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Pressure Relief Valve Sizing & Selection Report

No	Prpd.	Chk.	Appr.	Date	Revision
1	EVC			7-abr.-2022	New temperatures
0	EVC			7-mar.-2022	New valve on scope.

Quote Number: 093-093

Client: *TECHNIP ENERGIES*
Location: *CARTAGENA, SPAIN*
End-User Ref. No.: *201754C001*
Project: *C43 "New Bios 2G Hydrotreatment Unit"*
Project Ref. No.: *U-608 Hydrogen Unit*

Valve ID

Tag No.	*608-PSV-1140*
Service	*Nitrogen Compressor Suction*
PID No.	*P-C43-A-110990 H36*
Line No.	*4"SH-5707-D3-H*
Quantity	*1*

GENERAL

Valve Type	*Balanced Bellows, Direct Spring-Op*		
Safety / Relief	*Safety*	Balanced	*Yes*
Nozzle	*Full*	Bonnet	*Vented*

CONNECTIONS

Inlet	*1"*	*Flngd.*	*300#*	*RF*	Standard
Outlet	*2"*	*Flngd.*	*150#*	*RF*	*ASME B16.5*

MATERIALS OF CONSTRUCTION

Body / Base	*CS SA216-WCB/WCC*
Bonnet / Cylinder	*CS SA216-WCB/WCC*
Nozzle	*316 SST*
Disc	*316 SST*
Seat	*Metal*
Spindle	*416 SST*
Guide	*SS A297 Gr. HE*
Spring	*Ctd. Alloy Steel*
Gaskets	*316 SST*
Bellows	*Inconel® 625*
Cap Type	*Bolted w/ Test Rod*
NACE MR0175/ISO 15156:2015	*No*

Accessories: *Bug Screen*

SIZING / SELECTION SUMMARY

Valve Model No.		*1D2JBS-E36M-P*		
Brand		*Crosby®*		
Area (cm²)	Calculated	Selected		*0.710*
	Data Set	Orifice	*API*	*D*
Flow	Unit	Required	kg/hr	
		Maximum		884.335
Reaction Force, Open Discharge			*80.3 N*	
Noise Level (db), Open Discharge			*126.4 at 1.0000-m*	

SIZING DATA

Design Code	*ASME VIII/XIII - UV*	Sizing Std.	*API 520*
Sizing Basis	*Valve Open*		
Fluid State at Inlet	*Gas / Vapor*		
Relieving Case	*Pressure Relief*		

Fluid Properties

Fluid Name	*Nitrogen*
Molecular Weight, M	*28.0*
Compressibility, Z	*1.000*
Ratio of Sp. Heats, k (Cp / Cv)	*1.400*
Gas Constant, C	*270.3*

Sizing Coefficients

		Unit	-
Effective K, Gas		*0.975*	
Kb	Kc	*1*	*1*

Required Capacity

	Unit	
Total		

Pressures

		Unit	kg/cm² g
MAWP	Operating	*15*	*6*
Set	CDTP	*13.6*	*13.600*
Over Pressure		*1.36*	*10%*
Back Pressure	Built-Up		*1.6*
	Constant Superimposed		*0.3*
	Variable Superimposed		*1.5*
	Total		*3.4*
Inlet Loss		*0*	*0%*
Atmospheric (Barometric)		*1.033*	*kg/cm² a*

Temperatures

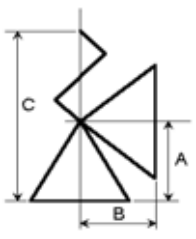
		Unit	°C
	Normal System		
Operating	Relieving	*35*	*35*
Design Min	Design Max		*80*

Tag Notes

1. Maximum Content P(%) 0.020 - S(%) 0.015. (body and bonnet)
2 . Standard C4M acc. ISO 12944
3. Opening Adjustment 5%
4. Blowd own: 11.8%
5. ASME "UV" Stamp required.

