of the loading weights. It is not allowed to change them.

No additional loading weights must be added. The lever must not be used for suspending any parts, e.g. for hanging clothes on.

13 Setting instructions for spring loaded safety valves

The following operating instructions only apply to valves without additional equipment. If there is additional equipment (such as O-ring dampers, proximity switches, bellows, ...) please refer to the corresponding assembly instructions.

13.1 Lifting device H3

1. Remove shaft (40.4).
2. Pull lever (40.6) out to the side.
3. Loosen hexagonal head screw (40.3).
4. Unscrew and remove lever cover (40.1).
5. Loosen lock nut (19).

6. ¹⁾ Turn adjusting screw (18) to the required set pressure.
Pay attention to the admissible pressure range of the spring!
Clockwise turning of adjusting screw increase the spring tension, giving a higher set pressure. Anticlockwise turning of adjusting screw reduces the spring tension, giving a lower set pressure.
7. Reassemble in reverse order and lock at the set pressure.

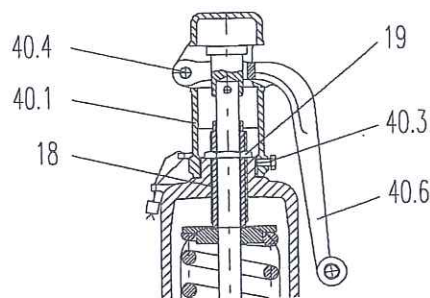


Fig. 1

13.2 Lifting device H4

1. Loosen the spring cover (40.1.1) and simultaneously press the lever (40.1.6) in the direction of the bonnet so that the lifting fork (40.1.5) comes free.
2. Remove the lever cover (40.1.1).
3. ¹⁾ Turn adjusting screw (18) as described in lifting device H3. Pay attention to the admissible pressure range of the spring!
4. Reassemble in reverse order and lock at the set pressure.

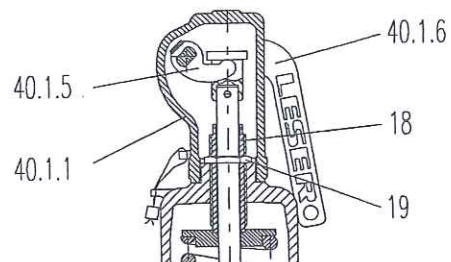


Fig. 2

13.3 Spring replacement

The following items refer to the figures shown on pages 3/40-3/42 of LESER's Complete Catalogue.

1. Loosen the existing lead seal.
2. Press the lever (40.6) towards the middle until it reaches the stop so that the lifting fork (40.5) no longer holds the spindle cap (40.12).

3. Loosen and remove the lever cover (40.1).
4. Loosen the spindle cap (40.12) from the spindle (12), remove the securing ring (40.14) and the pin (40.13).
5. Loosen the lock nut (19) of the adjusting screw (18).
6. ¹⁾ Turn the adjusting screw (18) anticlockwise to remove all spring tension.
7. Remove the hex. nuts (56) from the flange of the bonnet (9).
8. Lift off the bonnet (9).
9. Remove the upper spring plate (16).
10. Lift off the spring (54) and remove lower spring plate (16) and split rings (14).
11. Remove spindle (12) with guide (8) and disc (7).
12. Carefully clean seat (5) and disc (7), and if required body internals.
13. Refit spindle (12) with guide (8) and disc (7).
14. Fit the split rings (14) into spindle groove and retain with the securing ring (59); slip on lower spring plate (16) to locate on split rings (14).
15. Replace spring (54).
16. Slip on the upper spring plate (16) onto the spindle (12).
17. Align adjusting screw (18), and bonnet (9) over the spindle (12) and refit.
18. Fit and tighten the hex. nuts (56).
19. ¹⁾ Load the spring (54) to obtain the required set pressure. Clockwise rotation of adjusting screw (18) increases pressure. Anticlockwise rotation of adjusting screw (18) reduces pressure.
20. Tighten the lock nut (19) onto the adjusting screw (18).
21. Refit and secure spindle cap (40.12) by pin (40.13) and securing ring (40.14).
22. Screw-on the lever cover (40.1).
23. Pull the lever (40.6) towards the middle so that the lifting fork (40.5) is pushed under the spindle cap (40.12).
24. Test spindle will lift correctly by pulling lever.

These instructions are applicable for relief valves, safety valves and safety relief valves.

- 1) **Caution:** During all work the spindle has to be secured against twisting in order to prevent damage to the sealing surfaces.

The following points should be noted:

The pressure setting is wire-locked and sealed against unauthorized alteration. The rules of the TÜV, agreed by the manufacturer, require the fitting of a type test approval plate stating the correct valve data. The manufacturer cannot be held responsible for any changes to set pressure or other alterations after despatch from the factory. Necessary modifications should only be made by authorised distributors of LESER or under the supervision of the TÜV or any other competent inspection authority.

14 Handling

There is a risk of injury from sharp edges and burrs. For this reason all parts have to be handled with caution.

There is a risk from safety valves falling over. They always have to be secured adequately.

During dismantling the spring must not be tensioned. Otherwise there is danger of injury from flying parts. Observe the assembly instructions for the relevant safety valves!

Before dismantling you should always check whether there is, or could be, any medium in the bonnet; also check what the medium is.

There is a great risk of injury, chemical burns or poisoning if there is any remaining medium inside the safety valve.

One should use conventional high quality tools in order to minimise the risks arising from bad quality tools or inadequate tools. Any necessary special tools are indicated in the assembly instructions.

Safety valves may only be dismantled and assembled by skilled staff.

The training can be carried out:

- In the workshop by experienced staff
- At LESER training seminars
- By means of LESER documentation, e.g., videos, operating instructions, catalogues, assembly instructions

The maintenance staff must be informed about the risks during dismantling and installing the safety valves.

Contamination and damage to the safety valve must be avoided. Suitable cartons, protective covers for the flanges, wrapping foil, shipping pallets etc. have to be used. The packaging must be completely removed before installation as otherwise the function of the safety valve cannot be guaranteed.

Safety valves have to be handled with care as otherwise the vulnerable sealing surfaces can be damaged or the safety valve might even be rendered useless.

Safety valves must be stored in a dry place. The optimum storage temperature is 5 °C to 40 °C. For o-ring discs temperatures below freezing should be avoided, if possible. The temperature resistance, in particular of the o-ring materials, has to be taken into account.

Upper limit for storage: 50 °C

Lower limit for storage: -10 °C



15 Supplementary loading system

Even if the external energy supply (compressed air) fails, the direct-loaded safety valve is still fully functional. In this case the function is equivalent to the LESER standard safety valve without supplementary loading system. The compressed air filter must be serviced at regular intervals as specified in the maintenance instructions.

The installation should contain an air dryer. The compressed air should have a dew-point of minimum +2 °C.

The maximum pressure of the air supply is 10 bar, the minimum pressure is 3.5 bar. If the pressure rises above or falls below the specified interval, this may lead to temporary or permanent failure of the supplementary loading system. As a result the safety valve does not function or it will work as a standard valve without the supplementary loading system.

The supplementary loading system should be serviced and checked at least once a year by specially trained staff. For this essential work LESER offers a maintenance service which may be incorporated in a service agreement. Training and experience with handling the supplementary loading system in combination with the safety valves are essential.

The supplementary loading system has to be fitted in accordance with the rules and standards and the specifications distributed by LESER. If serviced correctly, failures due to contamination of the pressure and control lines can be excluded.

The control unit is to be protected from contamination. It has to be ensured that it is always closed. For special applications LESER offers an encapsulated box sealing the control unit.

The actuator on the safety valve itself as well as sliding parts inside an open bonnet must be protected from contamination. Otherwise there is the danger of jamming.

Temperatures:

The controls and actuators are designed for applications between 2 °C and 60 °C.

- At temperatures above 60 °C the compressed air connections must be as long as possible and equipped with a water seal.
- The control unit and actuators have to be positioned in a way that their temperature will not exceed 60 °C.
- At a temperature below 2 °C there may be danger of icing-up, therefore it may be

necessary to heat control unit, control lines and tapping lines.

The supplementary loading system is connected to the safety valve via a coupling. The coupling must not be blocked by objects. It is neither necessary nor permitted to apply a protective coating to the actuator.

The pressure tapping lines must not be shut off. If there are shut-off devices they have to be designed in such a way that they cannot be closed, e.g., by means of locking bars or seals.

LESER control units are equipped with a shut-off device for maintenance purposes. They are secured against shutting-off by means of a locking bar. This locking bar must not be removed.

The pressure switches are wire-locked and sealed. This seal indicates that the setting has not been changed. It is not permitted to manipulate the pressure switches (e.g., by opening the seal and modifying the adjustment or by opening the switching contacts, ...)

If a test gag is used during pressure testing of the installation it must be removed after the test.

16 Combined Safety Valve and Bursting Disc

The type test approval of the combination of bursting discs of a certain manufacturer with LESER safety valve ensures that both the functional and performance requirements are met. If you require information on the tested combinations, please contact LESER.

Combinations of LESER safety valves and bursting discs of other manufacturers are permissible, if they meet the safety requirements. This shall be certified for each individual case.

The following points should be noted in particular:

- Operating instructions for the bursting disc.
- Safety valves must not lose their function by placing the upstream bursting disc.
- The space between the rear side of the bursting disc and safety valve inlet should be monitored.
- The bursting disc should be designed in a way that it cannot be installed incorrectly.
- The bursting disc has to open free of fragments. Bursting disc components must not enter the inlet connecting pieces of the safety valve thus impairing the function.

- Sets of rules with reference to bursting discs (AD 2000-Merkblatt A1, ASME, ...)

17 Unexpected conditions

Not all errors can be prevented entirely.

However, their consequences must be estimated and reduced by:

- A risk analysis for the complete installation
- An estimate of the risk and potential damage
- Instructions about the measures to be taken in the case of malfunctioning
- Staff training at the manufacturer's and at the operator's
- Protective measures for people and for the environment.

18 Product overview

For the product overview please refer to the "Declaration of conformity".

19 Assembly instructions

In addition to the Operating Instructions there is a number of type-specific assembly instructions, which are listed in the "Request form LESER Assembly Instructions".

In detail the type-specific assembly instructions have to be observed.

20 Disclaimer

The manufacturer reserves the right to make technical changes or improvements at any time.

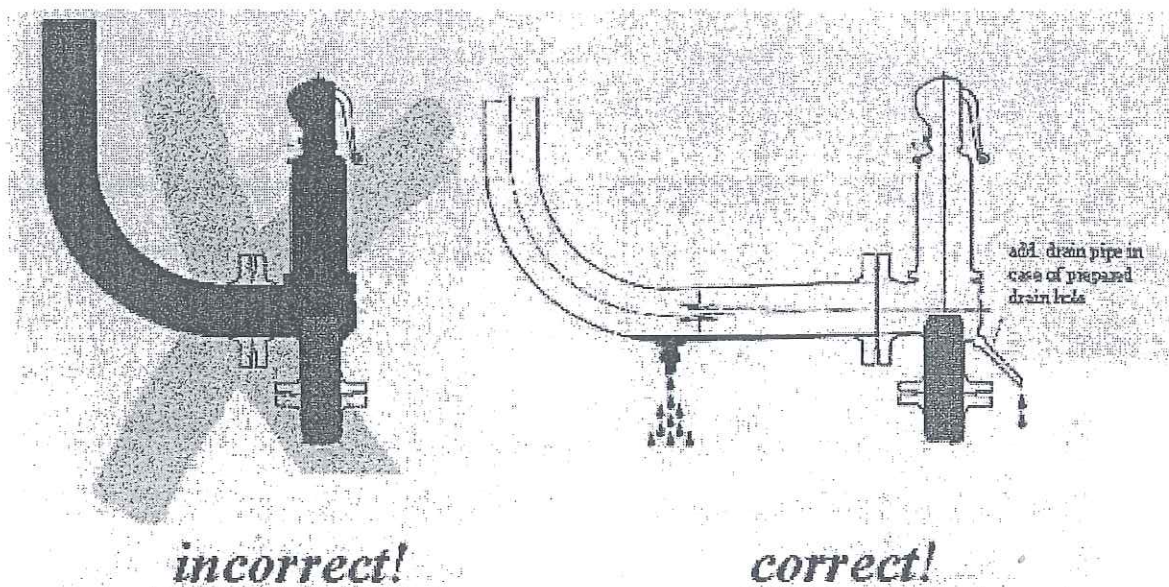
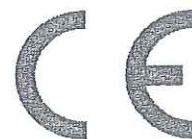


Fig. 4

Fig. 4

Declaration of Conformity/Konformitätserklärung according to Pressure Equipment Directive 97/23/EC nach Druckgeräterichtlinie 97/23/EG



LESER GmbH & Co. KG
Wendenstr. 133-135
20537 Hamburg/Germany

Name and address of the manufacturer/Name und Anschrift des Herstellers

Type*	Nominal pipe size/ Nennweite		EC-type examination No./ EG-Bauteilprüfnummer	Type*	Nominal pipe size/ Nennweite		EC-type examination No./ EG-Bauteilprüfnummer
	NPS	DN			NPS	DN	
411	3/4" - 6"	20 - 150	07 202 0111Z0008/0/02	532, 534	1/2" - 6"	20 - 150	07 202 0111Z0008/0/15
421	1" - 4"	25 - 100	07 202 0111Z0008/0/03	538	1/2"	10	07 202 0111Z0008/0/16
424	—	25 - 200	07 202 0111Z0008/0/04	539	1/2" - 3/4"	10 - 15	07 202 0111Z0008/0/17
427, 429	1/2" - 6"	15 - 150	07 202 0111Z0008/0/05	543, 544	2" - 4"	50 - 100	07 202 0111Z0008/0/18
431, 433	1/2" - 6"	15 - 150	07 202 0111Z0008/0/06	546	1" - 4"	25 - 100	07 202 0111Z0008/0/19
440	—	20 - 150	07 202 0111Z0008/0/07	483, 484, 485	1", 2"	25, 40	07 202 0111Z0008/0/20
441, 442	3/4" - 16"	20 - 400	07 202 0111Z0008/0/08	437, 438, 439, 481	1/2", 3/4", 1"	—	07 202 0111Z0008/0/21-1
447	1" - 4"	25 - 100	07 202 0111Z0008/0/09	700	—	—	07 202 0111Z0008/0/22
448	1" - 4"	25 - 100	07 202 0111Z0008/0/10	522	2" - 4"	50 - 100	07 202 0111Z0008/0/23
455, 456	1" - 4"	25 - 100	07 202 0111Z0008/0/11	450/460	3/4" - 1"	15 - 20	07 202 0111Z0008/0/24
457, 458	1" - 6"	25 - 150	07 202 0111Z0008/0/12	488	1" - 4"	25 - 100	07 202 0111Z0008/0/25
459	1/2" - 1"	10 - 20	07 202 0111Z0008/0/13	526	1" - 8"	25 - 200	07 202 0111Z0012/2/26
462	3/4" - 1"	15 - 20	07 202 0111Z0008/0/14	486, 586	1" - 3"	25 - 80	

Description of the pressure equipment/Beschreibung des Druckgerätes

* See name plate/siehe Bauteilprüfschild

Kategorie IV/Category IV

Applied category according to article 3 and annex II/Angewandte Kategorie nach Artikel 3 und Anhang II

Module/Modul	Conformity assessment procedures/ Konformitätsbewertungsverfahren	Certificate number/ Bescheinigungsnummer
B	EC type-examination/EG-Baumusterprüfung	See table/siehe Tabelle
D/D1	Production quality assurance/Qualitätssicherung Produktion	07 202 0111Z0008/0/01-2

Conformity assessment procedures according to article 10/Angewandte Konformitätsbewertungsverfahren nach Artikel 10

TÜV CERT - Zertifizierungsstelle für Druckgeräte der TÜV NORD GRUPPE
Identification number 0045, Große Bahnstr. 31, 22525 Hamburg/Germany

Name and address of the notified body (monitoring a.m. conformity assessment procedures)
Name und Anschrift der benannten Stelle (Zertifizierung/Überwachung nach o.g. Modulen)

The signing manufacturer confirms by this declaration that the design, manufacturing and inspection of this pressure equipment meet the requirements of the Pressure Equipment Directive.
Der unterzeichnende Hersteller bescheinigt hiermit, dass Konstruktion, Herstellung und Prüfung dieses Druckgerätes den Anforderungen der Druckgeräterichtlinie entsprechen.

At the moment no harmonized standards available/zurzeit keine harmonisierten Normen verfügbar

Applied harmonized standards/Angewandte harmonisierte Normen

DIN EN ISO 4126-1, AD 2000-Merkblatt A2, AD 2000-Merkblatt A4, TRB 403, TRD 421, TRD 721, DIN 3320, DIN 3840, VdTÜV SV 100
Other applied standards or technical rules/Andere angewandte Normen oder technische Spezifikationen

LESER GmbH & Co. KG
Wendenstr. 133-135, 20537 Hamburg

01.08.2003

Date

Manufacturer stamp

Authorized subscriber

LESER GmbH & Co. KG
Hamburg HRA 82 424
GF · BoD Joachim Klaus (E-Mail: seidel.m@leser.com)
Martin Leser (E-Mail: werner.c@leser.com)

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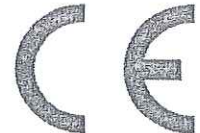
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Steuernr. · Tax No.
22/320/00123

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BLZ 200 300 00, Konto · Account 3203171
SWIFT: VUWB DE HH
IBAN: DE64 2003 0000 0003 2031 71

Declaration of Conformity/Konformitätserklärung according to Pressure Equipment Directive 97/23/EC nach Druckgeräterichtlinie 97/23/EG

LESER GmbH & Co. KG
Wendenstr. 133-135
20537 Hamburg/Germany

Name and address of the manufacturer/Name und Anschrift des Herstellers



Type*	Material/ Werkstoff	Nominal pipe size/ Nenn- weite	Description of pressure equipment/ Benennung des Druckgerätes	Applied category in acc. to article 3 and annex II/ Angewandte Kategorie nach Artikel 3 und Anhang II	Conformity assessment procedures according to article 10/ Angewandte Konformitäts- bewertungsverfahren nach Artikel 10	CE- marking/ CE-Kenn- zeichnung
310	1.0619 GS-C 25 GP 240 GH	DN 25	Change-over Valve	Art. 3 Par. 3 Art. 3 Abs. 3	Not necessary Nicht erforderlich	No Nein
	1.4408 X5 CrNiMo19-11-2	DN 40, DN 50	Wechselventil	Cat. II Kat. II	D1	Yes Ja

Description of the pressure equipment/Beschreibung des Druckgerätes

* See name plate/siehe Bauteilprüfschild

Module/Modul	Conformity assessment procedures/ Konformitätsbewertungsverfahren	Certificate number/ Bescheinigungsnummer
D1	Production quality assurance/Qualitätssicherung Produktion	07 202 0111Z00080/01-2

Certificate number of module D1/Zertifikatsnummer Modul D1

TÜV CERT - Zertifizierungsstelle für Druckgeräte der TÜV NORD GRUPPE
Identification number: 0045, Große Bahnstr. 31, 22525 Hamburg/Germany

Name and address of the notified body (monitoring a.m. conformity assessment procedures)
Name und Anschrift der benannten Stelle (Zertifizierung/Überwachung nach o.g. Modulen)

The signing manufacturer confirms by this declaration that the design, manufacturing and inspection of this pressure equipment meet the requirements of the Pressure Equipment Directive.
Der unterzeichnende Hersteller bescheinigt hiermit, dass Konstruktion, Herstellung und Prüfung dieses Druckgerätes den Anforderungen der Druckgeräterichtlinie entsprechen.

DIN EN 1503-1, DIN EN 10213-1, DIN EN 10213-2, DIN EN 10213-4

Applied harmonized standards/Angewandte harmonisierte Normen

DIN 3840

Other applied standards or technical rules/Andere angewandte Normen oder technische Spezifikationen

01.08.2003

Date

LESER GmbH & Co. KG
Wendenstr. 133-135, 20537 Hamburg

Manufacturer stamp

Authorized subscriber

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Hamburg HRA 82 424
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Martin Leser (E-Mail: werner.c@leser.com)

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22/320/00123

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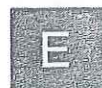
Declaration of Conformity/Konformitätserklärung according to Pressure Equipment Directive 97/23/EC nach Druckgeräterichtlinie 97/23/EG

LESER GmbH & Co. KG

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20537 Hamburg/Germany

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612	0.6025 GG-25/ GJL-250	15-50	Pressure Reducer Druckminderer	Art. 3 Par. 3 Art. 3 Abs. 3	Not necessary Nicht erforderlich	No Nein
		65-100		Kat. I Cat. I	A	Yes Ja
	1.0619 GS-C 25/ GP 240 GH	15-32		Art. 3 Par. 3 Art. 3 Abs. 3	Not necessary Nicht erforderlich	No Nein
		40-100		Kat. I Cat. I	A	Yes Ja

Description of the pressure equipment/Beschreibung des Druckgerätes

* See name plate/siehe Bauteilprüfschild

Module/Modul	Conformity assessment procedures/ Konformitätsbewertungsverfahren	Certificate number/ Bescheinigungsnummer
D1	Production quality assurance/Qualitätssicherung Produktion	07 202 0111Z0008/0/01-2

Certificate number of module D1/Zertifikatsnummer Modul D1

TÜV CERT - Zertifizierungsstelle für Druckgeräte der TÜV NORD GRUPPE

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DIN EN 1503-1, DIN EN 1503-3, DIN EN 10213-1, DIN EN 10213-2

Applied harmonized standards/Angewandte harmonisierte Normen

DIN 3840, DIN 1691, DIN EN 1561

Other applied standards or technical rules/Andere angewandte Normen oder technische Spezifikationen

LESER GmbH & Co. KG
Wendenstr. 133-135, 20537 Hamburg

01.08.2003

Date

Manufacturer stamp

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Anforderungsformular LESER-Betriebsanleitung pdf-Dateien
Request form LESER Operating Instructions pdf files


- | | | | |
|-------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| <input type="checkbox"/> Italienisch
<i>Italian</i> | <input type="checkbox"/> Russisch
<i>Russian</i> | <input type="checkbox"/> Schwedisch
<i>Swedish</i> | <input type="checkbox"/> Niederländisch
<i>Dutch</i> |
| <input type="checkbox"/> Portugiesisch
<i>Portuguese</i> | <input type="checkbox"/> Polnisch
<i>Polish</i> | <input type="checkbox"/> Slowakisch
<i>Slovakian</i> | |


Anforderungsformular LESER-Montageanweisungen pdf-Dateien
Request form LESER Assembly Instructions pdf files

Deutsch <i>German</i>	Englisch <i>English</i>	Italienisch <i>Italian</i>	Montageanweisung <i>Assembly Instructions</i>	LWN-Nr. <i>LWN-No.</i>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Type 437 <i>Type 437</i>	324.12
<input type="checkbox"/>	<input type="checkbox"/>		Type 438 und 481 <i>Type 438 and 481</i>	324.11
<input type="checkbox"/>	<input type="checkbox"/>		Type 483, 484, 485, 488 <i>Type 483, 484, 485, 488</i>	324.06
<input type="checkbox"/>	<input type="checkbox"/>		Hubbegrenzung durch Stellschraube <i>Lift stopper</i>	324.01
<input type="checkbox"/>	<input type="checkbox"/>		O-Ring-Dämpfer <i>O-Ring damper</i>	324.02
<input type="checkbox"/>	<input type="checkbox"/>		Mechanische Anlüftung H4 Gr. 0-1 <i>Mechanical lifting device H4 size 0-1</i>	324.05
<input type="checkbox"/>	<input type="checkbox"/>		Pneumatische Anlüftung H8 Gr. 0-3 <i>Pneumatic lifting device H8 size 0-3</i>	324.07
<input type="checkbox"/>	<input type="checkbox"/>		O-Ring-Dämpfer für Type 485 <i>O-Ring damper for type 485</i>	324.08
<input type="checkbox"/>	<input type="checkbox"/>		Blockierschraube <i>Test gag</i>	324.04
<input type="checkbox"/>	<input type="checkbox"/>		Berstscheiben <i>Bursting discs</i>	324.16
<input type="checkbox"/>	<input type="checkbox"/>		Anzugsdrehmoment <i>Tightening torque</i>	322.04
<input type="checkbox"/>	<input type="checkbox"/>		Anzugsdrehmoment <i>Tightening torque</i>	322.04
<input type="checkbox"/>	<input type="checkbox"/>		Näherungsinitiator <i>Proximity switch</i>	323.02
<input type="checkbox"/>	<input type="checkbox"/>		O-Ring-Teller <i>O-ring discs</i>	323.03
<input type="checkbox"/>	<input type="checkbox"/>		Lösbare Hubglocke <i>Removable lifting aid</i>	326.06



Please send your request to Ms. Gönülacar: goenuelacar.s@leser.com.

