



# SAFETY VALVE SIZING SHEET

GENERAL INFO									
1	TECHNICAL Ref. / Item	24-2385 / 1	4	Project	PR 200	DELTA			
2	Valve Code	3A0-E23-L2	5	Quantity	2				
3	Tag Number	PSV-RU0001A-04, PSV-RU0001B-04,							
DESIGN DATA									
6	Operating Pressure	3,7		bar g	10	Operating Temperature	-0,07	°C	
7	Ambient Pressure	1,013		bar a	11	Sizing Code	API Std 520		
8	Basis	FIRE WETTED			12	Fire Case	Yes		
9	Governing Case	Yes			13	Rupture Disc	No		
INSTALLATION DATA									
14	Inlet	1" ANSI 300 RF			22	Outlet	2" ANSI 150 RF		
15	Valve Model	30000			23	Valve Type	CONVENTIONAL		
16	Superimposed Bkp				24	Seat Type	METAL-TO-METAL		
17	Constant	Pbcs	0	bar g	25	Set Pressure	Ps	22,000	bar g
18	Variable	Pbvs	0	bar g	26	CDTP	22,000	bar g	
19	Total	Pbs	0	bar g	27	Overpressure	Overp	21	%
20	Built-up Backpressure	Pbb	0	bar g	28	Relieving Temperature	T <sub>0</sub>	70,1	°C
21	Total BackPressure	Pb	0	bar g	29	Required Flow Rate	W	3197,00	kg/h
FLUID PROPERTIES									
30	Phase	Gas			35	Density	ρ	53,3	kg/m3
31	Medium	PROPANE			36	Specific Volume	v	0,019	m3/kg
32	Ratio of Specific Heats	k	1,11	-	37	Specific Gravity	G	0,053	-
33	Molecular Weight	M	44,10	kg/kmol	38	Dynamic Viscosity	μ	0,0078	cP
34	Compressibility Factor	Z	0,8	-	39	Dryness Steam Factor	x0	-	-
SIZING CRITICAL FLOW - GAS&VAPOURS - API 520									
40	Critical / Subcritical Flow	CRITICAL			$A = \frac{W}{0,9 C P_0 K_D K_{BP} K_C} \sqrt{\frac{Z T_0}{M}}$ $C = 3,948 \sqrt{k \left(\frac{2}{k+1}\right)^{\frac{(k+1)}{(k-1)}}$ $W_T = \frac{W A_s}{A}$ <p><i>Units of measure</i> A [mm<sup>2</sup>]; W [kg/h]; P [kPa]; T [K]; M [kg/kg mole]</p>				
41	Relieving Pressure	P <sub>0</sub>	27,633	bar a					
42	C Factor	C	2,4890	-					
43	Discharge Coefficient	K <sub>D</sub>	0,951	-					
44	Backpressure Corr. Factor	K <sub>BP</sub>	1	-					
45	Subcritical Corr. Factor	K <sub>b</sub>	-	-					
46	Rupture Disk Corr. Factor	K <sub>c</sub>	1	-					
47	Steam Correction Factor EN	k <sub>s</sub>	-	-					
48	Superheat Corr. Factor	k <sub>sh</sub>	-	-					
49	Supercritical Corr. Factor	k <sub>sc</sub>	-	-					
50	Napier Factor	k <sub>n</sub>	-	-					
51	Viscosity Corr. Factor	K <sub>v</sub>	-	-					
52	Reynolds Number	Re	-	-					
53	Calculated Area	A	1,3552	cm <sup>2</sup>					
54	Orifice Designation	-	E	-					
55	Selected Area	A <sub>s</sub>	1,389	cm <sup>2</sup>					
56	Area Gain	-	2	%					
57	Maximum Flow Rate	W <sub>T</sub>	3276,79	kg/h					
58									
REACTION FORCE API 520 PART II OPEN DISCHARGE TO ATMOSPHERE									
59	Reaction force (Flow)	FF	264	N	$F_F = \frac{129 W_{MAX}}{0,9 * 3600} \sqrt{\frac{k T_0}{(k+1) M}} ; F_B = \frac{A_2 P_b}{10} ; F_T = F_F + F_B$				
60	Reaction force (Static Bkp)	FB	0	N					
61	Total Reaction Force	FT	264	N					
NOISE EVALUATION API 521 Not Applicable for Liquid									
62	Noise Level @ 30m	L30	103,8	dB	$L_{30} = L + 10 \log_{10} \left( \frac{W_{M-MAX} c^2}{3600 * 0,9 * 2} \right) ; c = 91,2 \left( \frac{k T_0}{M} \right)^{0,5}$ $L_p = L_{30} - 20 \log_{10} \left( \frac{d}{30} \right)$				
63	Distance d	d	1	m					
64	Outlet Tube Diameter	d <sub>a</sub>	0,05	m					
65	Noise Level @ distance d	L <sub>d</sub>	133,8	dB					
REMARKS: Process data are under customer responsibility.									
0	24/07/2024	FIRST ISSUE				TCH	B. CAVALIERI		
REV	DATE	DESCRIPTION				PREP.	CHECK.	APPROV.	



