Base Load Power Hub (BLPH)

TECHNICAL DATASHEET For Restriction Orifice

Document Number: 123A90-DDL-IN-DS-40054

Document Class: 2

02	06/12/2024	Accepted for Construction (AFC)	VBA	LCA	DLO
01	11/09/2024	Accepted for Construction (AFC)	VBA	LCA	DLO
00	16/07/2024	Issue for Review (IFR)	VBA	LCA	DLO
Rev.	Date	Description	Prepared	Reviewed	Approved

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Revision / Change Log

Rev.	Description
00	ISSUE FOR REVIEW (IFR)
01	ACCEPTED FOR CONSTRUCTION (AFC)
02	ACCEPTED FOR CONSTRUCTION (AFC)

HOLDS LIST

No.	Description
1.	
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GENERAL REQUIREMENTS / NOTES

1) This datasheet is to be read in conjunction with following documents:
   a) Instrumentation for Package Unit Specification (123A90-DDL-IN-SP-40094);
   b) Material Requisition (123A90-DDL-IN-MR-40055);
   c) Specification for Piping Material Classes (123A90-DDL-PP-SP-70000).

2) Ambient Temperature Min: -8.4 °C, Norm: 10.5 °C, Max: +25.0 °C.

3) The orifice bore sizing calculation shall be based on ISO 5167 and when not applicable e.g. for sonic flow R.W. Miller can be used. The sizing and thickness calculation shall be reviewed by Buyer. Restriction orifice plates shall be mounted between piping flanges. The surface finish shall match the flange surface finish.

4) Restriction orifice shall be single stage or single stage multi-hole or multi-stage type depending upon requirement.

5) Single stage multi-hole restriction orifice shall be used to abate the noise generated by single stage orifice due to high velocity through restriction orifice plate, bore which offers restriction from incoming fluid.'Stress calculation shall be submitted to justify the thickness of RO.

6) All flanges in ASME B31.3 and ASME B31.12 shall be Raised Face type.

7) Material test certificates MTCs shall be provided by Manufacturer for all valves, tubing & fittings. MTCs shall include EN 10204 3.1 certification for all metallic materials.

8) Orifice plate shall be permanently marked with Orifice plate information with sizing details, dimensional and material details.

9) Information with asterisk (*) shall be confirmed or provided by manufacturer according to the service condition.

10) Piping Bolt/Nuts and gaskets are provided by Contractor for orifice assemblies and diaphragm seal transmitters, Vendor to provide required bolt lengths details.

11) Orifice tag number, material, direction of flow, nominal diameter and bore diameter shall be permanently stamped on the orifice plate handle (on upstream side).

12) Vendor to ensure that the noise shall be with in 85 dBA in orifice sizing and selection.

13) Drain hole for vapour service and vent hole for liquid service shall be provided for the orifices in horizontal runs, as specified on the orifices in horizontal runs, as specified on the individual data sheets.

14) Maximum flow run case: "Emergency Fire Blowdown", as per 123A90-DDL-PR-RE-80030_01 "Relief, Vent and Blowdown Report, rev01.

15) Minimum temperature run case: "Low Temperature depressurization case", as per 123A90-DDL-PR-RE-80030_01 "Relief, Vent and Blowdown Report, rev01.

