



REQUEST FOR QUOTE

IET Control Valves RFQ-2020-000425

REQUIREMENTS & SPECIFICATIONS

TerraPower is seeking the following products:

- Control Valve, Low Flow, Part # 708SP050CB or equivalent – quantity 22 each
- Control Valve, Low Flow, Part # 708SP050S6 or equivalent – quantity 24 each
- Control Valve, Low Flow, Part # 80000GSP050HC or equivalent – quantity 16 each
- Control Valve, Low Flow, Part # 80000GSP075HC or equivalent – quantity 1 each

Please see the attached Datasheets for more information about each valve application.

TerraPower is requesting that the products be tested, cleaned, calibrated and certified. Please see the Datasheets (under Options) for more information.

TerraPower is requesting that Certificates of Conformance be provided along with the products.

Please deliver the products to the Everett Lab (via FOB Destination) by September 1, 2020 or earlier.

SCHEDULE

Date	Activity
May 19, 2020	Request for Quote (RFQ) Release in Bonfire.
May 27, 2020	Pre-Bid Meeting: May 27, 2020; 10:00 – 11:00 AM, PST, via WebEx. <i>Suppliers interested in attending the Pre-Bid Meeting will need to e-mail Sandy Lee (slee@terrapower.com) by May 26, 2020 for the WebEx call in number.</i> <i>TerraPower's technical team will be available via WebEx to provide an overview of the project and answer any technical questions.</i>
June 3, 2020	Last Day for Bidder Questions.
June 3, 2020	Bidders indicate their Intent to Bid in Bonfire by June 3, 2020, 5:00 PM PST.
June 4, 2020	Last Day for TerraPower to Provide Answers to Bidder Questions.
June 5, 2020	Bids Due. Supplier bid packages must be uploaded to Bonfire by June 5, 2020, 5:00 PM PST.
June 2020	Estimated Expected Award Date.



ALTERNATIVES/SUBSTITUTIONS

TerraPower will consider ideas and/or recommendations for alternatives or substitutions to the products listed above. Alternatives or substitutions should provide similar and/or better performance and quality as the manufacturer products listed.

Please provide your recommendations in a separate attachment and attach any background information that explains how the performance and quality are similar and/or better than the manufacturer products listed. Note that TerraPower will be under no obligation to choose an alternative or substitution; however, they will be reviewed.

COMPLIANCE WITH FEDERAL COOPERATIVE AGREEMENT

This project is funded by a U.S. Department of Energy (DOE) Cooperative Agreement administered through Southern Company Services (SCS). Company will adhere to the regulations set forth in 2 Code of Federal Regulations (CFR) Part 200 (2CFR200). The selected Supplier shall comply with the requirements of 2CFR200 as applicable.

CONTRACT AWARD

Contract award will be based on the lowest price and technically acceptable bid.

QUESTIONS AND CONTACTS

Any questions can be directed to:

Sandy Lee, Senior Buyer/Contract Administrator
(425) 324-2698
slee@terrapower.com



REQUEST FOR QUOTE FORM 1

Pricing

TerraPower is requesting the Bidder to provide **fully burdened, firm-fixed price** for the items listed below.

IET Control Valves – Firm Fixed Price				
Description	Quantity	Unit Price	Extended Price	Lead Time
Control Valve, Low Flow, Part # 708SP050CB or equivalent	22 Each	\$	\$	
Control Valve, Low Flow, Part # 708SP050S6 or equivalent	24 Each	\$	\$	
Control Valve, Low Flow, Part # 80000GSP050HC or equivalent	16 Each	\$	\$	
Control Valve, Low Flow, Part # 80000GSP075HC or equivalent	1 Each	\$	\$	
Shipping and delivery of the equipment – <u>FOB Destination</u> to the following address: TerraPower, LLC – Seaway Center 3315 Seaway Blvd, 36 Avenue W Everett, WA 98203	1 Shipment	\$	\$	
Subtotal			\$	
Sales Tax (9.8%)			\$	
TOTAL			\$	

Terms and Conditions

Do you accept TerraPower Purchase Order Terms and Conditions attached? ☐ Yes ☐ No

If No, list and describe any exceptions as an attachment with markup/redlines to the document for consideration. The Company will be under no obligation to accept the exceptions; however, they will be reviewed.



Quality:

The QA requirements for this RFQ would be the typical pedigree of paperwork for the products requested. Provide as an attachment (if available).

Proposer or Authorized Representative:

Signed this _____ day of _____ 2020

Company Name _____

Print Name & Title _____

Signature _____



REQUEST FOR PROPOSAL FORM 2

PROPOSER INFORMATION AND SIGNATURE

Date:	
Principal Contact Person:	
Title:	
Telephone Number:	
E-Mail Address:	
Firm's Legal Name:	
Firm's Address:	
State of Incorporation and Date Established:	

Check all that apply:

Firm's address is the following: ☐ Main Office ☐ Branch Office ☐ Other: _____

Corporate structure: ☐ Corporation ☐ Partnership ☐ Joint Venture ☐ Sole Proprietorship
☐ Other: _____

Business Classification (check all that apply)	Federal Certified	State Certified	Self Certified
Small Business (SB) (including ANC and Indian Tribes)			
Small Disadvantaged Business (SDB)			
Woman Owned Small Business (WOB)			
HUBZone Small Business (HUB)			
Veteran-Owned Small Business			
Service-Disabled Veteran-Owned Small Business			

Has your company been suspended or debarred from doing business with the U.S. Government?

☐ Yes ☐ No



Is your company registered in the System for Award Management (SAM)? ☐ Yes ☐ No

Complete the following:

Former Firm Name (if any):	
Parent Company Name:	
Parent Company Address:	
Washington State Contractor Registration Number:	
Washington State Unified Business Identifier Number:	
Employment Security Department Number:	
Federal Tax Identification Number:	
DUNS Number:	
NAICS Code and Size Standard:	

Certification

The Bidder certifies that, to the best of his/her knowledge, the information presented in this Request for Quote is a statement of facts and that the firm has the financial capability to perform the work. The Bidder further certifies that it knows of no personal and/or organizational conflict of interest prohibited under federal, state and local law.

I certify/declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Signature

Name

Title

Date

City and State



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LIST			
Document Number:	MCFRG-36-LIST-0006		Revision: 0
Document Title:	Control Valve Instrument List for Procurement		
Functional Area:	Innovation		
Effective Date:	5/11/2020	Released Date:	5/11/2020
Page Number:			1 of 44
Approval			
Title	Name	Signature	Date
Originator, Engineering Integration Engineer	Peter Tran	Approved in Agile	5/11/2020
Reviewer, Process Engineer	Howard Hendrix	Approved in JIRA	5/7/2020
Approver, Principal Project Manager	Michael VanDeVanter	Approved in JIRA	5/11/2020
Export Controlled Content:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	
QA Related:	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	
QA Criterion:	N/A		

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<p>Department of Energy review required before public release.</p>	
DOE Reviewer Name/Org:	Date:

*Controlled Document - Verify Current Revision***REVISION HISTORY**

Revision No.	Effective Date	Affected Section(s)	Description of Change(s)
0	5/11/2020	all	Initial Release

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1 INTRODUCTION

The list below (Table 1-1) provides the detailed technical data to be used for the purchase of the Control Valve instrumentation for the IET

Table 1-1: Control Valve Instrument List

Tag	System	P&ID Number	Qty	Description	Instrument Type	Manufacturer	Series	Model
01-PV-1001, 01-PV-4001	01	3270-01-P&ID-0001-05.dwg	2	DU Salt Pump Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6AKB4T4R4A7R0G
01-PV-1002, 01-PV-4002	01	3270-01-P&ID-0001-05.dwg	2	DU Salt Pump Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1BS3A3D00ADG0
10-PV-1301, 10-PV-2301	10	3270-10-P&ID-0001-03.dwg	2	PCS Salt Pump Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6AKB4T4R4A7R0G
10-PV-1302, 10-PV-2302	10	3270-10-P&ID-0001-03.dwg	2	PCS Salt Pump Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1AS3A3D00ADG0
10-PV-1401, 10-PV-2401	10	3270-10-P&ID-0001-02.dwg	2	Coolant Salt Expansion Tank Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ANB4T4R4A7R0G
10-PV-1402, 10-PV-2402	10	3270-10-P&ID-0001-02.dwg	2	Coolant Salt Expansion Tank Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1DS3A3D00ADG0
12-FV-0606	12	3270-12-P&ID-0001-06.dwg	1	Minimum Flow Control to Fuel Salt Scrubber	Flow Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTT6AMB4T4R4A7R0G
12-PV-0100	12	3270-12-P&ID-0001-05.dwg	1	Fuel Salt Buffer Tank Pressure Inlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ANB4T4R4A7R0G
12-PV-0600	12	3270-12-P&ID-0001-06.dwg	1	Fuel Salt Scrubber Gas Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP75HC / PTSH1ES3A3D00ADG0
12-PV-1000	12	3270-12-P&ID-0001-03.dwg	1	Compressor Suction Drum Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP075S6# / PTT6AMA4T4D4A7D0G
12-PV-1100	12	3270-12-P&ID-0001-03.dwg	1	Compressor Discharge Drum Vent Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTT6AMB4T4R4A7R0G
12-PV-1101	12	3270-12-P&ID-0001-03.dwg	1	Recycled Argon Header Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTT6ANB4T4R4A7R0G
12-PV-1102	12	3270-12-P&ID-0001-03.dwg	1	Compressor Discharge Drum Makeup Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTT6ANB4T4R4A7R0G
12-TV-2700	12	3270-12-P&ID-0001-02.dwg	1	Inline Mixer Outlet Temperature Control Valve	Temperature Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTT6AMB4T4R4A7R0G
12-TV-3003	12	3270-12-P&ID-0001-02.dwg	1	Finned Tube Heat Exchanger Discharge Temperature Control Valve	Temperature Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTT6AMB4T4R4A7R0G
13-PV-1021	13	3270-13-P&ID-0001-01.dwg	1	Coolant Salt Tank Argon Inlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6APB4T4R4A7R0G
13-PV-1041	13	3270-13-P&ID-0001-01.dwg	1	Coolant Salt Tank Argon Outlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1NS3A3D00ADG0
13-PV-1121	13	3270-13-P&ID-0001-02.dwg	1	Flush Salt Tank Argon Inlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6APB4T4R4A7R0G
13-PV-1141	13	3270-13-P&ID-0001-02.dwg	1	Flush Salt Tank Argon Outlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1NS3A3D00ADG0
13-PV-1221	13	3270-13-P&ID-0001-03.dwg	1	Coolant Salt Fill Cask Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ALB4T4R4A7R0G
13-PV-1241	13	3270-13-P&ID-0001-03.dwg	1	Coolant Salt Fill Cask Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1CS3A3D00ADG0
13-PV-1621	13	3270-13-P&ID-0001-07.dwg	1	Coolant Salt Withdrawal Buffer Tank Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ALB4T4R4A7R0G
13-PV-1641	13	3270-13-P&ID-0001-07.dwg	1	Coolant Salt Withdrawal Buffer Tank Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1CS3A3D00ADG0
13-TV-1035	13	3270-13-P&ID-0001-13.dwg	22	Freeze Valve Air Supply	Temperature Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050CB# / PTTGAQB4T4R4A7R0G
14-PV-1021	14	3270-14-P&ID-0001-01.dwg	1	DU Salt Tank Argon Inlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6APB4T4R4A7R0G

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Tag	System	P&ID Number	Qty	Description	Instrument Type	Manufacturer	Series	Model
14-PV-1041	14	3270-14-P&ID-0001-01.dwg	1	DU Salt Tank Argon Outlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1NS3A3D00ADG0
14-PV-1221	14	3270-14-P&ID-0001-02.dwg	1	Flush Salt Tank Argon Inlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6APB4T4R4A7R0G
14-PV-1241	14	3270-14-P&ID-0001-02.dwg	1	Flush Salt Tank Argon Outlet Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1NS3A3D00ADG0
14-PV-1321	14	3270-14-P&ID-0001-03.dwg	1	DU Salt Fill Cask Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ALB4T4R4A7R0G
14-PV-1341	14	3270-14-P&ID-0001-03.dwg	1	DU Salt Fill Cask Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1CS3A3D00ADG0
14-PV-1521	14	3270-14-P&ID-0001-08.dwg	1	DU Salt Bypass Pump Tank Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ALB4T4R4A7R0G
14-PV-1541	14	3270-14-P&ID-0001-08.dwg	1	DU Salt Bypass Pump Tank Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1CS3A3D00ADG0
14-PV-1551	14	3270-14-P&ID-0001-09.dwg	1	DU Salt Bypass Pump Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ALB4T4R4A7R0G
14-PV-1561	14	3270-14-P&ID-0001-09.dwg	1	DU Salt Bypass Pump Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1CS3A3D00ADG0
14-PV-1621	14	3270-14-P&ID-0001-07.dwg	1	Core Withdrawal Buffer Tank Argon Inlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	708SP or Equal	708SP050S6# / PTG6ALB4T4R4A7R0G
14-PV-1641	14	3270-14-P&ID-0001-07.dwg	1	Core Withdrawal Buffer Tank Argon Outlet Pressure Control Valve	Pressure Control Valve	LowFlow Valve or Equal	MARK 8000 Series	8000GSP050HC / PTSH1CS3A3D00ADG0

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2 DATASHEETS

The subsequent pages provide detailed descriptions of the IET Low Flow Switches.

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GENERAL	1	Tag No.		01-PV-1001, 01-PV-4001						
	2	Service		DU Salt Pump Argon Inlet Pressure Control Valve						
	3	P&ID No.	Line #	3270-01-P&ID-0001-05.dwg			01-110-1/2"-36L			
	4	Area Classification		N/A						
	5	Ambient Temperature:	Min.	Max.	25			40		
	6	Allowable Sound Pressure Level dBA		N/A						
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class VI						
	8	Available Air Supply Pressure:	Min.	Max.	90			125		
	9	Power Failure Position		FC						
	10	Quantity		2						
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"			150		
	12	Pipe Connection		NPT						
PROCESS CONDITIONS	13	Pipe Insulation		Heat Trace and Insulated to 200 C						
	14	Process Fluid		Gas - Argon (Clean)						
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
	16	Flow Rate	SLPM	2	12	20	2	12	20	
	17	Inlet Pressure	kPag	620.5	620.5	620.5	620.5	620.5	620.5	
	18	Outlet Pressure	kPag	34.5	34.5	34.5	206.8	206.8	206.8	
	19	Inlet Temperature	°C	200	200	200	200	200	200	
	20	Inlet Density / Specific Gravity / Molecular Mass	kg/m3	7.32	7.32	7.32	7.32	7.32	7.32	
	21	Inlet Compressibility Factor	-	0.999						
	22	Inlet Viscosity	cP	0.0328						
	23	Inlet Specific Heats Ratio	-	1.6702						
	24	Inlet Vapor Pressure	N/A	N/A						
	CALCULATED RESULTS	25	Flow Coefficient Cv	N/A	0.002	0.010	0.017	0.002	0.010	0.017
		26	Travel	%	8.3%	49.9%	83.2%	8.3%	49.9%	83.2%
27		Sound Pressure Level @ Maximum Flow:	dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		57	MFR	Model	LowFlow	Mark 16IQ-S or Equal	
	29	Model	708SP or Equal		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart	
	30	Body Type	Globe Valve		59	Increase Signal Valve:	Open			
	31	Body Size	Trim Size/Code	1/2" K	60	Enclosure	NEMA 4X			
	32	Rated Cv	Characteris.	0.02 Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT 150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS		63	Air Supply Pressure	45 psig			
	35	Bonnet Type	Material	316SS	64	Air Connection	1/4" NPT			
	36	Flow Direction			65	MFR	Model	N/A	N/A	
	37	Flow Action To			66	Type	N/A			
	38	Lubricator	Isolat. Valve	N/A Yes	67	When De-Enegr.Valve:	N/A			
	39	Guiding	No. of Ports		68					
	40	Trim Type	Standard, Linear, Hard Seat		69	MFR	Model	TBD	TBD	
	41	Rated Travel	100%		70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material	17-4		71	Contacts / Rating	Standard			
	43	Seat Material	316SS		72	Switching Position	OPEN / CLOSED			
	44	Packing	Graphite/Grafoil		73					
	45	Gasket Material	Grafoil		74	MFR	Model	TBD	TBD	
	46				75	Set Pressure	45 psig			
	ACTUATOR	47	MFR	Model	LowFlow Valve	14M	76	Filter	Gauge	YES YES
		48	Type	Diaphragm		77				
		49	Size	Area	14M	TBD	78	Proof Pressure Test	YES	
		50	Air Failure Valve:	FC		79	Leakage Test	YES		
		51	Handwheel Location	N/A		80				
52		Bench Range	3-15 psig		81	Manufacturer	LowFlow Valve or Equal			
53		Material	Aluminum		82	Model	708SP050S6# / PTG6AKB4T4R4A7R0G			
54					83	Purchase Order Num.				
55					84	Price	Item Number			
56					85	Serial Number				

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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MAY BE EXEMPT FROM FOIA							

