

Specifications for Control Valve 113-FV-6851
Annexure-B2

GENERAL	1	Tag No			113-FV-6851	
	2	Service			C2 HYDROCARBON	
	3	Line No.			10"-P-113-6852-B4A-IC	
	4	Area Classification			IEC Zone-2, Gr.IIC, T3	
	5	Ambient Temperature	Min	Max	1°C	39.8°C
	6	Allowable Sound Pressure Le	dBA		85	
	7	Control Action On-Off(OR) Modulating			Modulating	
	8	Available Air Supply Pressure	Min	Max	5 kgf/cm2g	10.5 kgf/cm2g
	9	Failure Position			Close	
PIPE LINE	10	Line Size and Schedule	Inlet	Outlet	10 in STD	10 in STD
	11	Inlet Line ID			254.5 mm	
	12	Outlet Line ID			254.5 mm	
PROCESS CONDITIONS	13	Process Fluid	Fluid State			Gas/Vapour
	14	% Flash	% Solids		-----	-----
	15	Differential Pressure- Shutoff			25.5 kgf/cm2	
					Units	@Max. Flow @Norm. Flow @Min. Flow
	16	Flow Rate			kg/hr	47288 41885 20942
	17	Inlet Pressure			kgf/cm2-g	21.12 21.27 21.57
	18	Pressure Drop			kgf/cm2	1 1.7 3.5
	19	Inlet Temperature			°C	-18.1 -18.1 -18.1
	20	Inlet Compressibility Factor			-	0.72
	21	Inlet Viscosity			cP	0.01 0.01 0.01
	22	Inlet Vapour Pressure			kgf/cm2-a	
CALCULATED RESULTS	23	Critical Pressure			kgf/cm2-a	51.05 51.05 51.05
	24	Flow Coefficient Cv	Max	Nor	Min	285 193 68.7
	25	Travel			%	Vendor to furnish
	26	Inlet Velocity			m/sec	Vendor to furnish
	27	Sound Pressure Level @Max Flow			dBA	31.5 41.5 55.4
BODY AND TRIM	28	Manufacturer			Vendor to furnish	
	29	Model			Vendor to furnish	
	30	Body Type			Single Seat Globe	
	31	Body Size			6 in	
	32	Trim Size			Vendor to furnish	
	33	Rated Cv	Characteristics		Vendor to furnish	Eq. %
	34	End Connection & Rating			6" , 300#	
	35	Facing Finish			RF 125 AARH	
	36	Body, Bonnet Material			ASTM A 352 GR.LCB or better	
	37	Packing Material			PTFE/Graphite(Vendor to specify)	
	38	Guiding			Vendor to furnish	
	39	Trim Type			Single Seat	
	40	Rated Travel			Vendor to furnish	
	41	Trim Material			Vendor to furnish	
	42	Gasket Material			Vendor to furnish	
	43	Soft Seat Material			Vendor to furnish	
	44	Type of Bonnet			Extended	
ACTUATOR	45	Manufacturer			Vendor to furnish	
	46	Model			Vendor to furnish	
	47	Type			Single Acting Pneumatic Spring Diaphragm	
	48	Hand Wheel Location			-----	
	49	Bench Range			Vendor to furnish	
	50	Spring Action			Close	
POSITIONER	51	Manufacturer			Vendor to furnish	
	52	Model			Vendor to furnish	
	53	Signal			4-20mA HART	
	54	Type			SMART Positioner	
	55	Air Supply pressure			Vendor to furnish	

	56	Gauges	Reqd. 2 nos	
SOLENOID VALVE	57	Manufacturer	Vendor to furnish	
	58	Model	Vendor to furnish	
	59	Rating	110 VAC; $\approx$ 3.5W(Low Power)	
	60	Type	3-Way Universal	
	61	When De-Energise	Actuator Pneumatic pressure to be vented	
	62	Tag No	113-FY-6851	
SWITCHES	63	Manufacturer	Vendor to furnish	
	64	Model	Vendor to furnish	
	65	Type	Quantity	Proximity 1
	66	Contact/Rating	24V DC	
	67	Switching Position	Full Close	
	68	Tag No	113-FZLC-6851	
AIR SET	69	Manufacturer	Vendor to furnish	
	70	Model	Vendor to furnish	
	71	Set Pressure	Vendor to furnish	
	72	Filter	Gauge	Required Yes, 1 No.
TIGHTNESS	73	Leakage Class	ANSI V	

Tag Number- 113-FV-6851

NOTES:-

1	Design temperature: -45/80 deg. C; Design Pressure: 25.5 Kg/cm ² ; Density: 41.028 Kg/m ³ .
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Cryogenic testing requirements as specified in SIV shall be complied.
4	M.W. = 28.64
5	Sp. Heat Ratio (Cp/Cv) = 1.832
6	Vendor shall supply valve with all the accessories in installed condition.
7	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-FV-7404
Annexure-B3

GENERAL	1	Tag No				113-FV-7404						
	2	Service				C2 HYDROCARBON						
	3	Line No.				8"-P-113-7404-B4A-IC						
	4	Area Classification				IEC Zone-2, Gr.IIA / IIB, T3						
	5	Ambient Temperature		Min	Max	1°C		39.8°C				
	6	Allowable Sound Pressure Level		Dba		85						
	7	Control Action On-Off(OR) Modulating				Modulating						
	8	Available Air Supply Pressure		Min	Max	5 kgf/cm2g		10.5 kgf/cm2g				
	9	Failure Position				Close						
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	8 in STD		8 in STD				
	11	Inlet Line ID				202.7 mm						
	12	Outlet Line ID				202.7 mm						
PROCESS CONDITIONS	13	Process Fluid	Fluid State					Liquid				
	14	% Flash	% Solids									
	15	Differential Pressure- Shutoff				21.5 kgf/cm2						
						Units		@Max. Flow		@Norm. Flow	@Min. Flow	
	16	Flow Rate				A m3/h		36		30		15
	17	Inlet Pressure				kgf/cm2-g		17.81		17.81		17.83
	18	Pressure Drop				kgf/cm2		9.91		10.03		10.27
	19	Inlet Temperature				°C		-11.3		-11.3		-11.3
	20	Inlet Compressibility Factor				-		----		----		----
	21	Inlet Viscosity				cP		0.069		0.069		0.069
	22	Inlet Vapour Pressure				kgf/cm2-a		18.54		18.54		18.54
	23	Critical Pressure				kgf/cm2-a		49.77		49.77		49.77
CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min			15.5		12.9		6.46
	25	Travel				%				Vendor to furnish		
	26	Inlet Velocity				m/sec				Vendor to furnish		
	27	Sound Pressure Level @Max Flow				dBA				Vendor to furnish		
BODY AND TRIM	28	Manufacturer				Vendor to furnish						
	29	Model				Vendor to furnish						
	30	Body Type				Single Seat Globe						
	31	Body Size				4 in						
	32	Trim Size				Vendor to furnish						
	33	Rated Cv	Characteristics			Vendor to furnish		Eq. %				
	34	End Connection & Rating				4" , 300#						
	35	Facing Finish				RF 125 AARH						
	36	Body, Bonnet Material				ASTM A 352 GR.LCB or better						
	37	Packing Material				PTFE/Graphite(Vendor to specify)						
	38	Guiding				Vendor to furnish						
	39	Trim Type				Single Seat						
	40	Rated Travel				Vendor to furnish						
	41	Trim Material				Vendor to furnish						
	42	Gasket Material				Vendor to furnish						
	43	Soft Seat Material				Vendor to furnish						
	44	Type of Bonnet				Extended						
ACTUATOR	45	Manufacturer				Vendor to furnish						
	46	Model				Vendor to furnish						
	47	Type				Single Acting Pneumatic Spring Diaphragm						
	48	Hand Wheel Location				-----						
	49	Bench Range				Vendor to furnish						
	50	Spring Action				Close						
POSITIONER	51	Manufacturer				Vendor to furnish						
	52	Model				Vendor to furnish						
	53	Signal				4-20mA HART						
	54	Type				SMART Positioner						
	55	Air Supply pressure				Vendor to furnish						

	56	Gauges		Reqd. 2 nos	
SOLENOID VALVE	57	Manufacturer		Vendor to furnish	
	58	Model		Vendor to furnish	
	59	Rating		110 VAC; ≈ 3.5W(Low Power)	
	60	Type		3-Way Universal	
	61	When De-Energise		Actuator Pneumatic pressure to be vented	
	62	Tag No		113-FY-7404	
AIR SET	69	Manufacturer		Vendor to furnish	
	70	Model		Vendor to furnish	
	71	Set Pressure		Vendor to furnish	
	72	Filter	Gauge	Required	Yes, 1 No.
TIGHTNESS	73	Leakage Class		ANSI V	

Tag Number- 113-FV-7404

NOTES:-

1	Design temperature: -45 deg. C; Design Pressure: 21.5 Kg/cm ² ; Density: 424.157 Kg/m ³ .
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Service is flashing.
4	Cryogenic testing requirements as specified in SIV shall be complied.
5	Vendor shall supply valve with all the accessories in installed condition.
6	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-FV-7501
Annexure-B4