	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page:		1 of 3
			Date:		24.04.2005
	VALVESTAR® - v 6.3.1		Project:		Kosice ASU
			Tag-No:		Z 12002
			Commission-No:		
Project: Kosice ASU					
Contractor: Air Liquide GmbH					
1	Valve - General				
2	Article number	4373.2602			
3	Lift characteristic steam/gas	Safety Relief Valve			
4	Lift characteristic liquid	Safety Relief Valve			
5	Bonnet / Lifting Device	Cap H2			
6	Certified coefficient of discharge for steam and gases	$\alpha_{d,DG}$	0,5		
7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,35		
8	Valve - Construction				
9	Minimum discharge area	A_0	78,54	mm ²	
10	Flow diameter	d_0	10	mm	
11	Thread Inlet	G 1/2"			
12	Design Inlet	Male			
13	Thread Outlet	G 1/2"			
14	Design Outlet	Female			
15	Valve - Dimensions				
16	Centre to face dimension	a	30	mm	
17	Centre to face dimension	b	33	mm	
18	Height	H	137	mm	
19	Weight	M	1,2	kg	
20	Medium				
21	Name	Water			
22	Formula	H ₂ O			
23	Density	ρ	998	kg / m ³	
24	Service condition				
25	Set pressure	p	16	bar-g	
26	Constant back pressure	p_{af}	0	bar-g	
27	Built up - back pressure	p_{aa}	0	bar-a	
28	Superimposed back pressure			bar-g	
29	Overpressure	dp	10	%	
30	Environmental pressure	p_U	1,013	bar-a	
31	Temperature	T	20	C	
32	Required massflow	$q_{m,ab}$	930	kg/h	
33	Sizing				
34	Certified mass flow	$q_{m,zu}$	5865,68	kg/h	
35	Certified volume flow (working condition)	$q_{vb,zu}$	5,88	m ³ / h	
36	Maximum mass flow	$q_{m,max}$	6517,42	kg/h	
37	Maximum volume flow (working condition)	$q_{vb,max}$	6,53	m ³ / h	
38	Capacity exceed		530,7	%	
39	Required effective discharge area	$A_{0,req}$	12,45	mm ²	
40	Required discharge diameter	$d_{0,Req}$	3,982	mm	
41	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	18,584	N	

		Sizing acc. to AD 2000:A2 / TRD 421 for liquids VALVESTAR® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 12002
				Commision-No:	
42	Valve - Partlist				
43	Pos	Denomination	Q	DIN	ASME
44	1	Inlet body	1	1.4104	430 F
45	2	Outlet body	1	1.4104	430 F
46	7	Disc incl. detachable lifting aid	1	1.4122	MT440
47	12	Spindle	1	1.4021	420
48	16	Spring plate	2	1.0718	Steel
49	18	Adjusting screw	1	1.4104	430 F
50	19	Lock nut	1	1.0718	Steel
51	47	packing gland H4	1	1.4404	316L
52	54	Spring	1	1.4310	Low temperature alloy steel
53	57	Pin	1	1.4310	Low temperature alloy steel
54	61	Ball washer	1	1.3541/1.4401	Stainless steel
55	89	grafite ring	1	Reingraphit	Pure graphite
	Name:	My PC	Hakon Røbsamen	Hakon Røbsamen	Hakon Røbsamen
	Date:	24.04.2005	22.04.2005	22.04.2005	22.04.2005
	Rev.No:	1	2	3	4

LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

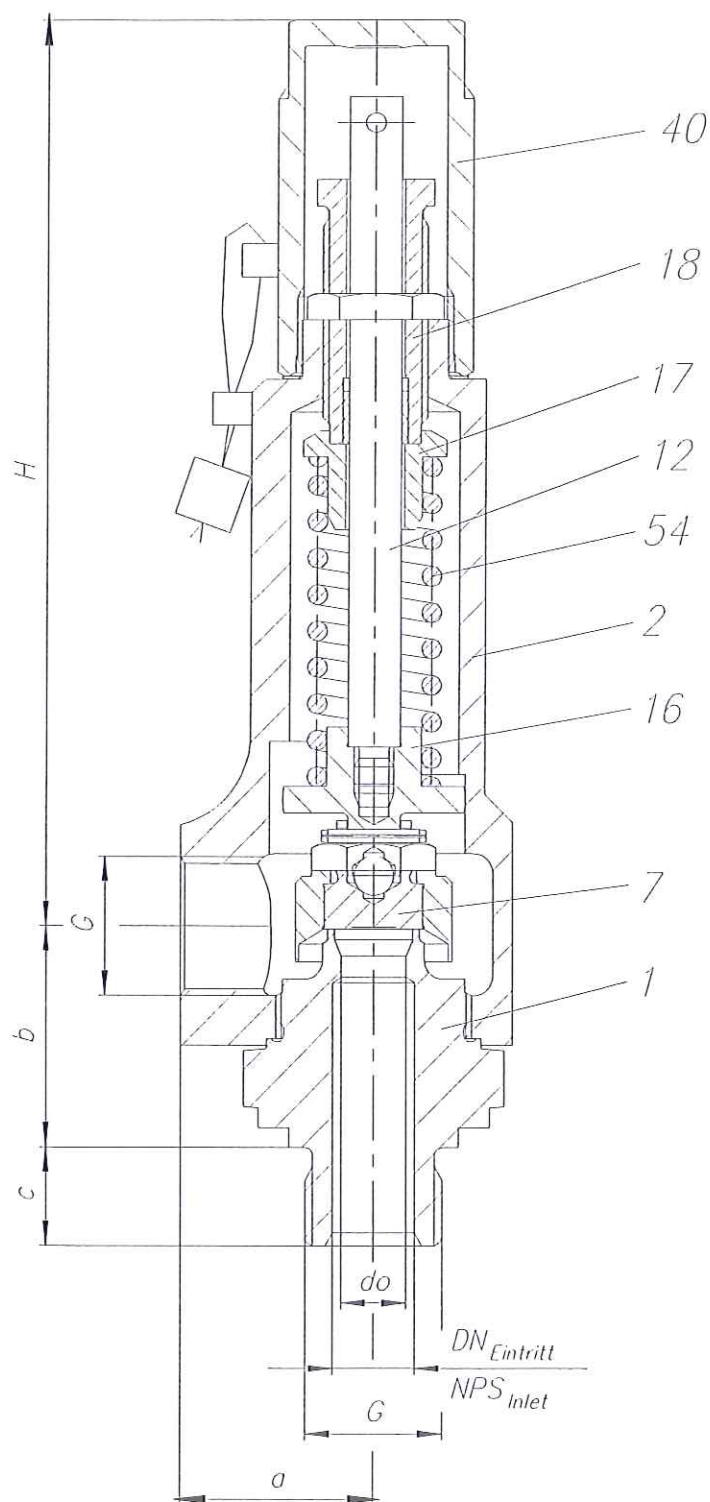
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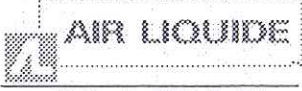
Date: 24.04.2005

Project: Kosice ASU

Tag-No: Z 12002

Commission-No:



 Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 9 / 154 Date: 28.12.2004 Rev: 0 Vendor: Spec-ID: SP198
			Procurement: IA.Z
ITEM		Unit	
TAG Number			Z12002
Service			chilled water pipe
Fluid name			water
Location/ line No			#002
Gauge pressure			
normal operation		bar g	approx.3
outlet		bar g	0
design		bar g	
set pressure gauge		bar g	16
Operating temperature		°C	approx. 20
Design temperature		°C	
Temperature at no flow		°C	ambient
Required capacity		Nm³/h	
Required capacity		kg/h	930
Fluid density		kg/m³	1000
Phase			liquid
Sizing basis			thermal expansion
Valve type			
Manufacturer			
Material			body/spring disc/seat
Notes: <u>Capacity Sizing:</u> same capacity as Z12071			
4			5
2			3
0	28.12.2004	JJ	1
rev	date	name	checked
rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 12002	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4373.2602		
3	Lift characteristic steam/gas	Safety Relief Valve		
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7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,35	
8	Valve - Construction			
9	Minimum discharge area	A_0	78,54	mm2
10	Flow diameter	d_0	10	mm
11	Thread Inlet		G 1/2"	
12	Design Inlet		Male	
13	Thread Outlet		G 1/2"	
14	Design Outlet		Female	
15	Valve - Dimensions			
16	Centre to face dimension	a	30	mm
17	Centre to face dimension	b	33	mm
18	Height	H	137	mm
19	Weight	M	1,2	kg
20	Medium			
21	Name	Water		
22	Formula	H2O		
23	Density	ρ	998	kg / m3
24	Service condition			
25	Set pressure	p	16	bar-g
26	Constant back pressure	p_{af}	0	bar-g
27	Built up - back pressure	p_{aa}	0	bar-a
28	Superimposed back pressure			bar-g
29	Overpressure	dp	10	%
30	Environmental pressure	p_u	1,013	bar-a
31	Temperature	T	20	C
32	Required massflow	$q_{m,ab}$	930	kg/h
33	Sizing			
34	Certified mass flow	$q_{m,zu}$	5865,68	kg/h
35	Certified volume flow (working condition)	$q_{vb,zu}$	5,88	m3 / h
36	Maximum mass flow	$q_{m,max}$	6517,42	kg/h
37	Maximum volume flow (working condition)	$q_{vb,max}$	6,53	m3 / h
38	Capacity exceed		530,7	%
39	Required effective discharge area	$A_{0,req}$	12,45	mm2
40	Required discharge diameter	$d_{0,Req}$	3,982	mm
41	Reaction force (calculated acc. to W. Gosslau and K. Weyl)	F_R	18,584	N

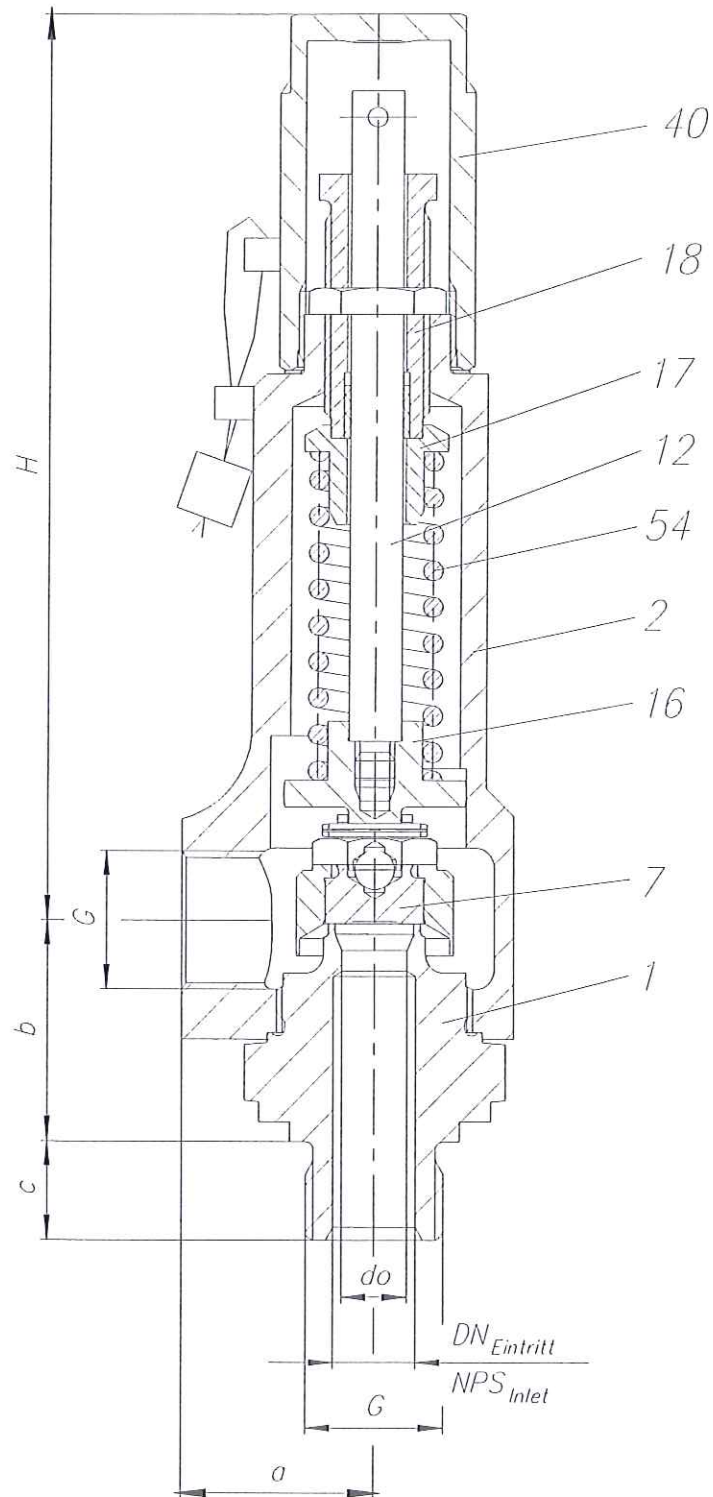
LESER		Sizing acc. to AD 2000:A2 / TRD 421 for liquids VALVESTAR ® - v 6.3.1		Page:	2 of 3	
				Date:	24.04.2005	
				Project:	Kosice ASU	
				Tag-No:	Z 12002	
				Commision-No:		
42	Valve - Partlist					
43	Pos	Denomination	Q	DIN	ASME	
44	1	Inlet body	1	1.4104	430 F	
45	2	Outlet body	1	1.4104	430 F	
46	7	Disc incl. detachable lifting aid	1	1.4122	MT440	
47	12	Spindle	1	1.4021	420	
48	16	Spring plate	2	1.0718	Steel	
49	18	Adjusting screw	1	1.4104	430 F	
50	19	Lock nut	1	1.0718	Steel	
51	47	packing gland H4	1	1.4404	316L	
52	54	Spring	1	1.4310	Low temperature alloy steel	
53	57	Pin	1	1.4310	Low temperature alloy steel	
54	61	Ball washer	1	1.3541/1.4401	Stainless steel	
55	89	grafite ring	1	Reingraphit	Pure graphite	
Name:		My PC	Hakon Røbsamen	Hakon Røbsamen	Hakon Røbsamen	
Date:		24.04.2005	22.04.2005	22.04.2005	22.04.2005	
Rev.No:		1	2	3	4	

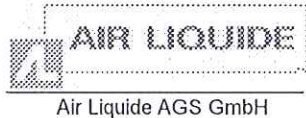
LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 12002
Commision-No:	





Item: Safety valve
Plant: A690 / L110
Location: Kosice
Project: K70101 ASU No. 9 Kosice
By: TV

Page: 9 / 154
Date: 28.12.2004
Rev: 0
Vendor:
Spec-ID: SP198

Procurement: IA.Z


ITEM	Unit	
TAG Number		Z12002
Service		chilled water pipe
Fluid name		water
Location/ line No		#002
Gauge pressure		
normal operation	bar g	approx.3
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	16
Operating temperature	°C	approx. 20
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity	kg/h	930
Fluid density	kg/m³	1000
Phase		liquid
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material		
body/spring		
disc/seat		

Notes:

Capacity Sizing: same capacity as Z12071

4				5			
2				3			
0	28.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 12071	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4373.2602		
3	Lift characteristic steam/gas	Safety Relief Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Cap H2		
6	Certified coefficient of discharge for steam and gases	$\alpha_{d,PG}$	0,5	
7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,35	
8	Valve - Construction			
9	Minimum discharge area	A_0	78,54	mm ²
10	Flow diameter	d_0	10	mm
11	Thread Inlet		G 1/2"	
12	Design Inlet		Male	
13	Thread Outlet		G 1/2"	
14	Design Outlet		Female	
15	Valve - Dimensions			
16	Centre to face dimension	a	30	mm
17	Centre to face dimension	b	33	mm
18	Height	H	137	mm
19	Weight	M	1,2	kg
20	Medium			
21	Name	Water		
22	Formula	H2O		
23	Density	ρ	998	kg / m ³
24	Service condition			
25	Set pressure	p	8	bar-g
26	Constant back pressure	p_{ef}	0	bar-g
27	Built up - back pressure	p_{ae}	0	bar-a
28	Superimposed back pressure			bar-g
29	Overpressure	dp	10	%
30	Environmental pressure	p_u	1,013	bar-a
31	Temperature	T	30	C
32	Required massflow	$q_{m,ab}$	930	kg/h
33	Sizing			
34	Certified mass flow	$q_{m,zu}$	4147,66	kg/h
35	Certified volume flow (working condition)	$q_{vb,zu}$	4,16	m ³ / h
36	Maximum mass flow	$q_{m,max}$	4608,51	kg/h
37	Maximum volume flow (working condition)	$q_{vb,max}$	4,62	m ³ / h
38	Capacity exceed		346	%
39	Required effective discharge area	$A_{0,req}$	17,61	mm ²
40	Required discharge diameter	$d_{0,Req}$	4,735	mm
41	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	9,292	N

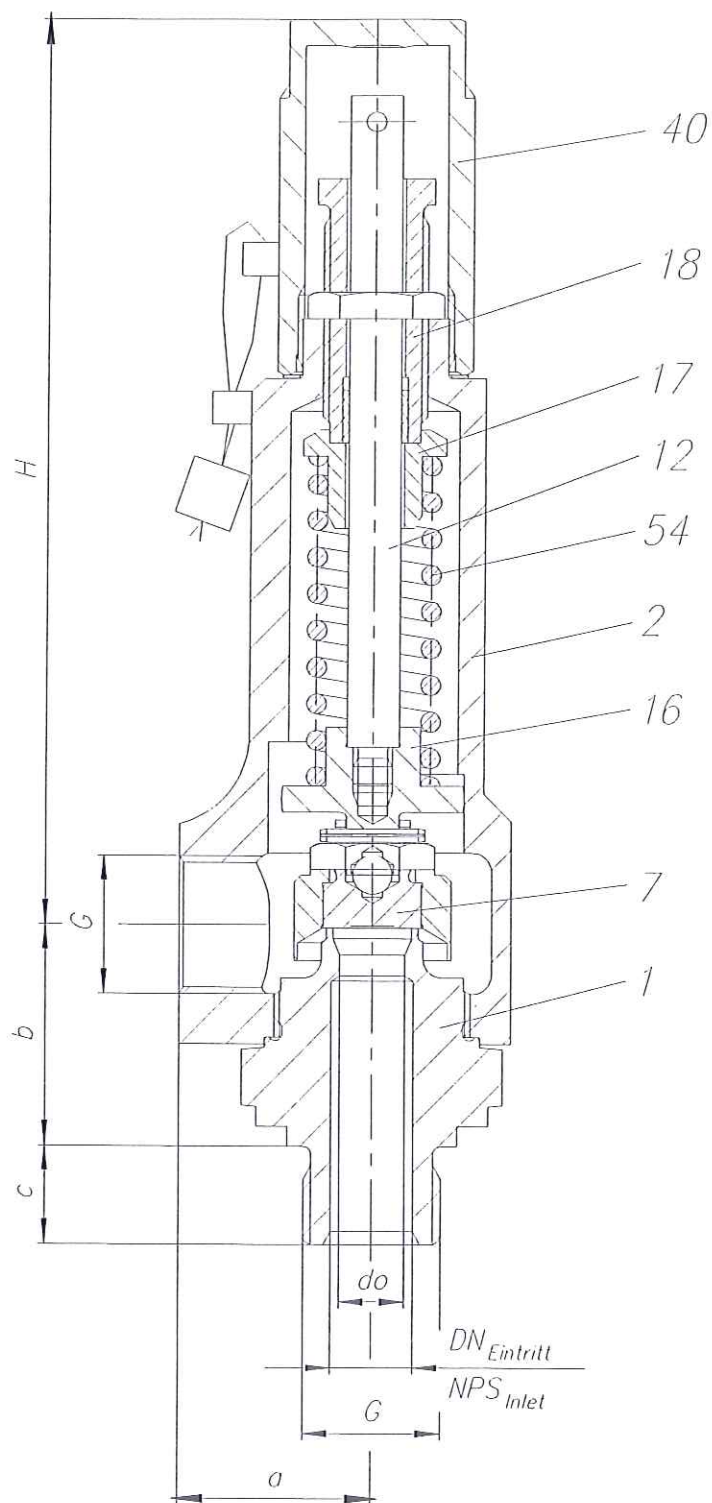
LESER		Sizing acc. to AD 2000:A2 / TRD 421 for liquids VALVESTAR ® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 12071
				Commision-No:	
42	Valve - Partlist				
43	Pos	Denomination	Q	DIN	ASME
44	1	Inlet body	1	1.4104	430 F
45	2	Outlet body	1	1.4104	430 F
46	7	Disc incl. detachable lifting aid	1	1.4122	MT440
47	12	Spindle	1	1.4021	420
48	16	Spring plate	2	1.0718	Steel
49	18	Adjusting screw	1	1.4104	430 F
50	19	Lock nut	1	1.0718	Steel
51	54	Spring	1	1.4310	Low temperature alloy steel
52	57	Pin	1	1.4310	Low temperature alloy steel
53	61	Ball washer	1	1.3541/1.4401	Stainless steel
Name:		My PC	Hakon RØbsamen	Hakon RØbsamen	
Date:		24.04.2005	22.04.2005	22.04.2005	
Rev.No:		1	2	3	

LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 12071
Commission-No:	



 Air Liquide AGS GmbH		Item:	Safety valve	Page:	10 / 154	
		Plant:	A690 / L110	Date:	28.12.2004	
		Location	Kosice	Rev:	0	
		Project:	K70101 ASU No. 9 Kosice	Vendor:		
		By	TV	Spec-ID:	SP198	
				Procurement:	IA.Z	

ITEM	Unit	
TAG Number		Z12071
Service		cooling water pipe
Fluid name		water
Location/ line No		#002
Gauge pressure		
normal operation	bar g	approx. 3
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	8
Operating temperature	°C	approx. 30
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity	kg/h	930
Fluid density	kg/m³	1000
Phase		liquid
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material	body/spring disc/seat	


Notes:

Capacity Sizing: 1 l/h per kW design duty (see DIN 4751-2)

Duty:	930 kW
Capacity:	930 l/h
Capacity:	930 kg/h

4				5			
2				3			
0	28.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page:	1 of 3
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 12071
Commision-No:				
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4373.2602		
3	Lift characteristic steam/gas	Safety Relief Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Cap H2		
6	Certified coefficient of discharge for steam and gases	$\alpha_{d,PG}$	0,5	
7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,35	
8	Valve - Construction			
9	Minimum discharge area	A_0	78,54	mm ²
10	Flow diameter	d_0	10	mm
11	Thread Inlet		G 1/2"	
12	Design Inlet		Male	
13	Thread Outlet		G 1/2"	
14	Design Outlet		Female	
15	Valve - Dimensions			
16	Centre to face dimension	a	30	mm
17	Centre to face dimension	b	33	mm
18	Height	H	137	mm
19	Weight	M	1,2	kg
20	Medium			
21	Name	Water		
22	Formula	H ₂ O		
23	Density	ρ	998	kg / m ³
24	Service condition			
25	Set pressure	p	8	bar-g
26	Constant back pressure	p_{af}	0	bar-g
27	Built up - back pressure	p_{aa}	0	bar-a
28	Superimposed back pressure			bar-g
29	Overpressure	dp	10	%
30	Environmental pressure	p_u	1,013	bar-a
31	Temperature	T	30	C
32	Required massflow	$q_{m,ab}$	930	kg/h
33	Sizing			
34	Certified mass flow	$q_{m,zu}$	4147,66	kg/h
35	Certified volume flow (working condition)	$q_{vb,zu}$	4,16	m ³ / h
36	Maximum mass flow	$q_{m,max}$	4608,51	kg/h
37	Maximum volume flow (working condition)	$q_{vb,max}$	4,62	m ³ / h
38	Capacity exceed		346	%
39	Required effective discharge area	$A_{0,req}$	17,61	mm ²
40	Required discharge diameter	$d_{0,Req}$	4,735	mm
41	Reaction force (calculated acc. to W. Gosslau and K. Weyl)	F_R	9,292	N

LESER		Sizing acc. to AD 2000:A2 / TRD 421 for liquids VALVESTAR ® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 12071
				Commision-No:	
42	Valve - Partlist				
43	Pos	Denomination	Q	DIN	ASME
44	1	Inlet body	1	1.4104	430 F
45	2	Outlet body	1	1.4104	430 F
46	7	Disc incl. detachable lifting aid	1	1.4122	MT440
47	12	Spindle	1	1.4021	420
48	16	Spring plate	2	1.0718	Steel
49	18	Adjusting screw	1	1.4104	430 F
50	19	Lock nut	1	1.0718	Steel
51	54	Spring	1	1.4310	Low temperature alloy steel
52	57	Pin	1	1.4310	Low temperature alloy steel
53	61	Ball washer	1	1.3541/1.4401	Stainless steel
	Name:	My PC	Hakon R�bsamen	Hakon R�bsamen	
	Date:	24.04.2005	22.04.2005	22.04.2005	
	Rev.No:	1	2	3	

LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

Page:

3 of 3

Date:

24.04.2005

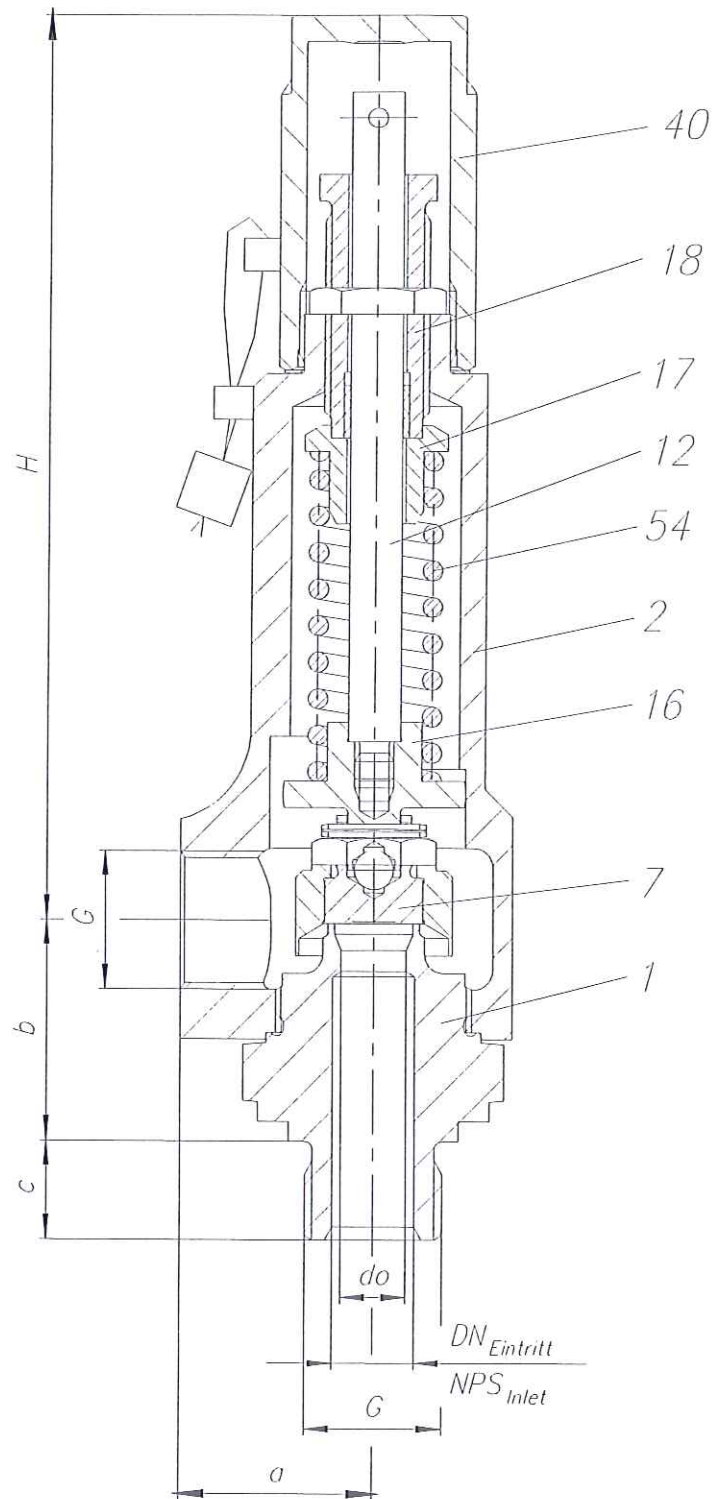
Project:


Kosice ASU

Tag-No:


Z 12071

Commission-No:



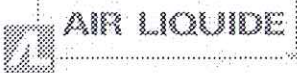
 AIR LIQUIDE Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 10 / 154 Date: 28.12.2004 Rev: 0 Vendor: Spec-ID: SP198
		Procurement: IA.Z	
ITEM TAG Number Service Fluid name Location/ line No Gauge pressure normal operation outlet design set pressure gauge Operating temperature Design temperature Temperature at no flow Required capacity Required capacity Fluid density Phase Sizing basis Valve type Manufacturer Material body/spring disc/seat	Unit	Z12071 cooling water pipe water #002 approx. 3 0 bar g bar g bar g bar g 8 °C approx. 30 °C °C ambient Nm³/h kg/h 930 kg/m³ 1000 liquid thermal expansion	
Notes: <div style="margin-left: 40px;"> <u>Capacity Sizing:</u> 1 l/h per kW design duty (see DIN 4751-2) </div> <div style="margin-left: 100px;"> Duty: 930 kW Capacity: 930 l/h Capacity: 930 kg/h </div>			
4			5
2			3
0	28.12.2004	JJ	TV
rev	date	name	checked

File:

	Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1		Page:	1 of 2	
			Date:	24.04.2005	
			Project:	Kosice ASU	
			Tag-No:	Z 16007	
			Commission-No:		
Project: Kosice ASU					
Contractor: Air Liquide GmbH					
1	Valve - General				
2	Article number	4412.4614			
3	Lift characteristic steam/gas	Full Lift Safety Valve			
4	Lift characteristic liquid	Safety Relief Valve			
5	Bonnet / Lifting Device	Lifting device H4 (gastight)			
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,7		
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,45		
8	Valve - Construction				
9	Minimum discharge area	A_0	21382,46	mm ²	
10	Flow diameter	d_0	165	mm	
11	Nominal diameter inlet	DN/NPS	200		
12	Pressure rating inlet	PN/PR	PN 25		
13	Contact facing inlet	Form C			
14	Nominal diameter outlet	DN/NPS	300		
15	Pressure rating outlet	PN/PR	PN 16		
16	Contact facing outlet	Form C			
17	Valve - Dimensions				
18	Centre to face dimension	a		mm	
19	Centre to face dimension	b		mm	
20	Height	H		mm	
21	Weight	M	258	kg	
22	Medium				
23	Name	Air			
24	Formula				
25	Molecular weight	M	29		
26	Ratio of specific heats	k	1,4		
27	Compressibility factor	Z	1		
28	Service condition				
29	Set pressure	p	6	bar-g	
30	Constant back pressure	p_{af}	0	bar-g	
31	Built up - back pressure	p_{ae}	0	bar-a	
32	Superimposed back pressure		0	bar-g	
33	Overpressure	dp	10	%	
34	Environmental pressure	p_u	1,013	bar-a	
35	Temperature	T	20	C	
36	Required massflow	$q_{m,ab}$	90440	kg/h	
37	Volume flow to be discharged (working condition)	$q_{vb,eb}$	9984,41	m ³ / h	
38	Volume flow to be discharged (standard condition)	$q_{vn,eb}$	69916,55	m ³ / h	
39	Sizing				
40	Certified mass flow	$q_{m,zu}$	96889,2	kg/h	
41	Certified volume flow (working condition)	$q_{vb,zu}$	10696,39	m ³ / h	
42	Certified volume flow (standard condition)	$q_{vn,zu}$	74902,25	m ³ / h	
43	Maximum mass flow	$q_{m,max}$	107654,67	kg/h	
44	Maximum volume flow (working condition)	$q_{vb,max}$	11884,88	m ³ / h	
45	Maximum volume flow (standard condition)	$q_{vn,max}$	83224,72	m ³ / h	
46	Capacity exceed		7,1	%	
47	Required effective discharge area	$A_{0,Req}$	19959,19	mm ²	
48	Required discharge diameter	$d_{0,Req}$	159,414	mm	
49	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	134,9	dB	
50	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	10257,714	N	

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR ® - v 6.3.1	Page:	2 of 2
		Date:	24.04.2005
		Project:	Kosice ASU
		Tag-No:	Z 16007
		Commision-No:	
51	Valve - Partlist		

	Name:	My PC	Hakon Røbsamen	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005	22.04.2005		
	Rev.No:	1	2	3		

 Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 12 / 154 Date: 28.12.2004 Rev: 0 Vendor: Spec-ID: SP198
		Procurement: IA.Z	

ITEM	Unit	
TAG Number		Z16007
Service		Booster air compressor (upstream)
Fluid name		air
Location/ line No		#006
Gauge pressure		
normal operation	bar g	4,6
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	6
Operating temperature	°C	25
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	awaiting information
Required capacity (1)	kg/h	
Fluid density	kg/m³	8,2
Phase		vapour
Sizing basis		pressure equalisation after BAC shutdown
Valve type		<div style="border: 2px solid black; padding: 10px; font-size: 2em; font-weight: bold;">preliminary</div>
Manufacturer		
Material	body/spring disc/seat	

Notes:

 capacity to be specified by BAC vendor

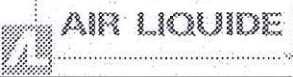
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2				3			
0	28.12.2004	JJ		1			
rev	date	name	checked	rev	date	name	checked

File:


LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 2	
	VALVESTAR ® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 16007	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4412.4614		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,7	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,45	
8	Valve - Construction			
9	Minimum discharge area	A ₀	21382,46	mm2
10	Flow diameter	d ₀	165	mm
11	Nominal diameter inlet	DN/NPS	200	
12	Pressure rating inlet	PN/PR	PN 25	
13	Contact facing inlet		Form C	
14	Nominal diameter outlet	DN/NPS	300	
15	Pressure rating outlet	PN/PR	PN 16	
16	Contact facing outlet		Form C	
17	Valve - Dimensions			
18	Centre to face dimension	a		mm
19	Centre to face dimension	b		mm
20	Height	H		mm
21	Weight	M	258	kg
22	Medium			
23	Name	Air		
24	Formula			
25	Molecular weight	M	29	
26	Ratio of specific heats	k	1,4	
27	Compressibility factor	Z	1	
28	Service condition			
29	Set pressure	p	6	bar-g
30	Constant back pressure	p _{af}	0	bar-g
31	Built up - back pressure	p _{aa}	0	bar-a
32	Superimposed back pressure		0	bar-g
33	Overpressure	dp	10	%
34	Environmental pressure	p _u	1,013	bar-a
35	Temperature	T	20	C
36	Required massflow	q _{m,ab}	90440	kg/h
37	Volume flow to be discharged (working condition)	q _{vb,ab}	9984,41	m3 / h
38	Volume flow to be discharged (standard condition)	q _{vn,ab}	69916,55	m3 / h
39	Sizing			
40	Certified mass flow	q _{m,zu}	96889,2	kg/h
41	Certified volume flow (working condition)	q _{vb,zu}	10696,39	m3 / h
42	Certified volume flow (standard condition)	q _{vn,zu}	74902,25	m3 / h
43	Maximum mass flow	q _{m,max}	107654,67	kg/h
44	Maximum volume flow (working condition)	q _{vb,max}	11884,88	m3 / h
45	Maximum volume flow (standard condition)	q _{vn,max}	83224,72	m3 / h
46	Capacity exceed		7,1	%
47	Required effective discharge area	A _{0,Req}	19959,19	mm2
48	Required discharge diameter	d _{0,Req}	159,414	mm
49	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	134,9	dB
50	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F _R	10257,714	N

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1	Page:	2 of 2
		Date:	24.04.2005
		Project:	Kosice ASU
		Tag-No:	Z 16007
		Commission-No:	
51	Valve - Partlist		

	Name:	My PC	Hakon Røbsamen	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005	22.04.2005		
	Rev.No:	1	2	3		

 Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 12 / 154 Date: 28.12.2004 Rev: 0 Vendor: Spec-ID: SP198
		Procurement: IA.Z	
ITEM		Unit	
TAG Number Service Fluid name Location/ line No Gauge pressure normal operation outlet design set pressure gauge Operating temperature Design temperature Temperature at no flow Required capacity Required capacity (1) Fluid density Phase Sizing basis Valve type Manufacturer Material body/spring disc/seat		bar g bar g bar g bar g °C °C °C Nm³/h kg/h kg/m³	Z16007 Booster air compressor (upstream) air #006 4,6 0 6 25 ambient awaiting information 8,2 vapour pressure equalisation after BAC shutdown <div style="border: 2px solid black; padding: 10px; text-align: center; font-size: 2em; font-weight: bold;">preliminary</div>
Notes: capacity to be specified by BAC vendor			
4		TV	5
2			3
0	28.12.2004	JJ	1
rev	date	name	checked
rev	date	name	checked

File:

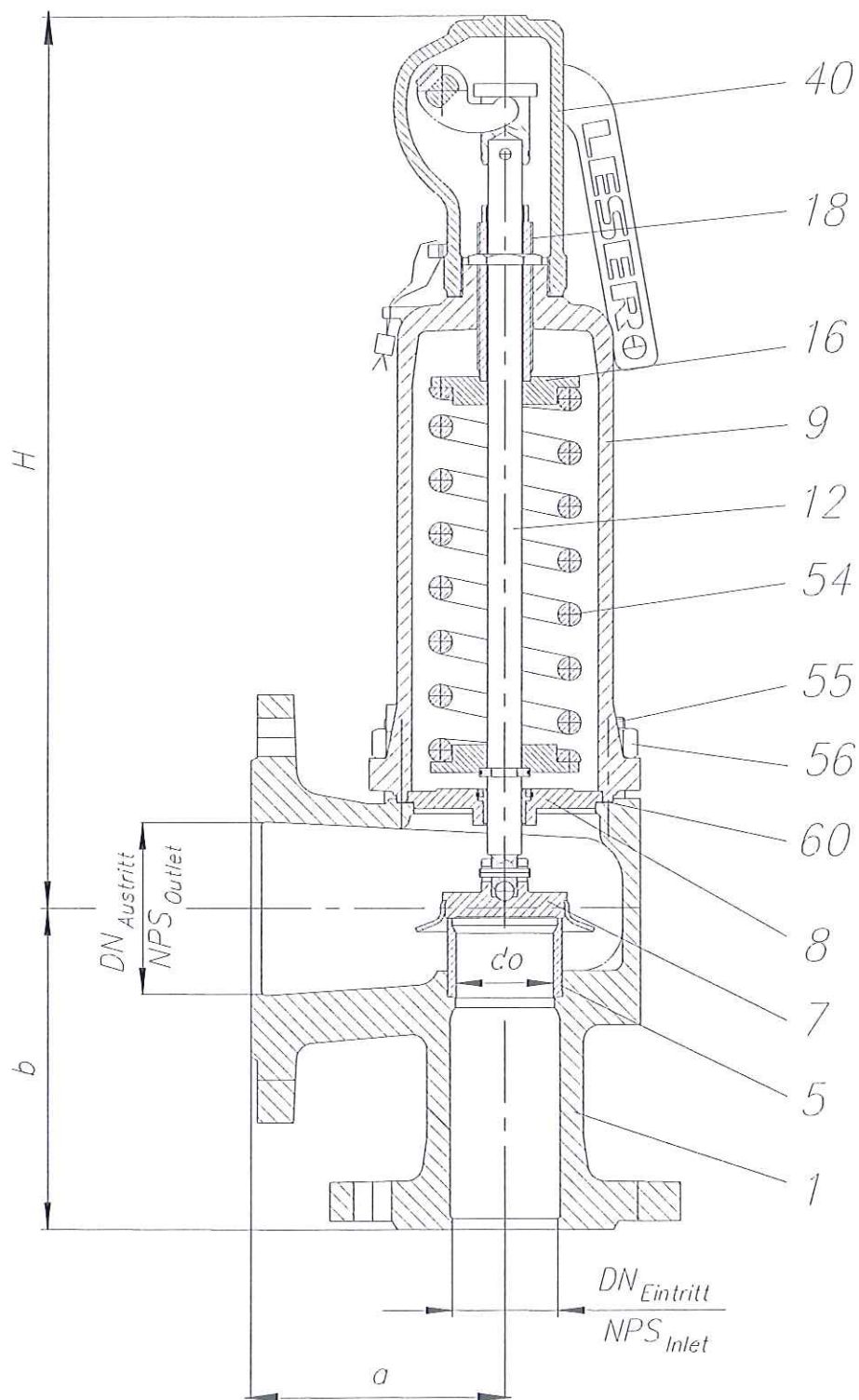
	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 20026
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4414.4654		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gaslight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,7	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,45	
8	Valve - Construction			
9	Minimum discharge area	A_0	660,52	mm2
10	Flow diameter	d_0	29	mm
11	Nominal diameter inlet	DN/NPS	32	
12	Pressure rating inlet	PN/PR	PN 40	
13	Contact facing inlet		Form C	
14	Nominal diameter outlet	DN/NPS	50	
15	Pressure rating outlet	PN/PR	PN 16	
16	Contact facing outlet		Form C	
17	Valve - Dimensions			
18	Centre to face dimension	a	110	mm
19	Centre to face dimension	b	115	mm
20	Height	H	322	mm
21	Weight	M	12	kg
22	Medium			
23	Name	Nitrogen		
24	Formula	N2		
25	Molecular weight	M	28	
26	Ratio of specific heats	k	1,4	
27	Compressibility factor	Z	1	
28	Service condition			
29	Set pressure	p	30	bar-g
30	Constant back pressure	p_{af}	0	bar-g
31	Built up - back pressure	p_{aa}	0	bar-a
32	Superimposed back pressure		0	bar-g
33	Overpressure	dp	10	%
34	Environmental pressure	p_u	1,013	bar-a
35	Temperature	T	-149	C
36	Required massflow	$q_{m,ab}$	16717	kg/h
37	Volume flow to be discharged (working condition)	$q_{vb,ab}$	181,19	m3 / h
38	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	13384,98	m3 / h
39	Sizing			
40	Certified mass flow	$q_{m,zu}$	20190,37	kg/h
41	Certified volume flow (working condition)	$q_{vb,zu}$	218,83	m3 / h
42	Certified volume flow (standard condition)	$q_{vn,zu}$	16166,04	m3 / h
43	Maximum mass flow	$q_{m,max}$	22433,74	kg/h
44	Maximum volume flow (working condition)	$q_{vb,max}$	243,14	m3 / h
45	Maximum volume flow (standard condition)	$q_{vn,max}$	17962,27	m3 / h
46	Capacity exceed		20,8	%
47	Required effective discharge area	$A_{0,Req}$	546,89	mm2
48	Required discharge diameter	$d_{0,Req}$	26,388	mm
49	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	104,7	dB
50	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	2142,446	N

		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR ® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 20026
					Commision-No:	
51	Valve - Partlist					
52	Pos	Denomination	Q	DIN	ASME	
53	1	Body	1	1.4408	SA-351/CF8M	
54	5	Seat	1	1.4404	316L	
55	7	Disc	1	1.4404	316L	
56	8	Guide	1	1.4404	316L	
57	9	Bonnet	1	1.4408	SA-351/CF8M	
58	12	Spindle	1	1.4404	316L	
59	14	Split ring	2	1.4404	316L	
60	16	Spring plate	2	1.4404	316L	
61	18	Adjusting screw	1	1.4404	316L	
62	19	Lock nut	1	1.4404	316L	
63	41	Lever cover H4	1	1.4408	SA-351/CF8M	
64	43	Lever H4	1	1.4301	304	
65	44	Lifting fork	1	1.4571	316Ti	
66	45	Shaft	1	1.4404	316L	
67	46	Spindle cap	1	1.4404	316L	
68	47	packing gland H4	1	1.4404	316L	
69	54	Spring	1	1.4310	Low temperature alloy steel	
70	54	Spring	1	1.4310	Low temperature alloy steel	
71	55	Bolt	4	1.4401	B8M	
72	56	Nut	4	1.4401	B8M	
73	57	Pin	1	1.4310	Low temperature alloy steel	
74	59	Securing ring	1	1.4571	316Ti	
75	60	Gasket	1	Reingraphit + 1.4401	Pure graphite/ss	
76	61	Ball washer	1	1.3541/1.4401	Stainless steel	
77	61	Ball washer	1	1.3541/1.4401	Stainless steel	
78	74	Pin	1	1.4401	B8M	
79	75	Spacer	1	1.4571	316Ti	
80	81	Washer	1	1.4401	B8M	
81	82	Nut	1	A2 / Poly	Stainl. steel/polyamid	
82	85	Lead seal	1	Kunststoff	Plastic	
83	86	Seal wire	1	1.4541	321	
84	89	grafite ring	1	Reingraphit	Pure graphite	
85	91	Securing ring	1	1.4571	316Ti	
86	98	sealing plug	1	1.4435	316L	
	Name:	My PC	Hakon Røbsamen	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005	22.04.2005		
	Rev.No:	1	2	3		

LESERSizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 20026
Commission-No:	



 Air Liquide AGS GmbH		Item:	Safety valve	Page:	17 / 154
		Plant:	A690 / L110	Date:	29.12.2004
		Location:	Kosice	Rev:	0
		Project:	K70101 ASU No. 9 Kosice	Vendor:	
		By:	TV	Spec-ID:	SP198

				Procurement:	IA.Z
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ITEM	Unit		
TAG Number		Z20026	
Service		Main heat exchanger	
Fluid name		Nitrogen	
Location/ line No		#009	
Gauge pressure		case 1:	case 2:
normal operation	bar g	21	21
outlet	bar g	0	0
design	bar g		
set pressure gauge	bar g	30	30
Operating temperature	°C	20	-149
Design temperature	°C		
Temperature at no flow	°C	ambient	ambient
Required capacity	Nm³/h		
Required capacity	kg/h	3236	16717
Fluid density	kg/m³	36	186
Phase		vapour	vapour
Sizing basis		thermal expansion in main heat exchanger	
Valve type			
Manufacturer			
Material	body/spring disc/seat		

Notes:

Maximum transferred heat in Main Exchanger is 462 kW (mode: MinGOX)

$$\Delta \dot{m} = \frac{\dot{Q}}{\Delta h_v} \cdot \rho \cdot \left(\frac{1}{\rho''} - \frac{1}{\rho'} \right)$$

ρ - density of discharged fluid 186 kg/m3

ρ' - liquid saturation density 446 kg/m3

ρ'' - vapour saturation density 186 kg/m3

Δh_v - enthalpy of evaporation 1624 kJ/kmol

16717 kg/h during vaporisation phase

The same volume flow is required if the gas is released at ambient temperature.

The pump capacity is less than the above scenarios.

4				5			
2				3			
0	29.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 20027
		Commision-No:		
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	5264.5884		
3	Lift characteristic steam/gas	Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,8	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,58	
8	Valve - Construction			
9	Minimum discharge area	A_0	2855,78	mm2
10	Flow diameter	d_0	60,3	mm
11	Nominal diameter inlet	DN/NPS	100	
12	Pressure rating inlet	PN/PR	40	
13	Contact facing inlet	C		
14	Nominal diameter outlet	DN/NPS	150	
15	Pressure rating outlet	PN/PR	16	
16	Contact facing outlet	C		
17	Valve - Dimensions			
18	Centre to face dimension	a	184	mm
19	Centre to face dimension	b	178	mm
20	Height	H	674	mm
21	Weight	M		kg
22	Medium			
23	Name	Oxygen		
24	Formula	O2		
25	Molecular weight	M	32	
26	Ratio of specific heats	k	1,4	
27	Compressibility factor	Z	1	
28	Service condition			
29	Set pressure	p	40	bar-g
30	Constant back pressure	p_{af}	0	bar-g
31	Built up - back pressure	p_{ae}	0	bar-a
32	Superimposed back pressure		0	bar-g
33	Overpressure	dp	10	%
34	Environmental pressure	p_U	1,013	bar-a
35	Temperature	T	-124	C
36	Required massflow	$q_{m,ab}$	113149	kg/h
37	Volume flow to be discharged (working condition)	$q_{vb,ab}$	974,12	m3 / h
38	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	79271,7	m3 / h
39	Sizing			
40	Certified mass flow	$q_{m,zu}$	128773,21	kg/h
41	Certified volume flow (working condition)	$q_{vb,zu}$	1108,63	m3 / h
42	Certified volume flow (standard condition)	$q_{vn,zu}$	90217,96	m3 / h
43	Maximum mass flow	$q_{m,max}$	143081,34	kg/h
44	Maximum volume flow (working condition)	$q_{vb,max}$	1231,81	m3 / h
45	Maximum volume flow (standard condition)	$q_{vn,max}$	100242,18	m3 / h
46	Capacity exceed		13,8	%
47	Required effective discharge area	$A_{0,Req}$	2509,28	mm2
48	Required discharge diameter	$d_{0,Req}$	56,524	mm
49	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	122,3	dB
50	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	13526,671	N

		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 20027
					Commision-No:	
51	Valve - Partlist					
52	Pos	Denomination	Q	DIN	ASME	
53	1	Body	1	1.4408	SA-351/CF8M	
54	5	Full nozzle	1	2.4360	2.4360	
55	6		1	1.4404	316L	
56	7	Disc		2.4360	2.4360	
57	8	Guide	1	1.4404	316L	
58	9	Bonnet	1	1.4571	316Ti	
59	12	Spindle	1	1.4021	420	
60	14	Split ring	2	1.4404	316L	
61	16	Spring plate	1	1.4404	316L	
62	18	Adjusting screw	1	1.4404	316L	
63	19	Lock nut	1	1.4404	316L	
64	41	Lever cover H4	1	1.4408	SA-351/CF8M	
65	43	Lever H4	1	1.4301	304	
66	44	Lifting fork	1	1.4581	SA-351/CF10M	
67	45	Shaft	1	1.4404	316L	
68	46	Spindle cap	1	1.4404	316L	
69	47	packing gland H4	1	1.4404	316L	
70	47	packing gland H4	1	1.4404	316L	
71	54	Spring	1	1.4104/CR [K]	430 F/CR [K]	
72	55	Bolt	8	1.4401	B8M	
73	56	Nut	8	1.0501	-	
74	60	Gasket	1	Reingraphit + 1.4401	Pure graphite/ss	
75	69	thrust needle bearing	1	1.4404	316L	
76	73		1	1.4404	316L	
77	74	Pin	1	1.4401	B8M	
78	75	Spacer	1	1.4301	304	
79	81	Washer	1	1.4401	B8M	
80	82	Nut	1	A2 / Poly	Stainl. steel/polyamid	
81	85	Lead seal	1	Kunststoff	Plastic	
82	86	Seal wire	1	1.4541	321	
83	89	grafite ring	1	Reingraphit	Pure graphite	
84	89	grafite ring	1	Reingraphit	Pure graphite	
85	91	Securing ring	1	1.4571	316Ti	
86	98	sealing plug	1	1.4435	316L	
	Name:	My PC	Hakon Røbsamen	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005	22.04.2005		
	Rev.No:	1	2	3		

LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:

3 of 3

Date:

24.04.2005

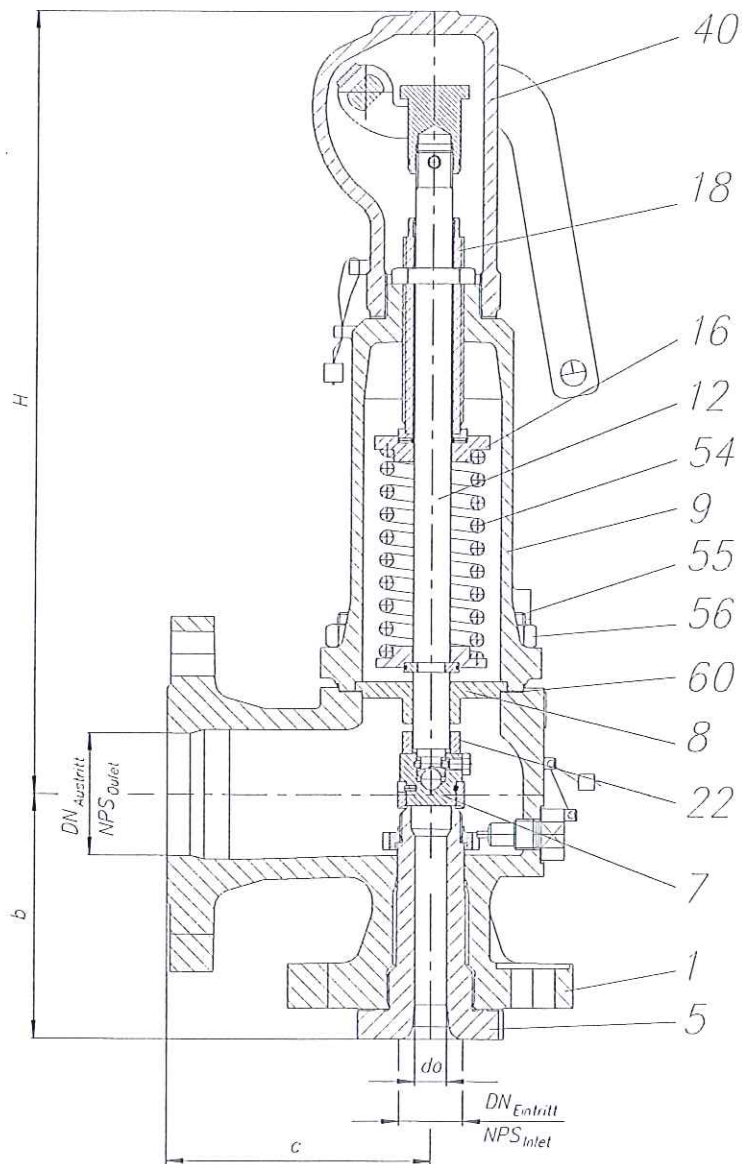
Project:


Kosice ASU

Tag-No:

Z 20027

Commission-No:



 AIR LIQUIDE Air Liquide AGS GmbH	Item:	Safety valve	Page:	18 / 154
	Plant:	A690 / L110	Date:	29.12.2004
	Location	Kosice	Rev:	0
	Project:	K70101 ASU No. 9 Kosice	Vendor:	
	By	TV	Spec-ID:	SP198

Procurement: IA.Z

ITEM	Unit	
TAG Number		Z20027
Service		Main heat exchanger
Fluid name		Oxygen
Location/ line No		#009
Gauge pressure		case 1: case 2:
normal operation	bar g	27 27
outlet	bar g	0 0
design	bar g	
set pressure gauge	bar g	40 40
Operating temperature	°C	20 -124
Design temperature	°C	
Temperature at no flow	°C	ambient ambient
Required capacity	Nm³/h	
Required capacity	kg/h	30.656 113149
Fluid density	kg/m³	55,0 203
Phase		vapour vapour
Sizing basis		thermal expansion in main heat exchanger
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

Maximum transferred heat in Main Exchanger is 3764 kW (mode: MaxGOX)

$$\Delta \dot{m} = \frac{\dot{Q}}{\Delta h_v} \cdot \rho \cdot \left(\frac{1}{\rho''} - \frac{1}{\rho'} \right)$$

113149 kg/h during vaporisation phase

ρ - density of discharged fluid	203	kg/m3
ρ' - liquid saturation density	690	kg/m3
ρ'' - vapour saturation density	203	kg/m3
Δh_v - enthalpy of evaporation	2698	kJ/kmol


The same volume flow is required if the gas is released at ambient temperature.

The pump capacity is less than the above scenarios.

