

## ENGINEERING SERVICES DEPARTMENT



## INSTRUMENT LOOP SPECIFICATION SHEET

<b>Project</b>	NW PlasGas Demonstration Facility		<b>Unit Tag Number</b>	PCV1303B	
<b>Datasheet Document No.</b>	ENS-NWPVR-SPE-24007		<b>Revision</b>	1	
<b>Description</b>	Pressure regulator on the oxygen gas supply line to the Plasma Reactor R1403 in the NW PlasGas Demonstration Facility.				
<b>Plant Location</b>	Necsa, Pelindaba, North-West Province.				
<b>Equipment Location</b>	NW PlasGas Demonstration Facility - Outside Laboratory 150, Building V-H2.				
<b>Safety Classification</b>	Non-classified(N) and SC-3(C).				
<b>Quality Classification</b>	Non-classified(N) and QC-3(C).				
<b>PROCESS CONDITIONS</b>	<b>UNITS</b>	<b>MINIMUM</b>	<b>NORMAL</b>	<b>MAXIMUM</b>	<b>ACCURACY</b>
<b>Measurement Range</b>	kPa(g)	400	600	1000	Medium
<b>Controlled Range</b>	kPa(g)	-	400	-	Medium
<b>GENERAL</b>	<b>MEASUREMENT POINT</b>			<b>CONTROL POINT</b>	
<b>Process Fluid</b>	Oxygen			Same as for measurement point	
<b>Fluid State</b>	Gas				
<b>P&amp;ID Number</b>	ENS-NWPVR-PID-24004 [6]				
<b>Line Number</b>	25-13-GSVP-12 [6]				
<b>Design Temperature [°C]</b>	93				
<b>Design Pressure [kPa(g)]</b>	21340				
<b>SIL Rating</b>	-				
<b>MEASUREMENT SPECIFICATION</b>					
<b>FLUID PROPERTIES</b>	<b>UNITS</b>	<b>MINIMUM</b>	<b>NORMAL</b>	<b>MAXIMUM</b>	<b>Reference</b>
<b>Molecular Weight</b>	kg/kmol		32		Table 2-164, page 2-139 [1]
<b>Operating Temperature</b>	°C	-2.6	25	40	[2]
<b>Operating Pressure (upstream)</b>	kPa(g)	400	600	1000	Minimum from Page 6 [3] Normal from [5]
<b>Density (@ min., normal, and max. for both operating pressure and temperature.)</b>	kg/m <sup>3</sup>	6,61	8,88	15,48	Note 1
<b>Viscosity (@ min., normal, and max. for operating temperature.)</b>	cP	0.019	0.0205	0.021	Table 2-364, page 2-321 [1]
<b>Compressibility Factor</b>	Z	1	1	1	Fig A.9, page 278 [7]
<b>Specific Heat Ratio (Cp/Cv)</b>	-	-	1.4	-	Table 4.3, page 165 [6]
<b>Thermal Conductivity</b>	W/m.K	0.023	0.0205	0.021	Note 2
<b>Required Measured Range (upstream)</b>	kPa(g)	0	-	1500	-
<b>Required Measured Range (downstream)</b>	kPa(g)	0	-	1500	-
<b>CONTROL INFORMATION</b>					
<b>VALVE SIZING INFO. &amp; SPECIFICATION</b>	<b>UNITS</b>	<b>MINIMUM</b>	<b>NORMAL</b>	<b>MAXIMUM</b>	
<b>Valve Inlet Pressure</b>	kPa(g)	400	600	1000	Minimum from Page 6 [3] Normal from [5]
<b>Valve Outlet Pressure = Regulator Setpoint Pressure</b>	kPa(g)	-	400	-	[5]
<b>Maximum Differential Pressure Allowed Across Control Valve</b>	kPa	-	-	600	-
<b>Critical Flow</b>	-	-	No	-	-
<b>Mass Flowrate</b>	kg/h	-	32,8	-	Page 6 [3]
<b>P<sub>c</sub> - Critical Pressure</b>	kPa(a)	-	5020	-	Table 2-164, page 2-139 [1]
<b>Fail Action</b>	-	N/A			-
<b>Seat Leakage Class</b>	-	Supplier to advise			-
<b>Maximum Shut - Off Differential Pressure</b>	kPa(g)	1000			-
<b>VALVE MECHANICAL PROPERTIES</b>					
<b>Materials of Construction</b>					
<b>Body</b>	<b>Bellows</b>	<b>Spring</b>		<b>Seat</b>	<b>Disk and STEM</b>
316 SS	Supplier To Advise	NA		Die-Formed Flexible Graphite With Anti-Extrusion Rings	316 SS
<b>Bonnet/Cap</b>		<b>Type</b>		<b>Wetted parts</b>	<b>Non-wetted parts</b>
316 SS		Two-stage		SS	SS
<b>Process Connections</b>					
	<b>Flange Spec.</b>		<b>Flange Rating</b>		<b>Pipe Size (NB)</b>
<b>Inlet</b>	SS, ASTM A182-F316/316L, ASME B16.5 (Supplier Shall Advise on Alternatives)		Class 1500		25
<b>Outlet</b>	SS, ASTM A182-F316/316L, ASME B16.5 (Supplier Shall Advise on Alternatives)		Class 1500		25
<b>Valve rating</b>	Class 1500				
<b>ALARM / SWITCH</b>	<b>FALLING</b>		<b>RISING</b>		<b>UNITS or %</b>
	<b>Low Low</b>	<b>Low</b>	<b>High</b>	<b>High High</b>	
<b>LOCAL ALARM</b>	-	-	-	-	kPa(g)
<b>REMOTE ALARM</b>	-	-	-	-	kPa(g)
<b>SWITCH ONLY</b>	-	-	-	-	kPa(g)
<b>DISPLAY</b>	<b>LOCAL</b>			<b>REMOTE</b>	
	Yes			-	
					<b>INTERLOCKS</b>
					N/A
					<b>RECORDING</b>
					-
<b>REFERENCE DRAWINGS / DOCUMENTS</b>					
[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] Sinnott, 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] Joseph F. Louvar, Daniel A Crowl, 2011: Chemical Process Safety Fundamentals with Applications.					
[7] Rase, H. F. (1963). Piping Design for Process Plant. New York: John Wiley & Sons, Inc.					

**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 using the compressibility chart Z values read from Fig A.9 on page 278 [6].

2) Thermal conductivity was calculated using Equation 8.13 in Section 8.8.3 on page 321 [5]. The specific heat capacity used in the equation was calculated from Equation in Appendix C, Page 939 of [4] at minimum, normal, and maximum temperatures.

	<b>Name</b>	<b>Signature</b>	<b>Date</b>
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