GENERAL	1	Tag No				113-FV-7501						
	2	Service				C2 HYDROCARBON						
	3	Line No.				10"-P-113-7402-B4A-IC						
	4	Area Classification				IEC Zone-2, Gr.IIA / IIB, T3						
	5	Ambient Temperature		Min	Max	1°C		39.8°C				
	6	Allowable Sound Pressure Level		dBA		85						
	7	Control Action On-Off(OR) Modulating				Modulating						
	8	Available Air Supply Pressure		Min	Max	5 kgf/cm2g		10.5 kgf/cm2g				
	9	Failure Position				Close						
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	10 in STD		10 in STD				
	11	Inlet Line ID				254.5 mm						
	12	Outlet Line ID				254.5 mm						
PROCESS CONDITIONS	13	Process Fluid	Fluid State					Liquid				
	14	% Flash	% Solids			----		----				
	15	Differential Pressure- Shutoff				21.4 kgf/cm2						
						Units		@Max. Flow		@Norm. Flow	@Min. Flow	
	16	Flow Rate				A m3/h		79		64		32
	17	Inlet Pressure				kgf/cm2-g		18.31		18.35		18.44
	18	Pressure Drop				kgf/cm2		0.62		0.7		0.78
	19	Inlet Temperature				°C		-15.1		-15.1		-15.1
	20	Inlet Compressibility Factor				-						
	21	Inlet Viscosity				cP		0.07		0.07		0.07
	22	Inlet Vapour Pressure				kgf/cm2-a		18.43		18.43		18.43
23	Critical Pressure				kgf/cm2-a		49.97		49.97		49.97	
CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min			76.8		58.5		27.7
	25	Travel				%		Vendor to furnish				
	26	Inlet Velocity				m/sec		Vendor to furnish				
	27	Sound Pressure Level @Max Flow				dBA		58.4		59.1		56.7
BODY AND TRIM	28	Manufacturer				Vendor to furnish						
	29	Model				Vendor to furnish						
	30	Body Type				Single Seat Globe						
	31	Body Size				6 in						
	32	Trim Size				Vendor to furnish						
	33	Rated Cv	Characteristics			Vendor to furnish		Eq. %				
	34	End Connection & Rating				6" , 300#						
	35	Facing Finish				RF 125 AARH						
	36	Body, Bonnet Material				ASTM A 352 GR.LCB or better						
	37	Packing Material				PTFE/Graphite(Vendor to specify)						
	38	Guiding				Vendor to furnish						
	39	Trim Type				Single Seat						
	40	Rated Travel				Vendor to furnish						
	41	Trim Material				Vendor to furnish						
	42	Gasket Material				Vendor to furnish						
	43	Soft Seat Material				Vendor to furnish						
44	Type of Bonnet				Extended							
ACTUATOR	45	Manufacturer				Vendor to furnish						
	46	Model				Vendor to furnish						
	47	Type				Single Acting Pneumatic Spring Diaphragm						
	48	Hand Wheel Location				-----						
	49	Bench Range				Vendor to furnish						
	50	Spring Action				Close						
POSITIONER	51	Manufacturer				Vendor to furnish						
	52	Model				Vendor to furnish						
	53	Signal				4-20mA HART						
	54	Type				SMART Positioner						
	55	Air Supply pressure				Vendor to furnish						
	56	Gauges				Reqd. 2 nos						
	57	Manufacturer				Vendor to furnish						
	58	Model				Vendor to furnish						

SOLENOID VALVE	59	Rating	110 VAC; $\approx$ 3.5W(Low Power)	
	60	Type	3-Way Universal	
	61	When De-Energise	Actuator Pneumatic pressure to be vented	
	62	Tag No	113-FV-7501	
AIR SET	69	Manufacturer	Vendor to furnish	
	70	Model	Vendor to furnish	
	71	Set Pressure	Vendor to furnish	
	72	Filter	Gauge	Required Yes, 1 No.
TIGHTNESS	73	Leakage Class	ANSI V	

Tag Number- 113-FV-7501

Notes:-

1	Design temperature: -45 deg. C; Design Pressure: 21.4 Kg/cm ² ; Density: 427.743 Kg/m ³ .
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Cryogenic testing requirements as specified in SIV shall be complied.
4	Vendor shall supply valve with all the accessories in installed condition.
5	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-PV-6402

Annexure-B5

GENERAL	1	Tag No			113-PV-6402				
	2	Service			METHANE OFF GAS FROM EP-329X				
	3	Line No.			10"-P-113-6201-A2K				
	4	Area Classification			IEC Zone-2, Gr.IIC, T3				
	5	Ambient Temperature		Min	Max	1°C		39.8°C	
	6	Allowable Sound Pressure Level		DbA		85			
	7	Control Action On-Off(OR) Modulating			Modulating				
	8	Available Air Supply Pressure		Min	Max	5 kgf/cm2g		10.5 kgf/cm2g	
	9	Failure Position			Close				
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	10 in 10S			
	11	Inlet Line ID			264.7 mm				
	12	Outlet Line ID			264.7 mm				
PROCESS CONDITIONS	13	Process Fluid		Fluid State		METHANE OFF GAS FROM EP-329X		Gas/Vapour	
	14	% Flash		% Solids		----		----	
	15	Differential Pressure- Shutoff			8.6 kgf/cm2				
						Units	@Max. Flow	@Norm. Flow	@Min. Flow
	16	Flow Rate				kg/hr	10797	9630	4635
	17	Inlet Pressure				kgf/cm2-g	5.88	5.89	5.91
	18	Pressure Drop				kgf/cm2	0.7	0.74	0.86
	19	Inlet Temperature				°C	35	35	35
	20	Inlet Compressibility Factor				-		1	
	21	Inlet Viscosity				cP	0.012	0.012	0.012
	22	Inlet Vapour Pressure				kgf/cm2-a			
	23	Critical Pressure				kgf/cm2-a	33.29	33.29	33.29
CALCULATED RESULTS	24	Flow Coefficient Cv		Max	Nor	Min	305	265	120
	25	Travel					%	Vendor to furnish	
	26	Inlet Velocity					m/sec	Vendor to furnish	
	27	Sound Pressure Level @Max Flow					dBA	80.5	81.5
BODY AND TRIM	28	Manufacturer			Vendor to furnish				
	29	Model			Vendor to furnish				
	30	Body Type				Single Seat Globe			
	31	Body Size				6 in			
	32	Trim Size			data to be furnished by Vendor				
	33	Rated Cv		Characteristics		data to be furnished by Vendor		Eq. %	
	34	End Connection & Rating			6" , 150#				
	35	Facing Finish			RF 125 AARH				
	36	Body, Bonnet Material			ASTM A 351 GR. CF8				
	37	Packing Material			PTFE/Graphite(Vendor to specify)				
	38	Guiding			Vendor to furnish				
	39	Trim Type			Single Seat				
	40	Rated Travel			Vendor to furnish				
	41	Trim Material			Vendor to furnish				
	42	Gasket Material			Vendor to furnish				
	43	Soft Seat Material			Vendor to furnish				
	44	Type of Bonnet			Extended				
ACTUATOR	45	Manufacturer			Vendor to furnish				
	46	Model			Vendor to furnish				
	47	Type			Single Acting Pneumatic Spring Diaphragm				
	48	Hand Wheel Location			-----				
	49	Bench Range			Vendor to furnish				
	50	Spring Action			Close				
POSITIONER	51	Manufacturer			Vendor to furnish				
	52	Model			Vendor to furnish				
	53	Signal			4-20mA HART				
	54	Type			SMART Positioner				
	55	Air Supply pressure			Vendor to furnish				
	56	Gauges			Reqd. 2 nos				
SOLENOID VALVE	57	Manufacturer			Vendor to furnish				
	58	Model			Vendor to furnish				
	59	Rating			110 VAC; ≈ 3.5W(Low Power)				
	60	Type			3-Way Universal				
	61	When De-Energise			Actuator Pneumatic pressure to be vented				
	62	Tag No			113-PY-6402				
SWITCHES	63	Manufacturer			Vendor to furnish				
	64	Model			Vendor to furnish				
	65	Type		Quantity		Proximity		1	
	66	Contact/Rating			24 VDC				
	67	Switching Position			Closed				

	68	Tag No	113-PZLC-6402	
AIR SET	69	Manufacturer	Vendor to furnish	
	70	Model	Vendor to furnish	
	71	Set Pressure	Vendor to furnish	
	72	Filter	Gauge	Required
				Yes, 1 No.
TIGHTNESS	73	Leakage Class	ANSI V	

Tag Number- 113-PV-6402

Notes:-

1	Design temperature: -180 deg. C; Design Pressure: 8.6 Kg/cm ² ; Density: 2.757 Kg/m ³ .
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Cryogenic testing requirements as specified in SIV shall be complied.
4	M.W. = 10.44
5	Sp. Heat Ratio(Cp/Cv) = 1.343
6	Vendor shall supply valve with all the accessories in installed condition.
7	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-TV-6901B
Annexure-B6

