







OWNER:  شرکت سست و سویی آیرپک ایران (سهامی خاص)	BUSHEHR PETROCHEMICAL COMPANY MEG PLANT						EPC CONTRACTOR:  Chagalesh-Enerchimi-Steam Joint Venture BUPC-MEG PLANT PROJECT		
MC :  شرکت سست و سویی آیرپک ایران تهران	CALCULATION & DATA SHEET OF SAFETY VALVE FOR EMERGENCY INSTRUMENT AIR COMPRESSOR						 Netherlands		
Owner Document Number: 17811-52B							Project	Area	Phase
	BU	20	VD	303	IN	DSH	0068	Rev.: 04	Page 1 of 11

CALCULATION & DATA SHEET OF SAFETY VALVE FOR EMERGENCY INSTRUMENT AIR COMPRESSOR



 شرکت پتروشیمی بوشهر	 Chagalesh-Enerchimi-Steam Joint Venture BUPC-MEG PLANT PROJECT	BUSHEHR PETROCHEMICAL COMPANY MEG PLANT
Document Review		
Issue Purpose:	AFC	
Result Code: AP,AN,CM,RE,NC	AP	
Next Status : IFC,IFA,IFI,AFC,AB	-	
Responsible Department	MECHANICAL	
Commented Date	7/25/2022	

**Approval or review hereunder shall not be construed to relieve Vendor /
Subcontractor of his responsibilities and liability under the contract.**

04	07/07/2022	Approved for Construction	TvT	KP	LdM	
03	16/06/2022	Approved for Construction	TvT	KP	LdM	
02	09/05/2022	Approved for Construction	TvT	KP	LdM	
01	27/10/2021	For approval	TvT	KP	LdM	
00	20/09/2021	For approval	TvT	KP	LdM	
Rev.	Date	Purpose of Issue	Prepared	Checked	Approved	AC Code
					Class: 1	Phase: P



INDEX			
No.	Device	Tag Number	Page
1	Pressure Safety Valve	PSV-71101	4
2	Pressure Safety Valve	PSV-71102	5
3	Pressure Safety Valve calculations	PSV-71101	6/7/8
4	Pressure Safety Valve calculations	PSV-71102	9/10/11
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
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Notes:

				INSTRUMENT AND VALVE DATASHEET Index 	
04	KP	07/07/2022	Approve for construction		
03	TT	16/06/2022	Approve for construction		
02	TT	09/05/2022	Approve for construction		
01	TT	27/10/2021	Approve for construction		
00	TT	20/09/2021	For Approval		
Rev	By	Date	Description	Sheet	3 of 11
				Based on P&ID	Rev.05

GENERAL	1	Tag Number		PSV-71101	
	2	Service		Pressure Safety Valve	
	3	P&ID No.		BU-20-VD-303-PR-WG-0066	
	4	Location		Compressor upstream After-cooler	
	5	Line/equip. No.		N/A	
	6	Design / nozzle type		Safety / Full	
	7	Conv., Bellows, Pilot op.		Conventional type	
	8	Bonnet Type /connection		Closed / bolted	
	9	Spring Cap /connection		Closed/ threaded	
PROCESS CONDITIONS	10	Fluid	State	Air	Dry Gas
	11	Pressure	Norm. Max.	21 Bar(a)	26 Bar(a)
	12	Temperature	Norm. Max.	180°C	195°C
	13	Design	Press. Temp.	26 Bar(g)	210°C
	14	Ambient Temp.	Min. Max.	5 °C	52 °C
BASIS AND SELECTION	15	Flow		55 Kg/hr / 43 Nm3/hr	
	16	Set Pressure		26 bar(g)	
	17	Molecular Weight	Oper. Sp. Gr.	28,97 kg/mol	1
	18	Back Pres. (bar(g))		0 bar(g)	
	19	Allowable Overpressure (%)		10 %	
	20	Compressibility Factor (Z)		1	
	21	Ratio of Specific Heat (Cp/Cv)		1.4	
	22	Operating Viscosity (cP)		-	
	23	Barometric Pressure		1,013	
	24	Max. Allowable Relief Pressure		29,613	
	25	Design Code		API 520, API 521, API 526	
	26	Size Basis		Blocked discharge	
	27	Calculated Area (sq.mm)		6	
	28	Selected Area (sq.mm)		153	
CONNECTIONS	29	Orifice Designation		D	
	30				
	31	Inlet Size	Outlet Size	1"	2"
	32	Inlet Connection	Outlet Conn.	RF	RF
	33	Inlet Rating	Outlet Rating	300#	150#
	34				
	35				
MATERIAL	36	Body and Bonnet		Carbon steel (SA-216 Gr. WCB)	
	37	Seat and Disc		SS 316	
	38	Guide and Rings		SS 316	
	39	Spring		Chrome Alloy	
	40	Nozzle		SS 316	
	41	Bonnet Bolt/nut		A193 B7 / A194 grade 2H	
	42				
OPTIONS	43	Lever: Plain or Packed		Plain	
	44	Test Gag		Yes	
	45				
	46				
	47				
CERTIFICATES	48	3.1 Material certificate		Yes	
	49	Calibration certificate		Yes	
	50	Leakage test acc to API STD 527		Yes	
	51	Functional test		Yes	
CALCULATIONS	52	Sizing calculation		Yes	
	53				
	54				
PURCHASE	55	Manufacturer		Leser	
	56	Model		5262	
	57				

