ENGINEERING SERVICES DEPARTMENT

INSTRUMENT LOOP SPECIFICATION SHEET

Project	NW PlasGas Demonstration Facility	**Unit Tag Number**	PCV1301B
Datasheet Document No.	ENS-NWPVR-SPE-24006	**Revision**	1
Description	Pressure regulator on the argon gas supply line to the Plasma Power Supply Y1401 in the NW PlasGas Demonstration Facility		
Plant Location	Necsa, Pelindaba, North-West Province.		
Equipment Location	NW PlasGas Demonstration Facility - Outside Laboratory 150, Building V-H2.		
Safety Classification	Non-classified(N) and SC-3(C)		
Quality Classification	Non-classified(N) and QC-3(C)		

PROCESS CONDITIONS	**UNITS**	**MINIMUM**	**NORMAL**	**MAXIMUM**	**ACCURACY**
Measurement Range	kPa(g)	400	600	1000	Medium
Controlled Range	kPa(g)	-	400	-	Medium

GENERAL	**MEASUREMENT POINT**	**CONTROL POINT**
Process Fluid	Argon	Same as for measurement point
Fluid State	Gas	
P&ID Number	ENS-NWPVR-PID-24004 [6]	
Line Number	15-13-GAVP-10 [6]	
Design Temperature [°C]	98	
Design Pressure [kPa(g)]	24820	
SIL Rating	-	

MEASUREMENT SPECIFICATION

FLUID PROPERTIES	**UNITS**	**MINIMUM**	**NORMAL**	**MAXIMUM**	**REFERENCE**
Molecular Weight	**kg/kmol**	-	39,948	-	Table 2-164 page 2-139 [1]
Operating Temperature	**°C**	-2.6	25	40	[2]
Operating Pressure (upstream)	**kPa(g)**	400	600	1000	Minimum from Page 6 [3] Normal from [5]
Compressibillity Factor	**Z**	0,97	0,98	0,99	Fig A.9, page 278 [6]
Density (@ min., normal, and max. for both operating pressure and temperature.)	**kg/m^3**	8,3	11,3	19,9	Note 1
Viscosity (@ min., normal, and max. for operating temperature.)	**Pa.s**	1,95E-05	2,75E-05	2,85E-05	Fig.2-32 page 2-321 [1]
Specific Heat Ratio (Cp/Cv)	**-**	-	1,67	-	Table 4.3, Page 165 [7]
Thermal Conductivity	**W/m.K**	0,01523	0,02148	0,02226	Note 2
Required Measured Range (Upstream)	**kPa(g)**	0	-	1500	-
Required Measured Range (Downstream)	**kPa(g)**	0	-	1500	-

CONTROL INFORMATION

VALVE SIZING INFO. & SPECIFICATION	**UNITS**	**MINIMUM**	**NORMAL**	**MAXIMUM**	**REFERENCE**
Valve Inlet Pressure	**kPa(g)**	400	600	1000	Minimum from Page 6 [3] Normal from [5]
Valve Outlet Pressure = Regulator Setpoint Pressure	**kPa(g)**	-	400	-	[5]
Maximum Differential Pressure Allowed Across Control Valve	**kPa**	-	-	600	-
Critical Flow	**-**	-	No	-	-
Mass Flowrate	**kg/h**	0	3	10	Page 6 [3]
P_c - Critical Pressure	**kPa(a)**	-	4900	-	Table 2-164 page 2-139 [1]
Fail Action	**-**	N/A			-
Seat Leakage Class		Supplier to advise			-
Maximum Shut - Off Differential Pressure	**kPa(g)**	1000			-

VALVE MECHANICAL PROPERTIES

MATERIAL OF CONSTRUCTION

Body	**Bellows**	**Spring**	**Seat**	**Disk and STEM**
316 Stainless Steel	Supplier To advise	NA	Die-Formed Flexible Graphite With Anti-Extrusion Rings	Stainless Steel
Bonnet/Cap		**Type**	**Wetted parts**	**Non-wetted parts**
316 Stainless Steel		Two-stage	Stainless Steel	Stainless Steel

PROCESS CONNECTION

	Flange Spec.	**Flange Rating**	**Pipe Size (NB)**
Inlet	SS, ASTM A182-F316/316L, ASME B16.5 (Supplier To Advise on Alternatives)	Class 3000	15
Outlet	SS, ASTM A182-F316/316L, ASME B16.5 (Supplier To Advise on Alternatives)	Class 3000	15
Valve rating	Class 3000		

ALARM / SWITCH	**FALLING**		**RISING**		**UNITS**	**INTERLOCKS**
	Low Low	**Low**	**High**	**High High**	**or %**	
LOCAL ALARM	-	-	-	-	-	N/A
REMOTE ALARM	-	-	-	-	-	
SWITCH ONLY	-	-	-	-	-	

DISPLAY	**LOCAL**	**REMOTE**	**RECORDING**
	Yes	-	-

REFERENCE DRAWINGS / DOCUMENTS

[1] Perry, R. H., & Green, D. W. (1997). Perry's Chemical Engineers Handbook 7th Edition. McGraw-Hill Company.

[2] SHEQ-2011-REP-01017,2011: Pelindaba Site, Site Description Rev 2, NECSA

[3] ENS-NWPVR-CLC-24013, Process Gases Requirements for the NW PlasGas Demonstration System

[4] Sinnot, R. K. (2005). Coulson & Richardson's CHEMICAL ENGINEERING, Chemical Engineering Design, Volume 6, 4th Edition.

[5] ENS-NWPVR-PID-24004, NW PlasGas Demonstration Plant P&ID Diagram, Subsystem 13

[6] Rase, H. F. (1963). Piping Design for Process Plant. New York: John Wiley & Sons, Inc.

[7] Joseph F. Louvar, Daniel A Crowl, 2011: Chemical Process Safety Fundamentals with Applications, 3rd edition

NOTES			
1) Minimum density was calculated from the highest temperature and lowest pressure, normal density at normal conditions, and maximum density at the lowest temperature and highest pressure			
2) Thermal conductivity was calculated from Equation 8.13 on Section 8.8.3 page 321 [4]. The specific heat capacity used in the equation was calculated from Equation on Appendix C, Page 939 of [4] at minimum, normal and maximum temperature.			
	Name	**Signature**	**Date**
Compiled by	M. Mashaya (Process Engineer)		
Process	M Nkadimeng (Process Engineer)		
Process	M Correia (Senior Process Engineer)		
Mechanical	S. Masango (Mechanical Engineer)		
Mechanical	S. Mngoma (Chief Mechanical Engineer)		
Instrumentation	G. Manuel (Chief C&I Engineer)		
Electrical	W. Van Den Berg (Chief Electrical Engineer)		
Approved by	K. Moodley (Chief Process Engineer)