GENERAL	1	Tag No			113-TV-6901B			
	2	Service			C2 HC			
	3	Line No.			8"-P-113-6902-B4A-IC			
	4	Area Classification			IEC Zone-2, Gr.IIC, T3			
	5	Ambient Temperature	Min	Max	1°C	39.8°C		
	6	Allowable Sound Pressure Level	dBA		85			
	7	Control Action On-Off(OR) Modulating			Modulating			
	8	Available Air Supply Pressure	Min	Max	5 kgf/cm2g	10.5 kgf/cm2g		
	9	Failure Position			Open			
PIPE LINE	10	Line Size and Schedule	Inlet	Outlet	8 in STD	8 in STD		
	11	Inlet Line ID			202.7 mm			
	12	Outlet Line ID			202.7 mm			
PROCESS CONDITIONS	13	Process Fluid	Fluid State			Gas/Vapour		
	14	% Flash	% Solids		----	----		
	15	Differential Pressure- Shutoff			25.5 kgf/cm2			
					Units	@Max. Flow	@Norm. Flow	@Min. Flow
	16	Flow Rate			kg/hr	23627		
	17	Inlet Pressure			kgf/cm2-g	19.92		
	18	Pressure Drop			kgf/cm2	0.33		
	19	Inlet Temperature			°C	-20.3		
	20	Inlet Compressibility Factor			-		0.73	
	21	Inlet Viscosity			cP	0.009		
22	Inlet Vapour Pressure			kgf/cm2-a				
23	Critical Pressure			kgf/cm2-a	51.05			
CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min		247	
	25	Travel			%	Vendor to furnish		
	26	Inlet Velocity			m/sec	Vendor to furnish		
	27	Sound Pressure Level @Max Flow			dBA	30.6		
BODY AND TRIM	28	Manufacturer			Vendor to furnish			
	29	Model			Vendor to furnish			
	30	Body Type			Single Seat Globe			
	31	Body Size			8 in			
	32	Trim Size			Vendor to furnish			
	33	Rated Cv	Characteristics		Vendor to furnish	Eq. %		
	34	End Connection & Rating			8" , 300#			
	35	Facing Finish			RF 125 AARH			
	36	Body, Bonnet Material			ASTM A 352 GR. LCB OR BETTER			
	37	Packing Material			PTFE/Graphite(Vendor to specify)			
	38	Guiding			Vendor to furnish			
	39	Trim Type			Single Seat			
	40	Rated Travel			Vendor to furnish			
	41	Trim Material			Vendor to furnish			
	42	Gasket Material			Vendor to furnish			
	43	Soft Seat Material			Vendor to furnish			
	44	Type of Bonnet			Extended			
ACTUATOR	45	Manufacturer			Vendor to furnish			
	46	Model			Vendor to furnish			
	47	Type			Pneumatic Spring Diaphragm			
	48	Hand Wheel Location			----			
	49	Bench Range			Vendor to furnish			
	50	Spring Action			Open			
POSITIONER	51	Manufacturer			Vendor to furnish			
	52	Model			Vendor to furnish			
	53	Signal			4-20mA HART			
	54	Type			SMART Positioner			
	55	Air Supply pressure			Vendor to furnish			
	56	Gauges			Reqd. 2 nos			
SOLENOID	57	Manufacturer			Vendor to furnish			
	58	Model			Vendor to furnish			
	59	Rating			110 VAC; ≈ 3.5W(Low power)			

VALVE	60	Type	3-Way Universal	
	61	When De-Energise	Actuator Pneumatic pressure to be vented	
	62	Tag No	113-TY-6901B	
SWITCHES	63	Manufacturer	Vendor to furnish	
	64	Model	Vendor to furnish	
	65	Type	Quantity	Proximity 1
	66	Contact/Rating	24 VDC	
	67	Switching Position	Full Open	
AIR SET	68	Tag No	113-TZLO-6901B	
	69	Manufacturer	Vendor to furnish	
	70	Model	Vendor to furnish	
	71	Set Pressure	Vendor to furnish	
TIGHTNESS	72	Filter	Gauge	Required Yes, 1 No.
	73	Leakage Class	ANSI IV (standard)	

Tag Number- 113-TV-6901B

Notes:-

1	Design temperature: -45/65 deg. C; Design Pressure: 25.5 Kg/cm ² ; Density: 38.562 Kg/m ³ .
2	MW shall be 28.64.
3	Cp/Cv shall be 1.791.
4	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
5	Cryogenic testing requirements as specified in SIV shall be complied.
7	Vendor shall supply valve with all the accessories in installed condition.
8	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-TV-6902B**Annexure-B7**

GENERAL	1	Tag No				113-TV-6902B				
	2	Service				C2 HC				
	3	Line No.				8"-P-113-6901-B4A-IC				
	4	Area Classification				IEC Zone-2, Gr.IIC, T3				
	5	Ambient Temperature		Min	Max	1°C		39.8°C		
	6	Allowable Sound Pressure Level		Db		85				
	7	Control Action On-Off(OR) Modulating				Modulating				
	8	Available Air Supply Pressure		Min	Max	5 kgf/cm2g		10.5 kgf/cm2g		
	9	Failure Position				Open				
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	8 in STD		8 in STD		
	11	Inlet Line ID				202.7 mm				
	12	Outlet Line ID				202.7 mm				
PROCESS CONDITIONS	13	Process Fluid		Fluid State				Gas/Vapour		
	14	% Flash		% Solids						
	15	Differential Pressure- Shutoff				25.5 kgf/cm2				
						Units		@Max. Flow	@Norm. Flow	@Min. Flow
	16	Flow Rate				kg/hr		23627		
	17	Inlet Pressure				kgf/cm2-g		19.92		
	18	Pressure Drop				kgf/cm2		0.33		
	19	Inlet Temperature				°C		-20.3		
	20	Inlet Compressibility Factor				-			0.73	
	21	Inlet Viscosity				cP		0.009		
	22	Inlet Vapour Pressure				kgf/cm2-a				
	23	Critical Pressure				kgf/cm2-a		51.05		
CALCULATED RESULTS	24	Flow Coefficient Cv		Max	Nor	Min		247		
	25	Travel				%		Vendor to furnish		
	26	Inlet Velocity				m/sec		Vendor to furnish		
	27	Sound Pressure Level @Max Flow				dBA		30.6		
BODY AND TRIM	28	Manufacturer				Vendor to furnish				
	29	Model				Vendor to furnish				
	30	Body Type				Single Seat Globe				
	31	Body Size				8 in				
	32	Trim Size				Vendor to furnish				
	33	Rated Cv		Characteristics		Vendor to furnish		Eq. %		
	34	End Connection & Rating				8" , 300#				
	35	Facing Finish				RF 125 AARH				
	36	Body, Bonnet Material				ASTM A 352 GR. LCB OR BETTER				
	37	Packing Material				PTFE/Graphite(Vendor to specify)				
	38	Guiding				Vendor to furnish				
	39	Trim Type				Single Seat				
	40	Rated Travel				Vendor to furnish				
	41	Trim Material				Vendor to furnish				
	42	Gasket Material				Vendor to furnish				
	43	Soft Seat Material				Vendor to furnish				
	44	Type of Bonnet				Extended				
ACTUATOR	45	Manufacturer				Vendor to furnish				
	46	Model				Vendor to furnish				
	47	Type				single Acting Pneumatic Spring Diaphragm				
	48	Hand Wheel Location				-----				
	49	Bench Range				Vendor to furnish				
	50	Spring Action				Open				
POSITIONER	51	Manufacturer				Vendor to furnish				
	52	Model				Vendor to furnish				
	53	Signal				4-20mA HART				
	54	Type				SMART Positioner				
	55	Air Supply pressure				Vendor to furnish				
	56	Gauges				Reqd. 2 nos				
	57	Manufacturer				Vendor to furnish				

SOLENOID VALVE	58	Model	Vendor to furnish	
	59	Rating	110 VAC; $\approx$ 3.5W(Low Power)	
	60	Type	3-Way Universal	
	61	When De-Energise	Actuator Pneumatic pressure to be vented	
	62	Tag No	113-TY-6902B	
SWITCHES	63	Manufacturer	Vendor to furnish	
	64	Model	Vendor to furnish	
	65	Type	Quantity	Proximity 1
	66	Contact/Rating	24 VDC	
	67	Switching Position	Full Open	
	68	Tag No	113-TZLO-6902B	
AIR SET	69	Manufacturer	Vendor to furnish	
	70	Model	Vendor to furnish	
	71	Set Pressure	Vendor to furnish	
	72	Filter	Gauge	Required Yes, 1 No.
TIGHTNESS	73	Leakage Class	ANSI IV (standard)	

Tag Number- 113-TV-6902B

Notes:-

1	Design temperature: -45/65 deg. C; Design Pressure: 25.5 Kg/cm ² ; Density: 38.562 Kg/m ³ .
2	MW shall be 28.64.
3	Cp/Cv shall be 1.791.
4	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
5	Cryogenic testing requirements as specified in SIV shall be complied.
6	Vendor shall supply valve with all the accessories in installed condition.
7	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-PV-9202**Annexure-B8**