NOTES :

04	KP	07/07/2022	Approve for construction	INSTRUMENT AND VALVE DATASHEET Pressure Safety Valve 	
03	TT	16/06/2022	Approve for construction		
02	TT	09/05/2022	Approve for construction		
01	TT	27/10/2021	Approve for construction		
00	TT	20/09/2021	For Approval		
Rev	By	Date	Description	Sheet 4 of 11 Based on P&ID Rev.05	

GENERAL	1	Tag Number		PSV-71102	
	2	Service		Pressure Safety Valve	
	3	P&ID No.		BU-20-VD-303-PR-WG-0066	
	4	Location		Compressor Cooling water outlet	
	5	Line/equip. No.		1 1/2"-CWR-7008-500C(N)	
	6	Design / nozzle type		Safety / Full	
	7	Conv., Bellows, Pilot op.		Conventional type	
	8	Bonnet Type /connection		Closed / bolted	
	9	Spring Cap /connection		Closed/ threaded	
PROCESS CONDITIONS	10	Fluid	State	Water	Liquid
	11	Pressure	Norm. Max.	2,5 Bar(g)	3 Bar(g)
	12	Temperature	Norm. Max.	45°C	55°C
	13	Design	Press. Temp.	7 Bar(g)	100°C
	14	Ambient Temp.	Min. Max.	5 °C	52 °C
BASIS AND SELECTION	15	Flow		3,5 m3/hr	
	16	Set Pressure		3,5 bar(g)	
	17	Molecular Weight	Oper. Sp. Gr.	18,015 g/mol	1
	18	Back Pres. (bar(g))		0 bar(g)	
	19	Allowable Overpressure (%)		10 %	
	20	Compressibility Factor (Z)		1	
	21	Ratio of Specific Heat (Cp/Cv)		1.4	
	22	Operating Viscosity (cP)		-	
	23	Barometric Pressure		1,013	
	24	Max. Allowable Relief Pressure		4,863	
	25	Design Code		API 520, API 521, API 526	
	26	Size Basis		Blocked discharge	
	27	Calculated Area (sq.mm)		102	
	28	Selected Area (sq.mm)		153	
29	Orifice Designation		D		
CONNECTIONS	30				
	31	Inlet Size	Outlet Size	1"	2"
	32	Inlet Connection	Outlet Conn.	RF	RF
	33	Inlet Rating	Outlet Rating	150#	150#
	34				
MATERIAL	35				
	36	Body and Bonnet		Carbon steel (SA-216 Gr. WCB)	
	37	Seat and Disc		SS 316	
	38	Guide and Rings		SS 316	
	39	Spring		Chrome Alloy	
	40	Nozzle		SS 316	
	41			A193 B7 / A194 grade 2H	
OPTIONS	42				
	43	Lever: Plain or Packed		Plain	
	44	Test Gag		Yes	
	45				
	46				
CERTIFICATES	47				
	48	3.1 Material certificate		Yes	
	49	Calibration certificate		Yes	
	50	Leakage test acc to API STD 527		Yes	
CALCULATIONS	51	Functional test		Yes	
	52	Sizing calculation		Yes	
	53				
PURCHASE	54				
	55	Manufacturer		Leser	
	56	Model		5262	
57					

NOTES :

				INSTRUMENT AND VALVE DATASHEET			
				Pressure Safety Valve			
04	KP	07/07/2022	Approve for construction				
03	TT	16/06/2022	Approve for construction				
02	TT	09/05/2022	Approve for construction				
01	TT	27/10/2021	Approve for construction				
00	TT	20/09/2021	For Approval				
Rev	By	Date	Description				
						Sheet 5 of 11 Based on P&ID Rev.05	

W _Ki The-Safety-Valve.com	Sizing acc. to API 520 for Gas VALVESTAR® - v.7.3.1.6 0 92 0	Pane:	lof6
		Date:	2022-04-22 11:16:06
		Project:	New project
		Tag No:	PSV-71101
		LESER Job N9	

Sizing - Medium			
1000	Designation	Air	
1004	Formula		
1001	Molar mass	M	29 kg/kmol
1002	Ratio of specific heats	k	1.400
1003	Compressibility factor	Z	1.000