Valve Dimensions

mm	
A	104.90
B	114.30
C	514.35
kg	
Weight	16.33



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Pressure Relief Valve Calculation Report

No	Prpd.	Chk.	Appr.	Date	Revision
1	EVC			7-abr.-2022	New temperatures
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Quote Number: 093-093

Client: *TECHNIP ENERGIES*

Location: *CARTAGENA, SPAIN*

End-User Ref. No.: *201754C001*

Project: *C43 "New Bios 2G Hydrotreatment Unit"*

Project Ref. No.: *U-608 Hydrogen Unit*

1	**VALVE ID**			
2	Tag No.	608-PSV-1140		
3	Valve Model No.	1D2JBS-E36M-P	Qty. 1	
4	**SIZING DATA**			
5	Design Code	ASME VIII/XIII - UV	Sizing Std.	API 520
6	Fluid State at Inlet	Gas / Vapor		

CALCULATION NOTES

1. Maximum Content P(%) 0.020 - S(%) 0.015. (body and bonnet)
2 . Standard C4M acc. ISO 12944
3. Opening Adjustment 5%
4. Blowd own: 11.8%
5. ASME "UV" Stamp required.

CALCULATION SUMMARY

8	Flow	Required		18	Area	Required	
9		Maximum	884.335 kg/hr	19		Selected	0.710 cm²
10	Reaction Force, Open Discharge		80.3 N	20	Noise Level (db), Open Discharge		126.4 at 1.0000 m

Variable Type	Variable Name	Symbol	Input Value		Equation Value	
Fluid Properties	Molecular Weight	M	28.0		28.0	
	Ratio of Specific Heats	k	1.400		1.400	
	Compressibility	Z	1.000		1.000	
Process Cond.	Required Mass Flow	Wreq				
	Set Pressure	Pset	13.6	kg/cm² g	13.337	barg
	Over Pressure	Pover	1.36	kg/cm² g	1.334	barg
	Inlet Line Loss	Ploss	0	kg/cm² g	0	barg
	Back Pressure	Pback	3.4	kg/cm² g	3.334	barg
	Atmospheric Pressure	Patm	1.033	kg/cm² a	1.013	bara
	Relieving Temperature	T	35	°C	308.150	°K
	Distance from Valve (noise)	r	1.0000	m	1.0000	m
	Rupture Disc CCF	Kc	1		1	
Valve Data	Discharge Coefficient (API)	K,API	0.975		0.975	
	Orifice Area	A	0.710	cm²	0.710	cm²
	Back Press. Correction Factor	Kb	1		1	
	Outlet Diameter	Do	52.5	mm	5.25	cm

Calculate Inlet Relieving Pressure, Outlet Pressure, Absolute Pr essure Ratio

P1 = Pset + Pover - Ploss + Patm	**P1**	15.684	bara
P2 = Pback + Patm	**P2**	4.348	bara
PR = P2 / P1	**PR**	0.277	

Calculate Gas Constant — **C** — 270.3

C = 394.8 * {k * [2 / (k + 1)]^[(k + 1) / (k - 1)] }^0.5

Calculate Mass Critical Flow — **W** — 884.335 kg/hr — 884.335 kg/hr

W = A * C * K,API * P1 * Kb * Kc * [M / (T * Z)]^0.5

Calculate Required Orifice Area — **Areq**

Areq = A * Wreq / W

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Location: *CARTAGENA, SPAIN*

End-User Ref. No.: *201754C001*

Project: *C43 "New Bios 2G Hydrotreatment Unit"*

Project Ref. No.: *U-608 Hydrogen Unit*

1	**VALVE ID**				
2	Tag No.	608-PSV-1140			
3	Valve Model No.	1D2JBS-E36M-P	Qty. 1		
4	**SIZING DATA**				
5	Design Code	ASME VIII/XIII - UV	Sizing Std.	API 520	
6	Fluid State at Inlet	Gas / Vapor			

CALCULATION NOTES

1. Maximum Content P(%) 0.020 - S(%) 0.015. (body and bonnet)
2 . Standard C4M acc. ISO 12944
3. Opening Adjustment 5%
4. Blowd own: 11.8%
5. ASME "UV" Stamp required.