# SAFETY VALVE SIZING SHEET

GENERAL INFO						
1	TECHNICAL Ref. / Item	24-2385 / 2	4	Project	PR 200	DELTA
2	Valve Code	3A0-FA3-L2	5	Quantity	2	
3	Tag Number	PSV-RU0001A-05, PSV-RU0001B-05,				

DESIGN DATA							
6	Operating Pressure	18,7	bar g	10	Operating Temperature	56,32	°C
7	Ambient Pressure	1,013	bar a	11	Sizing Code	API Std 520	
8	Basis	FIRE WETTED		12	Fire Case	Yes	
9	Governing Case	Yes		13	Rupture Disc	No	

INSTALLATION DATA								
14	Inlet	1½" ANSI 300 RF			22	Outlet	2" ANSI 150 RF	
15	Valve Model	30000			23	Valve Type	CONVENTIONAL	
16	Superimposed Bkp				24	Seat Type	METAL-TO-METAL	
17	Constant	Pbcs	0	bar g	25	Set Pressure	Ps	22,000 bar g
18	Variable	Pbvs	0	bar g	26	CDTP	22,000	bar g
19	Total	Pbs	0	bar g	27	Overpressure	Overp	21 %
20	Built-up Backpressure	Pbb	0	bar g	28	Relieving Temperature	T <sub>0</sub>	70,1 °C
21	Total BackPressure	Pb	0	bar g	29	Required Flow Rate	W	3479,00 kg/h

FLUID PROPERTIES								
30	Phase	Gas			35	Density	ρ	53,3 kg/m <sup>3</sup>
31	Medium	PROPANE			36	Specific Volume	v	0,019 m <sup>3</sup> /kg
32	Ratio of Specific Heats	k	1,11	-	37	Specific Gravity	G	0,053 -
33	Molecular Weight	M	44,10	kg/kmol	38	Dynamic Viscosity	μ	0,0078 cP
34	Compressibility Factor	Z	0,8	-	39	Dryness Steam Factor	x <sub>0</sub>	- -

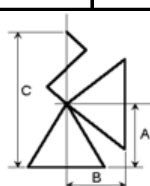
SIZING CRITICAL FLOW - GAS&VAPOURS - API 520								
40	Critical / Subcritical Flow	CRITICAL			$A = \frac{W}{0,9 C P_0 K_D K_{BP} K_C} \sqrt{\frac{Z T_0}{M}}$ $C = 3,948 \sqrt{k \left(\frac{2}{k+1}\right)^{\frac{(k+1)}{(k-1)}}$ $W_T = \frac{W A_s}{A}$ <p><i>Units of measure</i> A [mm<sup>2</sup>]; W [kg/h]; P [kPa]; T [K]; M [kg/kg mole]</p>			
41	Relieving Pressure	P <sub>0</sub>	27,633	bar a				
42	C Factor	C	2,4890	-				
43	Discharge Coefficient	K <sub>D</sub>	0,951	-				
44	Backpressure Corr. Factor	K <sub>BP</sub>	1	-				
45	Subcritical Corr. Factor	K <sub>b</sub>	-	-				
46	Rupture Disk Corr. Factor	K <sub>c</sub>	1	-				
47	Steam Correction Factor EN	k <sub>s</sub>	-	-				
48	Superheat Corr. Factor	k <sub>sh</sub>	-	-				
49	Supercritical Corr. Factor	k <sub>sc</sub>	-	-				
50	Napier Factor	k <sub>n</sub>	-	-				
51	Viscosity Corr. Factor	K <sub>v</sub>	-	-				
52	Reynolds Number	Re	-	-				
53	Calculated Area	A	1,4748	cm <sup>2</sup>				
54	Orifice Designation	-	F	-				
55	Selected Area	A <sub>s</sub>	2,164	cm <sup>2</sup>				
56	Area Gain	-	47	%				
57	Maximum Flow Rate	W <sub>T</sub>	5105,09	kg/h				
58								