Sizing - Service condition			
1100	Maximum allowable working pressure		
1101	Set pressure	p	26 bar-g
1102	Constant superimposed back pressure	paf	
2102	Variable superimposed back pressure		
1103	Built up back pressure	pae	
1104	Backpressure		
1105	Overpressure	dp	10.00 °A)
1106	Environmental pressure	pu	1.013 bar
1107	Relieving Temperature	T	210 °C
1111	Operating Temperature		210 °C
1108	Required massflow	qm,ab	50 kg/h
1109	Volume flow to be discharged (working condition)	qvb,ab	2.339 m³/h
1110	Volume flow to be discharged (std condition) [T=60 °F P=14.7 psi]	qvn,ab	24.031 SCFM
1120	Rupture disc correction factor	Kc	1.000

Initial Sizing according to API 520 for conventional safety valve		
1150	NPS inlet Orifice NPS outlet	1D2
1151	PR inlet x PR outlet	#300 x #150
1152	Material	WCB
1153	Required orifice	D
1154	Selected orifice	D

Sizing - Calculation			
1200	Certified massflow	qm,zu	1,375.207 kg/h
1201	Certified volumeflow (operating condition)	qvb,zu	64.327 m³/h
1203	Certified volumeflow (standard condition)	qvn,zu	1,123.09 m³/h
1204	Maximum mass flow	qnn,max	1,528.008 kg/h
1205	Maximum volume flow (working condition)	qvb,max	71.474 m³/h
1206	Maximum volume flow (standard condition)	qvn,max	1,247.878 m³/h
1207	Capacity exceed		2650.41 %

Name	AD 2000-Merkblatt A2			
Date	2022-04-22 11:16:06			
Rev.No	1			

W _____ _Ki The-Safety-Valve.com	Sizing acc. to API 5 2 0 for Gas VALVESTAR® - v.7.3.1.6 0 92 0	Page:	2of6
		Date:	2022-04-22 11:16:06
		Project:	New project
		Tag No:	PSV-71101
		LESER Job N9	

Valve - General			
1500	Article number		
1512	Reseller article number		
1513	Quantity of safety valve		1
1501	Certified coefficient of discharge for steam and gases	K,DG	0.455
1502	Certified coefficient of discharge for liquid	K,F	0.343
1453	Orifice		D
1505	Bonnet / Lifting device		Lifting device H4 (gastight)
1506	Body-/ Inlet base material		1.0619 / SA 216 WCB
1511	Bonnet		Closed Bonnet
1514	Order code		

Inlet connection			
1303	Connection standard		acc. to ASME B16.5
1304	DN / NPS		1"
1305	PN / PR		#300
1 306	Flange facing		RF

Outlet connection			
1353	Connection standard		acc. to ASME B16.5
1354	DN / NPS		2"
1355	PN / PR		#150
1 356	Flange facing		RF

Valve - Dimensions				
1400	Discharge area	Ao	153.938	m m ²
1401	Discharge diameter	do	14	mm
1402	Centre to Face dimensions	a	105	mm
1 403	Centre to Face dimensions	b	114	mm
1405	Height	H	440	mm
1406	Weight	M	17.3	kg
1411	Inlet flange thickness incl. raised face	S1	30	mm

Lift		
1507	Standard	1.5 mm

Name	AD 2000-Merkblatt A2
Date	2022-04-22 11:16:06
Rev.No	1

W 1 The-Safety-Valve.com _Ki	Sizing acc. to API 5 2 0 for Gas VALVESTAR ® - v.7.3.1.6 0 92 0	Page:	3of6
		Date:	2022-04-22 11:16:06
		Project:	New project
		Tag No:	PSV-71101
		LESER Job N9	

Valve - Calculation				
1200	Certified massflow	qm,zu	1,375.207	kg/h
1201	Certified volumeflow (operating condition)	qvb,zu	64.327	m ³ /h
1203	Certified volumeflow (standard condition)	qvn,zu	1,123.09	m ³ /h
1204	Maximum mass flow	qnn,max	1,528.008	kg/h
1205	Maximum volume flow (working condition)	qvb,max	71.474	m ³ /h
1206	Maximum volume flow (standard condition)	qvn,max	1,247.878	m ³ /h
1207	Capacity exceed		2650.41	%
1 600	Required actual discharge area	Ao, req	5.597	mm ²
1 601	Required discharge diameter	do,req	2.6 6 9	mm
1 61 7	Back pressure correction factor	Kb	1 .000	
1 61 8	Cold differential test pressure	CDTP	2 6.3 85	bar-g
1 62 0	Cold differential test pressure, manually	CDTP		