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GENERAL	1	Tag No.		01-PV-1002, 01-PV-4002									
	2	Service		DU Salt Pump Argon Outlet Pressure Control Valve									
	3	P&ID No.	Line #	3270-01-P&ID-0001-05.dwg		01-112-1/2"-36M							
	4	Area Classification		N/A									
	5	Ambient Temperature:	Min.	Max.	25		40						
	6	Allowable Sound Pressure Level	dBA		N/A								
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV									
	8	Available Air Supply Pressure:	Min.	Max.	90		125						
	9	Power Failure Position		FO									
	10	Quantity		2									
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		300						
	12	Pipe Connection		NPT									
PROCESS CONDITIONS	13	Pipe Insulation		Heat Trace and Insulated to 575 C									
	14	Process Fluid		Gas - Argon (Dirty)									
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate		SLPM	2	12	22	2	12	22			
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8			
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9			
	19	Inlet Temperature		°C	575	575	575	575	575	575			
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.16	1.16	1.16	1.74	1.74	1.74			
	21	Inlet Compressibility Factor		-	0.999								
	22	Inlet Viscosity		cP	0.0504								
	23	Inlet Specific Heats Ratio		-	1.6702								
	24	Inlet Vapor Pressure		N/A	N/A								
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.009	0.052	0.095	0.005	0.031	0.057		
		26	Travel		%	8.7%	52.0%	95.4%	5.2%	31.0%	56.9%		
27		Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal			
	29	Model		MARK 8000 Series		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart			
	30	Body Type		Globe Valve		59	Increase Signal Valve:		Open				
	31	Body Size	Trim Size/Code	1/2"		B	60	Enclosure		NEMA 4X			
	32	Rated Cv	Characteris.	0.1		Linear	61	Cam Characteristic					
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES		
	34	Body Material		Hastelloy C		SOLENOID VALVE	63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	Hastelloy C			64	Air Connection		1/4" NPT			
	36	Flow Direction					65	MFR	Model	N/A	N/A		
	37	Flow Action To					66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Engr. Valve:		N/A			
	39	Guiding	No. of Ports				68						
	40	Trim Type		Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel		100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material		Hastelloy C			71	Contacts / Rating		Standard			
	43	Seat Material		Hastelloy C			72	Switching Position		OPEN / CLOSED			
	44	Packing		Graphite/Grafoil			73						
	45	Gasket Material		Grafoil			74	MFR	Model	TBD	TBD		
	ACTUATOR	46					AIR SET	75	Set Pressure		45 psig		
		47	MFR	Model	LowFlow Valve	35M		76	Filter	Gauge	YES	YES	
		48	Type		Diaphragm			77					
		49	Size	Area	35M	TBD	TESTS	78	Proof Pressure Test		YES		
		50	Air Failure Valve:		FO			79	Leakage Test		YES		
		51	Handwheel Location		N/A			80					
52		Bench Range		3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material		Aluminum			82	Model		8000GSP050HC / PTSH1BS3A3D00ADG0			
54							83	Purchase Order Num.					
55							84	Price	Item Number				
56							85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		10-PV-1301, 10-PV-2301							
	2	Service		PCS Salt Pump Argon Inlet Pressure Control Valve							
	3	P&ID No.	Line #	3270-10-P&ID-0001-03.dwg		10-133-1/2"-36L					
	4	Area Classification		N/A							
	5	Ambient Temperature:	Min.	Max.	25		40				
	6	Allowable Sound Pressure Level	dBA		N/A						
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class VI							
	8	Available Air Supply Pressure:	Min.	Max.	90		125				
	9	Power Failure Position		FC							
	10	Quantity		2							
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		150				
	12	Pipe Connection		NPT							
	13	Pipe Insulation		Heat Trace and Insulated to 200 C							
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)							
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	
	16	Flow Rate		SLPM	2	12	18	2	12	18	
	17	Inlet Pressure		kPag	620.5	620.5	620.5	620.5	620.5	620.5	
	18	Outlet Pressure		kPag	34.5	34.5	34.5	413.7	413.7	413.7	
	19	Inlet Temperature		°C	200	200	200	200	200	200	
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	7.32	7.32	7.32	7.32	7.32	7.32	
	21	Inlet Compressibility Factor		-	0.999						
	22	Inlet Viscosity		cP	0.0328						
	23	Inlet Specific Heats Ratio		-	1.6702						
	24	Inlet Vapor Pressure		N/A	N/A						
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.002	0.010	0.015	0.002	0.012	0.019
		26	Travel		%	8.3%	49.9%	74.8%	10.3%	61.7%	92.5%
		27	Sound Pressure Level @ Maximum Flow:		dBA						
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal	
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart	
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open		
	31	Body Size	Trim Size/Code	1/2"		K	60	Enclosure		NEMA 4X	
	32	Rated Cv	Characteris.	0.02		Linear	61	Cam Characteristic			
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES
	34	Body Material	316SS		SOLENOID VALVE	63	Air Supply Pressure		45 psig		
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT		
	36	Flow Direction				65	MFR	Model	N/A	N/A	
	37	Flow Action To				66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Enegr.Valve:		N/A	
	39	Guiding	No. of Ports				68				
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD	
	41	Rated Travel	100%			70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard		
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED		
	44	Packing	Graphite/Grafoil			73					
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD	
	46					75	Set Pressure		45 psig		
	47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES
ACTUATOR	48	Type	Diaphragm		TESTS	77					
	49	Size	Area	14M		TBD	78	Proof Pressure Test		YES	
	50	Air Failure Valve:	FC			79	Leakage Test		YES		
	51	Handwheel Location	N/A		PURCHASE	80					
	52	Bench Range	3-15 psig			81	Manufacturer		LowFlow Valve or Equal		
	53	Material	Aluminum			82	Model		708SP050S6# / PTG6AKB4T4R4A7R0G		
	54					83	Purchase Order Num.				
	55					84	Price	Item Number			
	56				85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		10-PV-1302, 10-PV-2302										
	2	Service		PCS Salt Pump Argon Outlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-10-P&ID-0001-03.dwg					10-134-1/2"-36N					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		2										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 575 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	0	12	24	0	12	24				
	17	Inlet Pressure		kPag	310.3	310.3	310.3	413.7	413.7	413.7				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	575	575	575	575	575	575				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	2.33	2.33	2.33	2.91	2.91	2.91				
	21	Inlet Compressibility Factor		-	0.999									
	22	Inlet Viscosity		cP	0.0504									
	23	Inlet Specific Heats Ratio		-	1.6702									
	24	Inlet Vapor Pressure		N/A	N/A									
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.004	0.026	0.045	0.003	0.021	0.036			
		26	Travel		%	7.5%	52.2%	89.5%	6.0%	41.7%	71.5%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		A	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.05		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C		SOLENOID VALVE	63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				65	MFR	Model	N/A	N/A				
	37	Flow Action To				66	Type		N/A					
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports			68								
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard					
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil			74	MFR	Model	TBD	TBD				
	ACTUATOR	46			AIR SET	75	Set Pressure		45 psig					
		47	MFR	Model		LowFlow Valve	35M	76	Filter	Gauge	YES	YES		
		48	Type	Diaphragm		77								
		49	Size	Area	35M	TBD	TESTS	78	Proof Pressure Test		YES			
		50	Air Failure Valve:		FO	79		Leakage Test		YES				
		51	Handwheel Location		N/A	80								
52		Bench Range		3-15 psig	81	Manufacturer		LowFlow Valve or Equal						
53		Material		Aluminum	82	Model		8000GSP050HC / PTSH1AS3A3D00ADG0						
54					83	Purchase Order Num.								
55					84	Price	Item Number							
56					85	Serial Number								

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		10-PV-1401, 10-PV-2401								
	2	Service		Coolant Salt Expansion Tank Argon Inlet Pressure Control Valve								
	3	P&ID No.	Line #	3270-10-P&ID-0001-02.dwg		10-142-1/2"-36L						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FC								
	10	Quantity		2								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		150					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 200 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	15	120	210	15	120	210		
	17	Inlet Pressure		kPag	620.5	620.5	620.5	620.5	620.5	620.5		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	413.7	413.7	413.7		
	19	Inlet Temperature		°C	200	200	200	200	200	200		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	7.32	7.32	7.32	7.32	7.32	7.32		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0328							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.012	0.100	0.175	0.015	0.123	0.216	
		26	Travel		%	6.2%	49.9%	87.3%	7.7%	61.7%	107.9%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		N	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.2		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A	
	37	Flow Action To					66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports				68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	Graphite/Grafoil			73						
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD		
	46					75	Set Pressure		45 psig			
	47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77					
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FC			79	Leakage Test		YES		
		51	Handwheel Location	N/A			80					
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material	Aluminum			82	Model		708SP050S6# / PTG6ANB4T4R4A7R0G			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		10-PV-1402, 10-PV-2402								
	2	Service		Coolant Salt Expansion Tank Argon Outlet Pressure Control Valve								
	3	P&ID No.	Line #	3270-10-P&ID-0001-02.dwg		10-139-1/2"-36N						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FO								
	10	Quantity		2								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		300					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 575 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	15	120	210	15	120	175		
	17	Inlet Pressure		kPag	413.7	413.7	413.7	206.8	206.8	206.8		
	18	Outlet Pressure		kPag	68.9	68.9	68.9	68.9	68.9	68.9		
	19	Inlet Temperature		°C	575	575	575	575	575	575		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	2.91	2.91	2.91	1.74	1.74	1.74		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0504							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.023	0.187	0.328	0.041	0.325	0.474	
		26	Travel		%	4.7%	37.5%	65.5%	8.1%	65.0%	94.8%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		D	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.5		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES	
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT			
	36	Flow Direction				65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A	Yes	67	When De-Enegr.Valve:		N/A			
	39	Guiding	No. of Ports			68						
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard			
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED			
	44	Packing	Graphite/Grafoil			73						
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD		
	46					75	Set Pressure		45 psig			
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77					
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FO			79	Leakage Test		YES		
		51	Handwheel Location		N/A		80					
52		Bench Range		3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal		
53		Material		Aluminum			82	Model		8000GSP050HC / PTSH1DS3A3D00ADG0		
54							83	Purchase Order Num.				
55							84	Price	Item Number			
56							85	Serial Number				

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-FV-0606								
	2	Service		Minimum Flow Control to Fuel Salt Scrubber								
	3	P&ID No.	Line #	3270-12-P&ID-0001-06.dwg	12-780-1/2-36L							
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25 40							
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90 125							
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 150							
	12	Pipe Connection		NPT								
	13	Pipe Insulation		N/A								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15	Units		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate		SLPM	10	65	130	10	65	130		
	17	Inlet Pressure		kPag	620.5	620.5	620.5	620.5	620.5	620.5		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9		
	19	Inlet Temperature		°C	40	40	40	40	40	40		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	11.06	11.06	11.06	11.06	11.06	11.06		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.024							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.007	0.044	0.088	0.007	0.044	0.088	
		26	Travel		%	6.8%	44.0%	87.9%	6.8%	44.0%	87.9%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2" M		60	Enclosure		NEMA 4X			
	32	Rated Cv	Characteris.	0.1 Linear		61	Cam Characteristic					
	33	End Connec.	End Rating	NPT 150		62	Bypass	Gauges	NO	YES		
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A Yes		67	When De-Enegr.Valve:		N/A			
	39	Guiding	No. of Ports			68						
	40	Trim Type		Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD	
	41	Rated Travel		100%			70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material		17-4			71	Contacts / Rating		Standard		
	43	Seat Material		316SS			72	Switching Position		OPEN / CLOSED		
	44	Packing		316SS/Teflon		AIR SET	73					
	45	Gasket Material		316SS/Teflon			74	MFR	Model	TBD	TBD	
	46						75	Set Pressure		45 psig		
	47	MFR	Model	LowFlow Valve	14M		76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type		Diaphragm	TESTS	77					
		49	Size	Area	14M TBD		78	Proof Pressure Test		YES		
		50	Air Failure Valve:		FC		79	Leakage Test		YES		
		51	Handwheel Location		N/A		80					
52		Bench Range		3-15 psig	PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material		Aluminum		82	Model		708SP050S6# / PTT6AMB4T4R4A7R0G			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-PV-0100						
	2	Service		Fuel Salt Buffer Tank Pressure Inlet Control Valve						
	3	P&ID No.	Line #	3270-12-P&ID-0001-05.dwg	12-782-1/2"-36L					
	4	Area Classification		N/A						
	5	Ambient Temperature:	Min.	Max.	25					
	6	Allowable Sound Pressure Level	dBA		N/A					
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV						
	8	Available Air Supply Pressure:	Min.	Max.	90					
	9	Power Failure Position		FC						
	10	Quantity		1						
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					
	12	Pipe Connection		NPT						
	13	Pipe Insulation		Heat Trace and Insulated to 200 C						
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)						
	15	Units		Case 1	Case 2	Case 3				
	16	Flow Rate	SLPM	15	120	210				
	17	Inlet Pressure	kPag	620.5	620.5	620.5				
	18	Outlet Pressure	kPag	34.5	34.5	206.8				
	19	Inlet Temperature	°C	200	200	200				
	20	Inlet Density / Specific Gravity / Molecular Mass	kg/m3	7.32	7.32	7.32				
	21	Inlet Compressibility Factor	-	0.999						
	22	Inlet Viscosity	cP	0.0328						
	23	Inlet Specific Heats Ratio	-	1.6702						
	24	Inlet Vapor Pressure	N/A	N/A						
	CALCULATED RESULTS	25	Flow Coefficient Cv	N/A	0.012	0.100	0.175			
		26	Travel	%	6.2%	49.9%	87.3%			
		27	Sound Pressure Level @ Maximum Flow:	dBA						
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		57	MFR	Model	LowFlow	Mark 16IQ-S or Equal	
	29	Model	708SP or Equal		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart	
	30	Body Type	Globe Valve		59	Increase Signal Valve:		Open		
	31	Body Size	Trim Size/Code	1/2"	N	60	Enclosure		NEMA 4X	
	32	Rated Cv	Characteris.	0.2	Linear	61	Cam Characteristic			
	33	End Connec.	End Rating	NPT	150	62	Bypass	Gauges	NO	
	34	Body Material	316SS		63	Air Supply Pressure		45 psig		
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT	
	36	Flow Direction			65	MFR	Model	N/A	N/A	
	37	Flow Action To			66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A	Yes	67	When De-Enegr.Valve:		N/A	
	39	Guiding	No. of Ports			68				
	40	Trim Type	Standard, Linear, Hard Seat		69	MFR	Model	TBD	TBD	
	41	Rated Travel	100%		70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material	17-4		71	Contacts / Rating		Standard		
	43	Seat Material	316SS		72	Switching Position		OPEN / CLOSED		
	44	Packing	Graphite/Grafoil		73					
	45	Gasket Material	Grafoil		74	MFR	Model	TBD	TBD	
	46				75	Set Pressure		45 psig		
	ACTUATOR	47	MFR	Model	LowFlow Valve	14M	76	Filter	Gauge	YES
		48	Type	Diaphragm		77				
		49	Size	Area	14M	TBD	78	Proof Pressure Test		YES
		50	Air Failure Valve:	FC		79	Leakage Test		YES	
		51	Handwheel Location	N/A		80				
52		Bench Range	3-15 psig		81	Manufacturer		LowFlow Valve or Equal		
53		Material	Aluminum		82	Model		708SP050S6# / PTG6ANB4T4R4A7R0G		
54					83	Purchase Order Num.				
55					84	Price	Item Number			
56					85	Serial Number				