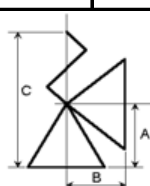
REACTION FORCE		API 520 PART II		OPEN DISCHARGE TO ATMOSPHERE	
59	Reaction force (Flow)	FF	411	N	$F_F = \frac{129 W_{MAX}}{0,9 * 3600} \sqrt{\frac{k T_0}{(k+1) M}} ; F_B = \frac{A_2 P_b}{10} ; F_T = F_F + F_B$
60	Reaction force (Static Bkp)	FB	0	N	
61	Total Reaction Force	FT	411	N	

NOISE EVALUATION		API 521		Not Applicable for Liquid	
62	Noise Level @ 30m	L <sub>30</sub>	106,1	dB	$L_{30} = L + 10 \log_{10} \left( \frac{W_{M-MAX} c^2}{3600 * 0,9 * 2} \right) ; c = 91,2 \left( \frac{k T_0}{M} \right)^{0,5}$ $L_p = L_{30} - 20 \log_{10} \left( \frac{d}{30} \right)$
63	Distance d	d	1	m	
64	Outlet Tube Diameter	d <sub>a</sub>	0,05	m	
65	Noise Level @ distance d	L <sub>d</sub>	135,7	dB	

**REMARKS: Process data are under customer responsibility.**

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REV	DATE	DESCRIPTION	PREP.	CHECK. APPROV.