CALCULATION SUMMARY

8	Flow	Required		Area	Required
9		Maximum	884.335 kg/hr		Selected 0.710 cm²
10	Reaction Force, Open Discharge		80.3 N	Noise Level (db), Open Discharge	126.4 at 1.0000 m

Calculate Noise Level at 100-ft (30-m) **L100** 96.9 db

L100 = [6.5 * log(1/PR) + 51.28] + [10 * log(1.1552 * W * k * T / M)]

Calculate Noise Level at Distance, r **Lp** 126.4 db

Lp = L100 - 20 * log(r / 30)

Calculate Reaction Force for Open Discharge **Fr** 80.3 N 80.3 N

Fr = (A * C * K,API * P1 * Kc / 27.907) * {k / [(k + 1) * Z]}^0.5

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Pressure Relief Valve Dimensional Drawing

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Quote Number: 093-093

Client: *TECHNIP ENERGIES*

Location: *CARTAGENA, SPAIN*

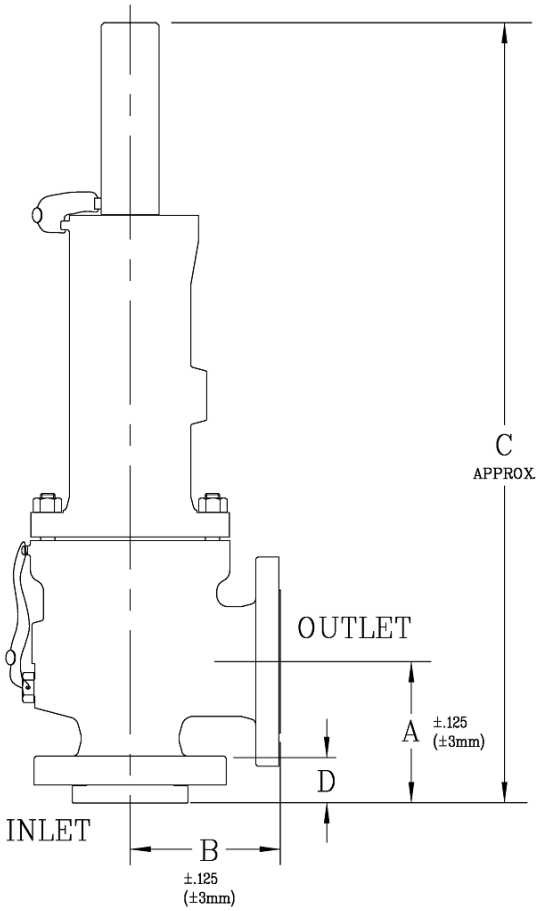
End-User Ref. No.: *201754C001*

Project: *C43 "New Bios 2G Hydrotreatment Unit"*

Project Ref. No.: *U-608 Hydrogen Unit*

	Valve ID		
2	Tag No.	*608-PSV-1140*	Quantity
3	Service	*Nitrogen Compressor Suction*	
4	PID No.	*P-C43-A-110990 H36*	
5	Line No.	*4"SH-5707-D3-H*	1
6			

	SELECTION SUMMARY					
8	Valve Model No.	1D2JBS-E36M-P				
9	Brand	Crosby®				
10	**CONNECTIONS**					
11	Inlet	1"	Flngd.	300#	RF	Standard
12	Outlet	2"	Flngd.	150#	RF	ASME B16.5



Wt.=	*36 lb*	=	*16.33 kg*
A=	*4.13 in*	=	*104.90 mm*
B=	*4.50 in*	=	*114.30 mm*
C=	*20.25 in*	=	*514.35 mm*
D=	*1.56 in*	=	*39.62 mm*
E=		=	
F=		=	
G=		=	
H=		=	

Tag Notes

1. Maximum Content P(%) 0.020 - S(%) 0.015. (body and bonnet)
2 . Standard C4M acc. ISO 12944
3. Opening Adjustment 5%
4. Blowd own: 11.8%
5. ASME "UV" Stamp required.

Dimension Notes

- Accessories not shown.
- Actual valve may vary from. image.