GENERAL	1	Tag No			113-PV-9202				
	2	Service			MEDIUM TR VAPURS FROM 113-VV-505				
	3	Line No.			10"-TR-113-9207-B4A-IC				
	4	Area Classification			IEC Zone-2, Gr.IIC, T3				
	5	Ambient Temperature		Min	Max	1°C	39.8°C		
	6	Allowable Sound Pressure Level		Db		85			
	7	Control Action On-Off(OR) Modulating			Modulating				
	8	Available Air Supply Pressure		Min	Max	5 kgf/cm2g	10.5 kgf/cm2g		
	9	Failure Position			Close				
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	10 in STD			
	11	Inlet Line ID			254.50 mm				
	12	Outlet Line ID			254.50 mm				
PROCESS CONDITIONS	13	Process Fluid	Fluid State		Tertiary Refrigerant Vapour		Gas/Vapour		
	14	% Flash	% Solids						
	15	Differential Pressure- Shutoff			20 kgf/cm2				
					Units		@Max. Flow	@Norm. Flow	@Min. Flow
	16	Flow Rate			kg/hr		25096	20598	7826
	17	Inlet Pressure			kgf/cm2-g		8.69	8.7	8.71
	18	Pressure Drop			kgf/cm2		0.61	0.71	0.87
	19	Inlet Temperature			°C		-11.3	-11.3	-11.3
	20	Inlet Compressibility Factor			-				
	21	Inlet Viscosity			cP		0.009	0.009	0.009
	22	Inlet Vapour Pressure			kgf/cm2-a				
	23	Critical Pressure			kgf/cm2-a		47.07	47.07	47.07
CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min	333	255	88.3	
	25	Travel			%		Vendor to furnish		
	26	Inlet Velocity			m/sec		Vendor to furnish		
	27	Sound Pressure Level @Max Flow			dBA		59.1	61.9	65.6
BODY AND TRIM	28	Manufacturer			Vendor to furnish				
	29	Model			Vendor to furnish				
	30	Body Type			Single Seat Globe				
	31	Body Size			6 in				
	32	Trim Size			Vendor to furnish				
	33	Rated Cv	Characteristics		Vendor to furnish		Eq. %		
	34	End Connection & Rating			6" , 300#				
	35	Facing Finish			RF 125 AARH				
	36	Body, Bonnet Material			ASTM A 352 GR. LCB OR BETTER				
	37	Packing Material			PTFE/Graphite(Vendor to specify)				
	38	Guiding			Vendor to furnish				
	39	Trim Type			Single Seat				
	40	Rated Travel			Vendor to furnish				
	41	Trim Material			Vendor to furnish				
	42	Gasket Material			Vendor to furnish				
	43	Soft Seat Material			Vendor to furnish				
	44	Type of Bonnet			Extended				
ACTUATOR	45	Manufacturer			Vendor to furnish				
	46	Model			Vendor to furnish				
	47	Type			Single Acting Pneumatic Spring Diaphragm				
	48	Hand Wheel Location			Side				
	49	Bench Range			Vendor to furnish				
	50	Spring Action			Close				
POSITIONER	51	Manufacturer			Vendor to furnish				
	52	Model			Vendor to furnish				
	53	Signal			Foundation Fieldbus(FF)				
	54	Type			FF Positioner				
	55	Air Supply pressure			Vendor to furnish				
	56	Gauges			Reqd. 2 nos				
AIR SET	57	Manufacturer			Vendor to furnish				
	58	Model			Vendor to furnish				
	59	Set Pressure			Vendor to furnish				
	60	Filter		Gauge	Required		Yes, 1 No.		
TIGHTNESS	61	Leakage Class			ANSI IV (standard)				

Tag Number- 113-PV-9202

Notes:-

1	Design temperature: -45/65 deg. C; Design Pressure: 20 Kg/cm ² ; Density: 13.736 Kg/m ³ .
2	M.W. = 28.44; Compressibility(Z) = 0.91; Sp. Heat Ratio(Cp/Cv) = 1.311
3	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
4	Cryogenic testing requirements as specified in SIV shall be complied.
5	Vendor shall supply valve with all the accessories in installed condition.
6	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 115-FV-1405
Annexure-B9

GENERAL	1	Tag No			115-FV-1405				
	2	Service			MP1 STEAM				
	3	Line No.			3"-SM1-115-1401-B2A-IH				
	4	Area Classification			IEC Zone-2, Gr.IIA / IIB, T3				
	5	Ambient Temperature	Min	Max	1°C	39.8°C			
	6	Allowable Sound Pressure Level	Dba		85				
	7	Control Action On-Off(OR) Modulating			Modulating				
	8	Available Air Supply Pressure	Min	Max	5 kgf/cm2g	10.5 kgf/cm2g			
	9	Failure Position			Close				
PIPE LINE	10	Line Size and Schedule	Inlet	Outlet	3 in STD	3 in STD			
	11	Inlet Line ID			77.9 mm				
	12	Outlet Line ID			77.9 mm				
PROCESS CONDITIONS	13	Process Fluid	Fluid State		Steam	Steam			
	14	% Flash	% Solids						
	15	Differential Pressure- Shutoff			21 kgf/cm2				
					Units	@Max. Flow	@Norm. Flow	@Min. Flow	
	16	Flow Rate			kg/hr	1700	909	240	
	17	Inlet Pressure			kgf/cm2-g	15	15.01	15.03	
	18	Pressure Drop			kgf/cm2	0.7	0.71	0.73	
	19	Inlet Temperature			°C	290	290	290	
	20	Inlet Compressibility Factor			-		0.96		
	21	Inlet Viscosity			cP	0.958	0.958	0.958	
	22	Inlet Vapour Pressure			kgf/cm2-a				
23	Critical Pressure			kgf/cm2-a					
CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min		30.7	16.3	4.24
	25	Travel			%	Vendor to furnish			
	26	Inlet Velocity			m/sec	Vendor to furnish			
	27	Sound Pressure Level @Max Flow			dBA	49.9	49.9	50.3	
BODY AND TRIM	28	Manufacturer			Vendor to furnish				
	29	Model			Vendor to furnish				
	30	Body Type			Single Seat Globe				
	31	Body Size			2 in				
	32	Trim Size			Vendor to furnish				
	33	Rated Cv	Characteristics		Vendor to furnish	Eq. %			
	34	End Connection & Rating			2" , 300#				
	35	Facing Finish			RF 125 AARH				
	36	Body, Bonnet Material			ASTM A 216 GR. WCB				
	37	Packing Material			Grafoil				
	38	Guiding			Vendor to furnish				
	39	Trim Type			Single Seat				
	40	Rated Travel			Vendor to furnish				
	41	Trim Material			Vendor to furnish				
	42	Gasket Material			Vendor to furnish				
	43	Soft Seat Material			Vendor to furnish				
	44	Type of Bonnet			Radiation Finned				
	ACTUATOR	45	Manufacturer			Vendor to furnish			
46		Model			Vendor to furnish				
47		Type			Single Acting Pneumatic Spring Diaphragm				
48		Hand Wheel Location			-----				
49		Bench Range			Vendor to furnish				
50		Spring Action			Close				
POSITIONER	51	Manufacturer			Vendor to furnish				
	52	Model			Vendor to furnish				
	53	Signal			4-20mA HART				
	54	Type			SMART Positioner				
	55	Air Supply pressure			Vendor to furnish				
	56	Gauges			Reqd. 2 nos				
	57	Manufacturer			Vendor to furnish				
	58	Model			Vendor to furnish				

SOLENOID VALVE	59	Rating	110 VAC; $\approx$ 3.5W(Low Power)	
	60	Type	3-Way Universal	
	61	When De-Energise	Actuator Pneumatic pressure to be vented	
	62	Tag No	115-FY-1405	
SWITCHES	63	Manufacturer	Vendor to furnish	
	64	Model	Vendor to furnish	
	65	Type	Quantity	Proximity 1
	66	Contact/Rating	24 VDC	
	67	Switching Position	Close	
	68	Tag No	115-FZLC-1405	
AIR SET	69	Manufacturer	Vendor to furnish	
	70	Model	Vendor to furnish	
	71	Set Pressure	Vendor to furnish	
	72	Filter	Gauge	Required Yes, 1 No.
TIGHTNESS	73	Leakage Class	ANSI V	

Tag Number- 115-FV-1405

Notes:-

1	Design temperature: 330 deg. C; Design Pressure: 21.0/FV Kg/cm ² ; Density: 6.329 Kg/m ³ .
2	IBR requirements as specified in SIV shall be complied.
3	Vendor shall supply valve with all the accessories in installed condition.
4	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-FV-6233
Annexure-B10