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GENERAL	1	Tag Number			25-RO-005			
	2	Service			HYDROGEN FROM STORAGE VESSEL (V-25001A) TO HYDROGEN VENT HEADER			
	3	P&ID Number			123A90-DDL-PR-PID-80015			
	4	Line Number			4"-HY-142-03HSS-N			
	5	Line Size	Line Schedule		4"	Thk (mm) = 3.05		
	6	Line Material			ASTM A312 Gr.TP316/316L			
	7							
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS		
	9	Design Pressure	Min.	Max.		40 barg		
	10	Design Temperature	Min.	Max.		80		
	11	Base Pressure	Base Temperature					
	12	Critical Pressure						
	13	Permanent Pressure Loss Across Meter						
	14	Entrained Gas / Liquid (% Mass)						
	15				Units	Note 14		Note 15
	16	Flow Operating			kg/h	2047		1300
	17	Upsteam Pressure			barg	30		28
	18	Temperature			°C	25		-8.4
	19	Density			kg/m^3	2.5		2.63
	20	Compressibility Factor			-	1		1
	21	Viscosity			cP	0.01		0.01
	22	Vapour Pressure						
	23	Specific Heat Ratio Cp/Cv			-	1.3		1.3
	24	Molecular Weight			2			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE - MULTIHOLES (Choked Flow)			
	26	Material			AISI 316/316L			
	27	Thickness			10mm			
	28	Bore Diameter			26 x 4.22mm (1)			
	29	Beta Ratio			0.19907			
	30	Drain or Vent Hole			N.A.			
	31	Flow Full Scale			2047 kg/h			
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar			
	33	Choking Pressure Ratio			0.5457			
ORIFICE FLANGES	34	Size			4" (Flanges are Out of scope of Vendor's supply)			
	35	Rating			300#			
	36	Type			Flanged			
	37	Facing			RF			
	38	Flange Material			ASTM A182 Gr.F316/316L			
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)			
	40	Taps Type	Quantity		-	-		
	41	Taps Size	Connection		-	-		
	42	Taps Orientation			-			
	43							
	44							
PURCHASE	45	Manufacturer			TECNOMATIC			
	46	Model			-			
	47	Purchase Order Number			1724001690			

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

INSTRUMENT DATASHEET

Orifice Plate

CROSSWIND

ROSETTI MARINO

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-007		
	2	Service			HYDROGEN FROM STORAGE VESSEL (V-25001B) TO HYDROGEN VENT HEADER		
	3	P&ID Number			123A90-DDL-PR-PID-80016		
	4	Line Number			4"-HY-167-03HSS-N		
	5	Line Size	Line Schedule		4"	Thk (mm) = 3.05	
	6	Line Material			ASTM A312 Gr.TP316/316L		
	7						
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS	
	9	Design Pressure	Min.	Max.		40 barg	
	10	Design Temperature	Min.	Max.		80	
	11	Base Pressure	Base Temperature				
	12	Critical Pressure					
	13	Permanent Pressure Loss Across Meter					
	14	Entrained Gas / Liquid (% Mass)					
	15				Units	Note 14	Note 15
	16	Flow Operating			kg/h	2047	1300
	17	Upsteam Pressure			barg	30	28
	18	Temperature			°C	25	-8.4
	19	Density			kg/m^3	2.5	2.63
	20	Compressibility Factor			-	1	1
	21	Viscosity			cP	0.01	0.01
	22	Vapour Pressure					
	23	Specific Heat Ratio Cp/Cv			-	1.3	1.3
	24	Molecular Weight			2		
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE - MULTIHOLES (Choked Flow)		
	26	Material			AISI 316/316L		
	27	Thickness			10mm		
	28	Bore Diameter			26 x 4.22mm (1)		
	29	Beta Ratio			0.19907		
	30	Drain or Vent Hole			N.A.		
	31	Flow Full Scale			2047 kg/h		
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar		
	33	Choking Pressure Ratio			0.5457		
ORIFICE FLANGES	34	Size			4" (Flanges are Out of scope of Vendor's supply)		
	35	Rating			300#		
	36	Type			Flanged		
	37	Facing			RF		
	38	Flange Material			ASTM A182 Gr.F316/316L		
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)		
	40	Taps Type	Quantity		-	-	
	41	Taps Size	Connection		-	-	
	42	Taps Orientation			-		
	43						
	44						
PURCHASE	45	Manufacturer			TECNOMATIC		
	46	Model			-		
	47	Purchase Order Number			1724001690		