4				5			
2				3			
0	29.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 20027
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	5264.5884		
3	Lift characteristic steam/gas	Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,8	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,58	
8	Valve - Construction			
9	Minimum discharge area	A_0	2855,78	mm2
10	Flow diameter	d_0	60,3	mm
11	Nominal diameter inlet	DN/NPS	100	
12	Pressure rating inlet	PN/PR	40	
13	Contact facing inlet		C	
14	Nominal diameter outlet	DN/NPS	150	
15	Pressure rating outlet	PN/PR	16	
16	Contact facing outlet		C	
17	Valve - Dimensions			
18	Centre to face dimension	a	184	mm
19	Centre to face dimension	b	178	mm
20	Height	H	674	mm
21	Weight	M		kg
22	Medium			
23	Name	Oxygen		
24	Formula	O2		
25	Molecular weight	M	32	
26	Ratio of specific heats	k	1,4	
27	Compressibility factor	Z	1	
28	Service condition			
29	Set pressure	p	40	bar-g
30	Constant back pressure	p_{af}	0	bar-g
31	Built up - back pressure	p_{aa}	0	bar-a
32	Superimposed back pressure		0	bar-g
33	Overpressure	dp	10	%
34	Environmental pressure	p_U	1,013	bar-a
35	Temperature	T	-124	C
36	Required massflow	$q_{m,ab}$	113149	kg/h
37	Volume flow to be discharged (working condition)	$q_{vb,ab}$	974,12	m3 / h
38	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	79271,7	m3 / h
39	Sizing			
40	Certified mass flow	$q_{m,zu}$	128773,21	kg/h
41	Certified volume flow (working condition)	$q_{vb,zu}$	1108,63	m3 / h
42	Certified volume flow (standard condition)	$q_{vn,zu}$	90217,96	m3 / h
43	Maximum mass flow	$q_{m,max}$	143081,34	kg/h
44	Maximum volume flow (working condition)	$q_{vb,max}$	1231,81	m3 / h
45	Maximum volume flow (standard condition)	$q_{vn,max}$	100242,18	m3 / h
46	Capacity exceed		13,8	%
47	Required effective discharge area	$A_{0,Req}$	2509,28	mm2
48	Required discharge diameter	$d_{0,Req}$	56,524	mm
49	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	122,3	dB
50	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	13526,671	N

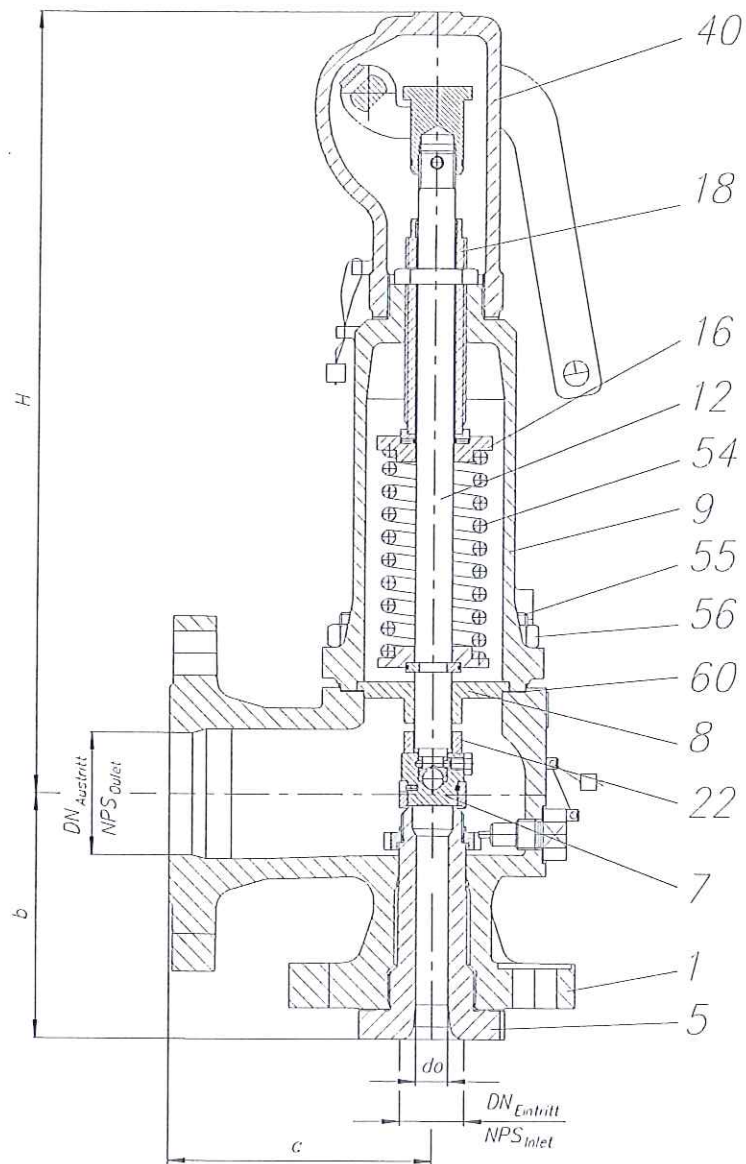
		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 20027
					Commision-No:	
51	Valve - Partlist					
52	Pos	Denomination	Q	DIN	ASME	
53	1	Body	1	1.4408	SA-351/CF8M	
54	5	Full nozzle	1	2.4360	2.4360	
55	6		1	1.4404	316L	
56	7	Disc		2.4360	2.4360	
57	8	Guide	1	1.4404	316L	
58	9	Bonnet	1	1.4571	316Ti	
59	12	Spindle	1	1.4021	420	
60	14	Split ring	2	1.4404	316L	
61	16	Spring plate	1	1.4404	316L	
62	18	Adjusting screw	1	1.4404	316L	
63	19	Lock nut	1	1.4404	316L	
64	41	Lever cover H4	1	1.4408	SA-351/CF8M	
65	43	Lever H4	1	1.4301	304	
66	44	Lifting fork	1	1.4581	SA-351/CF10M	
67	45	Shaft	1	1.4404	316L	
68	46	Spindle cap	1	1.4404	316L	
69	47	packing gland H4	1	1.4404	316L	
70	47	packing gland H4	1	1.4404	316L	
71	54	Spring	1	1.4104/CR [K]	430 F/CR [K]	
72	55	Bolt	8	1.4401	B8M	
73	56	Nut	8	1.0501	-	
74	60	Gasket	1	Reingraphit + 1.4401	Pure graphite/ss	
75	69	thrust needle bearing	1	1.4404	316L	
76	73		1	1.4404	316L	
77	74	Pin	1	1.4401	B8M	
78	75	Spacer	1	1.4301	304	
79	81	Washer	1	1.4401	B8M	
80	82	Nut	1	A2 / Poly	Stainl. steel/polyamid	
81	85	Lead seal	1	Kunststoff	Plastic	
82	86	Seal wire	1	1.4541	321	
83	89	grafite ring	1	Reingraphit	Pure graphite	
84	89	grafite ring	1	Reingraphit	Pure graphite	
85	91	Securing ring	1	1.4571	316Ti	
86	98	sealing plug	1	1.4435	316L	
	Name:	My PC	Hakon RØbsamen	Hakon RØbsamen		
	Date:	24.04.2005	22.04.2005	22.04.2005		
	Rev.No:	1	2	3		


LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 20027
Commision-No:	



 AIR LIQUIDE Air Liquide AGS GmbH	Item:	Safety valve	Page:	18 / 154
	Plant:	A690 / L110	Date:	29.12.2004
	Location	Kosice	Rev:	0
	Project:	K70101 ASU No. 9 Kosice	Vendor:	
	By	TV	Spec-ID:	SP198

Procurement: **IA.Z**

ITEM	Unit	
TAG Number		Z20027
Service		Main heat exchanger
Fluid name		Oxygen
Location/ line No		#009
Gauge pressure		case 1: case 2:
normal operation	bar g	27 27
outlet	bar g	0 0
design	bar g	
set pressure gauge	bar g	40 40
Operating temperature	°C	20 -124
Design temperature	°C	
Temperature at no flow	°C	ambient ambient
Required capacity	Nm³/h	
Required capacity	kg/h	30.656 113149
Fluid density	kg/m³	55,0 203
Phase		vapour vapour
Sizing basis		thermal expansion in main heat exchanger
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

Maximum transferred heat in Main Exchanger is 3764 kW (mode: MaxGOX)

$$\Delta \dot{m} = \frac{\dot{Q}}{\Delta h_v} \cdot \rho \cdot \left(\frac{1}{\rho''} - \frac{1}{\rho'} \right)$$

113149 kg/h during vaporisation phase

ρ - density of discharged fluid	203	kg/m3
ρ' - liquid saturation density	690	kg/m3
ρ'' - vapour saturation density	203	kg/m3
Δh_v - enthalpy of evaporation	2698	kJ/kmol

The same volume flow is required if the gas is released at ambient temperature.

The pump capacity is less than the above scenarios.

4				5			
2				3			
0	29.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 24155
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4593.2514		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm2
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
11	Design Inlet		Male	
12	Thread Outlet		G 1"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	230	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Air		
21	Formula			
22	Molecular weight	M	29	
23	Ratio of specific heats	k	1,4	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	16	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{aa}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	35	C
33	Required massflow	$q_{m,ab}$	1200	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	56,96	m3 / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	927,69	m3 / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	1659,61	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	78,77	m3 / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	1283	m3 / h
40	Maximum mass flow	$q_{m,max}$	1844,01	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	87,52	m3 / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	1425,56	m3 / h
43	Capacity exceed		38,3	%
44	Required effective discharge area	$A_{0,Req}$	95,97	mm2
45	Required discharge diameter	$d_{0,Req}$	11,054	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	106	dB
47	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	252,367	N

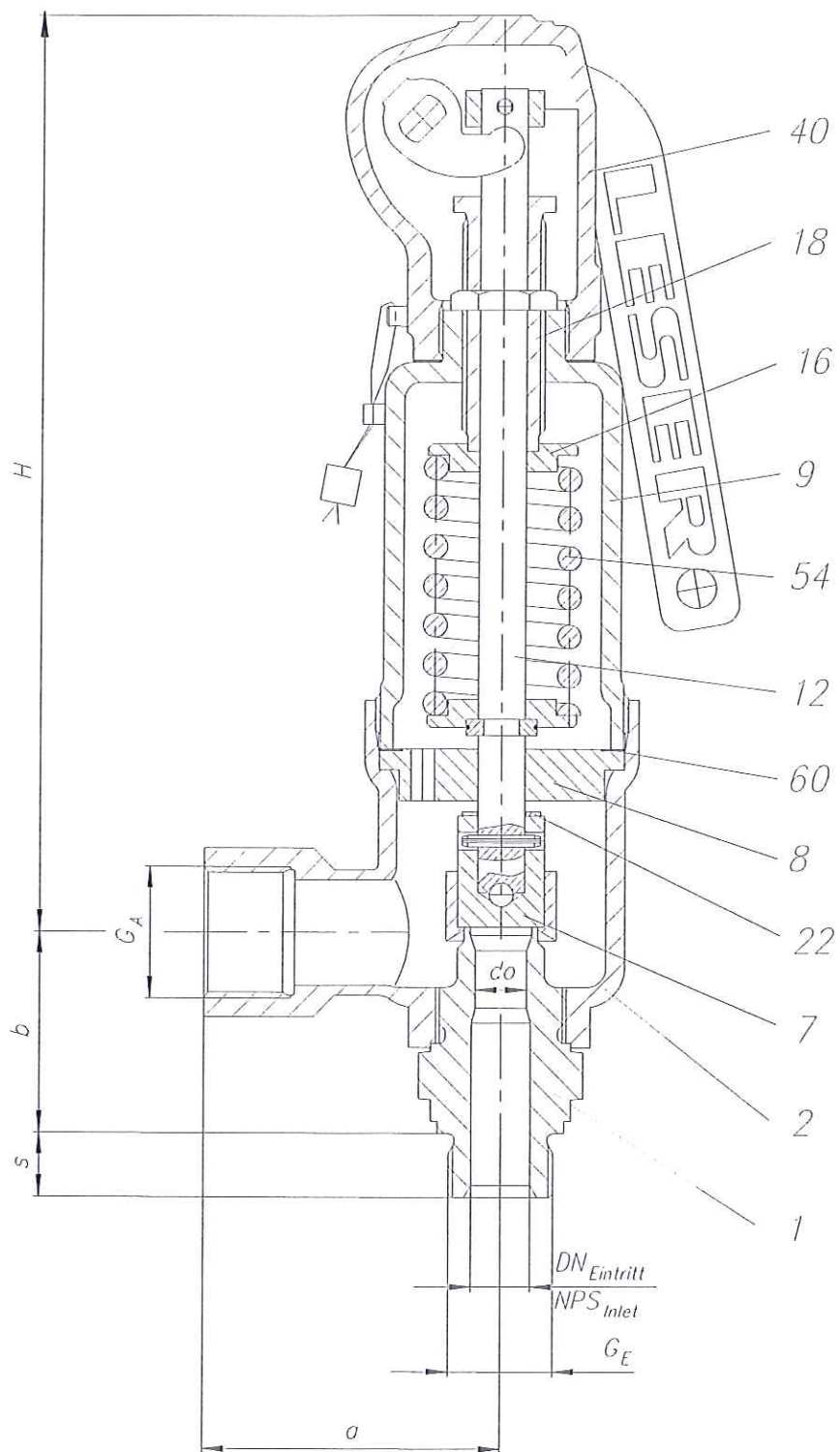
		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 24155
					Commision-No:	
48	Valve - Partlist					
49	Pos	Denomination	Q	DIN	ASME	
50	1	Inlet body	1	1.4104	430 F	
51	2	Outlet body	1	0.7043	SA-395/Gr. 60-40-18	
52	7	Disc	1	1.4122	MT440	
53	8	Guide	1	1.0501/1.0038/1.4104	Steel	
54	9	Bonnet	1	0.7043	SA-395/Gr. 60-40-18	
55	12	Spindle	1	1.4021	420	
56	14	Split ring	2	1.4104	430 F	
57	16	Spring plate	2	1.0718/1.0570	Steel	
58	18	Adjusting screw	1	1.4104	430 F	
59	19	Lock nut	1	1.4104	430 F	
60	41	Lever cover H4	1	0.7040	SA-395/Gr. 60-40-18	
61	43	Lever H4	1	1.0036	Steel	
62	44	Lifting fork	1	1.0531	Carbon steel	
63	45	Shaft	1	1.0718	Steel	
64	46	Spindle cap	1	1.0718	Steel	
65	47	packing gland H4	1	1.4404	316L	
66	54	Spring	1	1.1200	Carbon steel	
67	57	Pin	1	1.4310	Low temperature alloy steel	
68	59	Securing ring	1	1.4571	316Ti	
69	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss	
70	61	Ball washer	1	1.3541/1.4401	Stainless steel	
71	74	Pin	1	St	Steel	
72	75	Spacer	1	1.4571	316Ti	
73	79	O-ring	1	FPM [L]	FPM [L]	
74	80	Support ring	1	Federstahl	Spring steel	
75	81	Washer	1	1.4401	B8M	
76	82	Nut	1	A2 / Poly	Stainl. steel/polyamid	
77	83	Circlip	1	Federstahl	Spring steel	
78	85	Lead seal	1	Kunststoff	Plastic	
79	86	Seal wire	1	1.4541	321	
80	89	grafite ring	1	Reingraphit	Pure graphite	
81	91	Securing ring	1	1.4571	316Ti	
	Name:	My PC	Hakon Røbsamen			
	Date:	24.04.2005	22.04.2005			
	Rev.No:	1	2			

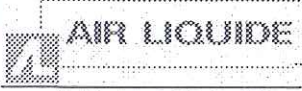
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Sizing acc. to
AD 2000:A2 / TRD 421 for gases


VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 24155
Commision-No:	



 Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 27 / 154 Date: 30.12.2004 Rev: 0 Vendor: Spec-ID: SP198																					
		Procurement: IA.Z																						
ITEM		Unit																						
TAG Number			Z24155																					
Service			turbine seal gas																					
Fluid name			air																					
Location/ line No			#029																					
Gauge pressure																								
normal operation		bar g	4																					
outlet		bar g	0																					
design		bar g																						
set pressure gauge		bar g	16																					
Operating temperature		°C	35																					
Design temperature		°C																						
Temperature at no flow		°C	ambient																					
Required capacity		Nm³/h																						
Required capacity		kg/h	1200																					
Fluid density		kg/m³	19,6																					
Phase			vapour																					
Sizing basis			max flow through PV24010 + V24155 + R24155 + pipe																					
Valve type																								
Manufacturer																								
Material		body/spring disc/seat																						
Notes:																								
<table border="0"> <tr> <td>Medium</td> <td>Nitrogen</td> <td>see AspenPlus calculation TurbSeal</td> </tr> <tr> <td>KVS</td> <td>0,9</td> <td></td> </tr> <tr> <td>KVS</td> <td>12</td> <td></td> </tr> <tr> <td>P1</td> <td>bara</td> <td>64</td> </tr> <tr> <td>T1</td> <td>K</td> <td>308</td> </tr> <tr> <td>P2</td> <td>bara</td> <td>17</td> </tr> <tr> <td>Flow</td> <td>kg/h</td> <td>1200</td> </tr> </table>				Medium	Nitrogen	see AspenPlus calculation TurbSeal	KVS	0,9		KVS	12		P1	bara	64	T1	K	308	P2	bara	17	Flow	kg/h	1200
Medium	Nitrogen	see AspenPlus calculation TurbSeal																						
KVS	0,9																							
KVS	12																							
P1	bara	64																						
T1	K	308																						
P2	bara	17																						
Flow	kg/h	1200																						
4			5																					
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0	30.12.2004	JJ	TV																					
rev	date	name	checked																					
File:																								

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page:		1 of 3
			Date:		24.04.2005
	VALVESTAR @ - v 6.3.1		Project:		Kosice ASU
			Tag-No:		Z 24255
		Commision-No:			
Project: Kosice ASU					
Contractor: Air Liquide GmbH					
1	Valve - General				
2	Article number	4593.2514			
3	Lift characteristic steam/gas	Full Lift Safety Valve			
4	Lift characteristic liquid	Safety Relief Valve			
5	Bonnet / Lifting Device	Lifting device H4 (gastight)			
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81		
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53		
8	Valve - Construction				
9	Minimum discharge area	A_0	132,73	mm ²	
10	Flow diameter	d_0	13	mm	
11	Thread Inlet		G 3/4"		
11	Design Inlet		Male		
12	Thread Outlet		G 1"		
12	Design Outlet		Female		
13	Valve - Dimensions				
14	Centre to face dimension	a	75	mm	
15	Centre to face dimension	b	50	mm	
16	Length	c	16	mm	
17	Height	H	230	mm	
18	Weight	M	2,6	kg	
19	Medium				
20	Name	Air			
21	Formula				
22	Molecular weight	M	29		
23	Ratio of specific heats	k	1,4		
24	Compressibility factor	Z	1		
25	Service condition				
26	Set pressure	p	16	bar-g	
27	Constant back pressure	p_{af}	0	bar-g	
28	Built up - back pressure	p_{as}	0	bar-a	
29	Superimposed back pressure		0	bar-g	
30	Overpressure	dp	10	%	
31	Environmental pressure	p_u	1,013	bar-a	
32	Temperature	T	35	C	
33	Required massflow	$q_{m,ab}$	1200	kg/h	
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	56,96	m ³ / h	
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	927,69	m ³ / h	
36	Sizing				
37	Certified mass flow	$q_{m,zu}$	1659,61	kg/h	
38	Certified volume flow (working condition)	$q_{vb,zu}$	78,77	m ³ / h	
39	Certified volume flow (standard condition)	$q_{vn,zu}$	1283	m ³ / h	
40	Maximum mass flow	$q_{m,max}$	1844,01	kg/h	
41	Maximum volume flow (working condition)	$q_{vb,max}$	87,52	m ³ / h	
42	Maximum volume flow (standard condition)	$q_{vn,max}$	1425,56	m ³ / h	
43	Capacity exceed		38,3	%	
44	Required effective discharge area	$A_{0,Req}$	95,97	mm ²	
45	Required discharge diameter	$d_{0,Req}$	11,054	mm	
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	106	dB	
47	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	252,367	N	

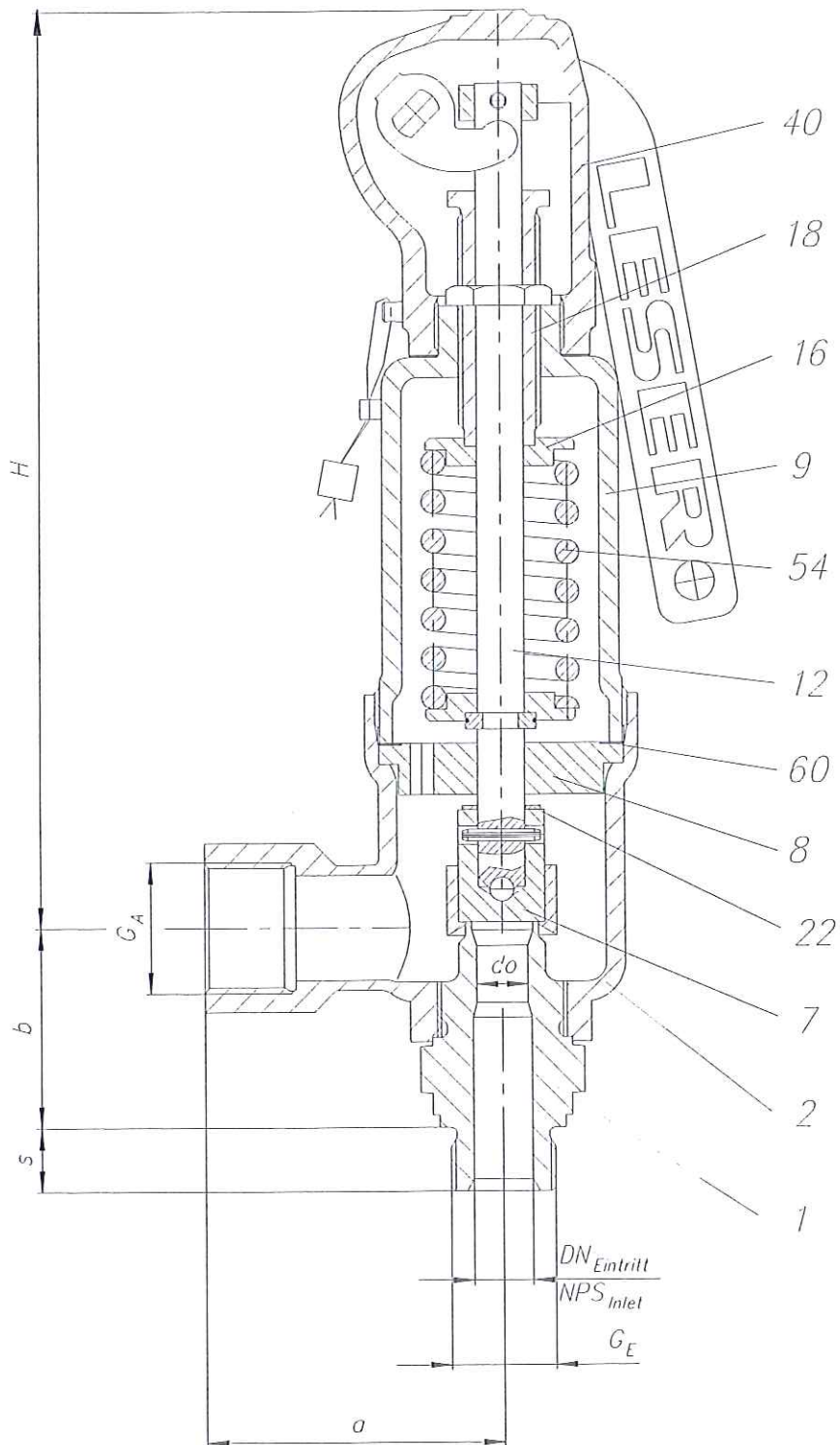
		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR ® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 24255
				Commision-No:	
48	Valve - Partlist				
49	Pos	Denomination	Q	DIN	ASME
50	1	Inlet body	1	1.4104	430 F
51	2	Outlet body	1	0.7043	SA-395/Gr. 60-40-18
52	7	Disc	1	1.4122	MT440
53	8	Guide	1	1.0501/1.0038/1.4104	Steel
54	9	Bonnet	1	0.7043	SA-395/Gr. 60-40-18
55	12	Spindle	1	1.4021	420
56	14	Split ring	2	1.4104	430 F
57	16	Spring plate	2	1.0718/1.0570	Steel
58	18	Adjusting screw	1	1.4104	430 F
59	19	Lock nut	1	1.4104	430 F
60	41	Lever cover H4	1	0.7040	SA-395/Gr. 60-40-18
61	43	Lever H4	1	1.0036	Steel
62	44	Lifting fork	1	1.0531	Carbon steel
63	45	Shaft	1	1.0718	Steel
64	46	Spindle cap	1	1.0718	Steel
65	54	Spring	1	1.1200	Carbon steel
66	57	Pin	1	1.4310	Low temperature alloy steel
67	59	Securing ring	1	1.4571	316Ti
68	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss
69	61	Ball washer	1	1.3541/1.4401	Stainless steel
70	74	Pin	1	St	Steel
71	75	Spacer	1	1.4571	316Ti
72	79	O-ring	1	FPM [L]	FPM [L]
73	80	Support ring	1	Federstahl	Spring steel
74	81	Washer	1	1.4401	B8M
75	82	Nut	1	A2 / Poly	Stainl. steel/polyamid
76	83	Circlip	1	Federstahl	Spring steel
77	85	Lead seal	1	Kunststoff	Plastic
78	86	Seal wire	1	1.4541	321
79	91	Securing ring	1	1.4571	316Ti
	Name:	My PC	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		

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Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 24255
Commission-No:	



LESER	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page:	1 of 3	
			Date:	24.04.2005	
	VALVESTAR® - v 6.3.1		Project:	Kosice ASU	
			Tag-No:	Z 44052	
			Commision-No:		
Project: Kosice ASU					
Contractor: Air Liquide GmbH					
1	Valve - General				
2	Article number	4414.4644			
3	Lift characteristic steam/gas	Full Lift Safety Valve			
4	Lift characteristic liquid	Safety Relief Valve			
5	Bonnet / Lifting Device	Lifting device H4 (gastight)			
6	Certified coefficient of discharge for steam and gases	$\alpha_{d,PG}$	0,7		
7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,45		
8	Valve - Construction				
9	Minimum discharge area	A_0	415,48	mm ²	
10	Flow diameter	d_0	23	mm	
11	Nominal diameter inlet	DN/NPS	25		
12	Pressure rating inlet	PN/PR	PN 40		
13	Contact facing inlet		Form C		
14	Nominal diameter outlet	DN/NPS	40		
15	Pressure rating outlet	PN/PR	PN 16		
16	Contact facing outlet		Form C		
17	Valve - Dimensions				
18	Centre to face dimension	a	100	mm	
19	Centre to face dimension	b	105	mm	
20	Height	H	234	mm	
21	Weight	M	9	kg	
22	Medium				
23	Name	Argon			
24	Formula				
25	Density	ρ	1369	kg / m ³	
26	Service condition				
27	Set pressure	p	5	bar-g	
28	Constant back pressure	p_{af}	0	bar-g	
29	Built up - back pressure	p_{ae}	0	bar-a	
30	Superimposed back pressure			bar-g	
31	Overpressure	dp	10	%	
32	Environmental pressure	p_u	1,013	bar-a	
33	Temperature	T	-182	C	
34	Required massflow	$q_{m,ab}$	25463	kg/h	
35	Sizing				
36	Certified mass flow	$q_{m,zu}$	26120,39	kg/h	
37	Certified volume flow (working condition)	$q_{vb,zu}$	19,08	m ³ / h	
38	Maximum mass flow	$q_{m,max}$	29022,66	kg/h	
39	Maximum volume flow (working condition)	$q_{vb,max}$	21,20	m ³ / h	
40	Capacity exceed		2,6	%	
41	Required effective discharge area	$A_{0,req}$	405,02	mm ²	
42	Required discharge diameter	$d_{0,Req}$	22,709	mm	
43	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	37,779	N	