GENERAL INFO										
TECHNICAL Ref. / Item		24-2385 / 1			Customer		DELTA			
Project		PR 200								
VALVE ID										
1	Tag Number	PSV-RU0001A-04, PSV-RU0001B-04,								
2	Valve Code	3A0-E23-L2		47	Quantity	2				
VALVE DESCRIPTION					SIZING DATA					
3	Valve Type	CONVENTIONAL			48	Sizing Code	API Std 520			
4	Lift Type / Value	Nozzle Type	FULL LIFT / 3,1 mm	Full	49	Basis	FIRE WETTED			
5	Bonnet Type		Closed		50	Fire Case	Yes	Governing Case	Yes	
6	Inlet	Outlet	1" ANSI 300 RF	2" ANSI 150 RF	51	Rupture Disc	No			
7	Orifice Designation/Area		E - 1,389 cm <sup>2</sup>		MEDIUM PROPERTIES					
8	Seat Type		METAL-TO-METAL		52	Medium	PROPANE			
9	NACE Compliance	Valve Stamp	NONE	UV stamp	53	Phase	Gas			
10	Seat Tightness Test Code		Acc. To API 527		54	Ratio of Specific Heats	k	1,110	-	
11	Valve Model	Overall Dimensions	30000	Acc. to API 526	55	Molecular Weight	M	44,10	kg/kmol	
12	Cap Type		Screwed		56	Compressibility Factor	Z	0,800	-	
MATERIALS					57	Density	ρ	53,30	kg/m <sup>3</sup>	
13	Body	A352 LCB			58	Specific Volume	v	0,019	m <sup>3</sup> /kg	
14	Bonnet	A352 LCB			59	Specific Gravity	G	0,05	-	
15	Cap	A352 LCB			60	Dynamic Viscosity	μ	0,01	cP	
16	Nozzle	A351 CF3M / A479 316L			REQUIRED CAPACITY					
17	Disc	A479 316L / A182 F316L			61	Required Flow Rate	W	3197	kg/h	
18	Guide	SS 316L			PRESSURES					
19	Stem	SS 316L			62	Design Pressure	Pd	22	bar g	
20	Blowdown Ring	SS 316L			63	Operating Pressure	Pop	3,7	bar g	
21	Disc-Holder	A747 CB7Cu-1			64	Ambient Pressure	Patm	1,013	bar a	
22	Spring	Alloy Steel			65	Set Pressure	Ps	22	bar g	
23	Spring Washer	CARBON STEEL			66	CDTP		22	bar g	
24	Gaskets	ARMED GRAPHITE			67	Overpressure		21	%	
25	Bolting / Nut	A193 B8M / A194 8M			68	Relieving Pressure	PO	27,63	bar a	
ACCESSORIES					69	Superimposed Bkp	Constant	Pbvs	0,00	bar g
26	Bellows	N/A			70		Variable	Pbcs	0,00	bar g
27	Balanced Piston	N/A			71		Total	Pbs	0,00	bar g
28	Lifting Lever	N/A			72	Built-up Backpressure	Pbb	0,00	bar g	
29	Test Gag	YES			73	Total BackPressure	Pb	0,00	bar g	
30	Jacket	N/A			74	Blowdown		7-10%		
31	Flushing Nozzle	N/A			TEMPERATURES					
32	Bug Screen	N/A			75	Design Temp.		-45/+120	°C	
33	Body Spacer	N/A			76	Operating Temp.		-0,07	°C	
34	Trevi Test (coupling)	N/A			77	Relieving Temperature		70,1	°C	
35	Valve Painting	TCH STDD			78	Ambient Temp.		-	°C	
SIZING RESULTS					SIZING CRITICAL FLOW - GAS&VAPOURS - API 520					
36	Calculated Area	A	1,3552	cm <sup>2</sup>	79	Critical / Subcritical Flow	CRITICAL			
37	Selected Orifice/Area	E - 1,389 cm <sup>2</sup>			80	C Factor	C	2,489	-	
38	Area Gain	-	2,00	%	81	Discharge Coefficient	KD	0,951	-	
39	Maximum Flow Rate	WT	3276,79	kg/h	82	Backpressure Corr. Factor	KBP	1,00	-	
40	Reaction force (Flow)	FF	264,00	N	83	Subcritical Corr. Factor	Kb	-	-	
41	Reaction force (Static Bkp)	FB	0,00	N	84	Rupture Disk Corr. Factor	KC	1,0	-	
42	Total Reaction Force	FT	264,00	N	85	Subcritical Corr. Factor	Kb	-	-	
43	Noise Level @ 30m	L30	103,84	dB	86	Viscosity Corr. Factor	KV	-	-	
44	Distance d	d	1,00	m	87	Reynolds Number	Re	-	-	
45	Outlet Tube Diameter	da	0,05	m	 <p>DIM. (mm) &amp; WT (kg): 105 (A); 115 (B); 365 (C); 15 (WT)</p>					
46	Noise Level @ distance d	Ld	133,77	dB						
Process data are under customer responsibility.										
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REV	DATE	DESCRIPTION			PREP.	CHECK.	APPROV.			