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-PV-0600								
	2	Service		Fuel Salt Scrubber Gas Outlet Pressure Control Valve								
	3	P&ID No.	Line #	3270-12-P&ID-0001-06.dwg		12-732--3/4"-36M						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FO								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	3/4"		300					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 575 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	15	120	210	15	120	210		
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9		
	19	Inlet Temperature		°C	575	575	575	575	575	575		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.16	1.16	1.16	1.74	1.74	1.74		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0504							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.068	0.545	0.954	0.041	0.325	0.569	
		26	Travel		%	6.8%	54.5%	95.4%	4.1%	32.5%	56.9%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	3/4"		E	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	1		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES	
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT			
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A	
	37	Flow Action To					66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports				68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard			
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED			
	44	Packing	Graphite/Grafoil			73						
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD		
	46					75	Set Pressure		45 psig			
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77					
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FO			79	Leakage Test		YES		
		51	Handwheel Location	N/A		PURCHASE	80					
52		Bench Range	3-15 psig		81		Manufacturer		LowFlow Valve or Equal			
53		Material	Aluminum		82		Model		8000GSP75HC / PTSH1ES3A3D00ADG0			
54							83	Purchase Order Num.				
55							84	Price	Item Number			
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-PV-1000								
	2	Service		Compressor Suction Drum Pressure Control Valve								
	3	P&ID No.	Line #	3270-12-P&ID-0001-03.dwg		12-770-3/4"-36L						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FO								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	3/4"		150					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		N/A								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	10	70	140	10	70	140		
	17	Inlet Pressure		kPag	861.8	861.8	861.8	620.5	620.5	620.5		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	34.5	34.5	34.5		
	19	Inlet Temperature		°C	40	40	40	40	40	40		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	14.76	14.76	14.76	11.06	11.06	11.06		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.024							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.005	0.035	0.070	0.007	0.047	0.093	
		26	Travel		%	5.0%	34.9%	69.8%	6.7%	46.6%	93.2%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	3/4"		M	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.1		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports			68						
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	316SS/Teflon			73						
	ACTUATOR	45	Gasket Material	316SS/Teflon		AIR SET	74	MFR	Model	TBD	TBD	
		46			75		Set Pressure		45 psig			
		47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES
		48	Type	Diaphragm		TESTS	77					
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FO			79	Leakage Test		YES		
		51	Handwheel Location		N/A		80					
52		Bench Range		3-15 psig	PURCHASE		81	Manufacturer		LowFlow Valve or Equal		
53		Material		Aluminum			82	Model		708SP075S6# / PTT6AMA4T4D4A7D0G		
54							83	Purchase Order Num.				
55							84	Price	Item Number			
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-PV-1100								
	2	Service		Compressor Discharge Drum Vent Pressure Control Valve								
	3	P&ID No.	Line #	3270-12-P&ID-0001-03.dwg		12-774-1/2"-36L						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		150					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		N/A								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	10	70	140	10	70	140		
	17	Inlet Pressure		kPag	861.8	861.8	861.8	620.5	620.5	620.5		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	34.5	34.5	34.5		
	19	Inlet Temperature		°C	40	40	40	40	40	40		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	14.76	14.76	14.76	11.06	11.06	11.06		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.024							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.005	0.035	0.070	0.007	0.047	0.093	
		26	Travel		%	5.0%	34.9%	69.8%	6.7%	46.6%	93.2%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		M	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.1		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS		SOLENOID VALVE	63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction				65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Engr. Valve:		N/A		
	39	Guiding	No. of Ports				68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	316SS/Teflon			73						
	ACTUATOR	45	Gasket Material	316SS/Teflon		AIR SET	74	MFR	Model	TBD	TBD	
		46					75	Set Pressure		45 psig		
		47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES
48		Type	Diaphragm		TESTS	77						
49		Size	Area	14M		TBD	78	Proof Pressure Test		YES		
50		Air Failure Valve:	FC			79	Leakage Test		YES			
51		Handwheel Location	N/A			80						
52		Bench Range	3-15 psig			81	Manufacturer		LowFlow Valve or Equal			
53		Material	Aluminum			82	Model		708SP050S6# / PTT6AMB4T4R4A7R0G			
54					PURCHASE	83	Purchase Order Num.					
55				84		Price	Item Number					
56				85		Serial Number						

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-PV-1101						
	2	Service		Recycled Argon Header Pressure Control Valve						
	3	P&ID No.	Line #	3270-12-P&ID-0001-03.dwg	12-775-1/2"-36L					
	4	Area Classification		N/A						
	5	Ambient Temperature:	Min.	Max.	25					
	6	Allowable Sound Pressure Level	dBA		N/A					
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV						
	8	Available Air Supply Pressure:	Min.	Max.	90					
	9	Power Failure Position		FC						
	10	Quantity		1						
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					
	12	Pipe Connection		NPT						
	13	Pipe Insulation		N/A						
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)						
	15	Units		Case 1	Case 2	Case 3				
	16	Flow Rate	SLPM	50	150	300				
	17	Inlet Pressure	kPag	861.8	861.8	861.8				
	18	Outlet Pressure	kPag	620.5	620.5	620.5				
	19	Inlet Temperature	°C	40	40	40				
	20	Inlet Density / Specific Gravity / Molecular Mass	kg/m3	14.76	14.76	14.76				
	21	Inlet Compressibility Factor	-	0.999						
	22	Inlet Viscosity	cP	0.024						
	23	Inlet Specific Heats Ratio	-	1.6702						
	24	Inlet Vapor Pressure	N/A	N/A						
	CALCULATED RESULTS	25	Flow Coefficient Cv	N/A	0.033	0.098	0.196			
		26	Travel	%	16.3%	48.9%	97.9%			
		27	Sound Pressure Level @ Maximum Flow:	dBA						
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		57	MFR	Model	LowFlow	Mark 16IQ-S or Equal	
	29	Model	708SP or Equal		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart	
	30	Body Type	Globe Valve		59	Increase Signal Valve:		Open		
	31	Body Size	Trim Size/Code	1/2"	N	60	Enclosure		NEMA 4X	
	32	Rated Cv	Characteris.	0.2	Linear	61	Cam Characteristic			
	33	End Connec.	End Rating	NPT	150	62	Bypass	Gauges	NO	
	34	Body Material	316SS		63	Air Supply Pressure	45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection	1/4" NPT		
	36	Flow Direction			65	MFR	Model	N/A	N/A	
	37	Flow Action To			66	Type	N/A			
	38	Lubricator	Isolat. Valve	N/A	Yes	67	When De-Engr. Valve:	N/A		
	39	Guiding	No. of Ports			68				
	40	Trim Type	Standard, Linear, Hard Seat		69	MFR	Model	TBD	TBD	
	41	Rated Travel	100%		70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material	17-4		71	Contacts / Rating	Standard			
	43	Seat Material	316SS		72	Switching Position	OPEN / CLOSED			
	44	Packing	316SS/Teflon		73					
	45	Gasket Material	316SS/Teflon		74	MFR	Model	TBD	TBD	
	46					75	Set Pressure	45 psig		
	ACTUATOR	47	MFR	Model	LowFlow Valve	14M	76	Filter	Gauge	YES
		48	Type	Diaphragm		77				
		49	Size	Area	14M	TBD	78	Proof Pressure Test	YES	
		50	Air Failure Valve:	FC		79	Leakage Test	YES		
		51	Handwheel Location	N/A		80				
52		Bench Range	3-15 psig		81	Manufacturer	LowFlow Valve or Equal			
53		Material	Aluminum		82	Model	708SP050S6# / PTT6ANB4T4R4A7R0G			
54						83	Purchase Order Num.			
55						84	Price	Item Number		
56						85	Serial Number			

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		12-PV-1102								
	2	Service		Compressor Discharge Drum Makeup Pressure Control Valve								
	3	P&ID No.	Line #	3270-12-P&ID-0001-03.dwg	12-709-1/2"-36L							
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25 40							
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90 125							
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 150							
	12	Pipe Connection		NPT								
	13	Pipe Insulation		N/A								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15	Units		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate	SLPM	30	150	200	30	150	200			
	17	Inlet Pressure	kPag	965.3	965.3	965.3	861.8	861.8	861.8			
	18	Outlet Pressure	kPag	689.5	689.5	689.5	620.5	620.5	620.5			
	19	Inlet Temperature	°C	25	25	25	25	25	25			
	20	Inlet Density / Specific Gravity / Molecular Mass	kg/m3	17.17	17.17	17.17	15.51	15.51	15.51			
	21	Inlet Compressibility Factor	-	0.999								
	22	Inlet Viscosity	cP	0.026								
	23	Inlet Specific Heats Ratio	-	1.6702								
	24	Inlet Vapor Pressure	N/A	N/A								
	CALCULATED RESULTS	25	Flow Coefficient Cv	N/A	0.017	0.087	0.174	0.020	0.098	0.196		
		26	Travel	%	8.7%	43.6%	87.2%	9.8%	48.9%	97.9%		
		27	Sound Pressure Level @ Maximum Flow:	dBA								
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2" N		60	Enclosure		NEMA 4X			
	32	Rated Cv	Characteris.	0.2 Linear		61	Cam Characteristic					
	33	End Connec.	End Rating	NPT 150		62	Bypass	Gauges	NO	YES		
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type	N/A				
	38	Lubricator	Isolat. Valve	N/A Yes		67	When De-Enegr.Valve:		N/A			
	39	Guiding	No. of Ports			68						
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	316SS/Teflon			73						
	ACTUATOR	45	Gasket Material	316SS/Teflon		AIR SET	74	MFR	Model	TBD	TBD	
		46			75		Set Pressure		45 psig			
		47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES
		48	Type	Diaphragm		TESTS	77					
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FC			79	Leakage Test		YES		
		51	Handwheel Location	N/A			80					
52		Bench Range	3-15 psig		PURCHASE		81	Manufacturer		LowFlow Valve or Equal		
53		Material	Aluminum			82	Model		708SP050S6# / PTT6ANB4T4R4A7R0G			
54				83		Purchase Order Num.						
55				84		Price	Item Number					
56				85		Serial Number						

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
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GENERAL	1	Tag No.		12-TV-2700								
	2	Service		Inline Mixer Outlet Temperature Control Valve								
	3	P&ID No.	Line #	3270-12-P&ID-0001-02.dwg	12-734-1/2"-36L							
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25	40						
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90	125						
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"	150						
	12	Pipe Connection		NPT								
	13	Pipe Insulation		N/A								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15	Units		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate		SLPM	10	65	130	10	65	130		
	17	Inlet Pressure		kPag	620.5	620.5	620.5	620.5	620.5	620.5		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9		
	19	Inlet Temperature		°C	40	40	40	40	40	40		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	11.06	11.06	11.06	11.06	11.06	11.06		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.024							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.007	0.044	0.088	0.007	0.044	0.088	
		26	Travel		%	6.8%	44.0%	87.9%	6.8%	44.0%	87.9%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		M	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.1		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS		SOLENOID VALVE	63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction				65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports				68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	316SS/Teflon			73						
	45	Gasket Material	316SS/Teflon			74	MFR	Model	TBD	TBD		
	ACTUATOR	46			AIR SET	75	Set Pressure		45 psig			
		47	MFR	Model		LowFlow Valve	14M	76	Filter	Gauge	YES	YES
		48	Type	Diaphragm		77						
		49	Size	Area	14M	TBD	TESTS	78	Proof Pressure Test		YES	
		50	Air Failure Valve:		FC	79		Leakage Test		YES		
		51	Handwheel Location		N/A	80						
52		Bench Range		3-15 psig	81	Manufacturer		LowFlow Valve or Equal				
53		Material		Aluminum	82	Model		708SP050S6# / PTT6AMB4T4R4A7R0G				
54					83	Purchase Order Num.						
55					84	Price	Item Number					
56					85	Serial Number						

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
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GENERAL	1	Tag No.		12-TV-3003								
	2	Service		Finned Tube Heat Exchanger Discharge Temperature Control Valve								
	3	P&ID No.	Line #	3270-12-P&ID-0001-02.dwg	12-781-1/2-36L							
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25 40							
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90 125							
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 150							
	12	Pipe Connection		NPT								
	13	Pipe Insulation		N/A								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15	Units		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate		SLPM	10	65	130	10	65	130		
	17	Inlet Pressure		kPag	620.5	620.5	620.5	620.5	620.5	620.5		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9		
	19	Inlet Temperature		°C	40	40	40	40	40	40		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	11.06	11.06	11.06	11.06	11.06	11.06		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.024							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.007	0.044	0.088	0.007	0.044	0.088	
		26	Travel		%	6.8%	44.0%	87.9%	6.8%	44.0%	87.9%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2" M		60	Enclosure		NEMA 4X			
	32	Rated Cv	Characteris.	0.1 Linear		61	Cam Characteristic					
	33	End Connec.	End Rating	NPT 150		62	Bypass	Gauges	NO	YES		
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A Yes		67	When De-Engr. Valve:		N/A			
	39	Guiding	No. of Ports			68						
	40	Trim Type		Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD	
	41	Rated Travel		100%			70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material		17-4			71	Contacts / Rating		Standard		
	43	Seat Material		316SS			72	Switching Position		OPEN / CLOSED		
	44	Packing		316SS/Teflon		AIR SET	73					
	45	Gasket Material		316SS/Teflon			74	MFR	Model	TBD	TBD	
	46						75	Set Pressure		45 psig		
	47	MFR	Model	LowFlow Valve	14M		76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type		Diaphragm	TESTS	77					
		49	Size	Area	14M TBD		78	Proof Pressure Test		YES		
		50	Air Failure Valve:		FC		79	Leakage Test		YES		
		51	Handwheel Location		N/A		80					
52		Bench Range		3-15 psig	PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material		Aluminum		82	Model		708SP050S6# / PTT6AMB4T4R4A7R0G			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-TV-1035								
	2	Service		Freeze Valve Air Supply								
	3	P&ID No.	Line #	3270-13-P&ID-0001-13.dwg			Varies					
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25			40				
	6	Allowable Sound Pressure Level dBA		N/A								
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90			125				
	9	Power Failure Position		FC								
	10	Quantity		22								
	11	Full Tag List		13-TV-1035, 13-TV-1085, 13-TV-1095, 13-TV-1135, 13-TV-1185, 13-TV-1195, 13-TV-1235, 13-TV-1285, 13-TV-1295, 13-TV-1635, 13-TV-1665, 14-TV-1035, 14-TV-1085, 14-TV-1095, 14-TV-1155, 14-TV-1235, 14-TV-1285, 14-TV-1295, 14-TV-1335, 14-TV-1635, 14-TV-1665, 14-TV-4155								
PIPE LINE	12	Line Size and Rating	Inlet	Outlet	1/2"			150				
	13	Pipe Connection		NPT								
	14	Pipe Insulation		N/A								
PROCESS CONDITIONS	15	Process Fluid		Gas - Air (Clean)								
	16			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	17	Flow Rate		SLPM	100	600	1350	100	600	1350		
	18	Inlet Pressure		kPag	620.5	620.5	620.5	620.5	620.5	620.5		
	19	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9		
	20	Inlet Temperature		°C	30	30	30	30	30	30		
	21	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	11.43	11.43	11.43	11.43	11.43	11.43		
	22	Inlet Compressibility Factor		-	0.997							
	23	Inlet Viscosity		cP	0.0196							
	24	Inlet Specific Heats Ratio		-	1.4							
	25	Inlet Vapor Pressure		N/A	N/A							
CALCULATED RESULTS	26	Flow Coefficient Cv		N/A	0.071	0.425	0.957	0.071	0.425	0.957		
	27	Travel		%	7.1%	42.5%	95.7%	7.1%	42.5%	95.7%		
	28	Sound Pressure Level @ Maximum Flow:		dBA								
BODY AND TRIM	29	MFR	LowFlow Valve or Equal		POSITIONER	58	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	30	Model	708SP or Equal			59	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	31	Body Type	Globe Valve			60	Increase Signal Valve:		Open			
	32	Body Size	Trim Size/Code	1/2"		Q	61	Enclosure		NEMA 4X		
	33	Rated Cv	Characteris.	1		Linear	62	Cam Characteristic				
	34	End Connec.	End Rating	NPT		150	63	Bypass	Gauges	NO	YES	
	35	Body Material		Carbons Steel		64	Air Supply Pressure		45 psig			
	36	Bonnet Type	Material	Carbons Steel		65	Air Connection		1/4" NPT			
	37	Flow Direction				66	MFR	Model	N/A	N/A		
	38	Flow Action To				67	Type		N/A			
	39	Lubricator	Isolat. Valve	N/A	Yes	68	When De-Enegr.Valve:		N/A			
	40	Guiding	No. of Ports			69						
	41	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	70	MFR	Model	TBD	TBD		
	42	Rated Travel	100%			71	Type	Quantity	TBD	2		
	43	Plug/ Ball/ Disk Material	17-4			72	Contacts / Rating		Standard			
	44	Seat Material	S316SS			73	Switching Position		OPEN / CLOSED			
	45	Packing	316SS/Teflon		AIR SET	74						
	46	Gasket Material	316SS/Teflon			75	MFR	Model	TBD	TBD		
	47					76	Set Pressure		45 psig			
	48	MFR	Model	LowFlow Valve		14M	77	Filter	Gauge	YES	YES	
	ACTUATOR	49	Type	Diaphragm		TESTS	78					
		50	Size	Area	14M		TBD	79	Proof Pressure Test		YES	
		51	Air Failure Valve:	FC			80	Leakage Test		YES		
		52	Handwheel Location	N/A			81					
		53	Bench Range	3-15 psig		PURCHASE	82	Manufacturer		LowFlow Valve or Equal		
		54	Material	Aluminum			83	Model		708SP050CB# / PTTGAQB4T4R4A7R0G		
		55					84	Purchase Order Num.				
		56					85	Price	Item Number			
57							86	Serial Number				