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Orifice Plate

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-010			
	2	Service			HYDROGEN FROM STORAGE VESSEL (V-25001C) TO HYDROGEN VENT HEADER			
	3	P&ID Number			123A90-DDL-PR-PID-80017			
	4	Line Number			4"-HY-171-03HSS-N			
	5	Line Size	Line Schedule		4"	Thk (mm) = 3.05		
	6	Line Material			ASTM A312 Gr.TP316/316L			
	7							
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS		
	9	Design Pressure	Min.	Max.		40 barg		
	10	Design Temperature	Min.	Max.		80		
	11	Base Pressure	Base Temperature					
	12	Critical Pressure						
	13	Permanent Pressure Loss Across Meter						
	14	Entrained Gas / Liquid (% Mass)						
	15				Units	Note 14		Note 15
	16	Flow Operating			kg/h	2047		1300
	17	Upsteam Pressure			barg	30		28
	18	Temperature			°C	25		-8.4
	19	Density			kg/m^3	2.5		2.63
	20	Compressibility Factor			-	1		1
	21	Viscosity			cP	0.01		0.01
	22	Vapour Pressure						
	23	Specific Heat Ratio Cp/Cv			-	1.3		1.3
	24	Molecular Weight			2			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE - MULTIHOLES (Choked Flow)			
	26	Material			AISI 316/316L			
	27	Thickness			10mm			
	28	Bore Diameter			26 x 4.22mm (1)			
	29	Beta Ratio			0.19907			
	30	Drain or Vent Hole			N.A.			
	31	Flow Full Scale			2047 kg/h			
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar			
	33	Choking Pressure Ratio			0.5457			
ORIFICE FLANGES	34	Size			4" (Flanges are Out of scope of Vendor's supply)			
	35	Rating			300#			
	36	Type			Flanged			
	37	Facing			RF			
	38	Flange Material			ASTM A182 Gr.F316/316L			
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)			
	40	Taps Type	Quantity		-	-		
	41	Taps Size	Connection		-	-		
	42	Taps Orientation			-			
	43							
	44							
PURCHASE	45	Manufacturer			TECNOMATIC			
	46	Model			-			
	47	Purchase Order Number			1724001690			

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-013			
	2	Service			HYDROGEN FROM STORAGE VESSEL (V-25001D) TO HYDROGEN VENT HEADER			
	3	P&ID Number			123A90-DDL-PR-PID-80018			
	4	Line Number			4"-HY-175-03HSS-N			
	5	Line Size	Line Schedule		4"	Thk (mm) = 3.05		
	6	Line Material			ASTM A312 Gr.TP316/316L			
	7							
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS		
	9	Design Pressure	Min.	Max.		40 barg		
	10	Design Temperature	Min.	Max.		80		
	11	Base Pressure	Base Temperature					
	12	Critical Pressure						
	13	Permanent Pressure Loss Across Meter						
	14	Entrained Gas / Liquid (% Mass)						
	15				Units	Note 14		Note 15
	16	Flow Operating			kg/h	2047		1300
	17	Upsteam Pressure			barg	30		28
	18	Temperature			°C	25		-8.4
	19	Density			kg/m^3	2.5		2.63
	20	Compressibility Factor			-	1		1
	21	Viscosity			cP	0.01		0.01
	22	Vapour Pressure						
	23	Specific Heat Ratio Cp/Cv			-	1.3		1.3
	24	Molecular Weight			2			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE - MULTIHOLES (Choked Flow)			
	26	Material			AISI 316/316L			
	27	Thickness			10mm			
	28	Bore Diameter			26 x 4.22mm (1)			
	29	Beta Ratio			0.19907			
	30	Drain or Vent Hole			N.A.			
	31	Flow Full Scale			2047 kg/h			
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar			
	33	Choking Pressure Ratio			0.5457			
ORIFICE FLANGES	34	Size			4" (Flanges are Out of scope of Vendor's supply)			
	35	Rating			300#			
	36	Type			Flanged			
	37	Facing			RF			
	38	Flange Material			ASTM A182 Gr.F316/316L			
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)			
	40	Taps Type	Quantity		-	-		
	41	Taps Size	Connection		-	-		
	42	Taps Orientation			-			
	43							
	44							
PURCHASE	45	Manufacturer			TECNOMATIC			
	46	Model			-			
	47	Purchase Order Number			1724001690			