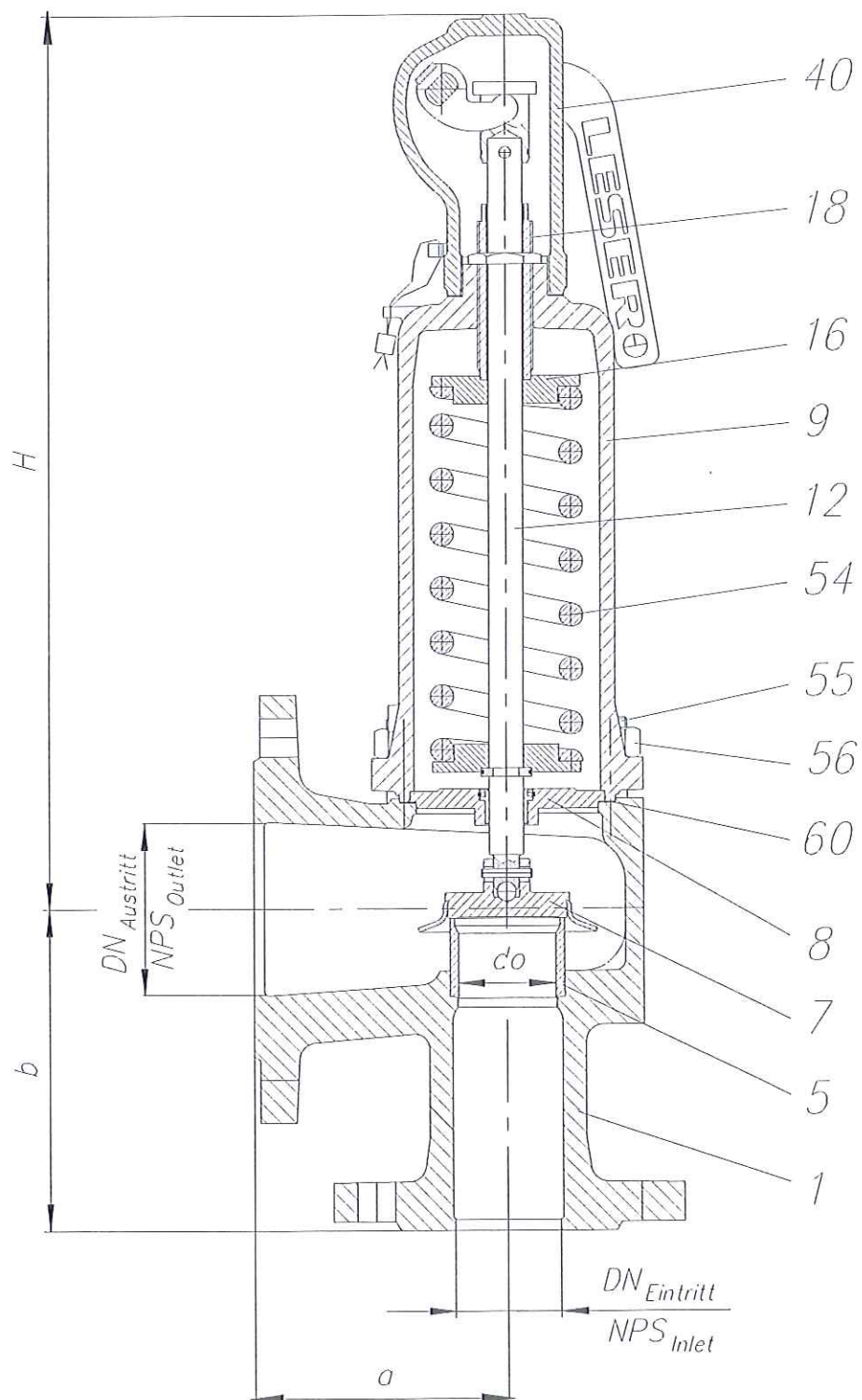
		Sizing acc. to AD 2000:A2 / TRD 421 for liquids VALVESTAR ® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 44052
				Commision-No:	
44	Valve - Partlist				
45	Pos	Denomination	Q	DIN	ASME
46	1	Body	1	1.4408	SA-351/CF8M
47	5	Seat	1	1.4404	316L
48	7	Disc	1	1.4404	316L
49	8	Guide	1	1.4404	316L
50	9	Bonnet	1	1.4408	SA-351/CF8M
51	12	Spindle	1	1.4404	316L
52	14	Split ring	2	1.4404	316L
53	16	Spring plate	2	1.4404	316L
54	18	Adjusting screw	1	1.4404	316L
55	19	Lock nut	1	1.4404	316L
56	41	Lever cover H4	1	1.4408	SA-351/CF8M
57	43	Lever H4	1	1.4301	304
58	44	Lifting fork	1	1.4571	316Ti
59	45	Shaft	1	1.4404	316L
60	46	Spindle cap	1	1.4404	316L
61	47	packing gland H4	1	1.4404	316L
62	54	Spring	1	1.4310	Low temperature alloy steel
63	54	Spring	1	1.1200	Carbon steel
64	55	Bolt	4	1.4401	B8M
65	56	Nut	4	1.4401	B8M
66	57	Pin	1	1.4310	Low temperature alloy steel
67	59	Securing ring	1	1.4571	316Ti
68	60	Gasket	1	Reingraphit + 1.4401	Pure graphite/ss
69	61	Ball washer	1	1.3541/1.4401	Stainless steel
70	74	Pin	1	1.4401	B8M
71	75	Spacer	1	1.4571	316Ti
72	81	Washer	1	1.4401	B8M
73	82	Nut	1	A2 / Poly	Stainl. steel/polyamid
74	85	Lead seal	1	Kunststoff	Plastic
75	86	Seal wire	1	1.4541	321
76	86	Seal wire	1	1.4541	321
77	89	grafite ring	1	Reingraphit	Pure graphite
78	91	Securing ring	1	1.4571	316Ti
79	98	sealing plug	1	1.4435	316L
	Name:	My PC	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		

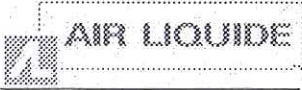
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Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 44052
Commision-No:	



 Air Liquide AGS GmbH	Item:	Safety valve	Page:	38 / 154
	Plant:	A690 / L110	Date:	03.01.2005
	Location	Kosice	Rev:	0
	Project:	K70101 ASU No. 9 Kosice	Vendor:	
	By	TV	Spec-ID:	SP198

Procurement: IA.Z

ITEM	Unit		
TAG Number		Z44052	
Service		LAR pump recycle	
Fluid name		Argon	
Location/ line No		#042	
Gauge pressure			
normal operation	bar g	0,5	
outlet	bar g	0	
design	bar g		
set pressure gauge	bar g	5	
Operating temperature	°C	-165	-182
Design temperature	°C		
Temperature at no flow	°C	ambient	ambient
Required capacity	Nm³/h		
Required capacity	kg/h	2036	25463
Fluid density	kg/m³	30	1369
Phase		vapour	liquid
Sizing basis		thermal expansion or recycle from P48001	
Valve type			
Manufacturer			
Material	body/spring disc/seat		

Notes:


(1) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h

Pipe diameter: 60 mm
Pipe length: 15 m
Gas flow: 0,20 kg/m²s (Standard 54010, Argon)
Insulation factor 1
Resulting required capacity 2036 kg/h

(2) Maximum capacity P48001 at set pressure 310 l/min

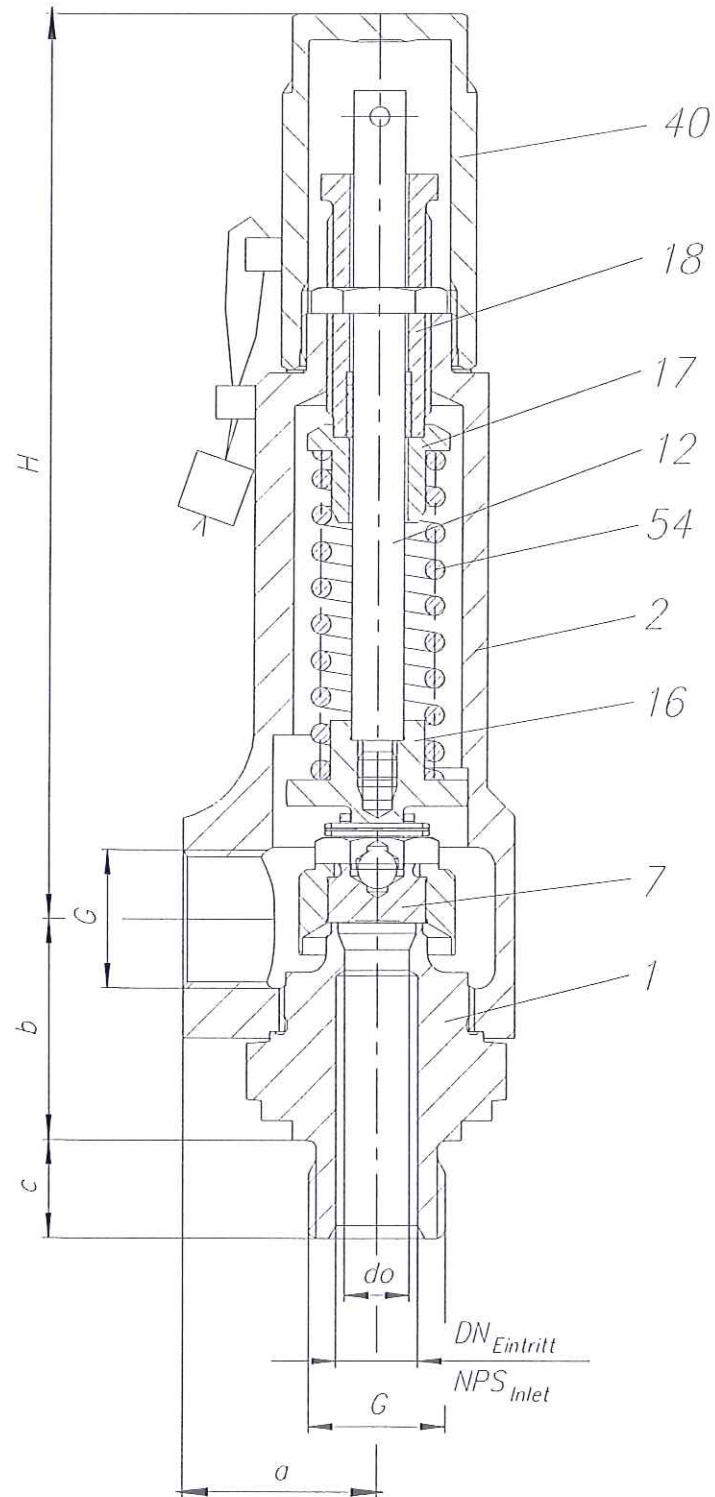
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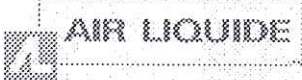
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	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 44110	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1 Valve - General				
2 Article number		4374.3142		
3 Lift characteristic steam/gas		Safety Relief Valve		
4 Lift characteristic liquid		Safety Relief Valve		
5 Bonnet / Lifting Device		Cap H2		
6 Certified coefficient of discharge for steam and gases		$\alpha_{w,DG}$	0,5	
7 Certified coefficient of discharge for liquid		$\alpha_{w,F}$	0,35	
8 Valve - Construction				
9 Minimum discharge area		A_0	78,54	mm2
10 Flow diameter		d_0	10	mm
11 Thread Inlet			G 1/2"	
11 Design Inlet			Male	
12 Thread Outlet			G 1/2"	
12 Design Outlet			Female	
13 Valve - Dimensions				
14 Centre to face dimension		a	30	mm
15 Centre to face dimension		b	33	mm
16 Length		c	15	mm
17 Height		H	137	mm
18 Weight		M	1,2	kg
19 Medium				
20 Name		Argon		
21 Formula		Ar		
22 Molecular weight		M	39,9	
23 Ratio of specific heats		k	1,65	
24 Compressibility factor		Z	1	
25 Service condition				
26 Set pressure		p	16	bar-g
27 Constant back pressure		p_{af}	0	bar-g
28 Built up - back pressure		p_{aa}	0	bar-a
29 Superimposed back pressure			0	bar-g
30 Overpressure		Δp	10	%
31 Environmental pressure		p_u	1,013	bar-a
32 Temperature		T	-147	C
33 Required massflow		$q_{m,ab}$	712	kg/h
34 Volume flow to be discharged (working condition)		$q_{vb,ab}$	10,06	m3 / h
35 Volume flow to be discharged (standard condition)		$q_{vn,ab}$	400,06	m3 / h
36 Sizing				
37 Certified mass flow		$q_{m,zu}$	1174,68	kg/h
38 Certified volume flow (working condition)		$q_{vb,zu}$	16,59	m3 / h
39 Certified volume flow (standard condition)		$q_{vn,zu}$	660,03	m3 / h
40 Maximum mass flow		$q_{m,max}$	1305,2	kg/h
41 Maximum volume flow (working condition)		$q_{vb,max}$	18,43	m3 / h
42 Maximum volume flow (standard condition)		$q_{vn,max}$	733,37	m3 / h
43 Capacity exceed			65	%
44 Required effective discharge area		$A_{0,Req}$	47,6	mm2
45 Required discharge diameter		$d_{0,Req}$	7,785	mm
46 Noise level in 1m distance from the valve (acc. to VDI 2713)		L	84	dB
47 Reaction force (calculated acc. to W. Gossiau and K. Weyl)		F_R	97,59	N

LESER		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR ® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 44110
					Commision-No:	
48	Valve - Partlist					
49	Pos	Denomination	Q	DIN	ASME	
50	1	Inlet body	1	1.4404	316L	
51	2	Outlet body	1	1.4404	316L	
52	7	Disc incl. detachable lifting	1	1.4404	316L	
53	12	Spindle	1	1.4404	316L	
54	16	Spring plate	2	1.4404	316L	
55	18	Adjusting screw	1	1.4404	316L	
56	19	Lock nut	1	1.4404	316L	
57	47	packing gland H4	1	1.4404	316L	
58	54	Spring	1	1.4310	Low temperature alloy steel	
59	57	Pin	1	1.4310	Low temperature alloy steel	
60	61	Ball washer	1	1.3541/1.4401	Stainless steel	
61	89	grafite ring	1	Reingraphit	Pure graphite	
	Name:	My PC	Hakon Røbsamen			
	Date:	24.04.2005	22.04.2005			
	Rev.No:	1	2			

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1	Page:	3 of 3
		Date:	24.04.2005
		Project:	Kosice ASU
		Tag-No:	Z 44110
		Commision-No:	



 Air Liquide AGS GmbH	Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 41 / 154 Date: 03.01.2005 Rev: 0 Vendor: Spec-ID: SP198
		Procurement: IA.Z

ITEM	Unit	
TAG Number		Z44110
Service		pipe to LP LAR tank
Fluid name		Argon
Location/ line No		#041
Gauge pressure		
normal operation	bar g	2
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	16
Operating temperature	°C	-147
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity (1)	kg/h	712
Fluid density	kg/m³	85
Phase		vapour
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material		body/spring disc/seat

Notes:

(1) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h

Pipe diameter: 30 mm

Pipe length: 30 m

Gas flow: 0,07 kg/m²s (Standard 54010, Argon)

Insulation factor 1

Resulting required capacity 712 kg/h

4				5			
2				3			
0	03.01.2005	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to	Page:	1 of 3	
	AD 2000:A2 / TRD 421 for gases	Date:	24.04.2005	
		Project:	Kosice ASU	
		Tag-No:	Z 44250	
	VALVESTAR® - v 6.3.1	Commission-No:		
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2562		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Cap H2		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm2
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
11	Design Inlet		Male	
12	Thread Outlet		G 1"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	228	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Argon		
21	Formula	Ar		
22	Molecular weight	M	39,9	
23	Ratio of specific heats	k	1,65	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	7	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{aa}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	-160	C
33	Required massflow	$q_{m,ab}$	1527	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	41,32	m3 / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	857,99	m3 / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	1589,6	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	43,02	m3 / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	893,17	m3 / h
40	Maximum mass flow	$q_{m,max}$	1766,22	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	47,80	m3 / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	992,41	m3 / h
43	Capacity exceed		4,1	%
44	Required effective discharge area	$A_{0,Req}$	127,51	mm2
45	Required discharge diameter	$d_{0,Req}$	12,741	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	83,9	dB
47	Reaction force (calculated acc. to W. Gossau and K. Weyl)	F_R	102,48	N

LESER

Sizing acc. to

AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:

Date:

Project:

Tag-No:

Commision-No:

2 of 3

24.04.2005

Kosice ASU

Z 44250

48

Valve - Partlist

49	Pos	Denomination	Q	DIN	ASME
50	1	Inlet body	1	1.4404	316L
51	2	Outlet body	1	1.4404	316L
52	7	Disc	1	1.4404	316L
53	8	Guide	1	1.4404	316L
54	9	Bonnet	1	1.4404	316L
55	12	Spindle	1	1.4404	316L
56	14	Split ring	2	1.4404	316L
57	16	Spring plate	2	1.4404	316L
58	18	Adjusting screw	1	1.4404	316L
59	19	Lock nut	1	1.4404	316L
60	42	Cap H2	1	1.4404	316L
61	54	Spring	1	1.4310	Low temperature alloy steel
62	57	Pin	1	1.4310	Low temperature alloy steel
63	59	Securing ring	1	1.4571	316Ti
64	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss
65	61	Ball washer	1	1.3541/1.4401	Stainless steel
66	85	Lead seal	1	Kunststoff	Plastic
67	86	Seal wire	1	1.4541	321
68	98	sealing plug	1	1.4435	316L

Name:

Date:

Rev.No:

My PC

24.04.2005

1

Hakon Røbsamen

22.04.2005

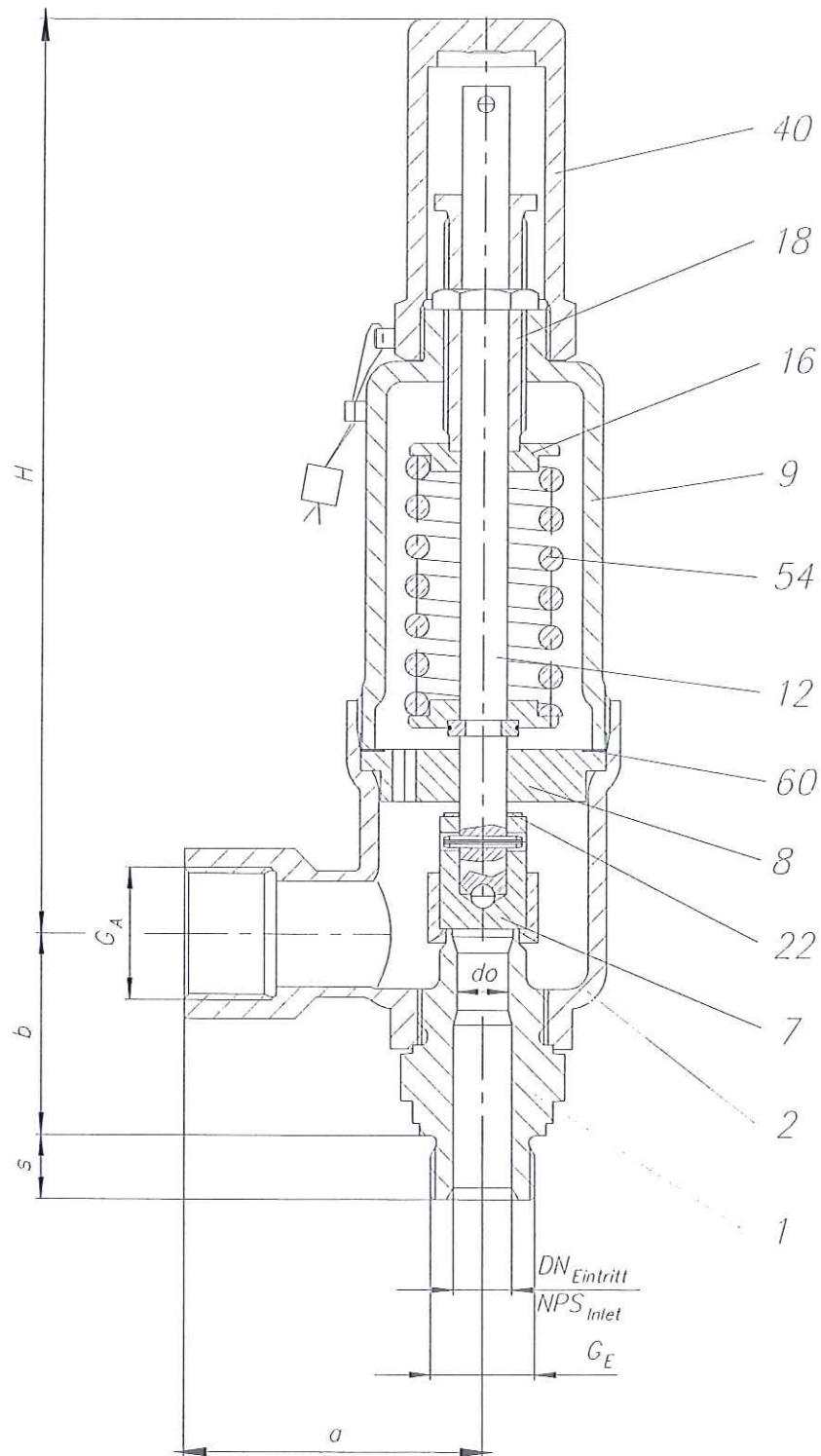
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LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 44250
Commision-No:	



Item: Safety valve
Plant: A690 / L110
Location: Kosice
Project: K70101 ASU No. 9 Kosice
By: TV

Page: 48 / 154
Date: 03.01.2005
Rev: 0
Vendor:
Spec-ID: SP198

Procurement: IA.Z

ITEM	Unit	
TAG Number		Z44250
Service		LAR to pump piping
Fluid name		Argon
Location/ line No		#042
Gauge pressure		
normal operation	bar g	0,5
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	7
Operating temperature	°C	-160
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity (1)	kg/h	1527
Fluid density	kg/m³	40
Phase		vapour
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

(1) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h

Pipe diameter: 90 mm
Pipe length: 10 m
Gas flow: 0,15 kg/m²s (Standard 54010, Argon)
Insulation factor 1
Resulting required capacity 1527 kg/h

4				5			
2				3			
0	03.01.2005	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 44251	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2562		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Cap H2		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm2
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
11	Design Inlet		Male	
12	Thread Outlet		G 1"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	228	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Argon		
21	Formula	Ar		
22	Molecular weight	M	39,9	
23	Ratio of specific heats	k	1,65	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	7	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{aa}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	Δp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	-160	C
33	Required massflow	$q_{m,ab}$	1527	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	41,32	m3 / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	857,99	m3 / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	1589,6	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	43,02	m3 / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	893,17	m3 / h
40	Maximum mass flow	$q_{m,max}$	1766,22	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	47,80	m3 / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	992,41	m3 / h
43	Capacity exceed		4,1	%
44	Required effective discharge area	$A_{0,Req}$	127,51	mm2
45	Required discharge diameter	$d_{0,Req}$	12,741	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	83,9	dB
47	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	102,48	N

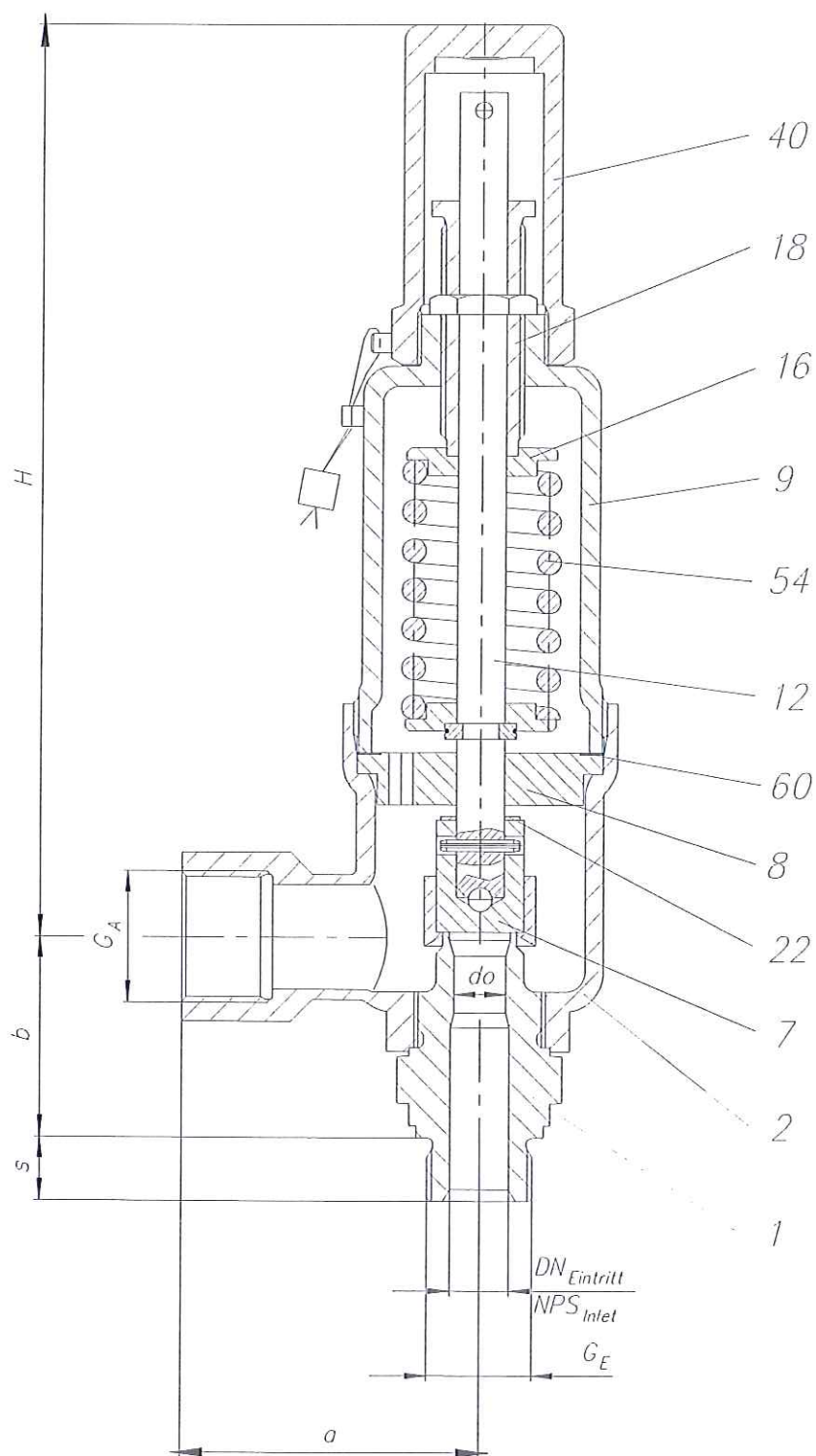
LESER		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 44251
					Commision-No:	
48	Valve - Partlist					
49	Pos	Denomination	Q	DIN	ASME	
50	1	Inlet body	1	1.4404	316L	
51	2	Outlet body	1	1.4404	316L	
52	7	Disc	1	1.4404	316L	
53	8	Guide	1	1.4404	316L	
54	9	Bonnet	1	1.4404	316L	
55	12	Spindle	1	1.4404	316L	
56	14	Split ring	2	1.4404	316L	
57	16	Spring plate	2	1.4404	316L	
58	18	Adjusting screw	1	1.4404	316L	
59	19	Lock nut	1	1.4404	316L	
60	42	Cap H2	1	1.4404	316L	
61	54	Spring	1	1.4310	Low temperature alloy steel	
62	57	Pin	1	1.4310	Low temperature alloy steel	
63	59	Securing ring	1	1.4571	316Ti	
64	60	Gasket	2	ReIngraphit + 1.4401	Pure graphite/ss	
65	61	Ball washer	1	1.3541/1.4401	Stainless steel	
66	85	Lead seal	1	Kunststoff	Plastic	
67	86	Seal wire	1	1.4541	321	
68	98	sealing plug	1	1.4435	316L	
	Name:	My PC	Hakon RØbsamen			
	Date:	24.04.2005	22.04.2005			
	Rev.No:	1	2			

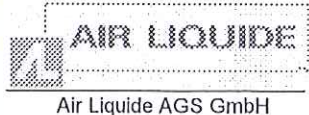
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Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 44251
Commission-No:	