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1021								
	2	Service		Coolant Salt Tank Argon Inlet Control Valve								
	3	P&ID No.	Line #	3270-13-P&ID-0001-01.dwg	13-512-1/2"-36L							
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25							
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90							
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"							
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 200 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	25	150	300	25	150	300		
	17	Inlet Pressure		kPag	482.6	482.6	482.6	482.6	482.6	482.6		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	310.3	310.3	310.3		
	19	Inlet Temperature		°C	200	200	200	200	200	200		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0328							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.026	0.154	0.308	0.031	0.188	0.376	
		26	Travel		%	5.1%	30.8%	61.7%	6.3%	37.6%	75.3%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		P	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.5		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A	
	37	Flow Action To					66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Engr.Valve:		N/A		
	39	Guiding	No. of Ports				68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	Graphite/Grafoil			73						
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD		
	46					75	Set Pressure		45 psig			
	47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77					
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FC			79	Leakage Test		YES		
		51	Handwheel Location	N/A			80					
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material	Aluminum			82	Model		708SP050S6# / PTG6APB4T4R4A7R0G			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1041										
	2	Service		Coolant Salt Tank Argon Outlet Control Valve										
	3	P&ID No.	Line #	3270-13-P&ID-0001-01.dwg					13-516-1/2"-36N					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	25	150	300	25	150	300				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	310.3	310.3	310.3				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	2.40	2.40	2.40				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0464				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.112	0.671	1.342	0.048	0.289	0.577			
		26	Travel		%	6.2%	37.3%	74.6%	2.7%	16.1%	32.1%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		N	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	1.8		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard					
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:	FO			79	Leakage Test		YES				
		51	Handwheel Location	N/A			80							
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum			82	Model		8000GSP050HC / PTSH1NS3A3D00ADG0					
54						83	Purchase Order Num.							
55						84	Price	Item Number						
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1121								
	2	Service		Flush Salt Tank Argon Inlet Control Valve								
	3	P&ID No.	Line #	3270-13-P&ID-0001-02.dwg		13-563-1/2"-36L						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25 40							
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90 125							
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 150							
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 200 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	25	150	300	25	150	300		
	17	Inlet Pressure		kPag	482.6	482.6	482.6	482.6	482.6	482.6		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	310.3	310.3	310.3		
	19	Inlet Temperature		°C	200	200	200	200	200	200		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0328							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.026	0.154	0.308	0.031	0.188	0.376	
		26	Travel		%	5.1%	30.8%	61.7%	6.3%	37.6%	75.3%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2" P		60	Enclosure		NEMA 4X			
	32	Rated Cv	Characteris.	0.5 Linear		61	Cam Characteristic					
	33	End Connec.	End Rating	NPT 150		62	Bypass	Gauges	NO	YES		
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A Yes		67	When De-Engr.Valve:		N/A			
	39	Guiding	No. of Ports			68						
	40	Trim Type		Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD	
	41	Rated Travel		100%			70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material		17-4			71	Contacts / Rating		Standard		
	43	Seat Material		316SS			72	Switching Position		OPEN / CLOSED		
	44	Packing		Graphite/Grafoil		73						
	45	Gasket Material		Grafoil		AIR SET	74	MFR	Model	TBD	TBD	
	46						75	Set Pressure		45 psig		
	47	MFR	Model	LowFlow Valve	14M		76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type		Diaphragm	TESTS	77					
		49	Size	Area	14M TBD		78	Proof Pressure Test		YES		
		50	Air Failure Valve:		FC		79	Leakage Test		YES		
		51	Handwheel Location		N/A	PURCHASE	80					
52		Bench Range		3-15 psig	81		Manufacturer		LowFlow Valve or Equal			
53		Material		Aluminum	82		Model		708SP050S6# / PTG6APB4T4R4A7R0G			
54					83		Purchase Order Num.					
55					84		Price	Item Number				
56					85	Serial Number						

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1141										
	2	Service		Flush Salt Tank Argon Outlet Control Valve										
	3	P&ID No.	Line #	3270-13-P&ID-0001-02.dwg					13-517-1/2"-36N					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	25	150	300	25	150	300				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	310.3	310.3	310.3				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	2.40	2.40	2.40				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0464				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.115	0.671	1.342	0.048	0.289	0.577			
		26	Travel		%	6.4%	37.3%	74.6%	2.7%	16.1%	32.1%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model		MARK 8000 Series		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type		Globe Valve		59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		N	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	1.8		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material		Hastelloy C		63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				65	MFR	Model	N/A	N/A				
	37	Flow Action To				66	Type		N/A					
	38	Lubricator	Isolat. Valve	N/A	Yes	67	When De-Enegr.Valve:		N/A					
	39	Guiding	No. of Ports			68								
	40	Trim Type		Standard, Linear, Hard Seat		69	MFR	Model	TBD	TBD				
	41	Rated Travel		100%		70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material		Hastelloy C		71	Contacts / Rating		Standard					
	43	Seat Material		Hastelloy C		72	Switching Position		OPEN / CLOSED					
	44	Packing		Graphite/Grafoil		73								
	45	Gasket Material		Grafoil		74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	ACTUATOR	47	MFR	Model	LowFlow Valve	35M	AIR SET	76	Filter	Gauge	YES	YES		
		48	Type		Diaphragm			77						
		49	Size	Area	35M	TBD								
		50	Air Failure Valve:		FO		TESTS	78	Proof Pressure Test		YES			
		51	Handwheel Location		N/A			79	Leakage Test		YES			
52		Bench Range		3-15 psig		80								
53		Material		Aluminum		PURCHASE	81	Manufacturer		LowFlow Valve or Equal				
54							82	Model		8000GSP050HC / PTSH1NS3A3D00ADG0				
55							83	Purchase Order Num.						
56							84	Price	Item Number					
56					85		Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1221		
	2	Service		Coolant Salt Fill Cask Argon Inlet Pressure Control Valve		
	3	P&ID No.	Line #	3270-13-P&ID-0001-03.dwg	13-509-1/2"-36L	
	4	Area Classification		N/A		
	5	Ambient Temperature:	Min.	Max.	25	
	6	Allowable Sound Pressure Level	dBA		N/A	
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV		
	8	Available Air Supply Pressure:	Min.	Max.	90	
	9	Power Failure Position		FC		
	10	Quantity		1		
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"	
	12	Pipe Connection		NPT		
	13	Pipe Insulation		Heat Trace and Insulated to 200 C		
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)		
	15			Units	Case 1	
	16	Flow Rate	SLPM	Case 2	Case 3	
	17	Inlet Pressure	kPag	Case 4	Case 5	
	18	Outlet Pressure	kPag	Case 6		
	19	Inlet Temperature	°C			
	20	Inlet Density / Specific Gravity / Molecular Mass	kg/m3			
	21	Inlet Compressibility Factor	-			
	22	Inlet Viscosity	cP			
	23	Inlet Specific Heats Ratio	-			
	24	Inlet Vapor Pressure	N/A			
	CALCULATED RESULTS	25	Flow Coefficient Cv	N/A	0.005	0.021
		26	Travel	%	10.3%	41.1%
		27	Sound Pressure Level @ Maximum Flow:	dBA	0.031	0.005
BODY AND TRIM	28	MFR	LowFlow Valve or Equal	57	MFR	
	29	Model	708SP or Equal	58	Signal: Inlet	
	30	Body Type	Globe Valve	59	Outlet	
	31	Body Size	Trim Size/Code	60	Increase Signal Valve:	
	32	Rated Cv	Characteris.	61	Enclosure	
	33	End Connec.	End Rating	62	Cam Characteristic	
	34	Body Material	316SS	63	Bypass	
	35	Bonnet Type	Material	64	Gauges	
	36	Flow Direction		65	NO	
	37	Flow Action To		66	YES	
	38	Lubricator	Isolat. Valve	67	Air Supply Pressure	
	39	Guiding	No. of Ports	68	45 psig	
	40	Trim Type	Standard, Linear, Hard Seat	69	Air Connection	
	41	Rated Travel	100%	70	1/4" NPT	
	42	Plug/ Ball/ Disk Material	17-4	71	MFR	
	43	Seat Material	316SS	72	Model	
	44	Packing	Graphite/Grafoil	73	TBD	
	45	Gasket Material	Grafoil	74	Quantity	
	46			75	TBD	
	ACTUATOR	47	MFR	Model	76	Contacts / Rating
		48	Type	Diaphragm	77	Switching Position
		49	Size	Area	78	OPEN / CLOSED
		50	Air Failure Valve:	FC	79	
		51	Handwheel Location	N/A	80	
52		Bench Range	3-15 psig	81		
53		Material	Aluminum	82		
54				83		
55				84		
56				85		

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1241										
	2	Service		Coolant Salt Fill Cask Argon Outlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-13-P&ID-0001-03.dwg					13-516-1/2"-36N					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	1.80	1.80	1.80				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0464				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.022	0.089	0.134	0.013	0.053	0.080			
		26	Travel		%	11.0%	44.5%	67.0%	6.5%	26.5%	40.0%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		C	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.2		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C		SOLENOID VALVE	63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				65	MFR	Model	N/A	N/A				
	37	Flow Action To				66	Type		N/A					
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard					
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil			74	MFR	Model	TBD	TBD				
	ACTUATOR	46				AIR SET	75	Set Pressure		45 psig				
		47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES		
		48	Type	Diaphragm			77							
		49	Size	Area	35M	TBD	TESTS	78	Proof Pressure Test		YES			
		50	Air Failure Valve:		FO	79		Leakage Test		YES				
		51	Handwheel Location		N/A	80								
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum			82	Model		8000GSP050HC / PTSH1CS3A3D00ADG0					
54						83	Purchase Order Num.							
55						84	Price	Item Number						
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1621										
	2	Service		Coolant Salt Withdrawal Buffer Tank Argon Inlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-13-P&ID-0001-07.dwg					13-511-1/2"-36L					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FC										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					150				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 200 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	483	483	483	483	483	483				
	18	Outlet Pressure		kPag	34	34	34	207	207	207				
	19	Inlet Temperature		°C	200	200	200	200	200	200				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0328				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.005	0.021	0.031	0.005	0.021	0.031			
		26	Travel		%	10.3%	41.1%	61.7%	10.5%	41.9%	62.9%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		L	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.05		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES			
	34	Body Material	316SS			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr. Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type		Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD			
	41	Rated Travel		100%			70	Type	Quantity	TBD	2			
	42	Plug/ Ball/ Disk Material		17-4			71	Contacts / Rating		Standard				
	43	Seat Material		316SS			72	Switching Position		OPEN / CLOSED				
	44	Packing		Graphite/Grafoil		73								
	45	Gasket Material		Grafoil		AIR SET	74	MFR	Model	TBD	TBD			
	46						75	Set Pressure		45 psig				
	47	MFR	Model	LowFlow Valve	14M		76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:		FC		79	Leakage Test		YES				
		51	Handwheel Location		N/A		80							
52		Bench Range		3-15 psig	PURCHASE	81	Manufacturer		LowFlow Valve or Equal					
53		Material		Aluminum		82	Model		708SP050S6# / PTG6ALB4T4R4A7R0G					
54						83	Purchase Order Num.							
55						84	Price	Item Number						
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		13-PV-1641									
	2	Service		Coolant Salt Withdrawal Buffer Tank Argon Outlet Pressure Control Valve									
	3	P&ID No.	Line #	3270-13-P&ID-0001-07.dwg	13-520-1/2"-36N								
	4	Area Classification		N/A									
	5	Ambient Temperature:	Min.	Max.	25								
	6	Allowable Sound Pressure Level	dBA		N/A								
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV									
	8	Available Air Supply Pressure:	Min.	Max.	90								
	9	Power Failure Position		FO									
	10	Quantity		1									
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 300								
	12	Pipe Connection		NPT									
	13	Pipe Insulation		Heat Trace and Insulated to 500 C									
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)									
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate		SLPM	5	20	30	5	20	30			
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8			
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9			
	19	Inlet Temperature		°C	550	550	550	550	550	550			
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	1.80	1.80	1.80			
	21	Inlet Compressibility Factor		-	0.999								
	22	Inlet Viscosity		cP	0.0464								
	23	Inlet Specific Heats Ratio		-	1.6702								
	24	Inlet Vapor Pressure		N/A	N/A								
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.022	0.089	0.134	0.013	0.053	0.080		
		26	Travel		%	11.0%	44.5%	67.0%	6.5%	26.5%	40.0%		
		27	Sound Pressure Level @ Maximum Flow:		dBA								
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal			
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart			
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open				
	31	Body Size	Trim Size/Code	1/2" C		60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.2 Linear		61	Cam Characteristic						
	33	End Connec.	End Rating	NPT 300		62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig				
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT				
	SOLENOID VALVE	36	Flow Direction		SOLENOID VALVE	65	MFR	Model	N/A	N/A			
		37	Flow Action To			66	Type	N/A					
		38	Lubricator	Isolat. Valve		N/A	Yes	LIMIT SWITCHES	69	MFR	Model	TBD	TBD
		39	Guiding	No. of Ports			70		Type	Quantity	TBD	2	
		40	Trim Type	Standard, Linear, Hard Seat		71	Contacts / Rating		Standard				
		41	Rated Travel	100%		72	Switching Position		OPEN / CLOSED				
		42	Plug/ Ball/ Disk Material	Hastelloy C		73							
		43	Seat Material	Hastelloy C		AIR SET	74	MFR	Model	TBD	TBD		
		44	Packing	Graphite/Grafoil			75	Set Pressure		45 psig			
		45	Gasket Material	Grafoil			76	Filter	Gauge	YES	YES		
		46			TESTS		77						
		47	MFR	Model		LowFlow Valve	35M	78	Proof Pressure Test		YES		
	48	Type	Diaphragm			79	Leakage Test		YES				
	49	Size	Area	35M		TBD	80						
	ACTUATOR	50	Air Failure Valve:		FO	PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
		51	Handwheel Location		N/A		82	Model		8000GSP050HC / PTSH1CS3A3D00ADG0			
52		Bench Range		3-15 psig	83		Purchase Order Num.						
53		Material		Aluminum	84		Price	Item Number					
54					85	Serial Number							
55													
56													
Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number													

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1021							
	2	Service		DU Salt Tank Argon Inlet Control Valve							
	3	P&ID No.	Line #	3270-14-P&ID-0001-01.dwg		14-612-1/2"-36L					
	4	Area Classification		N/A							
	5	Ambient Temperature:	Min.	Max.	25 40						
	6	Allowable Sound Pressure Level	dBA		N/A						
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV							
	8	Available Air Supply Pressure:	Min.	Max.	90 125						
	9	Power Failure Position		FC							
	10	Quantity		1							
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 150						
	12	Pipe Connection		NPT							
	13	Pipe Insulation		Heat Trace and Insulated to 200 C							
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)							
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	
	16	Flow Rate		SLPM	25	150	300	25	150	300	
	17	Inlet Pressure		kPag	482.6	482.6	482.6	482.6	482.6	482.6	
	18	Outlet Pressure		kPag	34.5	34.5	34.5	310.3	310.3	310.3	
	19	Inlet Temperature		°C	200	200	200	200	200	200	
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92	
	21	Inlet Compressibility Factor		-	0.999						
	22	Inlet Viscosity		cP	0.0328						
	23	Inlet Specific Heats Ratio		-	1.6702						
	24	Inlet Vapor Pressure		N/A	N/A						
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.026	0.154	0.308	0.031	0.188	0.376
		26	Travel		%	5.1%	30.8%	61.7%	6.3%	37.6%	75.3%
		27	Sound Pressure Level @ Maximum Flow:		dBA						
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal	
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart	
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open		
	31	Body Size	Trim Size/Code	1/2" P		60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.5 Linear		61	Cam Characteristic				
	33	End Connec.	End Rating	NPT 150		62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS			63	Air Supply Pressure		45 psig		
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT		
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A	
	37	Flow Action To				66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A Yes		67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports			68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD	
	41	Rated Travel	100%			70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard		
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED		
	44	Packing	Graphite/Grafoil			73					
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD	
	46					75	Set Pressure		45 psig		
	47	MFR	Model	LowFlow Valve 14M		76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77				
		49	Size	Area	14M TBD		78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FC			79	Leakage Test		YES	
		51	Handwheel Location	N/A			80				
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal		
53		Material	Aluminum			82	Model		708SP050S6# / PTG6APB4T4R4A7R0G		
54						83	Purchase Order Num.				
55						84	Price	Item Number			
56						85	Serial Number				

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1041										
	2	Service		DU Salt Tank Argon Outlet Control Valve										
	3	P&ID No.	Line #	3270-14-P&ID-0001-01.dwg					14-616-1/2"-36M					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	25	150	300	25	150	300				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	310.3	310.3	310.3				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	2.40	2.40	2.40				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0464				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.115	0.671	1.342	0.048	0.289	0.577			
		26	Travel		%	6.4%	37.3%	74.6%	2.7%	16.1%	32.1%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model		MARK 8000 Series		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type		Globe Valve		59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		N	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	1.8		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material		Hastelloy C		63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				65	MFR	Model	N/A	N/A				
	37	Flow Action To				66	Type		N/A					
	38	Lubricator	Isolat. Valve	N/A	Yes	67	When De-Enegr.Valve:		N/A					
	39	Guiding	No. of Ports			68								
	40	Trim Type		Standard, Linear, Hard Seat		69	MFR	Model	TBD	TBD				
	41	Rated Travel		100%		70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material		Hastelloy C		71	Contacts / Rating		Standard					
	43	Seat Material		Hastelloy C		72	Switching Position		OPEN / CLOSED					
	44	Packing		Graphite/Grafoil		73								
	45	Gasket Material		Grafoil		74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	ACTUATOR	47	MFR	Model	LowFlow Valve	35M	AIR SET	76	Filter	Gauge	YES	YES		
		48	Type	Diaphragm		77								
		49	Size	Area	35M	TBD		78	Proof Pressure Test		YES			
		50	Air Failure Valve:		FO		TESTS	79	Leakage Test		YES			
		51	Handwheel Location		N/A			80						
52		Bench Range		3-15 psig		81		Manufacturer		LowFlow Valve or Equal				
53		Material		Aluminum		PURCHASE	82	Model		8000GSP050HC / PTSH1NS3A3D00ADG0				
54							83	Purchase Order Num.						
55							84	Price	Item Number					
56							85	Serial Number						