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-016		
	2	Service			HYDROGEN FROM STORAGE VESSEL (V-25001E) TO HYDROGEN VENT HEADER		
	3	P&ID Number			123A90-DDL-PR-PID-80019		
	4	Line Number			4"-HY-180-03HSS-N		
	5	Line Size	Line Schedule		4"	Thk (mm) = 3.05	
	6	Line Material			ASTM A312 Gr.TP316/316L		
	7						
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS	
	9	Design Pressure	Min.	Max.		40 barg	
	10	Design Temperature	Min.	Max.		80	
	11	Base Pressure	Base Temperature				
	12	Critical Pressure					
	13	Permanent Pressure Loss Across Meter					
	14	Entrained Gas / Liquid (% Mass)					
	15				Units	Note 14	Note 15
	16	Flow Operating			kg/h	2047	1300
	17	Upsteam Pressure			barg	30	28
	18	Temperature			°C	25	-8.4
	19	Density			kg/m^3	2.5	2.63
	20	Compressibility Factor			-	1	1
	21	Viscosity			cP	0.01	0.01
	22	Vapour Pressure					
	23	Specific Heat Ratio Cp/Cv			-	1.3	1.3
	24	Molecular Weight			2		
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE - MULTIHOLES (Choked Flow)		
	26	Material			AISI 316/316L		
	27	Thickness			10mm		
	28	Bore Diameter			26 x 4.22mm (1)		
	29	Beta Ratio			0.19907		
	30	Drain or Vent Hole			N.A.		
	31	Flow Full Scale			2047 kg/h		
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar		
	33	Choking Pressure Ratio			0.5457		
ORIFICE FLANGES	34	Size			4" (Flanges are Out of scope of Vendor's supply)		
	35	Rating			300#		
	36	Type			Flanged		
	37	Facing			RF		
	38	Flange Material			ASTM A182 Gr.F316/316L		
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)		
	40	Taps Type	Quantity		-	-	
	41	Taps Size	Connection		-	-	
	42	Taps Orientation			-		
	43						
	44						
PURCHASE	45	Manufacturer			TECNOMATIC		
	46	Model			-		
	47	Purchase Order Number			1724001690		

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-019			
	2	Service			HYDROGEN FROM STORAGE VESSEL (V-25001F) TO HYDROGEN VENT HEADER			
	3	P&ID Number			123A90-DDL-PR-PID-80020			
	4	Line Number			4"-HY-184-03HSS-N			
	5	Line Size	Line Schedule		4"	Thk (mm) = 3.05		
	6	Line Material			ASTM A312 Gr.TP316/316L			
	7							
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS		
	9	Design Pressure	Min.	Max.		40 barg		
	10	Design Temperature	Min.	Max.		80		
	11	Base Pressure	Base Temperature					
	12	Critical Pressure						
	13	Permanent Pressure Loss Across Meter						
	14	Entrained Gas / Liquid (% Mass)						
	15				Units	Note 14		Note 15
	16	Flow Operating			kg/h	2047		1300
	17	Upsteam Pressure			barg	30		28
	18	Temperature			°C	25		-8.4
	19	Density			kg/m^3	2.5		2.63
	20	Compressibility Factor			-	1		1
	21	Viscosity			cP	0.01		0.01
	22	Vapour Pressure						
	23	Specific Heat Ratio Cp/Cv			-	1.3		1.3
	24	Molecular Weight			2			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE - MULTIHOLES (Choked Flow)			
	26	Material			AISI 316/316L			
	27	Thickness			10mm			
	28	Bore Diameter			26 x 4.22mm (1)			
	29	Beta Ratio			0.19907			
	30	Drain or Vent Hole			N.A.			
	31	Flow Full Scale			2047 kg/h			
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar			
	33	Choking Pressure Ratio			0.5457			
ORIFICE FLANGES	34	Size			4" (Flanges are Out of scope of Vendor's supply)			
	35	Rating			300#			
	36	Type			Flanged			
	37	Facing			RF			
	38	Flange Material			ASTM A182 Gr.F316/316L			
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)			
	40	Taps Type	Quantity		-	-		
	41	Taps Size	Connection		-	-		
	42	Taps Orientation			-			
	43							
	44							
PURCHASE	45	Manufacturer			TECNOMATIC			
	46	Model			-			
	47	Purchase Order Number			1724001690			