Name	AD 2000-Merkblatt A2				
Date	2022-04-22 11:16:06				
Rev.No	1				

WI The-Safety-Valve.com	Sizing acc. to API 520 for Liquid VALVESTAR® - v.7.3.1.60920	Page:	lof6
		Date:	2022-04-22 11:59:23
		Project:	New project
		Tag No:	PSV-71102
		LESER Job Ng	

Sizing - Medium			
1000	Designation	Water	
1004	Formula	H2O	
1005	Density	p	998 kg/m ³
1006	Viscosity	p or el	

Sizing - Service condition			
1100	Maximum allowable working pressure		
1101	Set pressure	p	3.5 bar-g
1102	Constant superimposed back pressure	paf	
2102	Variable superimposed back pressure		
1103	Built up back pressure	pae	
1104	Backpressure		
1105	Overpressure	dp	10.00 Wo
1106	Environmental pressure	pu	1.013 bar
1107	Relieving Temperature	T	60 °C
1111	Operating Temperature		60 °C
1108	Required massflow	qm,ab	3,493 kg/h
1109	Volume flow to be discharged (working condition)	qvb,ab	3.5 m ³ /h
1120	Rupture disc correction factor	Kc	1.000

Initial Sizing according to API 520 for conventional safety valve			
1150	NPS inlet Orifice NPS outlet		1D2
1151	PR inlet x PR outlet		#150 x #150
1152	Material		WCB
1153	Required orifice		D
1154	Selected orifice		D

Sizing - Calculation			
1200	Certified massflow	qm,zu	5,267.713 kg/h
1201	Certified volumeflow (operating condition)	qvb,zu	5.278 m ³ /h
1203	Certified volumeflow (standard condition)	qvn,zu	
1204	Maximum mass flow	qm,max	5,853.014 kg/h
1205	Maximum volume flow (working condition)	qvb,max	5.865 m ³ /h
1206	Maximum volume flow (standard condition)	qvn,max	
1207	Capacity exceed		50.81 Wo

Name	AD 2000-Merkblatt A2			
Date	2022-04-22 11:59:23			
Rev.No	1			

WI The-Safety-Valve.com	Sizing acc. to API 520 for Liquid VALVESTAR® - v.7.3.1.60920	Pane:	2 of 6
		Date:	2022-04-22 11:59:23
		Project:	New project
		Tag No:	PSV-71102
		LESER Job Ng	

Valve - General			
1500	Article number		
1512	Reseller article number		
1513	Quantity of safety valve		1
1501	Certified coefficient of discharge for steam and gases	K,DG	0.455
1502	Certified coefficient of discharge for liquid	K,F	0.343
1453	Orifice		D
1505	Bonnet / Lifting device		Cap H2
1506	Body-/ Inlet base material		1.0619 / SA 216 WCB
1511	Bonnet		Closed Bonnet
1514	Order code		

Inlet connection			
1303	Connection standard		acc. to ASME B16.5
1304	DN / NPS		1"
1305	PN / PR		#150
1306	Flange facing		RF

Outlet connection			
1353	Connection standard		acc. to ASME B16.5
1354	DN / NPS		2"
1355	PN / PR		#150
1356	Flange facing		RF

Valve - Dimensions				
1400	Discharge area	Ao	153.938	mm ²
1401	Discharge diameter	do	14	mm
1402	Centre to Face dimensions	a	105	mm
1403	Centre to Face dimensions	b	114	mm
1405	Height	H	440	mm
1406	Weight	M	17.3	kg
1411	Inlet flange thickness incl. raised face	S1	30	mm

Lift		
1507	Standard	1.5 mm

Name	AD 2000-Merkblatt A2
Date	2022-04-22 11:59:23
Rev.No	1

WI _1 2 The-Safety-Valve.com	Sizing acc. to API 520 for Liquid VALVESTAR® - v.7.3.1.60920	Pane:	3of6
		Date:	2022-04-22 11:59:23
		Project:	New project
		Tag No:	PSV-71102
		LESER Job Ng	

Valve - Calculation				
1200	Certified massflow	qm,zu	5,267.713	kg/h
1201	Certified volumeflow (operating condition)	qvb,zu	5.278	m ³ /h
1203	Certified volumeflow (standard condition)	qvn,zu		
1204	Maximum mass flow	qnn,max	5,853.014	kg/h
1205	Maximum volume flow (working condition)	qvb,max	5.865	m ³ /h
1206	Maximum volume flow (standard condition)	qvn,max		
1207	Capacity exceed		50.81	%
1600	Required actual discharge area	Ao, req	102.076	mm ²
1601	Required discharge diameter	do,req	11.4	mm
1618	Cold differential test pressure	CDTP	3.5	bar-g
1620	Cold differential test pressure, manually	CDTP		

Valve - Accessories	
J70	Lifting cap H2: Test Gag

Name	AD 2000-Merkblatt A2				
Date	2022-04-22 11:59:23				
Rev.No	1				