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1221								
	2	Service		Flush Salt Tank Argon Inlet Control Valve								
	3	P&ID No.	Line #	3270-14-P&ID-0001-02.dwg		14-663-1/2"-36L						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25 40							
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90 125							
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 150							
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 200 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	25	150	300	25	150	300		
	17	Inlet Pressure		kPag	482.6	482.6	482.6	482.6	482.6	482.6		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	310.3	310.3	310.3		
	19	Inlet Temperature		°C	200	200	200	200	200	200		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0328							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.026	0.154	0.308	0.031	0.188	0.376	
		26	Travel		%	5.1%	30.8%	61.7%	6.3%	37.6%	75.3%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2" P		60	Enclosure		NEMA 4X			
	32	Rated Cv	Characteris.	0.5 Linear		61	Cam Characteristic					
	33	End Connec.	End Rating	NPT 150		62	Bypass	Gauges	NO	YES		
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A Yes		67	When De-Enegr.Valve:		N/A			
	39	Guiding	No. of Ports			68						
	40	Trim Type		Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD	
	41	Rated Travel		100%			70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material		17-4			71	Contacts / Rating		Standard		
	43	Seat Material		316SS			72	Switching Position		OPEN / CLOSED		
	44	Packing		Graphite/Grafoil		73						
	45	Gasket Material		Grafoil		AIR SET	74	MFR	Model	TBD	TBD	
	46						75	Set Pressure		45 psig		
	47	MFR	Model	LowFlow Valve	14M		76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type		Diaphragm	TESTS	77					
		49	Size	Area	14M TBD		78	Proof Pressure Test		YES		
		50	Air Failure Valve:		FC		79	Leakage Test		YES		
		51	Handwheel Location		N/A		80					
52		Bench Range		3-15 psig	PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material		Aluminum		82	Model		708SP050S6# / PTG6APB4T4R4A7R0G			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1241								
	2	Service		Flush Salt Tank Argon Outlet Control Valve								
	3	P&ID No.	Line #	3270-14-P&ID-0001-02.dwg		14-665-1/2"-36M						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FO								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		300					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 500 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	25	150	300	25	150	300		
	17	Inlet Pressure		kPag	103.4	103.4	103.4	310.3	310.3	310.3		
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9		
	19	Inlet Temperature		°C	550	550	550	550	550	550		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	2.40	2.40	2.40		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0464							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.115	0.671	1.342	0.048	0.289	0.577	
		26	Travel		%	6.4%	37.3%	74.6%	2.7%	16.1%	32.1%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		N	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	1.8		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES	
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT			
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A	
	37	Flow Action To					66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports				68					
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard			
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED			
	44	Packing	Graphite/Grafoil			73						
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD		
	46					75	Set Pressure		45 psig			
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77					
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FO			79	Leakage Test		YES		
		51	Handwheel Location	N/A			80					
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material	Aluminum			82	Model		8000GSP050HC / PTSH1NS3A3D00ADG0			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1321								
	2	Service		DU Salt Fill Cask Argon Inlet Pressure Control Valve								
	3	P&ID No.	Line #	3270-14-P&ID-0001-03.dwg		14-609-1/2"-36L						
	4	Area Classification		N/A								
	5	Ambient Temperature:	Min.	Max.	25		40					
	6	Allowable Sound Pressure Level	dBA		N/A							
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV								
	8	Available Air Supply Pressure:	Min.	Max.	90		125					
	9	Power Failure Position		FC								
	10	Quantity		1								
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"		150					
	12	Pipe Connection		NPT								
	13	Pipe Insulation		Heat Trace and Insulated to 200 C								
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)								
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6		
	16	Flow Rate		SLPM	5	20	30	5	20	30		
	17	Inlet Pressure		kPag	483	483	483	483	483	483		
	18	Outlet Pressure		kPag	34	34	34	207	207	207		
	19	Inlet Temperature		°C	200	200	200	200	200	200		
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92		
	21	Inlet Compressibility Factor		-	0.999							
	22	Inlet Viscosity		cP	0.0328							
	23	Inlet Specific Heats Ratio		-	1.6702							
	24	Inlet Vapor Pressure		N/A	N/A							
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.005	0.021	0.031	0.005	0.021	0.031	
		26	Travel		%	10.3%	41.1%	61.7%	10.5%	41.9%	62.9%	
		27	Sound Pressure Level @ Maximum Flow:		dBA							
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal		
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart		
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open			
	31	Body Size	Trim Size/Code	1/2"		L	60	Enclosure		NEMA 4X		
	32	Rated Cv	Characteris.	0.05		Linear	61	Cam Characteristic				
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES	
	34	Body Material	316SS			63	Air Supply Pressure		45 psig			
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT			
	36	Flow Direction			SOLENOID VALVE	65	MFR	Model	N/A	N/A		
	37	Flow Action To				66	Type		N/A			
	38	Lubricator	Isolat. Valve	N/A		Yes	67	When De-Enegr.Valve:		N/A		
	39	Guiding	No. of Ports			68						
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
	41	Rated Travel	100%			70	Type	Quantity	TBD	2		
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard			
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED			
	44	Packing	Graphite/Grafoil			73						
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD		
	46					75	Set Pressure		45 psig			
	47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES	
	ACTUATOR	48	Type	Diaphragm		TESTS	77					
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES	
		50	Air Failure Valve:	FC			79	Leakage Test		YES		
		51	Handwheel Location	N/A			80					
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal			
53		Material	Aluminum			82	Model		708SP050S6# / PTG6ALB4T4R4A7R0G			
54						83	Purchase Order Num.					
55						84	Price	Item Number				
56						85	Serial Number					

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1341									
	2	Service		DU Salt Fill Cask Argon Outlet Pressure Control Valve									
	3	P&ID No.	Line #	3270-14-P&ID-0001-03.dwg		14-632-1/2"-36M							
	4	Area Classification		N/A									
	5	Ambient Temperature:	Min.	Max.	25 40								
	6	Allowable Sound Pressure Level	dBA		N/A								
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV									
	8	Available Air Supply Pressure:	Min.	Max.	90 125								
	9	Power Failure Position		FO									
	10	Quantity		1									
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2" 300								
	12	Pipe Connection		NPT									
	13	Pipe Insulation		Heat Trace and Insulated to 500 C									
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)									
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6			
	16	Flow Rate		SLPM	5	20	30	5	20	30			
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8			
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9			
	19	Inlet Temperature		°C	550	550	550	550	550	550			
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	1.80	1.80	1.80			
	21	Inlet Compressibility Factor		-	0.999								
	22	Inlet Viscosity		cP	0.0464								
	23	Inlet Specific Heats Ratio		-	1.6702								
	24	Inlet Vapor Pressure		N/A	N/A								
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.022	0.089	0.134	0.013	0.053	0.080		
		26	Travel		%	11.0%	44.5%	67.0%	6.5%	26.5%	40.0%		
		27	Sound Pressure Level @ Maximum Flow:		dBA								
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal			
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart			
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open				
	31	Body Size	Trim Size/Code	1/2" C		60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.2 Linear		61	Cam Characteristic						
	33	End Connec.	End Rating	NPT 300		62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig				
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT				
	SOLENOID VALVE	36	Flow Direction		SOLENOID VALVE	65	MFR	Model	N/A	N/A			
		37	Flow Action To			66	Type	N/A					
		38	Lubricator	Isolat. Valve		N/A	Yes						
		39	Guiding	No. of Ports									
		40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD		
		41	Rated Travel	100%			70	Type	Quantity	TBD	2		
		42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard			
		43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED			
		AIR SET	44	Packing	Graphite/Grafoil		AIR SET	73					
			45	Gasket Material	Grafoil			74	MFR	Model	TBD	TBD	
			46			75		Set Pressure		45 psig			
			47	MFR	Model	LowFlow Valve		35M	TESTS	76	Filter	Gauge	YES
	48		Type	Diaphragm		77							
	49		Size	Area	35M	TBD	78	Proof Pressure Test		YES			
	50		Air Failure Valve:	FO		79	Leakage Test			YES			
	PURCHASE		51	Handwheel Location	N/A		PURCHASE	80					
52		Bench Range	3-15 psig		81	Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum		82	Model		8000GSP050HC / PTSH1CS3A3D00ADG0					
54				83	Purchase Order Num.								
55				84	Price	Item Number							
56				85	Serial Number								

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1521										
	2	Service		DU Salt Bypass Pump Tank Argon Inlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-14-P&ID-0001-08.dwg					14-691-1/2"-36L					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FC										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					150				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 200 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	483	483	483	483	483	483				
	18	Outlet Pressure		kPag	34	34	34	207	207	207				
	19	Inlet Temperature		°C	200	200	200	200	200	200				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0328				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.005	0.021	0.031	0.005	0.021	0.031			
		26	Travel		%	10.3%	41.1%	61.7%	10.5%	41.9%	62.9%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		L	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.05		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES			
	34	Body Material	316SS			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard					
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:	FC			79	Leakage Test		YES				
		51	Handwheel Location	N/A			80							
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum			82	Model		708SP050S6# / PTG6ALB4T4R4A7R0G					
54						83	Purchase Order Num.							
55						84	Price	Item Number						
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1 Rev.: 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS		
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GENERAL	1	Tag No.		14-PV-1541										
	2	Service		DU Salt Bypass Pump Tank Argon Outlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-14-P&ID-0001-08.dwg					14-618-1/2"-36M					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	1.80	1.80	1.80				
	21	Inlet Compressibility Factor		-	0.999									
	22	Inlet Viscosity		cP	0.0464									
	23	Inlet Specific Heats Ratio		-	1.6702									
	24	Inlet Vapor Pressure		N/A	N/A									
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.022	0.089	0.134	0.013	0.053	0.080			
		26	Travel		%	11.0%	44.5%	67.0%	6.5%	26.5%	40.0%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		C	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.2		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard					
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:	FO			79	Leakage Test		YES				
		51	Handwheel Location	N/A		PURCHASE	80							
52		Bench Range	3-15 psig		81		Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum		82		Model		8000GSP050HC / PTSH1CS3A3D00ADG0					
54							83	Purchase Order Num.						
55							84	Price	Item Number					
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1551						
	2	Service		DU Salt Bypass Pump Argon Inlet Pressure Control Valve						
	3	P&ID No.	Line #	3270-14-P&ID-0001-09.dwg	14-697-1/2"-36L					
	4	Area Classification		N/A						
	5	Ambient Temperature:	Min.	Max.	25					
	6	Allowable Sound Pressure Level	dBA		N/A					
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV						
	8	Available Air Supply Pressure:	Min.	Max.	90					
	9	Power Failure Position		FC						
	10	Quantity		1						
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					
	12	Pipe Connection		NPT						
	13	Pipe Insulation		Heat Trace and Insulated to 200 C						
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)						
	15	Units		Case 1	Case 2	Case 3				
	16	Flow Rate	SLPM	5	20	30				
	17	Inlet Pressure	kPag	483	483	483				
	18	Outlet Pressure	kPag	34	34	34				
	19	Inlet Temperature	°C	200	200	200				
	20	Inlet Density / Specific Gravity / Molecular Mass	kg/m3	5.92	5.92	5.92				
	21	Inlet Compressibility Factor	-	0.999						
	22	Inlet Viscosity	cP	0.0328						
	23	Inlet Specific Heats Ratio	-	1.6702						
	24	Inlet Vapor Pressure	N/A	N/A						
	CALCULATED RESULTS	25	Flow Coefficient Cv	N/A	0.005	0.021	0.031			
		26	Travel	%	10.3%	41.1%	61.7%			
		27	Sound Pressure Level @ Maximum Flow:	dBA						
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		57	MFR	Model	LowFlow	Mark 16IQ-S or Equal	
	29	Model	708SP or Equal		58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart	
	30	Body Type	Globe Valve		59	Increase Signal Valve:		Open		
	31	Body Size	Trim Size/Code	1/2"	L	60	Enclosure		NEMA 4X	
	32	Rated Cv	Characteris.	0.05	Linear	61	Cam Characteristic			
	33	End Connec.	End Rating	NPT	150	62	Bypass	Gauges	NO	
	34	Body Material	316SS		63	Air Supply Pressure		45 psig		
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT	
	36	Flow Direction			65	MFR	Model	N/A	N/A	
	37	Flow Action To			66	Type		N/A		
	38	Lubricator	Isolat. Valve	N/A	Yes	67	When De-Enegr.Valve:		N/A	
	39	Guiding	No. of Ports			68				
	40	Trim Type	Standard, Linear, Hard Seat		69	MFR	Model	TBD	TBD	
	41	Rated Travel	100%		70	Type	Quantity	TBD	2	
	42	Plug/ Ball/ Disk Material	17-4		71	Contacts / Rating		Standard		
	43	Seat Material	316SS		72	Switching Position		OPEN / CLOSED		
	44	Packing	Graphite/Grafoil		73					
	45	Gasket Material	Grafoil		74	MFR	Model	TBD	TBD	
	46				75	Set Pressure		45 psig		
	ACTUATOR	47	MFR	Model	LowFlow Valve	14M	76	Filter	Gauge	YES
		48	Type	Diaphragm		77				
		49	Size	Area	14M	TBD	78	Proof Pressure Test		YES
		50	Air Failure Valve:	FC		79	Leakage Test		YES	
		51	Handwheel Location	N/A		80				
52		Bench Range	3-15 psig		81	Manufacturer		LowFlow Valve or Equal		
53		Material	Aluminum		82	Model		708SP050S6# / PTG6ALB4T4R4A7R0G		
54					83	Purchase Order Num.				
55					84	Price	Item Number			
56					85	Serial Number				

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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GENERAL	1	Tag No.		14-PV-1561										
	2	Service		DU Salt Bypass Pump Argon Outlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-14-P&ID-0001-09.dwg					14-699-1/2"-36M					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level dBA		N/A										
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	1.80	1.80	1.80				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0464				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.022	0.089	0.134	0.013	0.053	0.080			
		26	Travel		%	10.8%	44.5%	67.0%	6.5%	26.5%	40.0%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		C	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.2		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard					
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:	FO			79	Leakage Test		YES				
		51	Handwheel Location	N/A			80							
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum			82	Model		8000GSP050HC / PTSH1CS3A3D00ADG0					
54						83	Purchase Order Num.							
55						84	Price	Item Number						
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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Notes: Manufacturer shall include instrument specific detail as appropriate and confirm full model number. Flow rates to be confirmed by pump vendor.