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

INSTRUMENT DATASHEET

Orifice Plate

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-022		
	2	Service			HYDROGEN FROM H2 TANKS		
	3	P&ID Number			123A90-DDL-PR-PID-80014		
	4	Line Number			1"-HY-144-03HSS-N		
	5	Line Size	Line Schedule		1"	Thk (mm) = 3.38	
	6	Line Material			ASTM A312 Gr.TP316/316L		
	7						
PROCESS CONDITIONS	8	Fluid	State		HYDROGEN	GAS	
	9	Design Pressure	Min.	Max.		40 barg	
	10	Design Temperature	Min.	Max.		80	
	11	Base Pressure	Base Temperature				
	12	Critical Pressure					
	13	Permanent Pressure Loss Across Meter					
	14	Entrained Gas / Liquid (% Mass)					
	15				Units	Note 14	Note 15
	16	Flow Operating			kg/h	119	90
	17	Upsteam Pressure			barg	30	28
	18	Temperature			°C	25	-8.4
	19	Density			kg/m^3	2.5	2.63
	20	Compressibility Factor			-	1	1
	21	Viscosity			cP	0.01	0.01
	22	Vapour Pressure					
	23	Specific Heat Ratio Cp/Cv			-	1.3	1.3
	24	Molecular Weight			2		
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE CONCENTRIC TYPE (Choked Flow)		
	26	Material			AISI 316/316L		
	27	Thickness			6mm		
	28	Bore Diameter			5.19347 (1)		
	29	Beta Ratio			0.19492		
	30	Drain or Vent Hole			N.A.		
	31	Flow Full Scale			119 kg/h		
	32	Differential Pressure @ Full scale			30 barg - 15.9115 barg = 14.0885 bar		
	33	Choking Pressure Ratio			0.5457		
ORIFICE FLANGES	34	Size			1" (Flanges are Out of scope of Vendor's supply)		
	35	Rating			300#		
	36	Type			Flanged		
	37	Facing			RF		
	38	Flange Material			ASTM A182 Gr.F316/316L		
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)		
	40	Taps Type	Quantity		-	-	
	41	Taps Size	Connection		-	-	
	42	Taps Orientation			-		
	43						
	44						
PURCHASE	45	Manufacturer			TECNOMATIC		
	46	Model			-		
	47	Purchase Order Number			1724001690		

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			25-RO-024		
	2	Service			HYDROGEN FROM ELECTROLYZER (A-20000) TO HYDROGEN VENT HEADER		
	3	P&ID Number			123A90-DDL-PR-PID-80013		
	4	Line Number			1"-HY-143-03HSS-N		
	5	Line Size	Line Schedule		1"	Thk (mm) = 3.38	
	6	Line Material			ASTM A312 Gr.TP316/316L		
	7						
PROCESS CONDITIONS	8	Fluid	State		NITROGEN	GAS	
	9	Design Pressure	Min.	Max.		40 barg	
	10	Design Temperature	Min.	Max.		80	
	11	Base Pressure	Base Temperature				
	12	Critical Pressure					
	13	Permanent Pressure Loss Across Meter					
	14	Entrained Gas / Liquid (% Mass)					
	15				Units		
	16	Flow Operating			kg/h	30 (*)	30
	17	Upsteam Pressure			barg	2 (*)	8
	18	Temperature			°C	25 (*)	25
	19	Density			kg/m^3	3.4 (*)	10.2
	20	Compressibility Factor			-	1 (*)	1
	21	Viscosity			cP	0.018 (*)	0.018
	22	Vapour Pressure					
	23	Specific Heat Ratio Cp/Cv			-	1.4 (*)	1.4
	24	Molecular Weight			28		
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE CONCENTRIC TYPE (Choked Flow)		
	26	Material			AISI 316/316L		
	27	Thickness			6mm		
	28	Bore Diameter			4.26mm (1)		
	29	Beta Ratio			0.16013		
	30	Drain or Vent Hole			N.A.		
	31	Flow Full Scale			30 kg/h		
	32	Differential Pressure @ Full scale			2 barg - 0.5770 barg = 1.423 bar		
	33	Choking Pressure Ratio			0.5277		
ORIFICE FLANGES	34	Size			1" (Flanges are Out of scope of Vendor's supply)		
	35	Rating			300#		
	36	Type			Flanged		
	37	Facing			RF		
	38	Flange Material			ASTM A182 Gr.F316/316L		
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)		
	40	Taps Type	Quantity		-	-	
	41	Taps Size	Connection		-	-	
	42	Taps Orientation			-		
	43						
	44						
PURCHASE	45	Manufacturer			TECNOMATIC		
	46	Model			-		
	47	Purchase Order Number			1724001690		