GENERAL INFO										
TECHNICAL Ref. / Item		24-2385 / 2			Customer		DELTA			
Project		PR 200								
VALVE ID										
1	Tag Number	PSV-RU0001A-05, PSV-RU0001B-05,								
2	Valve Code	3A0-FA3-L2		47	Quantity	2				
VALVE DESCRIPTION					SIZING DATA					
3	Valve Type	CONVENTIONAL			48	Sizing Code	API Std 520			
4	Lift Type / Value	Nozzle Type	FULL LIFT / 4 mm	Full	49	Basis	FIRE WETTED			
5	Bonnet Type		Closed		50	Fire Case	Yes	Governing Case	Yes	
6	Inlet	Outlet	1½" ANSI 300 RF	2" ANSI 150 RF	51	Rupture Disc	No			
7	Orifice Designation/Area		F - 2,164 cm²		MEDIUM PROPERTIES					
8	Seat Type		METAL-TO-METAL		52	Medium	PROPANE			
9	NACE Compliance	Valve Stamp	NONE	UV stamp	53	Phase	Gas			
10	Seat Tightness Test Code		Acc. To API 527		54	Ratio of Specific Heats	k	1,110	-	
11	Valve Model	Overall Dimensions	30000	Acc. to API 526	55	Molecular Weight	M	44,10	kg/kmol	
12	Cap Type		Screwed		56	Compressibility Factor	Z	0,800	-	
MATERIALS					57	Density	ρ	53,30	kg/m³	
13	Body	A352 LCB			58	Specific Volume	v	0,019	m³/kg	
14	Bonnet	A352 LCB			59	Specific Gravity	G	0,05	-	
15	Cap	A352 LCB			60	Dynamic Viscosity	μ	0,01	cP	
16	Nozzle	A351 CF3M / A479 316L			REQUIRED CAPACITY					
17	Disc	A479 316L / A182 F316L			61	Required Flow Rate	W	3479	kg/h	
18	Guide	SS 316L			PRESSURES					
19	Stem	SS 316L			62	Design Pressure	Pd	22	bar g	
20	Blowdown Ring	SS 316L			63	Operating Pressure	Pop	18,7	bar g	
21	Disc-Holder	A747 CB7Cu-1			64	Ambient Pressure	Patm	1,013	bar a	
22	Spring	Alloy Steel			65	Set Pressure	Ps	22	bar g	
23	Spring Washer	CARBON STEEL			66	CDTP		22	bar g	
24	Gaskets	ARMED GRAPHITE			67	Overpressure		21	%	
25	Bolting / Nut	A193 B8M / A194 8M			68	Relieving Pressure	PO	27,63	bar a	
ACCESSORIES					69	Superimposed Bkp	Constant	Pbvs	0,00	bar g
26	Bellows	N/A			70		Variable	Pbcs	0,00	bar g
27	Balanced Piston	N/A			71		Total	Pbs	0,00	bar g
28	Lifting Lever	N/A			72	Built-up Backpressure	Pbb	0,00	bar g	
29	Test Gag	YES			73	Total BackPressure	Pb	0,00	bar g	
30	Jacket	N/A			74	Blowdown		7-10%		
31	Flushing Nozzle	N/A			TEMPERATURES					
32	Bug Screen	N/A			75	Design Temp.		-45/+120	°C	
33	Body Spacer	N/A			76	Operating Temp.		56,32	°C	
34	Trevi Test (coupling)	N/A			77	Relieving Temperature		70,1	°C	
35	Valve Painting	TCH STDD			78	Ambient Temp.		-	°C	
SIZING RESULTS					SIZING CRITICAL FLOW - GAS&VAPOURS - API 520					
36	Calculated Area	A	1,4748	cm²	79	Critical / Subcritical Flow	CRITICAL			
37	Selected Orifice/Area	F - 2,164 cm²			80	C Factor	C	2,489	-	
38	Area Gain	-	47,00	%	81	Discharge Coefficient	KD	0,951	-	
39	Maximum Flow Rate	WT	5105,09	kg/h	82	Backpressure Corr. Factor	KBP	1,00	-	
40	Reaction force (Flow)	FF	411,00	N	83	Subcritical Corr. Factor	Kb	-	-	
41	Reaction force (Static Bkp)	FB	0,00	N	84	Rupture Disk Corr. Factor	KC	1,0	-	
42	Total Reaction Force	FT	411,00	N	85	Subcritical Corr. Factor	Kb	-	-	
43	Noise Level @ 30m	L30	106,15	dB	86	Viscosity Corr. Factor	KV	-	-	
44	Distance d	d	1,00	m	87	Reynolds Number	Re	-	-	
45	Outlet Tube Diameter	da	0,05	m	 <p>DIM. (mm) &amp; WT (kg): 124 (A); 152 (B); 420 (C); 21 (WT)</p>					
46	Noise Level @ distance d	Ld	135,69	dB						
Process data are under customer responsibility.										
0	24/07/2024	FIRST ISSUE			TCH			B. CAVALIERI		
REV	DATE	DESCRIPTION			PREP.	CHECK.	APPROV.			