Air Liquide AGS GmbH

Item: Safety valve
Plant: A690 / L110
Location: Kosice
Project: K70101 ASU No. 9 Kosice
By: TV

Page: 49 / 154
Date: 03.01.2005
Rev: 0
Vendor:
Spec-ID: SP198

Procurement: IA.Z

ITEM	Unit	
TAG Number		Z44251
Service		LAR pump suction piping
Fluid name		Argon
Location/ line No		#042
Gauge pressure		
normal operation	bar g	0,5
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	7
Operating temperature	°C	-160
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity (1)	kg/h	1527
Fluid density	kg/m³	40
Phase		vapour
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:


(1) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h

Pipe diameter: 90 mm
Pipe length: 10 m
Gas flow: 0,15 kg/m²s (Standard 54010, Argon)
Insulation factor 1
Resulting required capacity 1527 kg/h

4				5			
2				3			
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rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page:	1 of 3
			Date:	24.04.2005
	VALVESTAR @ - v 6.3.1		Project:	Kosice ASU
			Tag-No:	Z 48011
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2562		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Cap H2		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm ²
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
11	Design Inlet		Male	
12	Thread Outlet		G 1"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	228	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Argon		
21	Formula	Ar		
22	Molecular weight	M	39,9	
23	Ratio of specific heats	k	1,65	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	7	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{aa}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	-160	C
33	Required massflow	$q_{m,ab}$	1527	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,eb}$	41,32	m ³ / h
35	Volume flow to be discharged (standard condition)	$q_{vn,eb}$	857,99	m ³ / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	1589,6	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	43,02	m ³ / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	893,17	m ³ / h
40	Maximum mass flow	$q_{m,max}$	1766,22	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	47,80	m ³ / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	992,41	m ³ / h
43	Capacity exceed		4,1	%
44	Required effective discharge area	$A_{0,Req}$	127,51	mm ²
45	Required discharge diameter	$d_{0,Req}$	12,741	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	83,9	dB
47	Reaction force (calculated acc. to W. Gossau and K. Weyl)	F_R	102,48	N

		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 48011
				Commision-No:	
48	Valve - Partlist				
49	Pos	Denomination	Q	DIN	ASME
50	1	Inlet body	1	1.4404	316L
51	2	Outlet body	1	1.4404	316L
52	7	Disc	1	1.4404	316L
53	8	Guide	1	1.4404	316L
54	9	Bonnet	1	1.4404	316L
55	12	Spindle	1	1.4404	316L
56	14	Split ring	2	1.4404	316L
57	16	Spring plate	2	1.4404	316L
58	18	Adjusting screw	1	1.4404	316L
59	19	Lock nut	1	1.4404	316L
60	42	Cap H2	1	1.4404	316L
61	54	Spring	1	1.4310	Low temperature alloy steel
62	57	Pin	1	1.4310	Low temperature alloy steel
63	59	Securing ring	1	1.4571	316Ti
64	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss
65	61	Ball washer	1	1.3541/1.4401	Stainless steel
66	85	Lead seal	1	Kunststoff	Plastic
67	86	Seal wire	1	1.4541	321
68	98	sealing plug	1	1.4435	316L
	Name:	My PC	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		

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Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:

3 of 3

Date:

24.04.2005

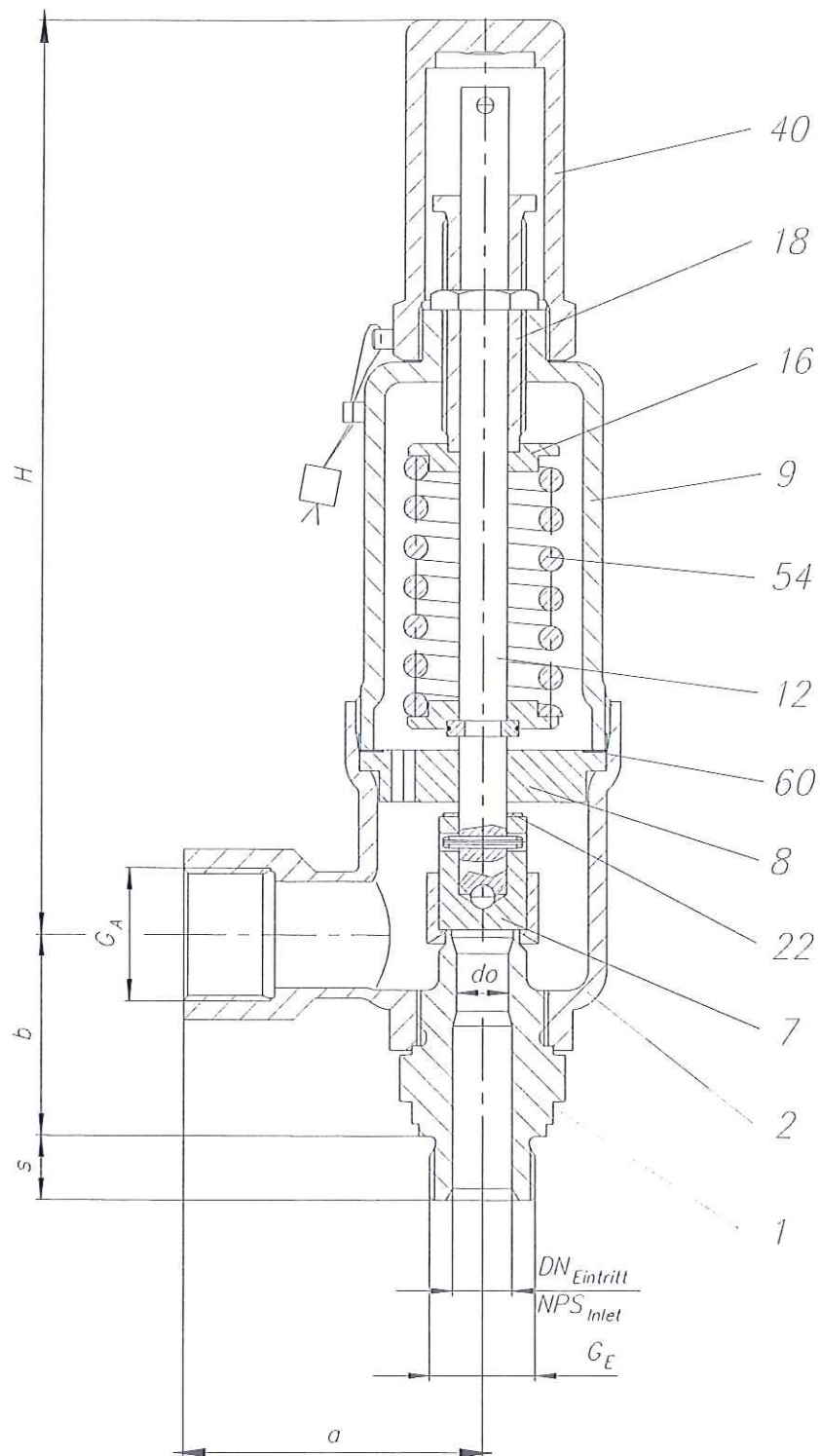
Project:

Kosice ASU

Tag-No:

Z 48011

Commission-No:



Procurement: IA.Z

ITEM	Unit	
TAG Number		Z48011
Service		LAR pump suction piping
Fluid name		Argon
Location/ line No		#043
Gauge pressure		
normal operation	bar g	0,5
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	7
Operating temperature	°C	-160
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity (1)	kg/h	1527
Fluid density	kg/m³	40
Phase		vapour
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material		
body/spring		
disc/seat		

Notes:


(1) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h

Pipe diameter:	90 mm	
Pipe length:	10 m	
Gas flow:	0,15 kg/m²s	(Standard 54010, Argon)
Insulation factor	1	
Resulting required capacity	1527 kg/h	

4				5			
2				3			
0	03.01.2005	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESEER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page:	1 of 3
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 48102
			Commission-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2564		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm ²
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
11	Design Inlet		Male	
12	Thread Outlet		G 1"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	230	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Argon		
21	Formula	Ar		
22	Molecular weight	M	39,9	
23	Ratio of specific heats	k	1,65	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	40	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{ae}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	20	C
33	Required massflow	$q_{m,ab}$	2456,03	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	33,33	m ³ / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	1380	m ³ / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	5102	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	69,24	m ³ / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	2866,72	m ³ / h
40	Maximum mass flow	$q_{m,max}$	5668,89	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	76,93	m ³ / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	3185,24	m ³ / h
43	Capacity exceed		107,7	%
44	Required effective discharge area	$A_{0,Req}$	63,9	mm ²
45	Required discharge diameter	$d_{0,Req}$	9,02	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	113,2	dB
47	Reaction force (calculated acc. to W. Gosslau and K. Weyl)	F_R	717,906	N

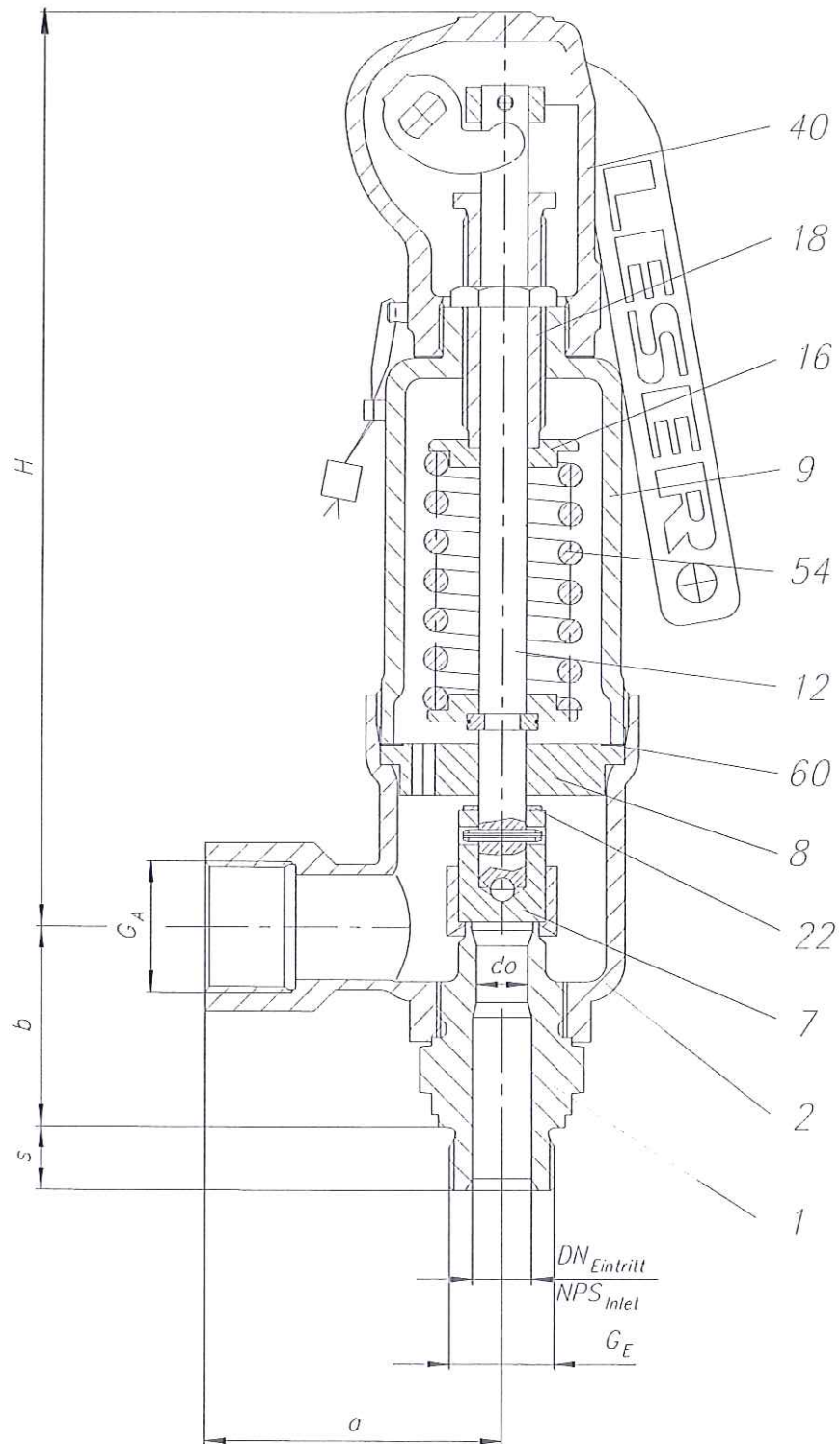
		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 48102
					Commision-No:	
48	Valve - Partlist					
49	Pos	Denomination	Q	DIN	ASME	
50	1	Inlet body	1	1.4404	316L	
51	2	Outlet body	1	1.4404	316L	
52	7	Disc	1	1.4404	316L	
53	8	Guide	1	1.4404	316L	
54	9	Bonnet	1	1.4404	316L	
55	12	Spindle	1	1.4404	316L	
56	14	Split ring	2	1.4404	316L	
57	16	Spring plate	2	1.4404	316L	
58	18	Adjusting screw	1	1.4404	316L	
59	19	Lock nut	1	1.4404	316L	
60	41	Lever cover H4	1	1.4408	SA-351/CF8M	
61	43	Lever H4	1	1.4301	304	
62	44	Lifting fork	1	1.4571	316Ti	
63	45	Shaft	1	1.4404	316L	
64	46	Spindle cap	1	1.4404	316L	
65	47	packing gland H4	1	1.4404	316L	
66	54	Spring	1	1.4310	Low temperature alloy steel	
67	57	Pin	1	1.4310	Low temperature alloy steel	
68	59	Securing ring	1	1.4571	316Ti	
69	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss	
70	61	Ball washer	1	1.3541/1.4401	Stainless steel	
71	74	Pin	1	1.4401	B8M	
72	75	Spacer	1	1.4571	316Ti	
73	81	Washer	1	1.4401	B8M	
74	82	Nut	1	A2 / Poly	Stainl. steel/polyamid	
75	85	Lead seal	1	Kunststoff	Plastic	
76	86	Seal wire	1	1.4541	321	
77	86	Seal wire	1	1.4541	321	
78	89	grafite ring	1	Reingraphit	Pure graphite	
79	91	Securing ring	1	1.4571	316Ti	
80	98	sealing plug	1	1.4435	316L	
	Name:	My PC	Hakon Røbsamen			
	Date:	24.04.2005	22.04.2005			
	Rev.No:	1	2			

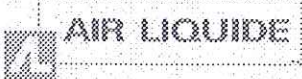
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Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 48102
Commision-No:	



 Air Liquide AGS GmbH	Item:	Safety valve	Page:	58 / 154
	Plant:	A690 / L110	Date:	03.01.2005
	Location	Kosice	Rev:	0
	Project:	K70101 ASU No. 9 Kosice	Vendor:	
	By	TV	Spec-ID:	SP198

Procurement: IA.Z


ITEM	Unit	
TAG Number		Z48102
Service		LAR ambient air vaporiser
Fluid name		Argon
Location/ line No		#044
Gauge pressure		
normal operation	bar g	20
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	40
Operating temperature	°C	25
Design temperature (2)	°C	
Temperature at no flow	°C	ambient
Required capacity (1)	Nm³/h	1.380
Required capacity (1)	kg/h	2.460
Fluid density (1)	kg/m³	68
Phase		vapour
Sizing basis		maximum vaporiser capacity
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

- (1) maximum capacity = 3 * design capacity;
(2) to be suitable for cryogenic temperatures

4				5			
2				3			
0	03.01.2005	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page:	1 of 3
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 48202
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2564		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gaslight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm ²
10	Flow diameter	d_0	13	mm
11	Thread Inlet	G 3/4"		
11	Design Inlet	Male		
12	Thread Outlet	G 1"		
12	Design Outlet	Female		
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	230	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Argon		
21	Formula	Ar		
22	Molecular weight	M	39,9	
23	Ratio of specific heats	k	1,65	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	40	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{as}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	25	C
33	Required massflow	$q_{m,ab}$	2456,03	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	33,9	m ³ / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	1380	m ³ / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	5059,03	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	69,83	m ³ / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	2842,58	m ³ / h
40	Maximum mass flow	$q_{m,max}$	5621,14	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	77,59	m ³ / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	3158,42	m ³ / h
43	Capacity exceed		106	%
44	Required effective discharge area	$A_{0,Req}$	64,44	mm ²
45	Required discharge diameter	$d_{0,Req}$	9,058	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	113,5	dB
47	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F_R	717,906	N

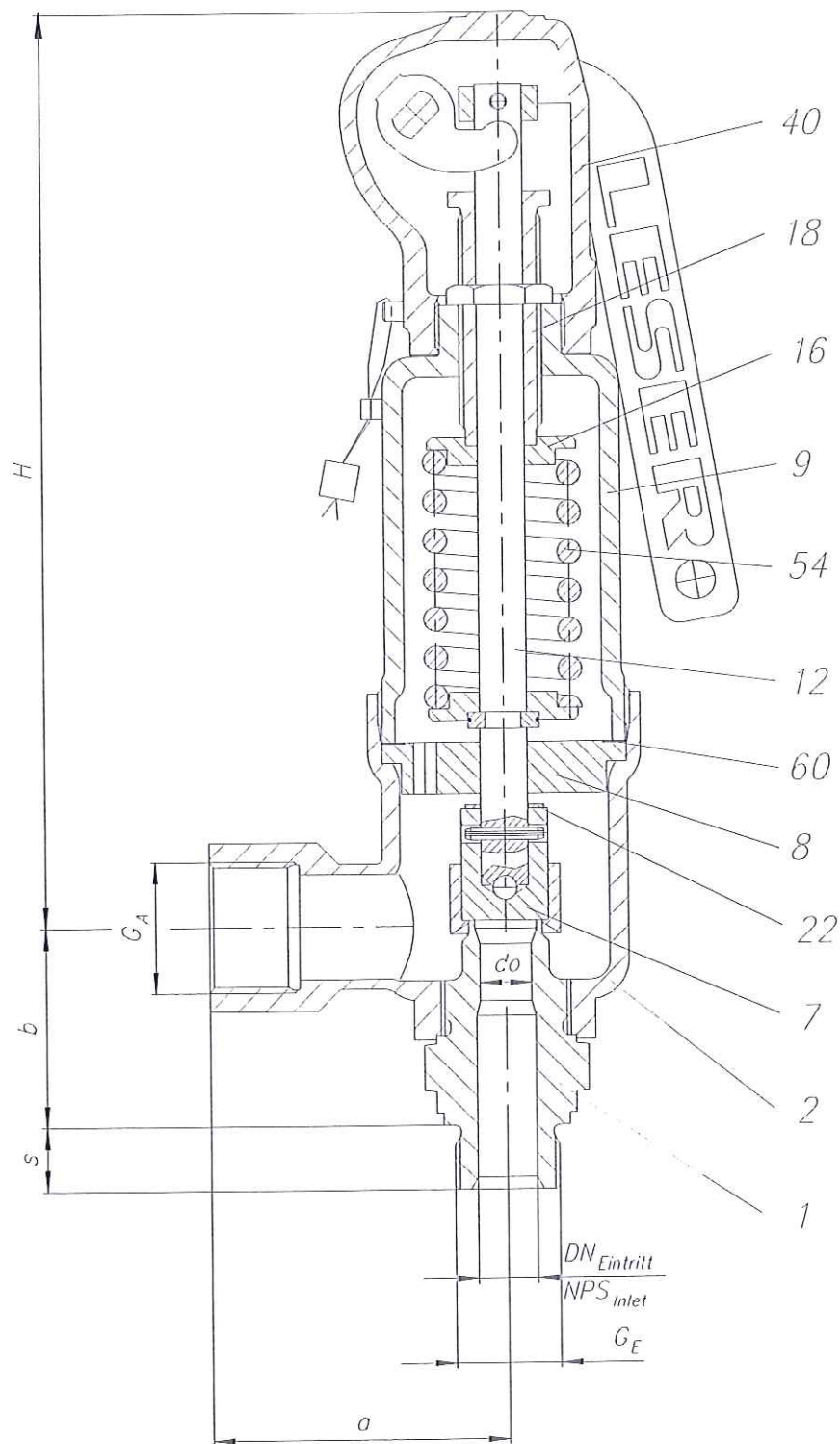
		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR ® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 48202
				Commision-No:	
48	Valve - Partlist				
49	Pos	Denomination	Q	DIN	ASME
50	1	Inlet body	1	1.4404	316L
51	2	Outlet body	1	1.4404	316L
52	7	Disc	1	1.4404	316L
53	8	Guide	1	1.4404	316L
54	9	Bonnet	1	1.4404	316L
55	12	Spindle	1	1.4404	316L
56	14	Split ring	2	1.4404	316L
57	16	Spring plate	2	1.4404	316L
58	18	Adjusting screw	1	1.4404	316L
59	19	Lock nut	1	1.4404	316L
60	41	Lever cover H4	1	1.4408	SA-351/CF8M
61	43	Lever H4	1	1.4301	304
62	44	Lifting fork	1	1.4571	316Ti
63	45	Shaft	1	1.4404	316L
64	46	Spindle cap	1	1.4404	316L
65	47	packing gland H4	1	1.4404	316L
66	54	Spring	1	1.4310	Low temperature alloy steel
67	57	Pin	1	1.4310	Low temperature alloy steel
68	59	Securing ring	1	1.4571	316Ti
69	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss
70	61	Ball washer	1	1.3541/1.4401	Stainless steel
71	74	Pin	1	1.4401	B8M
72	75	Spacer	1	1.4571	316Ti
73	81	Washer	1	1.4401	B8M
74	82	Nut	1	A2 / Poly	Stainl. steel/polyamid
75	85	Lead seal	1	Kunststoff	Plastic
76	86	Seal wire	1	1.4541	321
77	89	grafite ring	1	Reingraphit	Pure graphite
78	91	Securing ring	1	1.4571	316Ti
79	98	sealing plug	1	1.4435	316L
	Name:	My PC	Hakon RØbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		

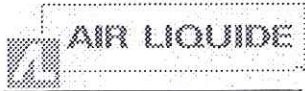
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Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 48202
Commision-No:	



 Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 59 / 154 Date: 03.01.2005 Rev: 0 Vendor: Spec-ID: SP198
			Procurement: IA.Z

ITEM	Unit	
TAG Number		Z48202
Service		LAR ambient air vaporiser
Fluid name		Argon
Location/ line No		#044
Gauge pressure		
normal operation	bar g	20
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	40
Operating temperature	°C	25
Design temperature (2)	°C	
Temperature at no flow	°C	ambient
Required capacity (1)	Nm³/h	1.380
Required capacity (1)	kg/h	2.460
Fluid density (1)	kg/m³	68
Phase		vapour
Sizing basis		maximum vaporiser capacity
Valve type		
Manufacturer		
Material		
body/spring		
disc/seat		

Notes:

(1) maximum capacity = 3 * design capacity;

(2) to be suitable for cryogenic temperatures

4				5			
2				3			
0	03.01.2005	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 71180
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number		4373.2604	
3	Lift characteristic steam/gas		Safety Relief Valve	
4	Lift characteristic liquid		Safety Relief Valve	
5	Bonnet / Lifting Device		Lifting device H4 (gastight)	
6	Certified coefficient of discharge for steam and gases		$\alpha_{w,DG}$	0,5
7	Certified coefficient of discharge for liquid		$\alpha_{w,F}$	0,35
8	Valve - Construction			
9	Minimum discharge area		A ₀	78,54 mm ²
10	Flow diameter		d ₀	10 mm
11	Thread Inlet		G 1/2"	
11	Design Inlet		Male	
12	Thread Outlet		G 1/2"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension		a	30 mm
15	Centre to face dimension		b	33 mm
16	Length		c	15 mm
17	Height		H	162 mm
18	Weight		M	1,2 kg
19	Medium			
20	Name		Nitrogen	
21	Formula		N ₂	
22	Molecular weight		M	28
23	Ratio of specific heats		k	1,4
24	Compressibility factor		Z	1
25	Service condition			
26	Set pressure		p	10 bar-g
27	Constant back pressure		p _{af}	0 bar-g
28	Built up - back pressure		p _{ae}	0 bar-a
29	Superimposed back pressure			0 bar-g
30	Overpressure		dp	10 %
31	Environmental pressure		p _u	1,013 bar-a
32	Temperature		T	20 C
33	Required massflow		Q _{m,ab}	206 kg/h
34	Volume flow to be discharged (working condition)		Q _{vb,ab}	14,93 m ³ / h
35	Volume flow to be discharged (standard condition)		Q _{vn,ab}	164,94 m ³ / h
36	Sizing			
37	Certified mass flow		Q _{m,zu}	394,14 kg/h
38	Certified volume flow (working condition)		Q _{vb,zu}	28,56 m ³ / h
39	Certified volume flow (standard condition)		Q _{vn,zu}	315,58 m ³ / h
40	Maximum mass flow		Q _{m,max}	437,93 kg/h
41	Maximum volume flow (working condition)		Q _{vb,max}	31,73 m ³ / h
42	Maximum volume flow (standard condition)		Q _{vn,max}	350,64 m ³ / h
43	Capacity exceed			91,3 %
44	Required effective discharge area		A _{0,Req}	41,05 mm ²
45	Required discharge diameter		d _{0,Req}	7,229 mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)		L	94,3 dB
47	Reaction force (calculated acc. to W. Gossiau and K. Weyl)		F _R	52,486 N

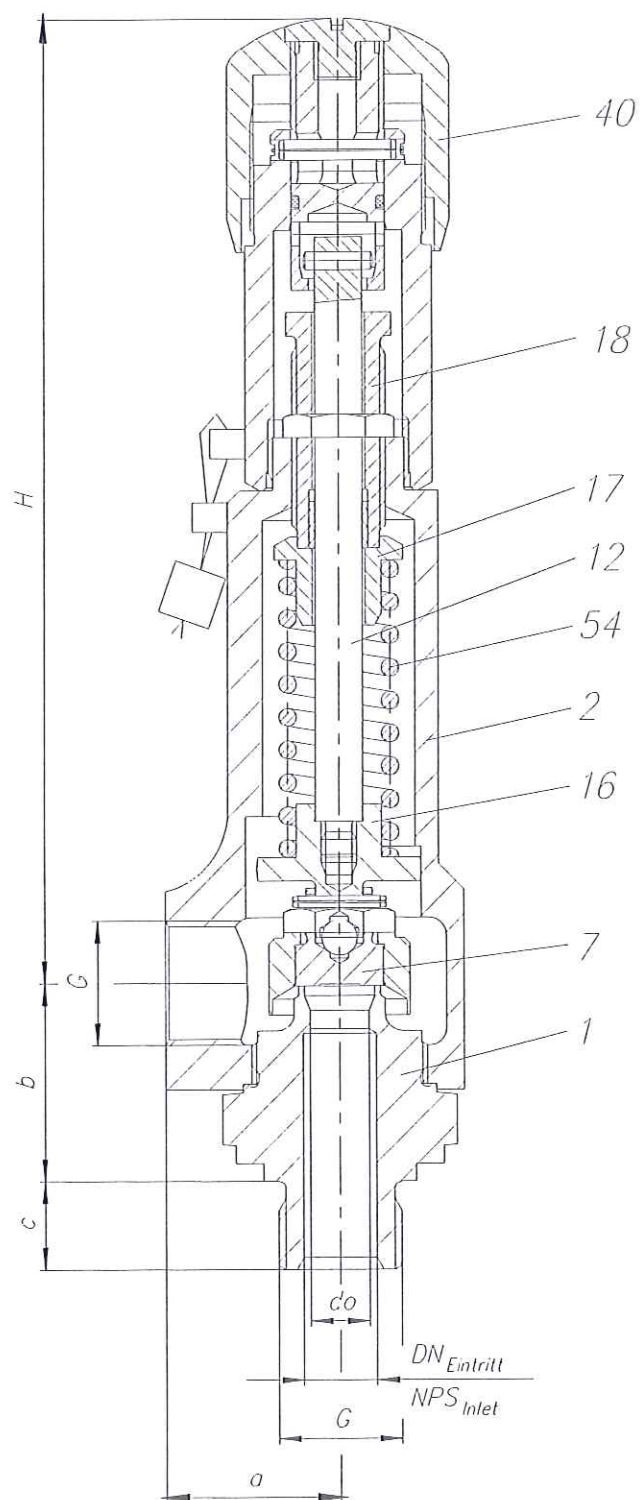
LESER		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1		Page:	2 of 3
				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 71180
				Commision-No:	
48	Valve - Partlist				
49	Pos	Denomination	Q	DIN	ASME
50	1	Inlet body	1	1.4104	430 F
51	2	Outlet body	1	1.4104	430 F
52	7	Disc incl. detachable lifting	1	1.4122	MT440
53	12	Spindle	1	1.4021	420
54	16	Spring plate	2	1.0718	Steel
55	18	Adjusting screw	1	1.4104	430 F
56	19	Lock nut	1	1.0718	Steel
57	54	Spring	1	1.4310	Low temperature alloy steel
58	57	Pin	1	1.4310	Low temperature alloy steel
59	61	Ball washer	1	1.3541/1.4401	Stainless steel
	Name:	My PC	Hakon RØbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		