GENERAL	1	Tag No			113-FV-6233		
	2	Service			DEMETHANIZER FEED 4 TO EP-321X		
	3	Line No.			3"-P-113-6240-B2K-IC		
	4	Area Classification			IEC Zone-2, Gr.IIC, T3		
	5	Ambient Temperature	Min	Max	1°C	39.8°C	
	6	Allowable Sound Pressure Level	dBA		85		
	7	Control Action On-Off(OR) Modulating			Modulating		
	8	Available Air Supply Pressure	Min	Max	5 kgf/cm2g	10.5 kgf/cm2g	
	9	Failure Position			Close		
PIPE LINE	10	Line Size and Schedule	Inlet	Outlet	3 in 10S		
	11	Inlet Line ID			161.5 mm		
	12	Outlet Line ID			161.5 mm		
PROCESS CONDITIONS	13	Process Fluid	Fluid State		DEMETHANIZER FEED 4 TO EP-321X	Liquid	
	14	% Flash	% Solids				
	15	Differential Pressure- Shutoff			39.4 kgf/cm2		
					Units	@Max. Flow	@Norm. Flow
	16	Flow Rate			A m3/h	86	74
	17	Inlet Pressure			kgf/cm2-g	32.27	32.29
	18	Pressure Drop			kgf/cm2	24.16	24.24
	19	Inlet Temperature			°C	-76.4	-76.4
	20	Inlet Compressibility Factor			-		
	21	Inlet Viscosity			cP	0.121	0.121
	22	Inlet Vapour Pressure			kgf/cm2-a	33.1	33.1
	23	Critical Pressure			kgf/cm2-a	48.88	48.88
	CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min	28.2
25		Travel			%	Vendor to furnish	
26		Inlet Velocity			m/sec	Vendor to furnish	
27		Sound Pressure Level @Max Flow			dBA		
BODY AND TRIM	28	Manufacturer			Vendor to furnish		
	29	Model			Vendor to furnish		
	30	Body Type			Single Seat Globe		
	31	Body Size			3 in		
	32	Trim Size			Vendor to furnish		
	33	Rated Cv	Characteristics		Vendor to furnish	Eq. %	
	34	End Connection & Rating			3" , 300#		
	35	Facing Finish			RF 125 AARH		
	36	Body, Bonnet Material			ASTM A 351 GR. CF8		
	37	Packing Material			Grafoil/PTFE(Vendor to specify)		
	38	Guiding			Vendor to furnish		
	39	Trim Type			Single Seat		
	40	Rated Travel			Vendor to furnish		
	41	Trim Material			Vendor to furnish		
	42	Gasket Material			Vendor to furnish		
	43	Soft Seat Material			Vendor to furnish		
	44	Type of Bonnet			Extended		
ACTUATOR	45	Manufacturer			Vendor to furnish		
	46	Model			Vendor to furnish		
	47	Type			Single Acting Pneumatic Spring Diaphragm		
	48	Hand Wheel Location			-----		
	49	Bench Range			Vendor to furnish		
POSITIONER	50	Spring Action			Close		
	51	Manufacturer			Vendor to furnish		
	52	Model			Vendor to furnish		
	53	Signal			4-20mA HART		
	54	Type			SMART Positioner		
	55	Air Supply pressure			Vendor to furnish		
AIR SET	56	Gauges			Reqd. 2 nos		
	57	Manufacturer			Vendor to furnish		
	58	Model			Vendor to furnish		
	59	Set Pressure			Vendor to furnish		
TIGHTNESS	60	Filter	Gauge		Required	Yes, 1 No.	
	61	Leakage Class			ANSI IV (standard)		

Tag Number- 113-FV-6233

Notes:-

1	Design temperature: -180 deg. C; Design Pressure: 39.4 Kg/cm2; Density: 533.774 Kg/m3.
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Cryogenic test requirements as specified in SIV shall be complied.
4	Service is flashing.
5	Vendor shall supply valve with all the accessories in installed condition.
6	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-FV-6234
Annexure - B11

GENERAL	1	Tag No	113-FV-6234			
	2	Service	DEMETHANIZER FEED 4 TO EP-321X			
	3	Line No.	4"-P-113-6241-B2K-IC			
	4	Area Classification	IEC Zone-2, Gr.IIC, T3			
	5	Ambient Temperature	Min	Max	1°C	39.8°C
	6	Allowable Sound Pressure L _d DbA	85			
	7	Control Action On-Off(OR) Modulating	Modulating			
	8	Available Air Supply Pressure	Min	Max	5 kgf/cm ² g	10.5 kgf/cm ² g
	9	Failure Position	Close			
PIPE LINE	10	Line Size and Schedule	Inlet	Outlet	4 in 10S	
	11	Inlet Line ID	108.2 mm			
	12	Outlet Line ID	108.2 mm			
PROCESS CONDITIONS	13	Process Fluid	Fluid State	DEMETHANIZER FEED 4 TO EP-321X		Liquid
	14	% Flash	% Solids			
	15	Differential Pressure- Shutoff	39.4 kgf/cm ²			
			Units		@Max. Flow	@Norm. Flow
	16	Flow Rate	A m ³ /h		37	32
	17	Inlet Pressure	kgf/cm ² -g		32.13	32.15
	18	Pressure Drop	kgf/cm ²		23.82	24
	19	Inlet Temperature	°C		-76.4	-76.4
	20	Inlet Compressibility Factor	-			
	21	Inlet Viscosity	cP		0.121	0.121
	22	Inlet Vapour Pressure	kgf/cm ² -a		33.1	33.1
	23	Critical Pressure	kgf/cm ² -a		48.88	48.88
	24	Flow Coefficient Cv	Max	Nor	Min	12.3
	25	Travel	%		Vendor to furnish	
	26	Inlet Velocity	m/sec		Vendor to furnish	
CALCULATED RESULTS	27	Sound Pressure Level @Max Flow	dBA			
	28	Manufacturer	Vendor to furnish			
BODY AND TRIM	29	Model	Vendor to furnish			
	30	Body Type	Single Seat Globe			
	31	Body Size	2 in			
	32	Trim Size	Vendor to furnish			
	33	Rated Cv	Characteristics	Vendor to furnish		Eq. %
	34	End Connection & Rating	2" , 300#			
	35	Facing Finish	RF 125 AARH			
	36	Body, Bonnet Material	ASTM A 351 GR. CF8			
	37	Packing Material	Grafoil/PTFE(Vendor to specify)			
	38	Guiding	Vendor to furnish			
	39	Trim Type	Single Seat			
	40	Rated Travel	Vendor to furnish			
	41	Trim Material	Vendor to furnish			
	42	Gasket Material	Vendor to furnish			
	43	Soft Seat Material	Vendor to furnish			
	44	Type of Bonnet	Extended			
ACTUATOR	45	Manufacturer	Vendor to furnish			
	46	Model	Vendor to furnish			
	47	Type	Single Acting Pneumatic Spring Diaphragm			
	48	Hand Wheel Location	-----			
	49	Bench Range	Vendor to furnish			
POSITIONER	50	Spring Action	Close			
	51	Manufacturer	Vendor to furnish			
	52	Model	Vendor to furnish			
	53	Signal	4-20mA HART			
	54	Type	SMART Positioner			
	55	Air Supply pressure	Vendor to furnish			
	56	Gauges	Reqd. 2 nos			
AIR SET	57	Manufacturer	Vendor to furnish			
	58	Model	Vendor to furnish			
	59	Set Pressure	Vendor to furnish			
	60	Filter	Gauge	Required		Yes, 1 No.
TIGHTNESS	61	Leakage Class	ANSI IV (standard)			

Tag Number- 113-FV-6234
Notes:-

1	Design temperature: -180 deg. C; Design Pressure: 39.4 Kg/cm ² ; Density: 533.748 Kg/m ³ .
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Cryogenic test requirements as specified in SIV shall be complied.
4	Service is flashing.
5	Vendor shall supply valve with all the accessories in installed condition.
6	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 113-TV-6233
Annexure - B12

GENERAL	1	Tag No				113-TV-6233			
	2	Service				LIGHT TR FROM VV-507			
	3	Line No.				4"-TR-113-6238-B2K-IC			
	4	Area Classification				IEC Zone-2, Gr.IIC, T3			
	5	Ambient Temperature		Min	Max	1°C		39.8°C	
	6	Allowable Sound Pressure Level		Db	85				
	7	Control Action On-Off(OR) Modulating				Modulating			
	8	Available Air Supply Pressure		Min	Max	5 kgf/cm2g		10.5 kgf/cm2g	
	9	Failure Position				Close			
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	4 in 10S			
	11	Inlet Line ID				108.2 mm			
	12	Outlet Line ID				108.2 mm			
PROCESS CONDITIONS	13	Process Fluid		Fluid State		LIGHT TR FROM VV-507		Liquid	
	14	% Flash		% Solids					
	15	Differential Pressure- Shutoff				30 kgf/cm2			
						Units		@Max. Flow	@Norm. Flow @Min. Flow
	16	Flow Rate				A m3/h		27	
	17	Inlet Pressure				kgf/cm2-g		24.51	
	18	Pressure Drop				kgf/cm2		23.33	
	19	Inlet Temperature				°C		-72	
	20	Inlet Compressibility Factor				-			
	21	Inlet Viscosity				cP		0.143	
	22	Inlet Vapour Pressure				kgf/cm2-a		24.19	
	23	Critical Pressure				kgf/cm2-a		47.12	
CALCULATED RESULTS	24	Flow Coefficient Cv		Max	Nor	Min	10.3		
	25	Travel				%		Vendor to furnish	
	26	Inlet Velocity				m/sec		Vendor to furnish	
	27	Sound Pressure Level @Max Flow				dBA			
BODY AND TRIM	28	Manufacturer				Vendor to furnish			
	29	Model				Vendor to furnish			
	30	Body Type		Single Seat Globe					
	31	Body Size		2 in					
	32	Trim Size				Vendor to furnish			
	33	Rated Cv		Characteristics		Vendor to furnish		Eq. %	
	34	End Connection & Rating				2" , 300#			
	35	Facing Finish				RF 125 AARH			
	36	Body, Bonnet Material				ASTM A 351 GR. CF8			
	37	Packing Material				Grafoil/PTFE(Vendor to specify)			
	38	Guiding				Vendor to furnish			
	39	Trim Type				Single Seat			
	40	Rated Travel				Vendor to furnish			
	41	Trim Material				Vendor to furnish			
	42	Gasket Material				Vendor to furnish			
	43	Soft Seat Material				Vendor to furnish			
	44	Type of Bonnet				Extended			
ACTUATOR	45	Manufacturer				Vendor to furnish			
	46	Model				Vendor to furnish			
	47	Type				Single Acting Pneumatic Spring Diaphragm			
	48	Hand Wheel Location				-----			
	49	Bench Range				Vendor to furnish			
POSITIONER	50	Spring Action				Close			
	51	Manufacturer				Vendor to furnish			
	52	Model				Vendor to furnish			
	53	Signal				Foundation Fieldbus			
	54	Type				FF Positioner			
	55	Air Supply pressure				Vendor to furnish			
AIR SET	56	Gauges				Reqd. 2 nos			
	57	Manufacturer				Vendor to furnish			
	58	Model				Vendor to furnish			
	59	Set Pressure				Vendor to furnish			
TIGHTNESS	60	Filter		Gauge		Required		Yes, 1 No.	
	61	Leakage Class				ANSI IV (standard)			