Notes:
(1) Downstream Pressure = atm
(*) Sizing case

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			50-RO-001		
	2	Service			SEA WATER BY-PASS PUMP P-50001A		
	3	P&ID Number			123A90-DDL-PR-PID-80021		
	4	Line Number			1"-SWS-146-01SD-E		
	5	Line Size	Line Schedule		1"	Thk (mm) = 3.38	
	6	Line Material			ASTM A790 UNS S32760		
	7						
PROCESS CONDITIONS	8	Fluid	State		SEA WATER	LIQUID	
	9	Design Pressure	Min.	Max.		7.6 barg	
	10	Design Temperature	Min.	Max.		100°C	
	11	Base Pressure	Base Temperature				
	12	Critical Pressure					
	13	Permanent Pressure Loss Across Meter					
	14	Entrained Gas / Liquid (% Mass)					
	15				Units	@ Max. Flow	@ Norm. Flow	@ Min. Flow
	16	Flow Operating			l/h		0.85	
	17	Upsteam Pressure			barg		5.6	
	18	Temperature			°C		22	
	19	Density			kg/m^3		1025	
	20	Compressibility Factor			-		N/A	
	21	Viscosity			cP		1	
	22	Vapour Pressure			bar		0.02	
	23	Specific Heat Ratio Cp/Cv			-		1.33	
	24	Molecular Weight			18			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE CONCENTRIC TYPE		
	26	Material			25% CR SDPLX		
	27	Thickness			3mm '(2)		
	28	Bore Diameter			(2) (1)		
	29	Beta Ratio			(2)		
	30	Drain or Vent Hole			N.A.		
	31	Flow Full Scale			(2)		
	32	Differential Pressure @ Full scale			(2)		
	33						
ORIFICE FLANGES	34	Size			1" (Flanges are Out of scope of Vendor's supply)		
	35	Rating			150#		
	36	Type			Flanged		
	37	Facing			RF		
	38	Flange Material			ASTM A182 Gr.F55		
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)		
	40	Taps Type	Quantity		-	-	
	41	Taps Size	Connection		-	-	
	42	Taps Orientation			-		
	43						
	44						
PURCHASE	45	Manufacturer			TECNOMATIC		
	46	Model			-		
	47	Purchase Order Number			1724001690		

Notes:
(1) Downstream Pressure = atm;
(2) The flow through the orifice will be determined during the performance test of the Seawater Lift Pump

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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Code: 314 Doc. No.: 123A90-DDL-IN-DS-40054 Rev 02

GENERAL	1	Tag Number			50-RO-002	
	2	Service			SEA WATER BY-PASS PUMP P-50001B	
	3	P&ID Number			123A90-DDL-PR-PID-80021	
	4	Line Number			1"-SWS-147-01SD-E	
	5	Line Size	Line Schedule		1"	Thk (mm) = 3.38
	6	Line Material			ASTM A790 UNS S32760	
	7					
PROCESS CONDITIONS	8	Fluid	State		SEA WATER	LIQUID
	9	Design Pressure	Min.	Max.		7.6 barg
	10	Design Temperature	Min.	Max.		100°C
	11	Base Pressure	Base Temperature			
	12	Critical Pressure				
	13	Permanent Pressure Loss Across Meter				
	14	Entrained Gas / Liquid (% Mass)				
	15				Units	@ Max. Flow	@ Norm. Flow	@ Min. Flow
	16	Flow Operating			l/h		0.85	
	17	Upsteam Pressure			barg		5.6	
	18	Temperature			°C		22	
	19	Density			kg/m^3		1025	
	20	Compressibility Factor			-		N/A	
	21	Viscosity			cP		1	
	22	Vapour Pressure			bar		0.02	
	23	Specific Heat Ratio Cp/Cv			-		1.33	
	24	Molecular Weight			18			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE CONCENTRIC TYPE			
	26	Material			25% CR SDPLX			
	27	Thickness			3mm '(2)			
	28	Bore Diameter			(2) (1)			
	29	Beta Ratio			(2)			
	30	Drain or Vent Hole			N.A.			
	31	Flow Full Scale			(2)			
	32	Differential Pressure @ Full scale			(2)			
	33							
ORIFICE FLANGES	34	Size			1" (Flanges are Out of scope of Vendor's supply)			
	35	Rating			150#			
	36	Type			Flanged			
	37	Facing			RF			
	38	Flange Material			ASTM A182 Gr.F55			
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)			
	40	Taps Type	Quantity		-	-		
	41	Taps Size	Connection		-	-		
	42	Taps Orientation			-			
	43							
	44							
PURCHASE	45	Manufacturer			TECNOMATIC			
	46	Model			-			
	47	Purchase Order Number			1724001690			

Notes:
(1) Downstream Pressure = atm;
(2) The flow through the orifice will be determined during the performance test of the Seawater Lift Pump

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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GENERAL	1	Tag Number			80-RO-001			
	2	Service			HYDROGEN FROM STORAGE VESSEL TO FUEL CELL			
	3	P&ID Number			123A90-DDL-PR-PID-80012			
	4	Line Number			1"-HY-163-01HSS-N			
	5	Line Size	Line Schedule		1"	Thk (mm) = 3.38		
	6	Line Material			ASTM A312 Gr.TP316/316L			
	7							
PROCESS CONDITIONS	8	Fluid	State		NITROGEN	GAS		
	9	Design Pressure	Min.	Max.		10		
	10	Design Temperature	Min.	Max.		80		
	11	Base Pressure	Base Temperature					
	12	Critical Pressure						
	13	Permanent Pressure Loss Across Meter						
	14	Entrained Gas / Liquid (% Mass)						
	15				Units			
	16	Flow Operating			kg/h	30		
	17	Upsteam Pressure			barg	2		
	18	Temperature			°C	25		
	19	Density			kg/m^3	3.4		
	20	Compressibility Factor			-	1		
	21	Viscosity			cP	0.018		
	22	Vapour Pressure						
	23	Specific Heat Ratio Cp/Cv			-	1.4		
	24	Molecular Weight			28			
ORIFICE PLATE	25	Type			RESTRICTION ORIFICE CONCENTRIC TYPE (Choked Flow)			
	26	Material			AISI 316/316L			
	27	Thickness			6mm			
	28	Bore Diameter			4.26mm (1)			
	29	Beta Ratio			0.16012			
	30	Drain or Vent Hole			N.A.			
	31	Flow Full Scale			30 kg/h			
	32	Differential Pressure @ Full scale			2 barg - 0.5770 barg = 1.423 bar			
	33	Choking Pressure Ratio			0.5277			
ORIFICE FLANGES	34	Size			1" (Flanges are Out of scope of Vendor's supply)			
	35	Rating			150#			
	36	Type			Flanged			
	37	Facing			RF			
	38	Flange Material			ASTM A182 Gr.F316/316L			
	39	Gasket Material			(Gaskets are Out of scope of Vendor's supply)			
	40	Taps Type	Quantity		-	-		
	41	Taps Size	Connection		-	-		
	42	Taps Orientation			-			
	43							
	44							
PURCHASE	45	Manufacturer			TECNOMATIC			
	46	Model			-			
	47	Purchase Order Number			1724001690			

Notes: (1) Downstream Pressure = atm

No.	Date	By	Chkd	Appr	Description
02	06/12/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
01	06/09/2024	VBA	LCA	DLO	Accepted for Construction (AFC)
00	22/02/2024	VBA	LCA	DLO	Issued for Review (IFR)

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