INSTRUMENT SPECIFICATION

Control Valve



Sheet 1 of 1

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GENERAL	1	Tag No.		14-PV-1621										
	2	Service		Core Withdrawal Buffer Tank Argon Inlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-14-P&ID-0001-07.dwg					14-620-1/2"-36L					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FC										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					150				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 200 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Clean)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	483	483	483	483	483	483				
	18	Outlet Pressure		kPag	34	34	34	207	207	207				
	19	Inlet Temperature		°C	200	200	200	200	200	200				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	5.92	5.92	5.92	5.92	5.92	5.92				
	21	Inlet Compressibility Factor		-						0.999				
	22	Inlet Viscosity		cP						0.0328				
	23	Inlet Specific Heats Ratio		-						1.6702				
	24	Inlet Vapor Pressure		N/A						N/A				
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.005	0.021	0.031	0.005	0.021	0.031			
		26	Travel		%	10.3%	41.1%	61.7%	10.5%	41.9%	62.9%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	708SP or Equal			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		L	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.05		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		150	62	Bypass	Gauges	NO	YES			
	34	Body Material	316SS			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	316SS		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr. Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	17-4			71	Contacts / Rating		Standard					
	43	Seat Material	316SS			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	47	MFR	Model	LowFlow Valve		14M	76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	14M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:	FC			79	Leakage Test		YES				
		51	Handwheel Location	N/A			80							
52		Bench Range	3-15 psig		PURCHASE	81	Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum			82	Model		708SP050S6# / PTG6ALB4T4R4A7R0G					
54						83	Purchase Order Num.							
55						84	Price	Item Number						
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1 Rev.: 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS		
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GENERAL	1	Tag No.		14-PV-1641										
	2	Service		Core Withdrawal Buffer Tank Argon Outlet Pressure Control Valve										
	3	P&ID No.	Line #	3270-14-P&ID-0001-07.dwg					14-619-1/2"-36M					
	4	Area Classification		N/A										
	5	Ambient Temperature:	Min.	Max.	25					40				
	6	Allowable Sound Pressure Level	dBA		N/A									
	7	Tightness Requirements		Leak Tight Shut Off - ANSI Class IV										
	8	Available Air Supply Pressure:	Min.	Max.	90					125				
	9	Power Failure Position		FO										
	10	Quantity		1										
PIPE LINE	11	Line Size and Rating	Inlet	Outlet	1/2"					300				
	12	Pipe Connection		NPT										
	13	Pipe Insulation		Heat Trace and Insulated to 500 C										
PROCESS CONDITIONS	14	Process Fluid		Gas - Argon (Dirty)										
	15			Units	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6				
	16	Flow Rate		SLPM	5	20	30	5	20	30				
	17	Inlet Pressure		kPag	103.4	103.4	103.4	206.8	206.8	206.8				
	18	Outlet Pressure		kPag	34.5	34.5	34.5	68.9	68.9	68.9				
	19	Inlet Temperature		°C	550	550	550	550	550	550				
	20	Inlet Density / Specific Gravity / Molecular Mass		kg/m3	1.19	1.19	1.19	1.80	1.80	1.80				
	21	Inlet Compressibility Factor		-	0.999									
	22	Inlet Viscosity		cP	0.0464									
	23	Inlet Specific Heats Ratio		-	1.6702									
	24	Inlet Vapor Pressure		N/A	N/A									
	CALCULATED RESULTS	25	Flow Coefficient Cv		N/A	0.022	0.089	0.134	0.013	0.053	0.080			
		26	Travel		%	11.0%	44.5%	67.0%	6.5%	26.5%	40.0%			
		27	Sound Pressure Level @ Maximum Flow:		dBA									
BODY AND TRIM	28	MFR	LowFlow Valve or Equal		POSITIONER	57	MFR	Model	LowFlow	Mark 16IQ-S or Equal				
	29	Model	MARK 8000 Series			58	Signal: Inlet	Outlet	4-20 mA	4-20 mA with Hart				
	30	Body Type	Globe Valve			59	Increase Signal Valve:		Open					
	31	Body Size	Trim Size/Code	1/2"		C	60	Enclosure		NEMA 4X				
	32	Rated Cv	Characteris.	0.2		Linear	61	Cam Characteristic						
	33	End Connec.	End Rating	NPT		300	62	Bypass	Gauges	NO	YES			
	34	Body Material	Hastelloy C			63	Air Supply Pressure		45 psig					
	35	Bonnet Type	Material	Hastelloy C		64	Air Connection		1/4" NPT					
	36	Flow Direction				SOLENOID VALVE	65	MFR	Model	N/A	N/A			
	37	Flow Action To					66	Type		N/A				
	38	Lubricator	Isolat. Valve	N/A	Yes		67	When De-Enegr.Valve:		N/A				
	39	Guiding	No. of Ports				68							
	40	Trim Type	Standard, Linear, Hard Seat		LIMIT SWITCHES	69	MFR	Model	TBD	TBD				
	41	Rated Travel	100%			70	Type	Quantity	TBD	2				
	42	Plug/ Ball/ Disk Material	Hastelloy C			71	Contacts / Rating		Standard					
	43	Seat Material	Hastelloy C			72	Switching Position		OPEN / CLOSED					
	44	Packing	Graphite/Grafoil			73								
	45	Gasket Material	Grafoil		AIR SET	74	MFR	Model	TBD	TBD				
	46					75	Set Pressure		45 psig					
	47	MFR	Model	LowFlow Valve		35M	76	Filter	Gauge	YES	YES			
	ACTUATOR	48	Type	Diaphragm		TESTS	77							
		49	Size	Area	35M		TBD	78	Proof Pressure Test		YES			
		50	Air Failure Valve:	FO			79	Leakage Test		YES				
		51	Handwheel Location	N/A		PURCHASE	80							
52		Bench Range	3-15 psig		81		Manufacturer		LowFlow Valve or Equal					
53		Material	Aluminum		82		Model		8000GSP050HC / PTSH1CS3A3D00ADG0					
54							83	Purchase Order Num.						
55							84	Price	Item Number					
56						85	Serial Number							

Notes: Manufacturer shall include instrument specific detail as appropriate, add TBD valves and confirm full model number

				INSTRUMENT SPECIFICATION Control Valve		Sheet 1 of 1	
1	MAV	4/28/2020	Update CV Size				
0	Atkins		100% Design				
No.	By	Date	Revision	Code: 1	Doc. No.: DS	Rev.: 1	
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END OF DOCUMENT



TerraPower, LLC Purchase Order Commercial Items Terms and Conditions (Short Form) - USG

These Purchase Order Terms and Conditions ("**Terms and Conditions**") shall apply to and be deemed a part of this Purchase Order.

1) COMPLETE AGREEMENT. This Purchase Order, including these Terms and Conditions, Exhibits to these Terms and Conditions, the SOW, all supplemental or other incorporated terms and conditions and all other documents incorporated by reference into this Purchase Order, constitutes the entire agreement between the parties and supersedes any previous communication, representations, whether oral or written, with respect to the subject matter of this Purchase Order. No revision, amendment or modification of any provision of this Purchase Order (other than any change or termination by Company expressly permitted herein) shall be valid, unless set forth in a written instrument signed by both parties.

2) ORDER OF PRECEDENCE. If any term of this Purchase Order conflicts with any other of its terms, the parties shall apply the following order of precedence: (a) the exceptions and supplemental terms (if any) set forth in Exhibit A; (b) these Terms and Conditions; (c) the applicable SOW; and (d) documents referenced in the applicable SOW, in each case, with amendments thereto ranking in precedent in reverse chronological order. Company shall not be bound by, and specifically objects to, any term, condition or other provision contained in or presented on any quotation, invoice, shipping document, acceptance, confirmation, correspondence or other documents from Supplier that purports to amend, modify or supplement this Purchase Order.

3) INTERPRETATION. In these Terms and Conditions, the singular includes the plural and the plural the singular; the terms "including" and "include" will mean "including but not limited to"; and references to a "Section" will mean a section of these Terms and Conditions, unless otherwise expressly stated. All section titles in these Terms and Conditions are for convenience or reference purposes only and shall not control or alter the meaning of these Terms and Conditions as set forth in the text.

4) DEFINITIONS. The following terms shall have the meanings assigned to them below when used in this Purchase Order:

- (a) "**Applicable Laws**" means all laws, ordinances, rules, regulations, orders, licenses, permits and other requirements, now or hereafter in effect, of any governmental or regulatory authority applicable to a party;
- (b) "**Claims**" means any demand, assertion, legal proceeding or governmental investigation brought by any third party and all resulting judgments, settlements, fines, penalties, losses, liabilities, damages and expenses (including reasonable attorneys' fees and costs);
- (c) "**Company**" means TerraPower, LLC;
- (d) "**Confidential Information**" means all non-public information and materials, including all designs, drawings, diagrams, plans, reports, equipment, specifications, Products, Services, prices, pricing policies, processes and inventions, samples, prototypes, software, source code, object code, passwords, customer lists, customer documents and requirements, financial information, employee lists and information and marketing and advertising information, that are made known to, developed by or otherwise acquired by Supplier in the course of or as a result of the performance of Supplier's obligations under this Purchase Order;
- (e) "**Contract Administrator**" or "**CA**" means the commercial representative of Company who is authorized to administer this Purchase Order as specified in the SOW under this Purchase Order;
- (f) "**days**" means calendar days unless business days are clearly stated;
- (g) "**Final Acceptance**" means when (1) all Products are finally inspected

and accepted by Company's representative at the final destination, and/or (2) the CA on behalf of the Company clearly and unequivocally approves specific Services rendered, in each case as complete performance of this Purchase Order; (h) "**Indemnitee**" means Company, its successors and assigns, and the respective directors, officers, employees, consultants, agents, representatives and (if applicable) customers of Company and their successors and assigns; (i) "**Products**" means any and all products, goods, studies, reports, documents, data, information, notes, designs, specifications, plans, drawings, patterns, samples, computer programs, software, results and other materials and items developed for or provided by Supplier to Company as part of the Work under this Purchase Order; (j) "**Purchase Order**" means this purchase order, including the signature page, all parts referenced on the signature page and all attachments thereto, each of which is hereby incorporated herein, as may be amended from time to time; (k) "**Services**" means the services provided or to be provided by Supplier to Company under this Purchase Order, as may be further described in the Statement of Work; (l) "**Supplier**" means the person, partnership, corporation or other entity specified in this Purchase Order as the seller or provider of Products and/or Services under this Purchase Order; (m) "**Supplier Coordination Request**" or "**SCR**" means a request submitted by Supplier to Company for disposition and response; (n) "**Statement of Work**" or "**SOW**" means the written statement of work that describes the Work to be performed by Supplier under this Purchase Order and which is incorporated into and forms an integral part of this Purchase Order; and (o) "**Work**" means all of the obligations to be performed by Supplier pursuant to this Purchase Order, including, as applicable, the supply and delivery of the Products and the performance of Services.

5) SUPPLIER ASSENT. Performance of any of the following acts by Supplier shall constitute Supplier's acceptance of these Terms and Conditions: (a) signing and returning a copy of this Purchase Order to Company; (b) shipment or delivery of any Products or performance of any Services, as applicable; and/or (c) informing Company in any manner of commencement of performance of any Work. Upon Supplier's performance of any of the foregoing acts, this Purchase Order shall be binding on Supplier, and no alteration, change, modification or revision of any part of this Purchase Order by Supplier shall be binding upon Company unless made in a writing referencing this Purchase Order and provided by the CA as signed by the Company's authorized representative.

6) WORK PERFORMANCE. The Work to be provided by Supplier under this Purchase Order will be described in the Statement of Work. Supplier shall perform all Work: (a) in a professional and workmanlike manner in accordance with this Purchase Order, utilizing the highest standards of care, skill and diligence observed in Supplier's industry for the performance of the Work and (b) in conformance to and in compliance with this Purchase Order. Supplier may not substitute any other materials or accessories for those specified in this Purchase Order without the express prior written authorization of Company. Supplier shall not subcontract any portion of the Work encompassed by this Purchase Order without Company's prior written approval. Time is of the essence in Supplier's performance under this Purchase Order.

7) IDENTIFICATION, PACKING AND DELIVERY.

- (a) Supplier shall:



TerraPower, LLC Purchase Order Commercial Items Terms and Conditions (Short Form) - USG

(i) include the number of this Purchase Order on all invoices, packing lists, packages, shipping notices, instruction manuals, and other written documents provided by Supplier under this Purchase Order, include a packing list that details the contents of each container, box or package shipped pursuant to this Purchase Order and mark the number of this Purchase Order on each such container, box or package; and

(ii) properly package all Products provided to Company in accordance with any requirements expressly stated in the SOW and in a manner to protect against any damage to or deterioration of such Products from shipment, handling, storage or other any other cause, ship all Products from the point of shipment specified in the SOW, email copies of the applicable shipping documents and packing slips to the CA on the day a shipment is made and deliver such Products to the delivery destination no later than the applicable delivery date, in each case as specified in the SOW.

(b) Company shall not be responsible or liable for any charges, fees or other amounts related to shipment of the Products in a manner different than that expressly authorized by this Purchase Order or required under the SOW.

(c) Unless otherwise expressly agreed by Company in writing, Company shall not process any invoice for payment until all Work covered by such invoice has been provided by Supplier and accepted by Company under this Purchase Order.

8) EXPEDITING; INSPECTIONS AND REJECTION.

(a) Company may elect to inspect or expedite any Work supplied under this Purchase Order, including any materials or components thereof, in its sole discretion, during and after manufacture, upon written notice to Supplier.

(b) All Work received from or performed by Supplier shall be subject to, as applicable, initial inspection by Company at the delivery destination specified in the SOW and further testing and review as part of Final Acceptance procedures detailed in the SOW ("**Acceptance Procedures**"), unless otherwise specified in this Purchase Order. Neither Company's initial inspection nor failure to inspect shall relieve Supplier of any responsibility with respect to such Work or imply any Final Acceptance thereof. During the Acceptance Procedures: (i) Company will review the Work furnished to Company to confirm there are no defects, deficiencies, errors or nonconformities in the Work and that all of the Work complies with the requirements of this Purchase Order and (ii) Supplier shall provide Company with such additional support as Company may request.

(c) Company will notify Supplier of its Final Acceptance or rejection of the Work upon completion of the Acceptance Procedures. In the event of rejection, Company shall notify Supplier of such rejection, identifying the reason(s) therefor, and Supplier will furnish conforming Work within twenty (20) days after its receipt of such notice. If Supplier fails to furnish conforming Work within such period of time, Company may elect to either (i) provide Supplier with a further opportunity to provide conforming Work; or (ii) receive a refund of all amounts paid under this Purchase Order for such Work, which refund Supplier shall pay to Company within thirty (30) days of Company's request for such refund. Any Final Acceptance by Company shall not be conclusive of the absence of latent defects.

9) TITLE AND RISK OF LOSS. Except as otherwise provided in this Purchase Order, title to all Products furnished by Supplier shall become the property of Company upon payment therefor or upon delivery, whichever occurs earlier. Notwithstanding the foregoing, Supplier shall be responsible for and shall bear any and all risk of loss for Products until Final Acceptance of the same. Supplier warrants that (a) all Products delivered or to be delivered under this Purchase Order shall be (i) free from all defects in title, (ii) merchantable, and (iii) free and clear of all liens, security interests, encumbrances and claims of laborers or material and (b) following Final Acceptance, Company shall have full and unencumbered ownership in and title to the Products. Company may withhold payment if it reasonably suspects that any Products do not comply with this Section 9 until it receives evidence in a form and substance satisfactory to it that Supplier and the Products are in compliance with this Section 9.

10) SUPPLIER COORDINATION REQUEST. A Supplier Coordination Request may be used by Supplier to request information, clarification or direction from Company regarding this Purchase Order, to request deviation from certain requirements set forth in this Purchase Order, to initiate a change request or to resolve a Supplier non-conformance to technical requirements. If Supplier wishes to submit a SCR to Company, it must complete and submit a Supplier Coordination Request form to Company detailing its request. The CA will provide the Supplier Coordination Request form, with instructions, to Supplier upon request. A Supplier Coordination Request form will formally document Supplier's SCR and Company's response. If the resolution of a SCR requires a change to this Purchase Order, then the CA will initiate a change in accordance with Section 11 (*Changes*) or an amendment to this Purchase Order in accordance with Section 1 (*Complete Agreement*).

11) CHANGES.

(a) Company shall have the right from time to time, upon written notice to Supplier, to make changes to the scope or contents of this Purchase Order, including changes to: (i) the drawings, designs, specifications, and/or technical attachments; (ii) schedule; (iii) additions to or deletions from quantities ordered; (iv) the method of delivery, shipment or packing of Products; or (v) the date or delivery destination specified in the SOW.

(b) Supplier may make, via SCR, a change request or non-conformance request to Company relating to the scope of the Work.

(c) If any requested or proposed change under paragraphs (a) or (b) above causes an increase or decrease in the cost or timing required to perform the Work, as Supplier's sole remedy an adjustment may be requested in the Price or the schedule, or both, and the Purchase Order shall be modified by a written Purchase Order revision executed by an authorized representative of each party. Any request by Supplier for adjustment must be asserted within thirty (30) days from the date of receipt by the Supplier of the notification of change from Company or discovery of circumstances prompting a Supplier-requested change via SCR.

(d) In the event that Supplier and Company disagree on any equitable adjustment in connection with this Section 11, such disagreement shall not excuse Supplier from performing its obligations with respect to any authorized Work and the Work as changed under this Purchase Order.

12) PRICE/TAXES. The purchase price (the "**Price**") is set forth on the cover page of this Purchase Order in United States dollars and, subject to



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Section 11 (*Changes*), shall apply during the term of this Purchase Order. Payment of the Price shall constitute full compensation for the Work and satisfactory performance of all of Supplier's obligations under this Purchase Order. The Price is deemed to include all Federal, state and local taxes (including fees and charges) levied with respect to the Work performed hereunder. If sales tax is included in the Price, it must be listed as a separate line item in the invoice provided by Supplier. If applicable, Company is responsible for Washington State use tax.

13) PAYMENT. Unless otherwise expressly agreed by Company in writing, Supplier shall invoice Company for any amounts payable by Company within twenty (20) days of completing the Work. Supplier shall submit all invoices to Invoices@terrapower.com. All payments shall be made in United States dollars. The payment date shall be calculated from the date of receipt by Company of an acceptable invoice. Payment terms are net 30 days.

14) INDEPENDENT CONTRACTOR. Supplier is an independent contractor of Company, and nothing herein shall be interpreted or construed as (a) creating or evidencing any association, joint venture, partnership or franchise between the parties; or (b) imposing any partnership or franchisor obligation or liability on either party.

15) CONFIDENTIAL INFORMATION. Supplier shall keep confidential and otherwise protect from disclosure all Confidential Information obtained by Supplier in connection with this Purchase Order. Supplier shall not use Company's name or opinions of Company's employees for advertisement purposes without the prior written consent of Company. Unless otherwise expressly authorized by Company, Supplier shall use such Confidential Information only in the performance and for the purposes of this Purchase Order. Upon Company's request or upon the completion, termination or cancellation of this Purchase Order, Supplier shall, within ten (10) days, either return all Confidential Information to Company or destroy all Confidential Information according to Company's direction. Supplier will certify in writing that it has fully complied with its obligations in the preceding sentence.