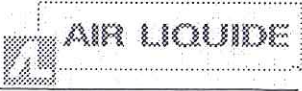
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Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 71180
Commision-No:	



 Air Liquide AGS GmbH		Item:	Safety valve	Page:	73 / 154
		Plant:	A690 / L110	Date:	29.12.2004
		Location:	Kosice	Rev:	0
		Project:	K70101 ASU No. 9 Kosice	Vendor:	
		By:	TV	Spec-ID:	SP198
					Procurement: IA.Z

ITEM	Unit	
TAG Number		Z71180
Service		LIN pump seal gas
Fluid name		Nitrogen
Location/ line No		#015
Gauge pressure		
normal operation	bar g	6
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	10
Operating temperature	°C	20
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity	kg/h	206
Fluid density	kg/m³	12,8
Phase		vapour
Sizing basis		PC71180 capacity
Valve type		
Manufacturer		
Material		
body/spring		
disc/seat		

Notes:

maximum flow through pressure regulator


KV 0,4


inlet pressure 31 bara

Resulting required capacity 206 kg/h

4				5			
2				3			
0	29.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page:	1 of 3	
			Date:	25.04.2005	
	VALVESTAR® - v 6.3.1		Project:	Kosice Tank Farm	
			Tag-No:	Z 73014	
			Commission-No:		
Project: Kosice Tank Farm					
Contractor: Air Liquide					
1	Valve - General		4374.3142		
2	Article number		Safety Relief Valve		
3	Lift characteristic steam/gas		Safety Relief Valve		
4	Lift characteristic liquid		Cap H2		
5	Bonnet / Lifting Device				
6	Certified coefficient of discharge for steam and gases		$\alpha_{w,DG}$	0,5	
7	Certified coefficient of discharge for liquid		$\alpha_{w,F}$	0,35	
8	Valve - Construction				
9	Minimum discharge area	A_0	78,54	mm ²	
10	Flow diameter	d_0	10	mm	
11	Thread Inlet		G 1/2"		
11	Design Inlet		Male		
12	Thread Outlet		G 1/2"		
12	Design Outlet		Female		
13	Valve - Dimensions				
14	Centre to face dimension	a	30	mm	
15	Centre to face dimension	b	33	mm	
16	Length	c	15	mm	
17	Height	H	137	mm	
18	Weight	M	1,2	kg	
19	Medium				
20	Name	Nitrogen			
21	Formula	N2			
22	Molecular weight	M	28		
23	Ratio of specific heats	k	1,4		
24	Compressibility factor	Z	1		
25	Service condition				
26	Set pressure	p	25	bar-g	
27	Constant back pressure	p_{af}	0	bar-g	
28	Built up - back pressure	p_{ae}	0	bar-a	
29	Superimposed back pressure		0	bar-g	
30	Overpressure	Δp	10	%	
31	Environmental pressure	p_u	1,013	bar-a	
32	Temperature	T	-153	C	
33	Required massflow	$Q_{m,ab}$	136	kg/h	
34	Volume flow to be discharged (working condition)	$Q_{vb,ab}$	1,7	m ³ / h	
35	Volume flow to be discharged (standard condition)	$Q_{vn,ab}$	108,89	m ³ / h	
36	Sizing				
37	Certified mass flow	$Q_{m,zu}$	1461,27	kg/h	
38	Certified volume flow (working condition)	$Q_{vb,zu}$	18,28	m ³ / h	
39	Certified volume flow (standard condition)	$Q_{vn,zu}$	1170,01	m ³ / h	
40	Maximum mass flow	$Q_{m,max}$	1623,63	kg/h	
41	Maximum volume flow (working condition)	$Q_{vb,max}$	20,31	m ³ / h	
42	Maximum volume flow (standard condition)	$Q_{vn,max}$	1300,01	m ³ / h	
43	Capacity exceed		974,5	%	
44	Required effective discharge area	$A_{0,Req}$	7,31	mm ²	
45	Required discharge diameter	$d_{0,Req}$	3,051	mm	
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	84,6	dB	
47	Reaction force (calculated acc. to W. Gossau and K. Weyl)	F_R	148,848	N	

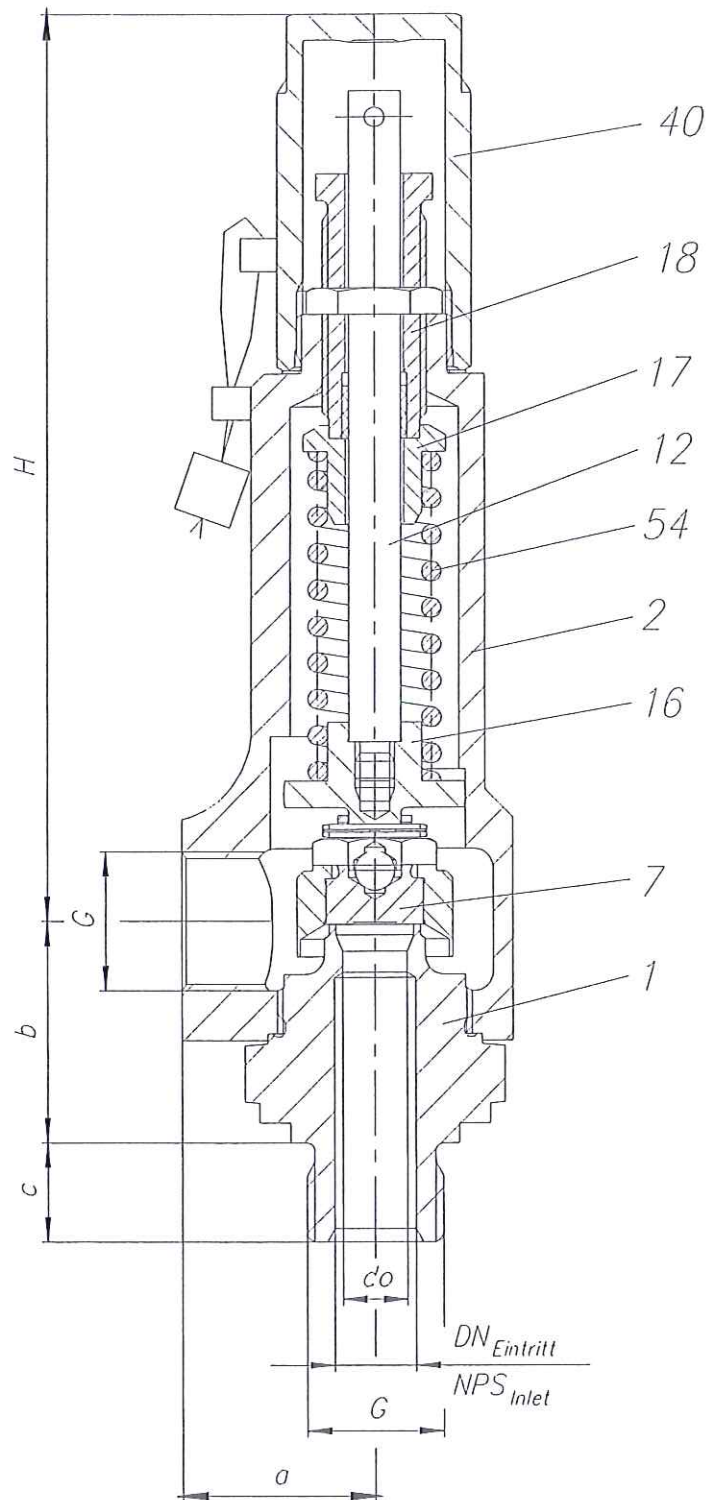
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				Date:	25.04.2005	
				Project:	Kosice Tank Farm	
				Tag-No:	Z 73014	
				Commision-No:		
48	Valve - Partlist					
49	Pos	Denomination	Q	DIN	ASME	
50	1	Inlet body	1	1.4404	316L	
51	2	Outlet body	1	1.4404	316L	
52	7	Disc incl. detachable lifting	1	1.4404	316L	
53	12	Spindle	1	1.4404	316L	
54	16	Spring plate	2	1.4404	316L	
55	18	Adjusting screw	1	1.4404	316L	
56	19	Lock nut	1	1.4404	316L	
57	54	Spring	1	1.1200	Carbon steel	
58	54	Spring	1	1.4310	Low temperature alloy steel	
59	57	Pin	1	1.4310	Low temperature alloy steel	
60	61	Ball washer	1	1.3541/1.4401	Stainless steel	
61	86	Seal wire	1	1.4541	321	
	Name:	Hakon Røbsamen	Hakon Røbsamen			
	Date:	25.04.2005	25.04.2005			
	Rev.No:	1	2			



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Sizing acc. to
AD 2000:A2 / TRD 421 for gases


VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	25.04.2005
Project:	Kosice Tank Farm
Tag-No:	Z 73014
Commission-No:	



 AIR LIQUIDE Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV		Page: Date: 29.11.2004 Rev: 0 Vendor: Spec-ID: SP198	
		Procurement: IA.Z			
ITEM		Unit			
TAG Number Service Fluid name Location/ line No Gauge pressure normal operation (1) outlet design set pressure gauge Operating temperature Design temperature Temperature at no flow Required capacity Required capacity (2) Fluid density Phase Sizing basis Valve type Manufacturer Material body/spring disc/seat				73014 LIN pipe from customer (TOP10) Nitrogen #38 11 0 bar g bar g bar g bar g °C °C °C Nm³/h kg/h kg/m³ ambient 136 131 vapour thermal expansion	
Notes: (1) estimated (2) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h Pipe diameter: 60 mm Pipe length: 10 m estimated Gas flow: 0,02 kg/m²s (MG Standard 54010, Nitrogen, FL) Insulation factor 1 Resulting required capacity 136 kg/h					
4				5	
2				3	
0	29.11.2004	TV		1	
rev	date	name	checked	rev	date name checked
File:					

	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 25.04.2005	
			Project: Kosice Tank Farm	
			Tag-No: Z 73115	
			Commission-No:	
Project: Kosice Tank Farm				
Contractor: Air Liquide				
1	Valve - General			
2	Article number	4374.3142		
3	Lift characteristic steam/gas	Safety Relief Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Cap H2		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,5	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,35	
8	Valve - Construction			
9	Minimum discharge area	A_0	78,54	mm ²
10	Flow diameter	d_0	10	mm
11	Thread Inlet		G 1/2"	
11	Design Inlet		Male	
12	Thread Outlet		G 1/2"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	30	mm
15	Centre to face dimension	b	33	mm
16	Length	c	15	mm
17	Height	H	137	mm
18	Weight	M	1,2	kg
19	Medium			
20	Name	Nitrogen		
21	Formula	N ₂		
22	Molecular weight	M	28	
23	Ratio of specific heats	k	1,4	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	25	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{ae}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	-153	°C
33	Required massflow	$q_{m,ab}$	136	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	1,7	m ³ / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	108,89	m ³ / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	1461,27	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	18,28	m ³ / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	1170,01	m ³ / h
40	Maximum mass flow	$q_{m,max}$	1623,63	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	20,31	m ³ / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	1300,01	m ³ / h
43	Capacity exceed		974,5	%
44	Required effective discharge area	$A_{0,Req}$	7,31	mm ²
45	Required discharge diameter	$d_{0,Req}$	3,051	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	84,6	dB
47	Reaction force (calculated acc. to W. Gossau and K. Weyl)	F_R	148,848	N

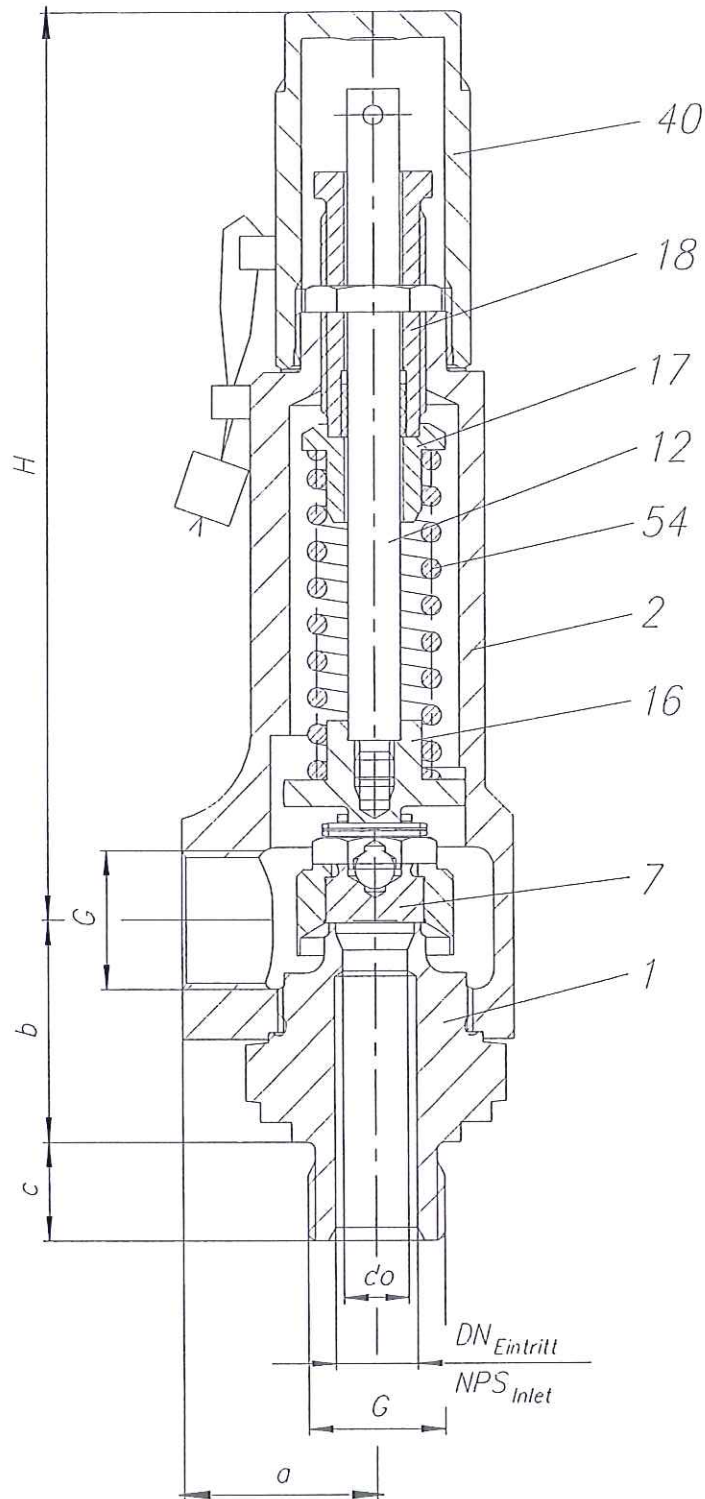
		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1		Page:	2 of 3
				Date:	25.04.2005
				Project:	Kosice Tank Farm
				Tag-No:	Z 73115
				Commision-No:	
48	Valve - Partlist				
49	Pos	Denomination	Q	DIN	ASME
50	1	Inlet body	1	1.4404	316L
51	2	Outlet body	1	1.4404	316L
52	7	Disc Incl. detachable lifting	1	1.4404	316L
53	12	Spindle	1	1.4404	316L
54	16	Spring plate	2	1.4404	316L
55	18	Adjusting screw	1	1.4404	316L
56	19	Lock nut	1	1.4404	316L
57	54	Spring	1	1.4310	Low temperature alloy steel
58	57	Pin	1	1.4310	Low temperature alloy steel
59	61	Ball washer	1	1.3541/1.4401	Stainless steel
	Name:	Hakon Rübsem	Hakon Rübsem		
	Date:	25.04.2005	25.04.2005		
	Rev.No:	1	2		

LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	25.04.2005
Project:	Kosice Tank Farm
Tag-No:	Z 73115
Commision-No:	



Item: Safety valve
Plant: A690 / L110
Location: Kosice
Project: K70101 ASU No. 9 Kosice
By: TV

Page:
Date: 29.11.2004
Rev: 0
Vendor:
Spec-ID: SP198

Procurement: IA.Z


ITEM	Unit	
TAG Number		73115
Service		LIN pipe from customer (TOP15)
Fluid name		Nitrogen
Location/ line No		#38
Gauge pressure		
normal operation (1)	bar g	11
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	25
Operating temperature	°C	-153
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity (2)	kg/h	136
Fluid density	kg/m³	131
Phase		vapour
Sizing basis		thermal expansion
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

(1) estimated

(2) Required capacity [kg/h] = Surface [m²] * Gas flow [kg/m²s] / Insulation factor * 3600 s/h

Pipe diameter: 60 mm
 Pipe length: 10 m estimated
 Gas flow: 0,02 kg/m²s (MG Standard 54010, Nitrogen, FL)
 Insulation factor 1
 Resulting required capacity 136 kg/h

4				5			
2				3			
0	29.11.2004	TV		1			
rev	date	name	checked	rev	date	name	checked

File:

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page:	1 of 3
	VALVESTAR® - v 6.3.1		Date:	25.04.2005
			Project:	Kosice Tank Farm
			Tag-No:	Z 87012
		Commission-No:		
Project: Kosice Tank Farm				
Contractor: Air Liquide				
1	Valve - General			
2	Article number	4412.4574		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{w,DG}$	0,56	
7	Certified coefficient of discharge for liquid	$\alpha_{w,F}$	0,45	
8	Valve - Construction			
9	Minimum discharge area	A_0	6647,61	mm ²
10	Flow diameter	d_0	92	mm
11	Nominal diameter inlet	DN/NPS	100	
12	Pressure rating inlet	PN/PR	PN 40	
13	Contact facing inlet	Form C		
14	Nominal diameter outlet	DN/NPS	150	
15	Pressure rating outlet	PN/PR	PN 16	
16	Contact facing outlet	Form C		
17	Valve - Dimensions			
18	Centre to face dimension	a	180	mm
19	Centre to face dimension	b	220	mm
20	Height	H	663	mm
21	Weight	M	75	kg
22	Medium			
23	Name	Nitrogen		
24	Formula	N ₂		
25	Molecular weight	M	28	
26	Ratio of specific heats	k	1,4	
27	Compressibility factor	Z	1	
28	Service condition			
29	Set pressure	p	0,4	bar-g
30	Constant back pressure	p _{af}	0	bar-g
31	Built up - back pressure	p _{as}	0	bar-a
32	Superimposed back pressure		0	bar-g
33	Overpressure	dp	0,1	bar-a
34	Environmental pressure	p _u	1,013	bar-a
35	Temperature	T	25	C
36	Required massflow	q _{m,ab}	4000	kg/h
37	Volume flow to be discharged (working condition)	q _{vb,ab}	2340,58	m ³ / h
38	Volume flow to be discharged (standard condition)	q _{vn,ab}	3202,72	m ³ / h
39	Sizing			
40	Certified mass flow	q _{m,zu}	4455,04	kg/h
41	Certified volume flow (working condition)	q _{vb,zu}	2606,84	m ³ / h
42	Certified volume flow (standard condition)	q _{vn,zu}	3567,06	m ³ / h
43	Maximum mass flow	q _{m,max}	4950,04	kg/h
44	Maximum volume flow (working condition)	q _{vb,max}	2896,49	m ³ / h
45	Maximum volume flow (standard condition)	q _{vn,max}	3963,40	m ³ / h
46	Capacity exceed		11,4	%
47	Required effective discharge area	A _{0,Req}	5968,62	mm ²
48	Required discharge diameter	d _{0,Req}	87,175	mm
49	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	112,5	dB
50	Reaction force (calculated acc. to W. Gossiau and K. Weyl)	F _R	484,082	N

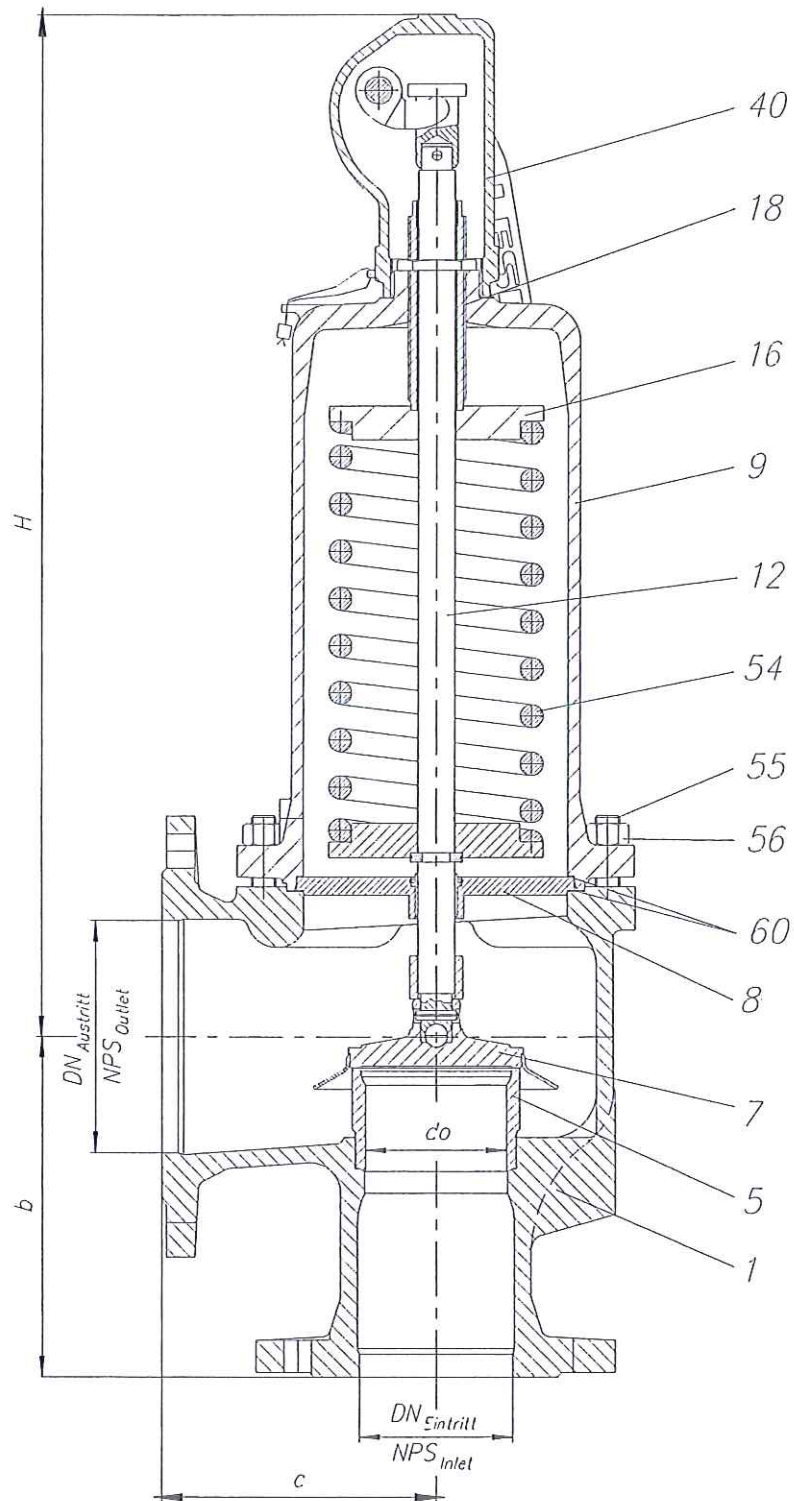
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				Date:	25.04.2005
				Project:	Kosice Tank Farm
				Tag-No:	Z 87012
				Commision-No:	
51	Valve - Partlist				
52	Pos	Denomination	Q	DIN	ASME
53	1	Body	1	1.0619	SA-216/WCB
54	5	Seat	1	1.4404	316L
55	7	Disc	1	1.4122	MT440
56	8	Guide	1	1.0501/1.0038/1.4104	Steel
57	9	Bonnet	1	0.7040	SA-395/Gr. 60-40-18
58	12	Spindle	1	1.4021	420
59	14	Split ring	2	1.4104	430 F
60	16	Spring plate	2	1.0718/1.0570	Steel
61	18	Adjusting screw	1	1.4104	430 F
62	19	Lock nut	1	1.0718	Steel
63	22	Lift stopper	1	1.4404	316L
64	41	Lever cover H4	1	0.7040	SA-395/Gr. 60-40-18
65	43	Lever H4	1	1.0501	Carbon steel
66	44	Lifting fork	1	0.7040	SA-395/Gr. 60-40-18
67	45	Shaft	1	1.0718	Steel
68	46	Spindle cap	1	1.0718	Steel
69	54	Spring	1	1.8159/FD Si Cr	High temperature alloy steel
70	54	Spring	1	1.4310	Low temperature alloy steel
71	55	Bolt	8	1.1181	Carbon steel
72	56	Nut	8	1.0501	-
73	57	Pin	1	1.4310	Low temperature alloy steel
74	59	Securing ring	1	1.4571	316Ti
75	60	Gasket	1	Reingraphit + 1.4401	Pure graphite/ss
76	61	Ball washer	1	1.3541/1.4401	Stainless steel
77	61	Ball washer	1	1.3541/1.4401	Stainless steel
78	74	Pin	1	St	Steel
79	75	Spacer	1	1.4301	304
80	79	O-ring	1	FPM [L]	FPM [L]
81	80	Support ring	1	Federstahl	Spring steel
82	81	Washer	1	St	Steel
83	82	Nut	1	1.0501	Carbon steel
84	83	Circlip	1	Federstahl	Spring steel
85	85	Lead seal	1	Kunststoff	Plastic
86	86	Seal wire	1	1.4541	321
87	91	Securing ring	1	1.4571	316Ti
88	Warnings				
89	All dimensions are based on standard connections. Please refer the catalogue for correct values.				
	Name:	Hakon Røbsamen	Hakon Røbsamen		
	Date:	25.04.2005	25.04.2005		
	Rev.No:	1	2		

LESER


Sizing acc. to
AD 2000:A2 / TRD 421 for gases

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	25.04.2005
Project:	Kosice Tank Farm
Tag-No:	Z 87012
Commision-No:	