Tag Number- 113-TV-6233
Notes:-

1	Design temperature: -75 deg. C; Design Pressure: 30 Kg/cm2; Density: 568.599 Kg/m3.
2	The valve shall have extended bonnet as per BS-6364 (Non cold box application).
3	Cryogenic test requirements as specified in SIV shall be complied.
4	Service is flashing.
5	Vendor shall supply valve with all the accessories in installed condition.
6	Asbestos free gasket and stem packing shall be used.

Specifications for Control Valve 118-PV-2405A
Annexure - B13

GENERAL	1	Tag No				118-PV-2405A				
	2	Service				HP Nitrogen from 118-VV-160				
	3	Line No.				1.5"-HHN-118-2403-F1D				
	4	Area Classification				IEC Zone-1, Gr.IIA / IIB, T3				
	5	Ambient Temperature		Min	Max					
	6	Allowable Sound Pressure L		Db	85					
	7	Control Action On-Off(OR) Modulating				Modulating				
	8	Available Air Supply Pressur		Min	Max	5 kgf/cm2g		10.5 kgf/cm2g		
	9	Failure Position				Open				
PIPE LINE	10	Line Size and Schedule		Inlet	Outlet	1 1/2 in 160		1 1/2 in 160		
	11	Inlet Line ID				1.383 in				
	12	Outlet Line ID				1.383 in				
PROCESS CONDITIONS	13	Process Fluid		Fluid State		Nitrogen		Gas/Vapour		
	14	% Flash		% Solids						
	15	Differential Pressure- Shutoff				165 kgf/cm2				
						Units		@Max. Flow	@Norm. Flow	@Min. Flow
	16	Flow Rate				kg/hr		80	6	4
	17	Inlet Pressure				kgf/cm2-g		81	81	81
	18	Pressure Drop				kgf/cm2		35	35	35
	19	Inlet Temperature				°C		50	50	50
	20	Inlet Compressibility Factor				-			1	
	21	Inlet Viscosity				cP				
	22	Inlet Vapour Pressure				Pa-a				
	23	Critical Pressure				bar-g				
CALCULATED RESULTS	24	Flow Coefficient Cv	Max	Nor	Min			0.0701	0.00526	0.00351
	25	Travel				%		Vendor to furnish		
	26	Inlet Velocity				m/sec		Vendor to furnish		
	27	Sound Pressure Level @Max Flow				dBA		60.3	37.8	34.2
BODY AND TRIM	28	Manufacturer				Vendor to furnish				
	29	Model				Vendor to furnish				
	30	Body Type				Single Seat Globe				
	31	Body Size				1 in				
	32	Trim Size				Vendor to furnish				
	33	Rated Cv		Characteristics		Vendor to furnish		Linear		
	34	End Connection & Rating				1" BW, 1500#				
	35	Facing Finish				Butt Weld				
	36	Body Material				ASTM A217 Gr.WC6 or ASTM A182Gr.F11 CL2. Material shall be Normalised and Tempered				
	37	Packing Material				PTFE/Graphite(Vendor to specify)				
	38	Guiding		No. of Ports		Vendor to furnish		1		
	39	Trim Type				Single Seat				
	40	Rated Travel				Vendor to furnish				
	41	Trim Material				Vendor to furnish				
	42	Gasket Material				Vendor to furnish				
	43	Soft Seat Material				Vendor to furnish				
	44	Type of Bonnet				Plain				
ACTUATOR	45	Manufacturer				Vendor to furnish				
	46	Model				Vendor to furnish				
	47	Type				Pneumatic Piston				
	48	Hand Wheel Location				Required				
	49	Bench Range				Vendor to furnish				
	50	Spring Action				Open				
POSITIONER	51	Manufacturer				Vendor to furnish				
	52	Model				Vendor to furnish				
	53	Signal				4-20mA HART				
	54	Type				SMART Positioner				
	55	Air Supply pressure				Vendor to furnish				
	56	Gauges				Reqd. 2 nos				
AIR SET	69	Manufacturer				Vendor to furnish				
	70	Model				Vendor to furnish				
	71	Set Pressure				Vendor to furnish				
	72	Filter		Gauge		Required		Yes, 1 No.		
TIGHTNESS	73	Leakage Class				ANSI IV (standard)				

Tag Number- 118-PV-2405A
Notes:-

1	Design temperature: 65 deg. C; Design Pressure: 165 Kg/cm2.
2	Mol.Wt. : 28.01 Kg/Kmol; Sp. Heat Ratio: 1.4
3	Modified equal % trim characteristic is also acceptable.
4	Asbestos free gasket and stem packing shall be used.
5	Radiography shall be performed after heat treatment.
6	Vendor shall supply valve with all the accessories in installed condition.

INSPECTION & TEST PLAN

1.0 SCOPE

This Inspection and Test Plan covers the minimum inspection and testing requirements for Control valve.

2.0 REFERENCE DOCUMENTS

PO/PR / Standards referred there in /Job specifications / Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

Sl. No.	Stage / Activity	Characteristics	Quantum of Check	Record	Scope of Inspection		
					Sub Supplier	Supplier	BCPL/TPIA
1.0	Material Inspection						
1.1	Accessories such as Positioners, I/P Converters, Solenoid valves, Limit Switches and Air filter Regulators etc.	Make, model no, functional check.	100%	Material Test Certificates / Test Lab Certificates	H	H	R
2.0	In Process Inspection						
2.1	Stellited & Hardened Trim (As specified)	D P Test	100%	Supplier's Test Records	—	H	R
2.2	NDT , Post Weld Heat Treatment (PWHT) (If specified)	• Radiography for weld joints • Dye Penetration test. • Post Weld Heat Treatment of welds	100%	NDT reports / PWHT chart	—	H	R
3.0	Final Inspection						

3.1	Final Inspection on assembled Valve	• Visual / Dimensional check • Hydrostatic test. • Helium leak test (if specified). • Check for valve characteristics like stroke, Linearity & Hysteresis, etc. • Functional tests including : i) Seat leakage test, lift characteristics. ii) Test on smart positioners. iii) Control valve dynamic response and response time verification.(If specified) iv) Test on Accessories. • Interoperability test for Field bus positioners. • Pneumatic test on actuator on representative samples. • Type test for valves in cryogenic service.(if specified) • capability of smart and field bus transmitters to accept multimeters and check for configuration, calibration, diagnostics through Hand Held terminal.	100%	Inspection Witness Record	—	H	RW
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3.2	Submission of certificates/document	• Certificate from testing agency like BASEEFA, FM, PTB, CIMFR etc. for accessories like solenoid valves, FP converters, Limit switches etc. for use in specified hazardous area. • BIS approval for explosion proof construction of above accessories manufactured indigenously. • Statutory approval certificates for instruments from CCOE/PESO for use in specified hazardous area. • Degree of protection certificate (IP) for instrument housing. • "LRIS,DNV BV or TUV certified Cryogenic Type test report"	Prototype for each model	Statutory Approval Certificates / Type Test Certificates	–	H	R
4.0	Packing						
4.1	Packing	• Suitable protection to prevent entry of foreign material.	100%	Test Records	–	H	
5.0	Documentation and IC						
5.1	Documentation and IC	• Review of Internal Test Reports, MTC • Issuance of Inspection Certificate	100%	Supplier Test Records / IC	–	H	H
5.2	Final Document submission	Compilation of Inspection reports ,drawings, etc as per PR	100%	Final data folder /Completeness certificate	–	H	H

Legends: H- Hold (Do not proceed without approval, R- Review, RW-Random witness (As specified or 10 % - Samples must include min 1 No of each type), W- Witness (Give due notice, work may proceed after scheduled date).

Procurement of Control Valves in ECU & PPU

SPECIAL INSTRUCTION TO VENDORS (SIV)

PART-A

BIDDING INSTRUCTIONS

A1. The vendor is responsible to meet all the technical requirements in this Purchase Requisition including instrument data sheets. If at any stage, till the completion of order, the offered instruments and its accessories are found unsuitable to meet the PR specification, vendor shall replace the same with suitable items, without any time / cost implication.

A2. The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the purchaser's enquiry;

ASME	American Society of Mechanical Engineer
B 1.20.1	Pipe Threads, General Purpose (Inch)
B 16.5	Pipe Flanges and Flanged Fittings
B 16.20	Metallic Gaskets for Pipe Flanges, Ring Joint, Spiral Wound and Jacketed
B 16.34	Valves – flanged, Threaded and Welding End
B 16.47-B	Large Diameter Steel Flanges
ANSI / FCI	American National Standard Institute / Fluid Control Institute
FCI 70-2	Control Valve Seat Leakage
API	American Petroleum Institute
6 D	Pipeline valves (Gate valve, Plug, Ball and Check valves)
598	Inspection Requirements
609	Lug and wafer type, Butterfly valves
AWWA C207	Class D American Water Works Association – Steel Pipe Flanges for Water Works Services
BS	British Standards
6364	Valves in cryogenic service
EN	European Standards
10204	Inspection Documents for Metallic Products
61056-1	Specification for performance, design and construction of valve, regulated sealed type
IBR	Indian Boiler Regulation
IS/IEC	Indian Standards / International Electro-Technical Commission
IS/IEC 60079	Electrical Apparatus for Explosive Gas Atmosphere
IS/IEC 60529	Degree of Protection Provided by Enclosures
IEC 60534-3-2	Face to Face dimension of rotary valves except butterfly valves
IEC 60534-4	Seat leakage
IEC 60534-8.3	Industrial process control valves, noise consideration, control valve aerodynamic noise prediction method

Procurement of Control Valves in ECU & PPU

IEC 60534-8.4	Industrial process control valves, noise consideration, prediction of noise generated by hydrodynamic flow
IEC 61158	Fieldbus Standard for use in Industrial Control system
IEC 61158-2	Physical layer specification and Service definition for Fieldbus
FF890	Function Block Application Process Part 1
FF891	Function Block Application Process Part 2
FF892	Function Block Application Process Part 3
FF893	Function Block Application Process Part 4
FF894	Function Block Application Process Part 5
IEC 61508	Functional Safety of Electrical/Electronic/ Programmable Electronic Safety related Systems
IEC 61511	Functional Safety Instrumented system for the Process Industry sector
IEC 61804	Function Blocks (FB) for Process Control; Electronic Device Description

ISA	International Society of Automation
75.01.01	Flow equation for sizing control valves
75.02	Control valve capacity test procedure
TR75.04	Control valve positioned stability
75.05.01	Control valve terminology
75.07	Laboratory measurement of aerodynamic noise generated by control valves
75.08.01	Face to face dimensions for integral flanged Globe-style control valve bodies (ASME Class 125, 150, 300 and 600)
75.08.02	Face to face dimensions for flangeless control valve (ASME Class 150, 300 and 600)
75.08.04	Face to face dimensions for Butt weld-end globe style control valve (ASME Class 4500)
75.08.05	Face to face dimensions for Butt weld-end globe style control valve (ASME Class 150, 300, 600, 900, 1500 and 2500)
75.08.06	Face to face dimensions for flanged Globe style control valve bodies (ASME Class 900, 1500 and 2500)
75.11.01	Inherent flow characteristic and Rangeability of control valves
75.19.01	Hydrostatic testing of control valves
75.22	Face to centre-line dimensions for flanged Globe-style Angle control valve bodies (ASME Class 150, 300 and 600)
75.25.01	Test Procedure for Control valve response measurement for step inputs
TR 75.25.02	Control valve response measurement for step inputs
75.13	Method of evaluating the performance of positioners with analog input signals and pneumatic output
75.17	Control valve aerodynamic noise prediction
RP75.23	Considerations for evaluating control valve cavitation

ITK Interoperability Test Kit (latest version)

MSS Manufacturer's Standardisation Society
 SP25 Standard Markings System for Valves, Fittings, Flanges and Unions

NACE National Association of Common Engineers

Procurement of Control Valves in ECU & PPU

MR0103 Materials Resistant to Sulphide stress cracking in Corrosive Petroleum Refinery Environments

OSHA Occupational Safety and Health Authority

PART-B **SPECIFIC JOB REQUIREMENTS**

B1. Vendor shall read the datasheet specification together with the notes given at the bottom of the datasheets.

B2. Vendor to supply only standard product out of their manufacturing range as listed out in their product catalogues including valve model nos., sizes and Cv values for the indicated sizes etc. Valve with non-standard model no., Cv's and size shall not be acceptable.

B3. SPECIFIC TEST REQUIREMENTS

i. RADIOGRAPHY REQUIREMENTS:

For all valve castings with ratings ANSI 600# and above and wherever asked for, valve castings and welds shall undergo Radiography as follows:

100% radiography testing shall be applied. The radiography procedure and the areas of castings shall be as per ANSI B16.34 and acceptance criteria shall be as per ANSI B16.34. For areas of castings to be radiographed for valves not covered as per ANSI B16.34 guidelines, the vendor shall furnish details of the areas to be radiographed as per ANSI B16.34

B4. For valves in cryogenic service, vendor shall meet the following acceptance criteria:

a) Vendor shall furnish, along with the offer, type test certificate, duly witnessed by Third Party Inspection agency like M/S LRIS, DNV, BV or TUV of having successfully conducted the cryogenic test as per BS 6364 on the offered valves in cryogenic service.

Further vendor to note the following:

Test temperature shall be -45 °C for LTCS and -196 °C for all grades of austenitic Stainless Steel.

Test carried out on a particular size of one type of valve, pressure rating and material shall qualify all sizes equal to and below the test valve size for the same type, pressure rating and material. In case of austenitic Stainless Steel any one grade would qualify for other grades of austenitic Stainless Steel.

b) In case vendor does not have cryogenic type test certificate for the offered valves as mentioned above, vendor shall confirm to conduct the cryogenic test on the offered valves and furnish the test report meeting requirements specified in Clause B4.a) above.

In case the vendor fails to conduct cryogenic test(s) within 12 weeks or failure in the test(s) conducted after receipt of order, the purchaser reserves the right to invoke any of the provisions of the purchase order including cancellation of the Purchase Order at the risk and cost of vendor.

B5. Control valve accessories like Air Filter Regulators, Smart Positioner / Foundation fieldbus Positioners, Solenoid valves, Limit switches, Pneumatic lock relay etc. (Wherever applicable) shall be supplied in fully assembled conditions with minimum of ¼" OD size SS air tubing. Tube fittings shall be of flareless compression type of SS material. Tubing of higher size for proper actuation of actuator / control valve shall be restricted to ½" OD which needs to be furnished by vendor during detailed engineering.

Procurement of Control Valves in ECU & PPU

Accessories like AFR shall be selected to match the air tubing requirements. This shall have no price or delivery implication.

B6. The actuator offered shall be pneumatically operated type working on instrument air. Vendor shall size these actuators based on 5.0 kg/cm²g air supply pressure. Available instrument air supply pressure is 6.0 kg/cm²g (min)/ 6.5 Kg/cm²g (nor) and 10.5 Kg/cm²g (design).

B7. Vendor to note that sizing of actuator is their responsibility and actuator sizing shall not be verified by the purchaser. However, vendor must submit these calculations for review. Any change in actuator model number necessary to meet PR requirements shall be taken care of by vendor without any price or delivery implications.

B8. The orientation of the actuator may be changed after order. The vendor shall do the same without any price implication.

B9. SIZING

- a) The control valve capacities in terms of flow coefficient (Cv) shown in the purchaser's datasheets have been calculated based on the formulae given in the standard ISA 75.01 "Control valve sizing equations".
- b) All factors used while arriving at the sizing are also as per ISA 75.01. Vendor must resize the control valves considering various factors specific to the offered valves.
- c) Purchaser's data sheet indicates calculated flow co-efficient values at minimum, normal and maximum operating conditions. Vendor shall calculate this co-efficient as per the offered control valve and select the size considering valve openings as under:
 - At maximum flow - less than 80% open
 - At normal flow - typically 50% open
 - At minimum flow - more than 20% open
- d) Rangeability of globe type of valves shall be 30:1, as a minimum. Vendor shall ensure that the actual rangeability of offered valves shall meet these requirements. For other types of offered control valves, vendor to specify that the available rangeability of the offered valves meet the requirements specified in the purchaser's data sheets.

B10. NOISE REDUCTION:

- a) Vendor shall examine each control valve for noise generation possibilities. The noise level shall be calculated as per ISA 75.17 or any other equivalent standard.
- b) Noise generated by control valve during operation shall be limited to OSHA specified levels i.e. the maximum allowable noise shall be less than 85 dBA, when measured at a distance governed by ISA 75.17.
- c) If the predicted noise level is found to exceed 85 dBA SPL, control valve shall be treated for noise and Anti-noise trim shall be used for noise reduction.

B11. Vendor to note all electrical/ electronic accessories on the valve and actuator shall be suitable for installation in electric area class IEC Zone-1 (irrespective of the zone indicated in the respective datasheets), temperature T3. Safe areas and the gas group, i.e. group IIA/IIB or group IIC shall be specified in the individual control valve datasheets. Field bus and Smart positioners shall be certified as intrinsically safe. Solenoid Valves shall be flameproof (EExd) type suitable for 110 VAC. Offered Solenoid valve shall be of Class H insulation in coil and the SOV should operate at up to 85% of nominal voltage. Relevant certificate indicating the entity parameters shall be furnished for the specified area

Procurement of Control Valves in ECU & PPU

classification from a statutory body. The requirement of statutory approvals for usage of equipment/instruments/ systems in electrically hazardous areas shall be as follows:

a) The vendor shall be responsible for obtaining all statutory approvals, as applicable for all instruments and control systems.

b) Equipment/instrument/systems located in electrically hazardous areas shall be certified for use by statutory authorities for their use in the area of their installation. In general, the following certification shall be provided by the vendor:

- For all intrinsically safe/ flameproof/ protected by other methods, equipment/ instrument/systems, which are manufactured abroad (outside India) and certified by any approving authority like Baseefa, FM, UL, PTB,LCIE etc., certification by the Indian authorities - Petroleum Explosives Safety Organisation (PESO) /Chief Controller of Explosives (CCE), Nagpur, India is mandatory.

- For all flameproof equipment manufactured locally (within India), the testing shall be carried out by any of the approved testing houses - PESO/Central Mining Research Institute (CMRI) / ERTL etc. The item shall in addition bear the valid certification from PESO / CCE and also the manufacturer shall hold a valid Bureau of Indian Standards (BIS) license.

- For all intrinsically safe equipment manufactured locally (within India), the testing shall be carried out by any of the approved testing houses - Central Mining Research Institute (CMRI) / ERTL etc. The item shall in addition bear the valid certification from PESO/ CCE.

B12. For control valves where body material has been specified as ASTM A 216 Gr.WCB, ASTM A 216 GR.WCC is also acceptable.

B13. Wherever solenoid valves have been asked for control valves in modulating service, the control valves are for modulating cum shutdown application. For all such cases, solenoid valve shall be installed between positioner output and actuator. The de-energisation of solenoid valve shall bring the control valve to failure position by venting the actuator.

B14. FIELDBUS AND SMART POSITIONER:

a) Vendor to offer Positioner with Field bus & HART output of Metso / Fisher DVC / Masoneilan make wherever positioner is specified in the Control Valve data sheets.

b) Smart Positioners shall be provided for valves wherever specified in the datasheets. Fieldbus Positioners shall be provided for valves wherever specified in the datasheets.

In addition to operational and maintenance data provided by the positioner like actual stem position, instrument input signal, Pneumatic pressure to the actuator etc. the positioner shall also provide the cycle counting and store accumulation data to help keep control valve stem leakage in control. The positioner shall also have build-in manual stroke button for stroke open or close the valve for quick verification.

c) Vendor to ensure that valve Fieldbus positioners and Smart positioners shall be able to communicate with Universal Hand Held communicator (type 375H for HART and type 375F for Fieldbus; not in bidder's scope).

d) Vendor to ensure that for Fieldbus positioners, DD files and Device support files shall be in native format.

Procurement of Control Valves in ECU & PPU

e) Vendor to ensure that for Fieldbus positioners following data is furnished after placement of order in excel format attached with PR.

- i) Tag No.
- ii) FF Registered product code
- iii) Device Type
- iv) Manufacturing ID number
- v) ITK revision
- vi) Firmware revision
- vii) Device Revision
- viii) DD File Revision
- ix) CF file Revision
- x) Compatibility test with various DCS.

Vendor to confirm that output splitter (OS) block is available in the positioner supplied.

f) Vendor to ensure that for Smart positioners following data is furnished after placement of order in excel format attached with PR.

- i) Tag No.
- ii) Device Hardware Revision.
- iii) DD Revision No.
- iv) DTM Revision No.

B15. Advanced Diagnostics Software for Positioners:

Separate ADS for offered SMART positioner with Yokogawa make DCS shall be required which, in case needed shall be ordered separately on vendor.

Owner DCS shall be supplied with Maintenance Information System along with standard software of DCS.

The advanced diagnostics software shall be used to diagnose control valve performance problems from DCS platform of Make: Yokogawa Centrum VP

The advanced diagnostics software shall meet the following requirements as a minimum:

The software shall acquire data from each of the positioners of same make when run on DCS platform of makes specified above and shall provide control valve diagnostics.

B16. Vendor shall supply air filter regulators of their own make or Placka / Shavo make.

B17. Vendor shall supply low power ($\approx 3.5W$) consumption type solenoid valves of ASCO / Norgren Herion make. Quantity shall be as per each valve datasheet.

B18. Vendor to note that there shall not be any price or delivery implications in case the valve port size need to be changed to accommodate minor process changes while keeping the valve size and other specifications same.

B19. Inspection and Test requirements:

- a) All the items supplied / integrated by the vendor at his works shall be subject to inspection at vendor's works by Owner.
- b) As a minimum, the inspection and testing requirements as per Inspection Test Plan for Control Valves (BCPL/ITP/CV-Rev 0) attached along with the PR shall be adhered to.

B20. Instrument Tube fittings shall be from one of the following approved make:

- (i) ASTEC VALVES & FITTINGS PVT. LTD. INDIA

Procurement of Control Valves in ECU & PPU

- (ii) AUTOCLAVE ENGINEERS FLUID COMPONENTS USA
- (iii) BADOTHERM PROCESS INSTRUMENTS B.V. NETHERLANDS
- (iv) CIRCOR INSTRUMENTATION LTD. UK
- (v) EXCEL HYDRO PNEUMATICS PVT. LTD. INDIA
- (vi) EXCELSIOR ENGG. WORKS INDIA
- (vii) FLUID CONTROLS PVT. LTD. INDIA
- (viii) JRU CONTROLS PVT. LTD. INDIA
- (ix) MULTIMETAL INDUSTRIES INDIA
- (x) PARKER HANNIFIN CORPORATION INDIA
- (xi) PRECISION ENGINEERING INDUSTRIES INDIA
- (xii) PRIME ENGINEERS INDIA
- (xiii) RELIANCE ENGINEERING & ELECTRICALS CORPN. INDIA
- (xiv) SWAGELOK CO. INDIA
- (xv) SWASTIK ENGINEERING WORKS INDIA
- (xvi) DEBLOAN AND CO. INDIA
- (xvii) HAM-LET (ISREAL-CANADA) LTD ISRAEL
- (xviii) KWALITY PRECISION PRODUCT PVT. LTD. INDIA
- (xix) PLACKA INSTRUMENTS & CONTROLS PVT LTD INDIA

B21. Tube shall be from one of the following approved make:

- (i) HEAVY METALS & TUBES LIMITED (MEHSANA) INDIA
- (ii) NUCLEAR FUEL COMPLEX INDIA
- (iii) RATNAMANI METALS & TUBES LTD. INDIA
- (iv) SANDVIK ASIA LIMITED INDIA

B22. Bidder shall furnish soft copies of all drawings and data sheets in AutoCAD/ MS Excel formats for loading in Owner's Documentation Node.

B23. Asbestos free gasket & stem packing shall be used for all the valves.

B24. FINISH

a) The body shall be painted as below:

Carbon steel body Light grey

Alloy steel body - Canary yellow

Stainless steel body- Natural

Above 150°C - Aluminium paint (white colour)

Items like silencers, diffuser plate assemblies etc., shall be painted as per respective control valve body requirements.

b) The actuator shall be painted as below:

Direct action (open on air failure) valves- Green

Reverse acting (close on air failure) valve - Yellow

Items like air volume tanks etc., supplied as an accessory along with the actuators, shall be painted as per corresponding actuator.

B25. NAMEPLATE

Each control valve shall have a stainless steel nameplate attached firmly to it at a visible place, furnishing the following information as minimum:

Tag number as per purchaser's data sheet.

Body and port sizes in inches.

Procurement of Control Valves in ECU & PPU

Valve flow coefficient (Cv).

Stem travel in millimetres.

Action on air failure.

Spring range.

Air supply pressure.

Manufacturer's model number for the valve body & actuator.

Manufacturer's Serial No. of the complete valve.

B26. SHIPPING

- a) The control valve and its accessories shall be supplied pre-assembled and pre-tubed.
- b) All threaded and flanged openings shall be suitably protected to prevent entry of foreign material.
- c) Valves with external lubricators shall be lubricated prior to shipment.

B27. SITE CONDITIONS:

The Valves and accessories covered in the PR shall be suitable for unprotected installation in Hot, Humid and Corrosive environment having following ambient condition.

The site environmental conditions at Lepetkata are as follows:

Ambient temperature : 39.8 deg. C (Max. / Design) / 1 deg. C (Min.).

Relative humidity : 49% @ Min. Temp. / 93% @ Max. Temp.

Maximum Record Rainfall : 606.9 mm in 24 hour.