Supplier shall ensure that all subcontracts, purchase orders and other agreements entered into by Supplier or any of its subcontractors or suppliers of any tier related to the Work shall provide to Company the same rights and protection with regard to such subcontractors and suppliers as are contained in this Section with regard to Supplier.

16) PROPRIETARY RIGHTS. If the Goods to be supplied under this Purchase Order have been designed in accordance with specifications or data furnished or originated by Company, such documents shall not be reproduced except with the prior written approval of Company. All drawings, photographs, data, and other written material or information supplied in connection with this Purchase Order shall at all times remain the property of Company (or its designee) and be returned to Company promptly upon written request.

17) ASSIGNMENT. Supplier shall not assign this Purchase Order or any rights, obligations, or monies due under this Purchase Order, directly, by operation of law or otherwise, without Company's prior written consent. Any attempted assignment without such consent shall be void and have no effect.

18) INDEMNITY. Supplier shall indemnify, hold harmless and, at Company's option, defend each Indemnitee from and against all Claims arising out of or relating to: (a) any breach of any obligation or warranty under this Purchase Order, whether arising before or after completion of the Work; (b) any bodily injury (including death) or property damage attributable to the fault, negligence or strict liability of Supplier, or any of Supplier's employees or contractors or anyone else under Supplier's direction, supervision or control; or (c) any claim of infringement, misappropriation or violation of any patent, copyright, trade name, trademark, trade secret or other proprietary right of a third party. If use of any Work provided under this Purchase Order is enjoined or threatened to be enjoined or is determined to be infringing of any rights, Supplier shall notify Company in writing and immediately, at Supplier's expense, (i) procure for Company the right to continue the use of such Work as contemplated under this Purchase Order, or (ii) replace or modify such Work so that such Work becomes non-infringing, provided that any replacement or modification is equivalent in function and meets the requirements and specifications of this Purchase Order to Company's satisfaction. If options (i) or (ii) are not available to Supplier, Company shall have the right to terminate this Purchase Order and Supplier shall refund all amounts paid by Company with respect to the infringing Work and shall reimburse Company all costs of the Company associated with transitioning the Work to a replacement supplier.

19) SUSPENSION; EXTENSION OF TIME. Notwithstanding any other provisions of this Purchase Order, Company may at any time suspend or extend the time for Supplier's performance of the Work in accordance with Company's instructions and, in the case of suspension, resume performance as subsequently directed by Company. Provided that the suspension or extension does not result from any acts, omissions or delays of Supplier and provided further that Supplier timely complies with the requirements set forth below, Supplier shall be entitled to reimbursement for additional costs reasonably and necessarily incurred by Supplier, excluding profit, in implementing such suspension or extension. In the case of extension, Supplier must provide Company its written claim for the additional costs with supporting documentation within ten (10) days after receipt of the notice of extension. In the case of a suspension, Supplier must: (i) provide Company with written notice of its intent to claim additional costs together with an estimate of the elements and amounts of any cost within ten (10) days after receipt of the notice of suspension; (ii) provide Company written updates on the additional costs estimates on a bi-weekly basis during the period of suspension or as Company may otherwise reasonably request; and (iii) provide Company its written claim for additional costs with supporting documentation no later than thirty (30) days after receipt of Company's notice to resume the Work.

20) TERMINATION.

(a) *Breach; Default.* Company may terminate this Purchase Order, or any part thereof, by written notice: (i) in the event of any breach or default by Supplier of any of its obligations under this Purchase Order, (ii) if, following request by Company, Supplier fails to provide timely and acceptable assurance of Supplier's ability to meet the delivery date(s) of this Purchase Order, (iii) if Supplier fails to comply with Applicable Laws, pursuant to Section 24 (*Compliance with Laws*) or (iv) if Supplier becomes insolvent, does not pay its debts as due, or makes a general



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assignment for the benefit of creditors or reasonable grounds for insecurity arise with respect to Supplier's ability to perform.

In the event of any occurrence of item (i), Company will provide Supplier with written notice of the nature of the default and Company's intention to terminate for default. Company may by written notice terminate this Purchase Order in the event Supplier does not correct the default within ten (10) days of such notice or such longer period of time as appropriate considering the circumstances and as specified in such notice of default to Supplier.

Upon the occurrence of any of items (ii), (iii) or (iv), Company may terminate this Purchase Order immediately upon written notice without any cure period.

(b) Company's Convenience. Company may terminate this Purchase Order, in whole or in part, at any time for its convenience by giving written notice to Supplier. Upon termination pursuant to this Section 20(b), Supplier may claim reasonable costs incurred for the Work completed prior to the effective date of such termination based on the percentage of Work complete, but not previously paid and a reasonable amount for any Products then in production (other than for Products which are Supplier's standard stock); provided, however, that the total sum payable to Supplier upon termination shall not exceed the Price had all Work been completed under this Purchase Order. The amounts to be paid to Supplier shall be set out in a written Purchase Order revision signed by Company's authorized representative. The payment will not include any consideration for loss of anticipated profits on the terminated Work, all claims for which Supplier agrees to waive. Furthermore, the total sum to be paid to Supplier for termination shall be subject to adjustment to the extent any Work contains defects as of the termination date. Supplier shall hold all partially completed Work or raw material in trust for Company to be disposed of or transferred in accordance with Company's instructions.

(c) Effect of Termination. Upon the completion, termination or cancellation of this Purchase Order pursuant to paragraph (a) or (b) above, (i) Supplier and Company shall cooperate to affect an orderly, efficient, effective and expeditious termination of the parties' respective activities under this Purchase Order; and (ii) Supplier shall, within ten (10) days of the effective termination date, return to Company or destroy all Confidential Information pursuant to Section 15 (*Confidential Information*).

Upon receipt of any notice of termination pursuant to paragraph (a), Supplier shall in addition, unless the notice requires otherwise: (1) immediately discontinue the Work on the date and to the extent specified in the notice, (2) place no further orders for materials or services other than as may be necessarily required for completion of any portion of the Work that is not terminated; (3) obtain cancellation on terms satisfactory to Company of all contracts with sub-suppliers unless Supplier is directed by Company to take other actions with respect to the same, which may include assignment of all or some of those contracts to Company or Company's designee on terms satisfactory to such assignee; and (4) assist Company upon request in the maintenance, protection, and disposition of property acquired by Supplier under this Purchase Order. In addition, Company may procure, under such terms and in such manner as Company may deem appropriate, items of the Work which are similar to the items so terminated and Supplier shall be liable to Company for: (A)

any additional costs for such similar items of Work that exceed the amounts that Company would have paid Supplier for the terminated items of Work pursuant to this Purchase Order, including recovery of price paid for undelivered goods, (B) backcharges covering the costs of Company to complete the Work with respect to the terminated items of Work; and (C) any other costs incurred by Company for Supplier's non-delivery, repudiation and breach of this Purchase Order, including all fees and costs in exercising any remedy. Company may exercise any other rights or remedies available to Company at law or in equity. Supplier shall also be liable to Company for the cost of rework, repurchase and Company's backcharges related thereto in the event that any Work contains defects as of such termination date. If this Purchase Order is not terminated in its entirety, Supplier shall continue the performance of this Purchase Order to the extent not terminated by Company.

21) REPRESENTATIONS, CERTIFICATIONS.

Each party represents and warrants to the other that it has the full right and authority to enter into and to perform its obligations under this Purchase Order and that its performance of its obligations under this Purchase Order will not conflict with any other obligation it may have to any third party.

22) WARRANTY OF WORK.

(a) Supplier represents and warrants to Company that all Work furnished under this Purchase Order will be free from defects in design, material and workmanship, will conform to all requirements set forth in this Purchase Order, and will be fit for its intended purpose.

(b) Upon Company's discovery that any Work does not conform with the warranties set forth in Section 22(a), Company may elect, in its sole discretion, to: (i) have Supplier correct or repair the non-conforming Products, or to re-perform the defective or nonconforming Service, or (ii) receive a full refund from Supplier for all amounts paid by Company for the non-conforming Work. Any repairs, corrections, or re-performance by Supplier shall be at no cost to Company and shall be performed by Supplier within a reasonable time following Supplier's receipt of notice from Company regarding the applicable non-conformance. The warranties set forth in Section 22(a) shall apply to any work performed by Supplier to address a non-conformance in any Work under this Section 22(b), with the warranty period beginning upon the date of delivery of the corrected or re-performed Work. If Supplier fails or refuses to correct or re-perform any Work, Company may, by contract or otherwise, correct or replace such Work with similar goods or services and charge to Supplier the cost occasioned to Company thereby, or make an equitable adjustment in the Price, at the election of Company in its sole discretion.

(c) Notwithstanding anything to the contrary herein, when Products are returned to Supplier, Supplier shall bear the transportation costs from the delivery destination specified in the SOW to Supplier's facility and return to Company.

(d) Notwithstanding the provisions of this Section 22, Company retains its rights under existing common and statutory law for any defective or non-conforming Products delivered or Services performed under this Purchase Order.

23) NON-WAIVER. The failure of Company to insist upon or enforce strict performance of any provisions of this Purchase Order, or to exercise any right or remedy granted to Company under this Purchase Order, shall not be



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construed as a waiver or relinquishment to any extent of Company's right to assert or rely upon any such provision, right or remedy in that or any other instance; rather, the same shall be and continue in full force and effect.

24) COMPLIANCE WITH LAWS. Supplier represents and warrants that (a) it shall comply with all Applicable Laws in connection with the Work and the performance of Supplier's obligations under this Purchase Order, and that it shall ensure that the Work and its sub-tier suppliers and subcontractors (if any) comply with all Applicable Laws; and (b) it is aware of, understands and shall comply with, and will ensure that any sub-tier suppliers and subcontractors are aware of, understand and shall comply with, all applicable U.S. and foreign anti-corruption laws, including the U.S. Foreign Corrupt Practices Act, as such laws may be amended from time to time.

25) RECORDS AND AUDIT. Supplier shall maintain records and accounts in connection with the performance of this Purchase Order which will accurately document incurred costs, both direct and indirect, of whatever nature for a period of three (3) years from final payment unless a longer period is otherwise specified by Applicable Law. Company or its representatives shall have the right to examine and copy, at all reasonable times and with advance notification, such records and accounts for the purposes of confirming compliance with Purchase Order provisions, verifying payments or requests for payment when costs are the basis of such payment or evaluating the reasonableness of proposed Price adjustments and claims. If Company establishes uniform codes of accounts for the project the subject of this Purchase Order, Supplier shall use such codes in identifying its records and accounts.

26) REMEDIES. All of the remedies specified in this Purchase Order shall be cumulative and in addition to any other remedies provided in law or equity.

27) GOVERNING LAW AND COURTS. This Purchase Order shall be interpreted and construed in accordance with the laws of the State of Washington, without regard to choice of law principles to the contrary. Supplier irrevocably consents to the exclusive jurisdiction of the state and federal courts located in King County, Washington.

28) ALTERNATIVE DISPUTE RESOLUTION. Each of Supplier and Company shall make good-faith efforts to initially resolve any dispute or claim that arises in connection with this Purchase Order through discussions and negotiations between the parties within thirty (30) days. If such efforts fail to result in a mutually agreeable resolution, the parties shall consider the use of alternative dispute resolution ("**ADR**"). In the event non-binding mediation or arbitration is agreed upon, the site of the proceedings shall be King County, Washington. The mediator or arbitrator shall allocate costs as part of the final resolution or award, and each party shall bear its discretionary costs. In the event that ADR fails or is not pursued, either party may bring a claim in the courts specified in Section 27 (*Governing Law and Courts*).

29) SEVERABILITY. If any provision of this Purchase Order is deemed invalid or unenforceable by a court of competent jurisdiction, such provision: (a) will be severable from the remaining provisions of this Purchase Order and (b) shall not affect any other term or provision of this Purchase Order, which will otherwise continue in full force and effect.

30) SURVIVAL. Obligations under this Purchase Order of a continuing nature shall survive the completion, termination or cancellation of this Purchase Order.

31) GOVERNMENT CONTRACTS. As this Purchase Order is issued in connection with Work to be performed pursuant to a U.S. Government contract or grant award, Supplier acknowledges and agrees that the required contractual flowdown provisions set forth in Exhibit A (*Required Flowdowns*) to this Purchase Order are incorporated into and form an integral part of this Purchase Order and Supplier shall be bound by the same to the extent applicable.

EXHIBIT A

REQUIRED FLOWDOWNS

EXHIBIT A
ARC FLOWDOWN REQUIREMENTS

FLOWDOWN CONTRACT TERMS FOR TERRAPOWER SUBCONTRACTORS

**(TERRAPOWER AS “SUBRECIPIENT” UNDER DEPT. OF ENERGY GRANT;
SUBCONTRACTOR AS SUPPLIER OF GOODS OR NON-RESEARCH SERVICES)**

ARC FLOWDOWN REQUIREMENTS. As a Supplier to Company in connection with Department of Energy (“DOE”), DE-NE0008473, Cooperative Agreement, the required flowdowns (“**Required Flowdowns**”) set out in this Exhibit B (*ARC Flowdown Requirements*), to the extent reasonably applicable to Supplier’s scope of work, are incorporated into and made a material part of the Purchase Order/Agreement. In the event of a conflict between any Required Flowdowns and any Purchase Order Terms and Conditions, the relevant Required Flowdowns will take precedence.

1 Federal Acquisition Regulations

Subcontractor shall comply with the following select Federal Acquisition Regulations (“FARs”):

- a) FAR 52.203-13, Contractor Code of Business Ethics and Conduct (Oct 2015) (41 U.S.C. 3509), if Subcontract exceeds \$5.5 million and has a performance period of more than 120 days;
- b) FAR 52.203-15, Whistleblower Protections Under the American Recovery and Reinvestment Act of 2009 (Section 1553 of Pub. L. 111-5), if the subcontract is funded under the Recovery Act;
- c) FAR 52.203-19, Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements;
- d) FAR 52.204-21, Basic Safeguarding of Covered Contractor Information Systems (June 2016), other than subcontracts for commercially available off-the-shelf items, if flow down is required in accordance with FAR 52.204-21(c);
- e) FAR 52.219-8, Utilization of Small Business Concerns (15 U.S.C. 637(d)(2) and (3)), if the subcontract offers further subcontracting opportunities. If the subcontract (except subcontracts to small business concerns) exceeds \$700,000 (\$1.5 million for construction of any public facility), the subcontractor must include FAR 52.219-8 in lower tier subcontracts (if permitted) that offer subcontracting opportunities;
- f) FAR 52.222-21, Prohibition of Segregated Facilities;
- g) FAR 52.222-26, Equal Opportunity (Executive Order 11246, Sept 2016);
- h) FAR 52.222-37, Employment Reports on Veterans (Feb 2016) (38 U.S.C. 4212);
- i) FAR 52.222-40, Notification of Employee Rights Under the National Labor Relations Act (Executive Order 13496, Dec 2010), if flow down is required in accordance with FAR 52.222-40(f);
- j) FAR 52.222-50, Combatting Trafficking in Persons (22 U.S.C. 78; Executive Order 13627, March 2015);
- k) FAR 52.222-55, Minimum Wages under Executive Order 13658 (Dec 2015), if flowdown is required in accordance with FAR 52.222-55(k);
- l) FAR 52.222-59, Compliance with Labor Laws (Executive Order 13673, Oct 2016), if the estimated subcontract value exceeds \$500,000 and for product other than commercially available off-the-shelf items;
- m) FAR 52.222-60, Paycheck Transparency (Executive Order 13673, Oct 2016), if the estimated subcontract value exceeds \$500,000, and for product other than commercially available off-the-shelf items;
- n) FAR 52.222-62, Paid Sick Leave (Executive Order 13706, Jan 2017), if flowdown is required in accordance with FAR 52.222-62(m);
- o) FAR 52.224-3, Privacy Training (5 U.S.C. 552a) if flow down is required in accordance with 52.224-3(f) or Alternate I of FAR 52.224-3 if the agency specifies that only its agency-provided training is acceptable;
- p) FAR 52.225-26, Contractors Performing Private Security Functions Outside the United States (Oct 2016) (Section 862, as amended, of the National Defense Authorization Act for Fiscal Year 2008; Note to 10 U.S.C. 2302);
- q) FAR 52.232-40, Providing Accelerated Payments to Small Business Subcontractors (Dec 2013), if flow down is required in accordance with FAR 52.232-40(c); and
- r) FAR 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (Feb 2006) (46 U.S.C. App. 1241; 10 U.S.C. 2631), if flow down is required in accordance with FAR 52.247-64(d).

2 Equal Employment Opportunity

All contracts must contain a provision requiring compliance with Executive Order 11246, as amended by Executive Order 11375, and as supplemented by regulations at 41 CFR chapter 60 “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor”.

3 Lobbying Restrictions

By accepting funds under this Agreement, Subcontractor agrees that none of the funds made available under this Agreement shall be expended, directly or indirectly, to influence or attempt to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in

EXHIBIT A
ARC FLOWDOWN REQUIREMENTS

FLOWDOWN CONTRACT TERMS FOR TERRAPOWER SUBCONTRACTORS

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connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352, other than to communicate to Members of Congress as described in 18 U.S.C. 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

4 Prohibition on Personally Identifiable Information

Subcontractor must not provide personally identifiable information ("PII"), either printed or electronic, to the U.S. Department of Energy within any deliverable, report or submittal under this Agreement. PII includes any information maintained by TerraPower or Subcontractor about an individual, including but not limited to, education, financial transactions, medical history and criminal or employment history, and information that can be used to distinguish or trace an individual's identity, such as his/her name, social security number, date and place of birth, mother's maiden name, biometric data, etc., and including any other personal information that is linked or linkable to a specific individual.

5 Access to Books and Records (2 C.F.R. § 200.336)

Subcontractor shall provide authorized representatives of DOE, Inspectors General, the Comptroller General of the United States with right of access to any documents, papers, or other records of the Subcontractor which are pertinent to the Cooperative Agreement, in order to make audits, examinations, excerpts, and transcripts, and with timely and reasonable access to personnel for the purpose of interview and discussion related to such documents. The rights of access in this Section 5 are not limited to the required retention period of three (3) years but last as long as the records are retained.

6 Compliance with DOE Procurement Standards and Federal Statutes

- a) Subcontractor shall comply with the DOE Procurement Standards and the flowdowns applicable to Subcontractor set forth in 2 CFR 200.317-2 and Appendix II to 2 CFR Part 200.
- b) Subcontractor shall comply with the following in its performance of the Work:
 - (i) Subcontractor shall not subcontract any Work under this Agreement;
 - (ii) If the Agreement value exceeds \$150,000, Supplier shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q.) and Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended, and report any violations to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).
 - (iii) Debarment and Suspension (2 CFR 180.220, implementing Executive Orders 12549 and 12689): A contract award must not be made to parties listed on the government-wide exclusions in the System for Award Management (SAM).

7 Compliance with Laws Applicable to Construction-Related Work

- a) Subcontractor shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874; 40 U.S.C. 276c; as supplemented by 29 CFR part 3) if contract is in excess of \$2,000 for construction or repair. A contractor is prohibited from inducing, by any means, any person employed in the construction, completion or repair of public work, to give up any part of the compensation to which he is otherwise entitled, and must report all suspected or reported violations to the responsible DOE contracting officer.
- b) Subcontractor shall comply with Sections 102 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333, as supplemented by 29 CFR part 5), if contract is in excess of \$100,000 for construction and other purposes that involve the employment of mechanics or laborers. Section 102 requires a contractor to compute wages on the basis of a standard 40-hour work week. Hours in excess of the standard work week are permissible so long as worker is compensated at a rate not less than 1-1/2 times the basic rate of pay. Section 107 requires that no laborer or mechanic is required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous.
- c) Subcontractor shall comply with the Davis-Bacon Act (40 U.S.C. 276a), requiring payment of prevailing wages on projects, if the contract (i) is for construction of public works, (ii) requires compliance under a particular program statute or (iii) if title to the construction facility rests with the Government.

8 Enhancement of Contractor Protection from Reprisal for Disclosure of Certain Information

All contracts must include, in full, the provisions set out in Attachment 1 to this Exhibit B.

EXHIBIT A
ARC FLOWDOWN REQUIREMENTS

FLOWDOWN CONTRACT TERMS FOR TERRAPOWER SUBCONTRACTORS

**(TERRAPOWER AS "SUBRECIPIENT" UNDER DEPT. OF ENERGY GRANT;
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9 FAR 52.204-21, Basic Safeguarding of Covered Contractor Information Systems (JUN 2016), other than subcontracts for commercially available off-the-shelf items, if Subcontractor may have Federal contract information residing or transiting through its information systems:

(a) Definitions. As used in this clause -

Covered contractor information system means an information system that is owned or operated by a contractor that processes, stores, or transmits Federal contract information.

Federal contract information means information, not intended for public release, that is provided by or generated for the Government under a contract to develop or deliver a product or service to the Government, but not including information provided by the Government to the public (such as on public Web sites) or simple transactional information, such as necessary to process payments.

Information means any communication or representation of knowledge such as facts, data, or opinions, in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual (Committee on National Security Systems Instruction (CNSSI) 4009).

Information system means a discrete set of information resources organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information (44 U.S.C. 3502).

Safeguarding means measures or controls that are prescribed to protect information systems.

(b) Safeguarding requirements and procedures.

(1) The Contractor shall apply the following basic safeguarding requirements and procedures to protect covered contractor information systems. Requirements and procedures for basic safeguarding of covered contractor information systems shall include, at a minimum, the following security controls:

- (i) Limit information system access to authorized users, processes acting on behalf of authorized users, or devices (including other information systems).
- (ii) Limit information system access to the types of transactions and functions that authorized users are permitted to execute.
- (iii) Verify and control/limit connections to and use of external information systems.
- (iv) Control information posted or processed on publicly accessible information systems.
- (v) Identify information system users, processes acting on behalf of users, or devices.
- (vi) Authenticate (or verify) the identities of those users, processes, or devices, as a prerequisite to allowing access to organizational information systems.
- (vii) Sanitize or destroy information system media containing Federal Contract Information before disposal or release for reuse.
- (viii) Limit physical access to organizational information systems, equipment, and the respective operating environments to authorized individuals.
- (ix) Escort visitors and monitor visitor activity; maintain audit logs of physical access; and control and manage physical access devices.
- (x) Monitor, control, and protect organizational communications (i.e., information transmitted or received by organizational information systems) at the external boundaries and key internal boundaries of the information systems.
- (xi) Implement subnetworks for publicly accessible system components that are physically or logically separated from internal networks.
- (xii) Identify, report, and correct information and information system flaws in a timely manner.
- (xiii) Provide protection from malicious code at appropriate locations within organizational information systems.
- (xiv) Update malicious code protection mechanisms when new releases are available.
- (xv) Perform periodic scans of the information system and real-time scans of files from external sources as files are downloaded, opened, or executed.

(2) Other requirements. This clause does not relieve the Contractor of any other specific safeguarding requirements specified by Federal agencies and departments relating to covered contractor information systems generally or other Federal safeguarding requirements for controlled unclassified information (CUI) as established by Executive Order 13556.

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(c) Subcontracts. The Contractor shall include the substance of this clause, including this paragraph (c), in subcontracts under this contract (including subcontracts for the acquisition of commercial items, other than commercially available off-the-shelf items), in which the subcontractor may have Federal contract information residing in or transiting through its information system.

10 FAR 52.222-35, Equal Opportunity for Veterans (OCT 2015), if Subcontract value exceeds \$150,000:

(a) Definitions. As used in this clause -

"Active duty wartime or campaign badge veteran," "Armed Forces service medal veteran," "disabled veteran," "protected veteran," "qualified disabled veteran," and "recently separated veteran" have the meanings given at FAR 22.1301.

(b) Equal opportunity clause. The Contractor shall abide by the requirements of the equal opportunity clause at 41 CFR 60-300.5(a), as of March 24, 2014. This clause prohibits discrimination against qualified protected veterans, and requires affirmative action by the Contractor to employ and advance in employment qualified protected veterans.

(c) Subcontracts. The Contractor shall insert the terms of this clause in subcontracts of \$150,000 or more unless exempted by rules, regulations, or orders of the Secretary of Labor. The Contractor shall act as specified by the Director, Office of Federal Contract Compliance Programs, to enforce the terms, including action for noncompliance. Such necessary changes in language may be made as shall be appropriate to identify properly the parties and their undertakings.

11 FAR 52.222-36, Equal Opportunity for Workers with Disabilities (July 2014) (29 U.S.C. 793), if Subcontract value equals or exceeds \$15,000:

(a) Equal opportunity clause. The Contractor shall abide by the requirements of the equal opportunity clause at 41 CFR 60-741.5(a), as of March 24, 2014. This clause prohibits discrimination against qualified individuals on the basis of disability, and requires affirmative action by the Contractor to employ and advance in employment qualified individuals with disabilities.

(b) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of \$15,000 unless exempted by rules, regulations, or orders of the Secretary, so that such provisions will be binding upon each subcontractor or vendor. The Contractor shall act as specified by the Director, Office of Federal Contract Compliance Programs of the U.S. Department of Labor, to enforce the terms, including action for noncompliance. Such necessary changes in language may be made as shall be appropriate to identify properly the parties and their undertakings.

**EXHIBIT A
ARC FLOWDOWN REQUIREMENTS**

FLOWDOWN CONTRACT TERMS FOR TERRAPOWER SUBCONTRACTORS

**(TERRAPOWER AS "SUBRECIPIENT" UNDER DEPT. OF ENERGY GRANT;
SUBCONTRACTOR AS SUPPLIER OF GOODS OR NON-RESEARCH SERVICES)**

ATTACHMENT 1

(Enhancement of Contractor Protection from Reprisal for Disclosure of Certain Information)

41 US Code §4712

(a) Prohibition of Reprisals.—

(1) In general.—

An employee of a contractor, subcontractor, grantee, or subgrantee or personal services contractor may not be discharged, demoted, or otherwise discriminated against as a reprisal for disclosing to a person or body described in paragraph (2) information that the employee reasonably believes is evidence of gross mismanagement of a Federal contract or grant, a gross waste of Federal funds, an abuse of authority relating to a Federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a Federal contract (including the competition for or negotiation of a contract) or grant.

(2) Persons and bodies covered.—The persons and bodies described in this paragraph are the persons and bodies as follows:

- (A) A Member of Congress or a representative of a committee of Congress.
- (B) An Inspector General.
- (C) The Government Accountability Office.
- (D) A Federal employee responsible for contract or grant oversight or management at the relevant agency.
- (E) An authorized official of the Department of Justice or other law enforcement agency.
- (F) A court or grand jury.
- (G) A management official or other employee of the contractor, subcontractor, or grantee who has the responsibility to investigate, discover, or address misconduct.

(3) Rules of construction.—For the purposes of paragraph (1)—

- (A) an employee who initiates or provides evidence of contractor, subcontractor, or grantee misconduct in any judicial or administrative proceeding relating to waste, fraud, or abuse on a Federal contract or grant shall be deemed to have made a disclosure covered by such paragraph; and
- (B) a reprisal described in paragraph (1) is prohibited even if it is undertaken at the request of an executive branch official, unless the request takes the form of a non-discretionary directive and is within the authority of the executive branch official making the request.

(b) Investigation of Complaints.—

(1) Submission of complaint.—

A person who believes that the person has been subjected to a reprisal prohibited by subsection (a) may submit a complaint to the Inspector General of the executive agency involved. Unless the Inspector General determines that the complaint is frivolous, fails to allege a violation of the prohibition in subsection (a), or has previously been addressed in another Federal or State judicial or administrative proceeding initiated by the complainant, the Inspector General shall investigate the complaint and, upon completion of such investigation, submit a report of the findings of the investigation to the person, the contractor or grantee concerned, and the head of the agency.

(2) Inspector general action.—

(A) Determination or submission of report on findings.—

Except as provided under subparagraph (B), the Inspector General shall make a determination that a complaint is frivolous, fails to allege a violation of the prohibition in subsection (a), or has previously been addressed in another Federal or State judicial or administrative proceeding initiated by the complainant or submit a report under paragraph (1) within 180 days after receiving the complaint.

(B) Extension of time.—

If the Inspector General is unable to complete an investigation in time to submit a report within the 180-day period specified in subparagraph (A) and the person submitting the complaint agrees to an extension of time, the Inspector General shall submit a report under paragraph (1) within such additional period of time, up to 180 days, as shall be agreed upon between the Inspector General and the person submitting the complaint.

(3) Prohibition on disclosure.—The Inspector General may not respond to any inquiry or disclose any information from or about any person alleging the reprisal, except to the extent that such response or disclosure is—

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(A) made with the consent of the person alleging the reprisal;

(B) made in accordance with the provisions of section 552a of title 5 or as required by any other applicable Federal law; or

(C) necessary to conduct an investigation of the alleged reprisal.

(4) Time limitation.—

A complaint may not be brought under this subsection more than three years after the date on which the alleged reprisal took place.

(c) Remedy and Enforcement Authority.—

(1) In general.—Not later than 30 days after receiving an Inspector General report pursuant to subsection (b), the head of the executive agency concerned shall determine whether there is sufficient basis to conclude that the contractor or grantee concerned has subjected the complainant to a reprisal prohibited by subsection (a) and shall either issue an order denying relief or shall take one or more of the following actions:

(A) Order the contractor or grantee to take affirmative action to abate the reprisal.

(B) Order the contractor or grantee to reinstate the person to the position that the person held before the reprisal, together with compensatory damages (including back pay), employment benefits, and other terms and conditions of employment that would apply to the person in that position if the reprisal had not been taken.

(C) Order the contractor or grantee to pay the complainant an amount equal to the aggregate amount of all costs and expenses (including attorneys' fees and expert witnesses' fees) that were reasonably incurred by the complainant for, or in connection with, bringing the complaint regarding the reprisal, as determined by the head of the executive agency.

(2) Exhaustion of remedies.—

If the head of an executive agency issues an order denying relief under paragraph (1) or has not issued an order within 210 days after the submission of a complaint under subsection (b), or in the case of an extension of time under paragraph (b)(2)(B), not later than 30 days after the expiration of the extension of time, and there is no showing that such delay is due to the bad faith of the complainant, the complainant shall be deemed to have exhausted all administrative remedies with respect to the complaint, and the complainant may bring a de novo action at law or equity against the contractor or grantee to seek compensatory damages and other relief available under this section in the appropriate district court of the United States, which shall have jurisdiction over such an action without regard to the amount in controversy. Such an action shall, at the request of either party to the action, be tried by the court with a jury. An action under this paragraph may not be brought more than two years after the date on which remedies are deemed to have been exhausted.

(3) Admissibility of evidence.—

An Inspector General determination and an agency head order denying relief under paragraph (2) shall be admissible in evidence in any de novo action at law or equity brought pursuant to this subsection.

(4) Enforcement of orders.—

Whenever a person fails to comply with an order issued under paragraph (1), the head of the executive agency concerned shall file an action for enforcement of such order in the United States district court for a district in which the reprisal was found to have occurred. In any action brought under this paragraph, the court may grant appropriate relief, including injunctive relief, compensatory and exemplary damages, and attorney fees and costs. The person upon whose behalf an order was issued may also file such an action or join in an action filed by the head of the executive agency.

(5) Judicial review.—

Any person adversely affected or aggrieved by an order issued under paragraph (1) may obtain review of the order's conformance with this subsection, and any regulations issued to carry out this section, in the United States court of appeals for a circuit in which the reprisal is alleged in the order to have occurred. No petition seeking such review may be filed more than 60 days after issuance of the order by the head of the executive agency. Review shall conform to chapter 7 of title 5. Filing such an appeal shall not act to stay the enforcement of the order of the head of an executive agency, unless a stay is specifically entered by the court.

(6) Burdens of proof.—

The legal burdens of proof specified in section 1221(e) of title 5 shall be controlling for the purposes of any investigation conducted by an Inspector General, decision by the head of an executive agency, or judicial or administrative proceeding to determine whether discrimination prohibited under this section has occurred.

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(7) Rights and remedies not waivable.—

The rights and remedies provided for in this section may not be waived by any agreement, policy, form, or condition of employment.

(d) Notification of Employees.—

The head of each executive agency shall ensure that contractors, subcontractors, and grantees of the agency inform their employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.

(e) Construction.—

Nothing in this section may be construed to authorize the discharge of, demotion of, or discrimination against an employee for a disclosure other than a disclosure protected by subsection (a) or to modify or derogate from a right or remedy otherwise available to the employee.

(f) Exceptions.—

(1) This section shall not apply to any element of the intelligence community, as defined in section 3(4) of the National Security Act of 1947 (50 U.S.C. 401a(4)).

(2) This section shall not apply to any disclosure made by an employee of a contractor, subcontractor, or grantee of an element of the intelligence community if such disclosure—

(A) relates to an activity of an element of the intelligence community; or

(B) was discovered during contract, subcontract, or grantee services provided to an element of the intelligence community.

(g) Definitions.—In this section:

(1) The term “abuse of authority” means an arbitrary and capricious exercise of authority that is inconsistent with the mission of the executive agency concerned or the successful performance of a contract or grant of such agency.

(2) The term “Inspector General” means an Inspector General appointed under the Inspector General Act of 1978 and any Inspector General that receives funding from, or has oversight over contracts or grants awarded for or on behalf of, the executive agency concerned.

(h) Construction.—

Nothing in this section, or the amendments made by this section,[1] shall be construed to provide any rights to disclose classified information not otherwise provided by law.

(Added Pub. L. 112–239, div. A, title VIII, § 828(a)(1), Jan. 2, 2013, 126 Stat. 1837; amended Pub. L. 113–66, div. A, title X, § 1091(e), Dec. 26, 2013, 127 Stat. 876; Pub. L. 114–261, § 1(a)(2), (3)(A), Dec. 14, 2016, 130 Stat. 1362.)