Tank farm

 AIR LIQUIDE Air Liquide AGS GmbH	Item:	Safety valve	Page:	81 / 154
	Plant:	A690 / L110	Date:	30.12.2004
	Location	Kosice	Rev:	0
	Project:	K70101 ASU No. 9 Kosice	Vendor:	
	By	TV	Spec-ID:	SP198

Procurement: IA.Z


ITEM	Unit	
TAG Number		Z87012
Service		Coldbox purge
Fluid name		Nitrogen
Location/ line No		#024
Gauge pressure		
normal operation	bar g	0,1
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	0,4
Operating temperature	°C	25
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity	kg/h	4000
Fluid density	kg/m³	1,6
Phase		vapour
Sizing basis		max flow through PCV87011 or WN through orifice
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

Medium		WN orifice Nitrogen	PV87011 Nitrogen
P1	bara	3	7
T1	K	298	298
P2	bara	1,4	1,4
Flow	kg/h	4000	140

4				5			
2				3			
0	30.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File:

	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 90013	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2564		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{d,DG}$	0,81	
7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,53	
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm ²
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
12	Design Inlet		Male	
13	Thread Outlet		G 1"	
14	Design Outlet		Female	
15	Valve - Dimensions			
16	Centre to face dimension	a	75	mm
17	Centre to face dimension	b	50	mm
18	Height	H	230	mm
19	Weight	M	2,6	kg
20	Medium			
21	Name	Stickstoff flüssig		
22	Formula			
23	Density	ρ	716	kg / m ³
24	Service condition			
25	Set pressure	p	16	bar-g
26	Constant back pressure	p_{af}	0	bar-g
27	Built up - back pressure	p_{aa}	0	bar-a
28	Superimposed back pressure			bar-g
29	Overpressure	dp	10	%
30	Environmental pressure	p_U	1,013	bar-a
31	Temperature	T	-177	C
32	Required massflow	$q_{m,ab}$	6500	kg/h
33	Sizing			
34	Certified mass flow	$q_{m,zu}$	12714,63	kg/h
35	Certified volume flow (working condition)	$q_{vb,zu}$	17,76	m ³ / h
36	Maximum mass flow	$q_{m,max}$	14127,37	kg/h
37	Maximum volume flow (working condition)	$q_{vb,max}$	19,73	m ³ / h
38	Capacity exceed		95,6	%
39	Required effective discharge area	$A_{0,req}$	67,86	mm ²
40	Required discharge diameter	$d_{0,Req}$	9,295	mm
41	Reaction force (calculated acc. to W. Gossrau and K. Weyl)	F_R	47,544	N

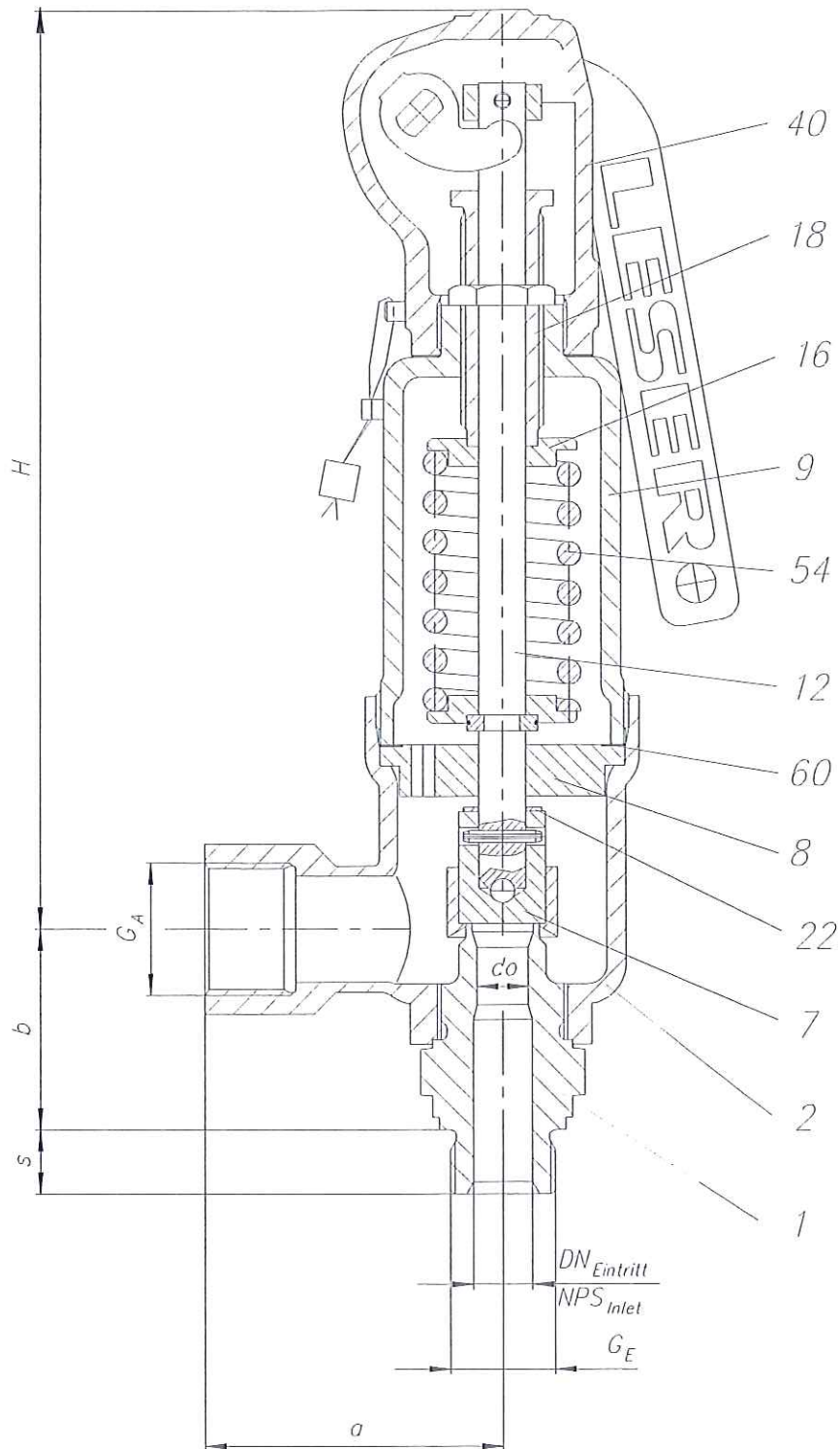
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				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 90013
				Commision-No:	
42	Valve - Partlist				
43	Pos	Denomination	Q	DIN	ASME
44	1	Inlet body	1	1.4404	316L
45	2	Outlet body	1	1.4404	316L
46	7	Disc	1	1.4404	316L
47	8	Guide	1	1.4404	316L
48	9	Bonnet	1	1.4404	316L
49	12	Spindle	1	1.4404	316L
50	14	Split ring	2	1.4404	316L
51	16	Spring plate	2	1.4404	316L
52	18	Adjusting screw	1	1.4404	316L
53	19	Lock nut	1	1.4404	316L
54	41	Lever cover H4	1	1.4408	SA-351/CF8M
55	43	Lever H4	1	1.4301	304
56	44	Lifting fork	1	1.4571	316Ti
57	45	Shaft	1	1.4404	316L
58	46	Spindle cap	1	1.4404	316L
59	47	packing gland H4	1	1.4404	316L
60	54	Spring	1	1.4310	Low temperature alloy steel
61	54	Spring	1	1.4310	Low temperature alloy steel
62	57	Pin	1	1.4310	Low temperature alloy steel
63	59	Securing ring	1	1.4571	316Ti
64	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss
65	61	Ball washer	1	1.3541/1.4401	Stainless steel
66	61	Ball washer	1	1.3541/1.4401	Stainless steel
67	74	Pin	1	1.4401	B8M
68	75	Spacer	1	1.4571	316Ti
69	81	Washer	1	1.4401	B8M
70	82	Nut	1	A2 / Poly	Stainl. steel/polyamid
71	85	Lead seal	1	Kunststoff	Plastic
72	86	Seal wire	1	1.4541	321
73	89	grafite ring	1	Reingraphit	Pure graphite
74	91	Securing ring	1	1.4571	316Ti
75	98	sealing plug	1	1.4435	316L
	Name:	My PC	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		

LESER


Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 90013
Commission-No:	



LESER	Sizing acc. to AD 2000:A2 / TRD 421 for liquids		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date:	24.04.2005
			Project:	Kosice ASU
			Tag-No:	Z 90014
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number	4594.2574		
3	Lift characteristic steam/gas	Full Lift Safety Valve		
4	Lift characteristic liquid	Safety Relief Valve		
5	Bonnet / Lifting Device	Lifting device H4 (gastight)		
6	Certified coefficient of discharge for steam and gases	$\alpha_{d,DG}$	0,79	
7	Certified coefficient of discharge for liquid	$\alpha_{d,F}$	0,52	
8	Valve - Construction			
9	Minimum discharge area	A ₀	240,53	mm ²
10	Flow diameter	d ₀	17,5	mm
11	Thread Inlet		G 1"	
12	Design Inlet		Male	
13	Thread Outlet		G 1 1/2"	
14	Design Outlet		Female	
15	Valve - Dimensions			
16	Centre to face dimension	a	75	mm
17	Centre to face dimension	b	54	mm
18	Height	H	227	mm
19	Weight	M	3	kg
20	Medium			
21	Name	Sauerstoff flüssig		
22	Formula			
23	Density	ρ	1120	kg / m ³
24	Service condition			
25	Set pressure	p	16	bar-g
26	Constant back pressure	p _{af}	0	bar-g
27	Built up - back pressure	p _{ae}	0	bar-a
28	Superimposed back pressure			bar-g
29	Overpressure	dp	10	%
30	Environmental pressure	p _u	1,013	bar-a
31	Temperature	T	-177	C
32	Required massflow	q _{m,ab}	16000	kg/h
33	Sizing			
34	Certified mass flow	q _{m,zu}	28273,08	kg/h
35	Certified volume flow (working condition)	q _{vb,zu}	25,24	m ³ / h
36	Maximum mass flow	q _{m,max}	31414,53	kg/h
37	Maximum volume flow (working condition)	q _{vb,max}	28,04	m ³ / h
38	Capacity exceed		76,7	%
39	Required effective discharge area	A _{0,req}	136,12	mm ²
40	Required discharge diameter	d _{0,Req}	13,165	mm
41	Reaction force (calculated acc. to W. Gossau and K. Weyl)	F _R	54,104	N

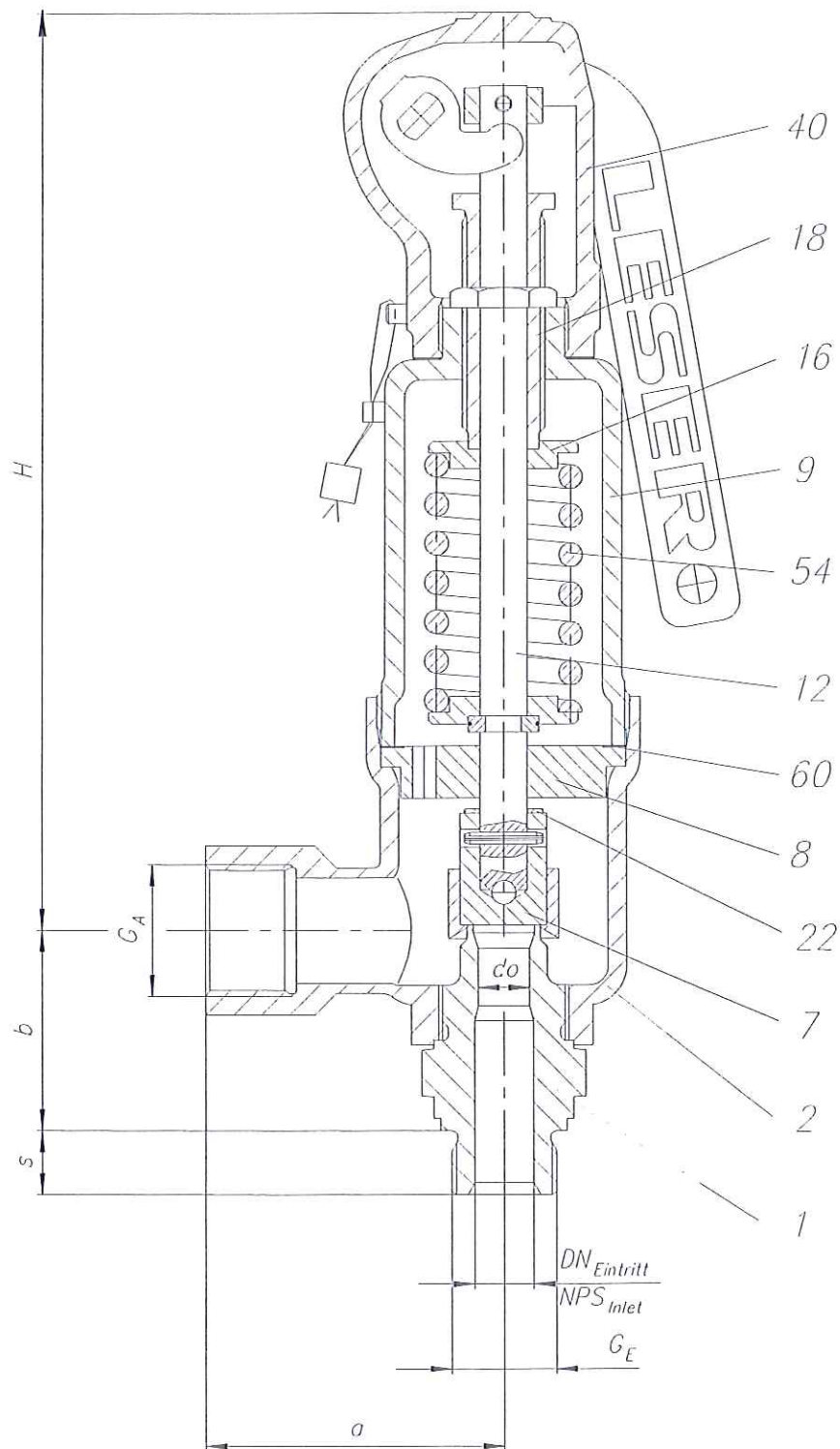
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				Date:	24.04.2005
				Project:	Kosice ASU
				Tag-No:	Z 90014
				Commision-No:	
42	Valve - Partlist				
43	Pos	Denomination	Q	DIN	ASME
44	1	Inlet body	1	2.4360	2.4360
45	2	Outlet body	1	1.4404	2.4360
46	7	Disc	1	2.4360	316L
47	8	Guide	1	1.4404	316L
48	9	Bonnet	1	1.4404	316L
49	12	Spindle	1	1.4404	316L
50	14	Split ring	2	1.4404	316L
51	16	Spring plate	2	1.4404	316L
52	18	Adjusting screw	1	1.4404	316L
53	19	Lock nut	1	1.4404	316L
54	41	Lever cover H4	1	1.4408	SA-351/CF8M
55	43	Lever H4	1	1.4301	304
56	44	Lifting fork	1	1.4571	316Ti
57	45	Shaft	1	1.4404	316L
58	46	Spindle cap	1	1.4404	316L
59	47	packing gland H4	1	1.4404	316L
60	54	Spring	1	1.4310	Low temperature alloy steel
61	57	Pin	1	1.4310	Low temperature alloy steel
62	59	Securing ring	1	1.4571	316Ti
63	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss
64	61	Ball washer	1	1.3541/1.4401	Stainless steel
65	74	Pin	1	1.4401	B8M
66	75	Spacer	1	1.4571	316Ti
67	81	Washer	1	1.4401	B8M
68	82	Nut	1	A2 / Poly	Stainl. steel/polyamid
69	85	Lead seal	1	Kunststoff	Plastic
70	86	Seal wire	1	1.4541	321
71	89	grafite ring	1	Reingraphit	Pure graphite
72	91	Securing ring	1	1.4571	316Ti
73	98	sealing plug	1	1.4435	316L
	Name:	My PC	Hakon Røbsamen		
	Date:	24.04.2005	22.04.2005		
	Rev.No:	1	2		


LESER

Sizing acc. to
AD 2000:A2 / TRD 421 for liquids

VALVESTAR® - v 6.3.1

Page:	3 of 3
Date:	24.04.2005
Project:	Kosice ASU
Tag-No:	Z 90014
Commision-No:	



 AIR LIQUIDE Air Liquide AGS GmbH	Item:	Safety valve	Page:	85 / 154
	Plant:	A690 / L110	Date:	30.12.2004
	Location	Kosice	Rev:	0
	Project:	K70101 ASU No. 9 Kosice	Vendor:	
	By	TV	Spec-ID:	SP198

Procurement: **IA.Z**

ITEM	Unit	
TAG Number		Z90014
Service		dump vaporiser header
Fluid name		oxygen
Location/ line No		#026
Gauge pressure		
normal operation	bar g	0,2
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	16
Operating temperature	°C	-144 -177
Design temperature	°C	
Temperature at no flow	°C	ambient ambient
Required capacity	Nm³/h	
Required capacity	kg/h	800 16000
Fluid density	kg/m³	66 1120
Phase		vapour liquid
Sizing basis		thermal expansion or IC pump to dump
Valve type		
Manufacturer		
Material	body/spring disc/seat	

Notes:

thermal expansion

Pipe surface area : \varnothing [mm]= 80 Length [m] = 20 A [m²] = 5,027
Generated flow [kg/h] = $0,04 * 3600 \text{ kg/hm}^2 * A = 724 \text{ kg/h}$ (see Standard 54010)


pump to dump

Medium Oxygen
valve LV23076
Kvs 4
P1 bara 30
T1 K 95
P2 bara 17
Flow kg/h 16000

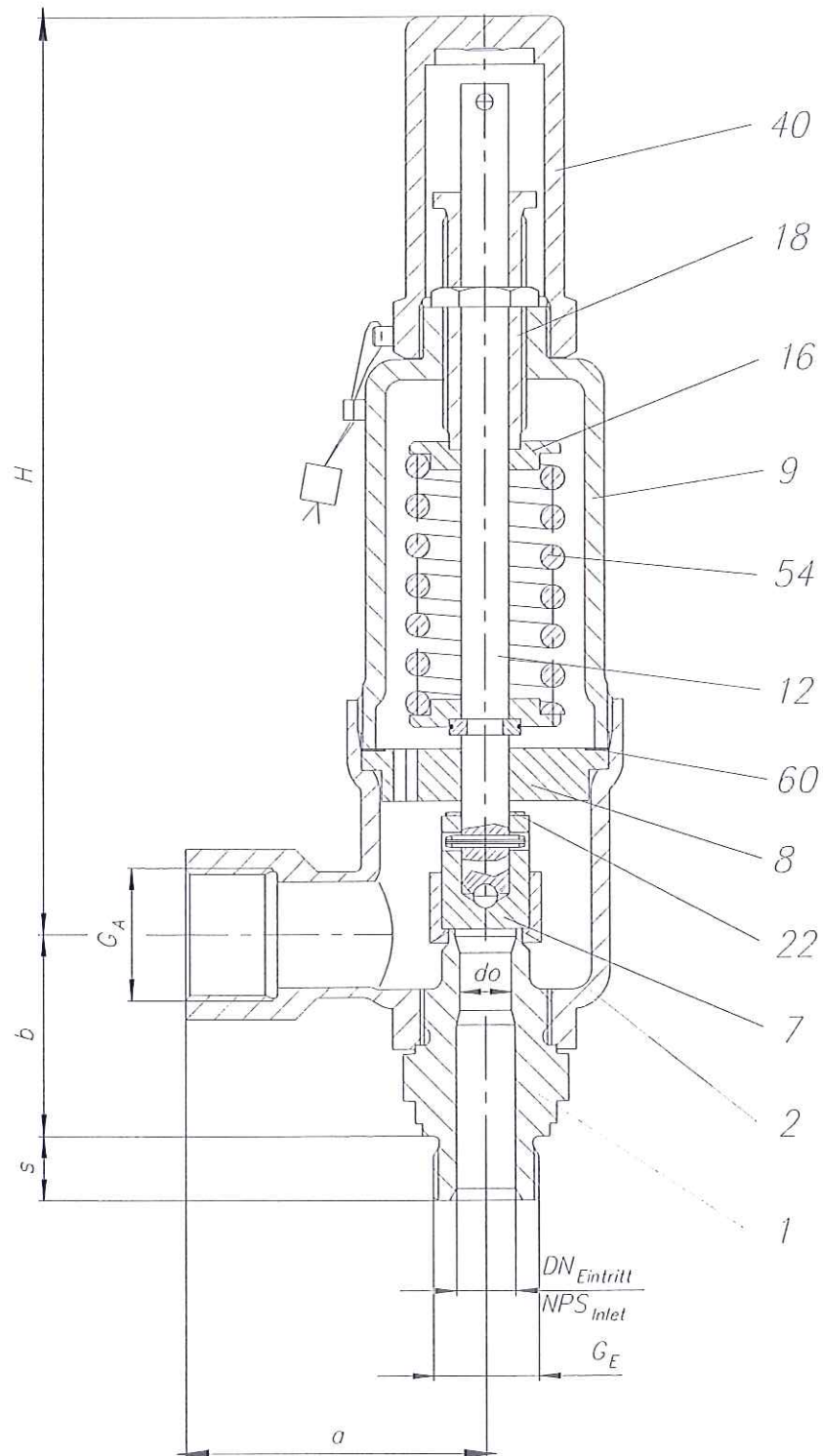
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2				3			
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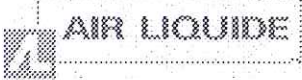
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LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases		Page: 1 of 3	
	VALVESTAR® - v 6.3.1		Date: 24.04.2005	
			Project: Kosice ASU	
			Tag-No: Z 90015	
			Commision-No:	
Project: Kosice ASU				
Contractor: Air Liquide GmbH				
1	Valve - General			
2	Article number		4594.2562	
3	Lift characteristic steam/gas		Full Lift Safety Valve	
4	Lift characteristic liquid		Safety Relief Valve	
5	Bonnet / Lifting Device		Cap H2	
6	Certified coefficient of discharge for steam and gases		$\alpha_{w,DG}$	0,81
7	Certified coefficient of discharge for liquid		$\alpha_{w,F}$	0,53
8	Valve - Construction			
9	Minimum discharge area	A_0	132,73	mm2
10	Flow diameter	d_0	13	mm
11	Thread Inlet		G 3/4"	
11	Design Inlet		Male	
12	Thread Outlet		G 1"	
12	Design Outlet		Female	
13	Valve - Dimensions			
14	Centre to face dimension	a	75	mm
15	Centre to face dimension	b	50	mm
16	Length	c	16	mm
17	Height	H	228	mm
18	Weight	M	2,6	kg
19	Medium			
20	Name	Acetone		
21	Formula			
22	Molecular weight	M	29	
23	Ratio of specific heats	k	1,4	
24	Compressibility factor	Z	1	
25	Service condition			
26	Set pressure	p	16	bar-g
27	Constant back pressure	p_{af}	0	bar-g
28	Built up - back pressure	p_{aa}	0	bar-a
29	Superimposed back pressure		0	bar-g
30	Overpressure	dp	10	%
31	Environmental pressure	p_u	1,013	bar-a
32	Temperature	T	-147	C
33	Required massflow	$q_{m,ab}$	1000	kg/h
34	Volume flow to be discharged (working condition)	$q_{vb,ab}$	19,43	m3 / h
35	Volume flow to be discharged (standard condition)	$q_{vn,ab}$	773,07	m3 / h
36	Sizing			
37	Certified mass flow	$q_{m,zu}$	2593,84	kg/h
38	Certified volume flow (working condition)	$q_{vb,zu}$	50,4	m3 / h
39	Certified volume flow (standard condition)	$q_{vn,zu}$	2005,22	m3 / h
40	Maximum mass flow	$q_{m,max}$	2882,04	kg/h
41	Maximum volume flow (working condition)	$q_{vb,max}$	56,00	m3 / h
42	Maximum volume flow (standard condition)	$q_{vn,max}$	2228,02	m3 / h
43	Capacity exceed		159,4	%
44	Required effective discharge area	$A_{0,Req}$	51,17	mm2
45	Required discharge diameter	$d_{0,Req}$	8,072	mm
46	Noise level in 1m distance from the valve (acc. to VDI 2713)	L	89,9	dB
47	Reaction force (calculated acc. to W. Gossau and K. Weyl)	F_R	252,367	N

		Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1			Page:	2 of 3
					Date:	24.04.2005
					Project:	Kosice ASU
					Tag-No:	Z 90015
					Commision-No:	
48	Valve - Partlist					
49	Pos	Denomination	Q	DIN	ASME	
50	1	Inlet body	1	1.4404	316L	
51	2	Outlet body	1	1.4404	316L	
52	7	Disc	1	1.4404	316L	
53	8	Guide	1	1.4404	316L	
54	9	Bonnet	1	1.4404	316L	
55	12	Spindle	1	1.4404	316L	
56	14	Split ring	2	1.4404	316L	
57	16	Spring plate	2	1.4404	316L	
58	18	Adjusting screw	1	1.4404	316L	
59	19	Lock nut	1	1.4404	316L	
60	42	Cap H2	1	1.4404	316L	
61	47	packing gland H4	1	1.4404	316L	
62	54	Spring	1	1.4310	Low temperature alloy steel	
63	57	Pin	1	1.4310	Low temperature alloy steel	
64	59	Securing ring	1	1.4571	316Ti	
65	60	Gasket	2	Reingraphit + 1.4401	Pure graphite/ss	
66	61	Ball washer	1	1.3541/1.4401	Stainless steel	
67	85	Lead seal	1	Kunststoff	Plastic	
68	86	Seal wire	1	1.4541	321	
69	89	grafite ring	1	Reingraphit	Pure graphite	
70	98	sealing plug	1	1.4435	316L	
	Name:	My PC	Hakon Røbsamen			
	Date:	24.04.2005	22.04.2005			
	Rev.No:	1	2			

LESER	Sizing acc. to AD 2000:A2 / TRD 421 for gases VALVESTAR® - v 6.3.1	Page:	3 of 3
		Date:	24.04.2005
		Project:	Kosice ASU
		Tag-No:	Z 90015
		Commission-No:	



 Air Liquide AGS GmbH		Item: Safety valve Plant: A690 / L110 Location: Kosice Project: K70101 ASU No. 9 Kosice By: TV	Page: 86 / 154 Date: 30.12.2004 Rev: 0 Vendor: Spec-ID: SP198
		Procurement: IA.Z	

ITEM	Unit	
TAG Number		Z90015
Service		dump vaporiser header
Fluid name		argon
Location/ line No		#026
Gauge pressure		
normal operation	bar g	0,2
outlet	bar g	0
design	bar g	
set pressure gauge	bar g	16
Operating temperature	°C	-147
Design temperature	°C	
Temperature at no flow	°C	ambient
Required capacity	Nm³/h	
Required capacity	kg/h	1000
Fluid density	kg/m³	85
Phase		Thermal expansion
Sizing basis		
Valve type		
Manufacturer		
Material		body/spring disc/seat

Notes:

Pipe surface area : \varnothing [mm]= 50 Length [m] = 20 A [m²] = 3,142

Generated flow [kg/h] = $0,08 * 3600 \text{ kg/hm}^2 * A = 905 \text{ kg/h}$ (see Standard 54010)

4				5			
2				3			
0	30.12.2004	JJ	TV	1			
rev	date	name	checked	rev	date	name	checked

File: