TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)
(FOR RATE CONTRACT)

VOLUME II–B

SECTION C & D

SPECIFICATION No.
PE–TS–20–145–I104

	TITLE: TECHNICAL SPECIFICATION CONTROL VALVES WITH ACCESSORIES (Pneumatically Operated) (FOR RATE CONTRACT)	DOC. NO. PE–TS–20–145–I104
BHEL	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	

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TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

(RATE CONTRACT)

VOLUME – II B

SECTIONS- C & D

SPECIFICATION No: PE-TS-20-145-I104

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT DIVISION
NOIDA, INDIA

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SPECIFIC TECHNICAL REQUIREMENTS

SPECIFIC TECHNICAL REQUIREMENTS

1.0 This specification is intended for finalization of rate contract between BHEL-PEM and bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL-PEM and Bidder. Project specific technical detail, process parameters, tests requirement shall be made available to the bidder along with project enquiry.

2.0 This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Control Valves assembly complete with Pneumatic Actuator and other accessories, as mentioned in different sections of this specification.

3.0 The bids shall be evaluated as per NIT. Ordering shall be done separately for each project.

4.0 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Project specific quality plan, shall be furnished to the bidder along with the project specific enquiry, which shall be complied by the bidder in totality without any additional cost to BHEL.

5.0 GENERAL TECHNICAL INSTRUCTIONS

I. It is not the intent here to specify all the details of design and manufacturing. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.

II. The omission of specific reference to any component / accessory necessary for the proper performance of the equipment's shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

III. BHEL's/Customer's representatives shall be given access to the shop in which equipment are being manufactured or tested and all test records shall be made available to them.

IV. The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / Customer.

V. <u>The bidder to quote for items as per price format attached. The quantity as mentioned in the BOQ is only for evaluation purpose. However actual ordered quantity may vary from project to project throughout the year.</u>

VI. Rates quoted by bidder shall be valid for a period of 2 years from the date of issue of rate contract for the equipment.

VII. During rate contract in force; any other BHEL unit may also make use of rates.

VIII. Inspection shall be carried out in line with pre-approved project specific Quality Plan, drawings/data sheet/QP.

IX. Quality plan, attached herewith, is to be duly signed and stamped and to be furnished along with the bid as a token of acceptance as a minimum requirement. Any deviation w.r.t specification and quality plan, shall not be acceptable and bid / offer shall be rejected.

X. Wherever in data sheet more than one options are marked, bidder to comply for all the options. However, bidder to note that any one option shall be selected by BHEL for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.

XI. Scope of supply shall include Control Valves with Pneumatic Actuator along with accessories, tubing as mentioned in different sections of this specification. Other items of the control valve sub-assembly, valve accessories; as listed in the BOQ shall be ordered as per project's specific requirement.

XII. Cv test – Cv test shall be carried out for each type of control valve (of same size, same Cv., same trim characteristics) for every project. During the project specific enquiry, bidder to inform the tag nos. of control valves for which the Cv tests have to be conducted. Cv. test reports/ certificates conducted for same type of control valve shall also be acceptable subject to Customer's acceptance for a project. Bidder to note that only those Cv. test reports for same type of control valves shall be offered for verification which are not older than 3 years from the date of submission of bidder's technical un-priced offer for rate contract. The validity of the Cv. test certificates shall be verified during review of the project specific documents. In case valid Cv. test certificates are not available or the test certificates are not acceptable to Customer, bidder to conduct the Cv. test for those valves at Fluid Control Research Institute (FCRI, Palakkad) FCRI/laboratory approved by Govt. Of India/ BHEL approved laboratory. Bidder to quote for the Cv. tests as per the price format for Cv. test enclosed. No payment shall be made if the Cv test is not conducted by the bidder.

XIII. FL test - FL test, as applicable, shall be conducted at FCRI/laboratory approved by Govt. Of India/ BHEL approved laboratory.

XIV. Multistage and Multipath Control Valve to be provided for the following Control Valves :-

S. NO.	DATASHEET REF.	SERVICE DESCRIPTION
1	Data Sheet No. A6	GSC MIN. FLOW RECIRCULATION
2	Data Sheet No. A21	LOW LOAD FEED CONTROL VALVE

Bidder may offer multi-stage, multi path control valves for other services also, if felt necessary, without any commercial implication to BHEL.

XV. Valve Trim, Valve body –
(i) Trim material and body material has been specified in Datasheets-A. Bidder to offer trim material/body material combination equivalent or better than the material specified in Datasheets-A. Wherever there is deviation from the datasheets, bidder to furnish a documentary proof for confirming superior trim material/body material selection along with their offer. If the offered material is not acceptable to the Customer, bidder to provide material as per the datasheet requirement without any commercial implication.
(ii) Valve sizes, with tentative Cv range has been indicated in the datasheet and the price format. The bidder may offer a higher valve size so as to meet Cv v/s. % Lift requirement. The same may be accepted, however no commercial implication will be applicable.
(iii) If the valve's trim design comprises of the guide bush, material of the guide bush shall be harder and superior to the cage material offered by the bidder.

XVI. Noise level – Bidder to note that noise abatement shall be achieved through valve body and trim design & not by any external means. If the noise abatement (< 85 dBA) is not achieved only by the valve's design, bidder may offer a cartridge/low dB plate/diffuser of a suitable size subject to acceptance by the Customer. The expander between the valve and this cartridge shall also be provided by the bidder and included in the quoted price of the valve.

XVII. Bidder to include volume booster, if required, in their offer to achieve the stroking time (travel time) < 10 secs. Volume booster wherever applicable shall be as per hook-up diagram enclosed in this technical specification without any commercial implication to BHEL.

XVIII. Bidder to provide diagnostic software to be installed on HART MANAGEMENT SYSTEM (HMS) PC for communicating with the smart positioner and accessing the diagnostic features of the smart positioner. Bidder to offer latest version of calibration and diagnostic software which should be compatible with latest operating system at the time of commissioning of valve/positioner without any additional cost to BHEL. The offered software shall be compatible with the HMS hardware of reputed makes like MTL, P&F etc.

XIX. The sub-vendor list has been enclosed in this specification. Bidder may propose sub-vendors other than those listed in the specification, with supporting documents/credentials for their proven track record. However, all sub-vendors are subjected to BHEL's and Customer's approval without any commercial implication to BHEL.

XX. For the valves, manufactured and supplied from a foreign country, expenses for all inspection shall be included in bidder's quoted price.

XXI. Pneumatic tubing of the control valves will be either PVC insulated copper with flare-less brass fittings or SS tubing with SS fitting as per hook-up diagrams enclosed in this specification. BHEL will select either of these two (2) options during project specific enquiry and bidder to provide the same without any commercial implication to BHEL.

XXII. SS fittings wherever applicable, shall be double compression type of SWAGELOK or equivalent make (subject to approval by end Customer).

XXIII. Spring diaphragm Actuator/Double Acting Piston Cylinder Actuator - Bidder to consider double acting piston cylinder type actuator for low load feed control valve (Data Sheet No. A22) in their offer. For other control valves, bidder may offer either spring diaphragm or piston cylinder type actuator as per their actuator design meeting the shut off pressure requirement, stroke length for the respective control valves.

XXIV. If any part/component of control valve(s) is required for a specific project which is not included in the price format, BHEL will procure the same at percentage (%) of valve's price/other item price as quoted by the bidder in the price format as given below :-

(i) Valve body = 40 % of the valve's price
(ii) Bonnet = 5 % of the valve's price
(iii) Cage = 60 % of the valve trim's price
(iv) Plug = 20 % of the valve trim's price
(v) Seat Ring = 15 % of the valve trim's price
(vi) Valve Stem = 5 % of the valve trim's price
(vii) Yoke = 1 % of the valve's price
(viii) Spring for Diaphragm type actuator = 50 % of the actuator's price

XXV. Sea worthy packing – Sea worthy packing (if applicable) for a specific project shall be informed during the project specific enquiry. The same shall be provided by the bidder without any commercial implication. Inspection of sea worthy packing shall be done as per project specific sea worthy packing specification by Customer/BHEL/BHEL appointed inspection agency.

XXVI. Requirement of moisture separator, if called for in a specific project; shall be informed in the project specific requirement and bidder to provide the same as per the unit price quoted in the price format.

XXVII. Refer Section-D viz. “Equipment Specification” for Codes and Standards, Technical requirements, Tests & Inspection, Drawings and Documents, Packing, Marking & applicable Datasheets reference.

XXVIII. The “Service” description indicated in the respective datasheets is for reference only. The actual service description for respective datasheets and all inputs like pipe size, design/ process parameters & accessories requirements shall be informed during project specific enquiry.

XXIX. Price format has to be duly filled by the bidder in all respects. Bids incomplete in any form shall not be evaluated and shall be liable for rejection.

XXX. Typical process parameters for the various control valves services covered in the datasheets A1 through A23 have been listed in Section-C of the specification. Actual process parameters for each service shall be informed to bidder during project specific order. Bidder to perform the valve sizing/selection accordingly for a project.

XXXI. For overseas projects where Indian standards like IBR, etc. are not acceptable to Customer, bidder to follow equivalent codes/standards followed in the respective country. This shall be informed during project specific enquiry and bidder to comply this requirement without any commercial implication to BHEL.

XXXII. The final documentation including the requisite number of operating manuals, maintenance and service manuals, component documentation, assembly documentation, drawings and listing, etc. shall be submitted in requisite quantities in English language and also in other language as per Customer’s requirement. This shall be informed during project specific enquiry and Bidder to comply to this requirement without any commercial implication to BHEL.

CUSTOMER'S SPECIFICATION

Same shall be informed by BHEL during project specific order (if any)

RATE CONTRACT FOR CONTROL VALVES

TYPICAL PROCESS PARAMETERS FOR DIFFERENT VALVE SERVICES

DATASHEET REFERENCE		A1			
SERVICE DESCRIPTION		DEAERATOR PEGGING FROM AUX STEAM HEADER(323.9X9.53/559X10)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	7.5% BMCR	18	16	1.65	290
2	15% BMCR(COLD)	42	16	1.7	290
3	15% BMCR(HOT)	60	16	3.7	290

DATASHEET REFERENCE		A1			
SERVICE DESCRIPTION		DEAERATOR PEGGING FROM AUX STEAM HEADER(273.9X6.35/457X9.53)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	5	11	1.5	310
2	CASE-I	12	11	1.5	310
3	MAX	30	11	3.5	310

DATASHEET REFERENCE		A2			
SERVICE DESCRIPTION		DEAERATOR PEGGING FROM CRH LINE(406.4X16/965X34)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	15% BMCR	52	15	3.65	341
2	30% BMCR	120	20	3.65	347
3	60% BYPASS	238	37	4.55	360

DATASHEET REFERENCE		A2			
SERVICE DESCRIPTION		DEAERATOR PEGGING FROM CRH LINE(273X9.27/508X12.7)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	15% BMCR	15.6	10.15	3.65	330
2	60% BYPASS	68.25	24.89	3.65	330

DATASHEET REFERENCE		A3			
SERVICE DESCRIPTION		CRH TO AUX. STEAM SYSTEM BYPASS LINE			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	COND 1	10	24	16	350
2	COND 2	30	61	16	345

DATASHEET REFERENCE		A4			
SERVICE DESCRIPTION		CONDENSATE SPRAY TO FLASH TANK			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MAX	10	35	0.5	50

DATASHEET REFERENCE		A5			
SERVICE DESCRIPTION		DEARATOR OVERFLOW DRAIN TO FLASH TANK			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MAX 10% BMCR	260	12.01	0.3	200

DATASHEET REFERENCE		A5			
SERVICE DESCRIPTION		DEARATOR OVERFLOW DRAIN TO FLASH TANK-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MAX	81	8.04	0.2	161

DATASHEET REFERENCE		A6			
SERVICE DESCRIPTION		GSC MIN FLOW RECIRCULATION			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	32.4	42.5	0.3	49
2	MAX	324	40.5	0.7	50

DATASHEET REFERENCE		A6			
SERVICE DESCRIPTION		GSC MIN FLOW RECIRCULATION-250MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	22	16.1	0.2	47
2	MAX	220	14.9	0.2	47

DATASHEET REFERENCE		A7			
SERVICE DESCRIPTION		CEP-A/B/C MIN FLOW RECIRCULATION			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	30	42.8	0.6	50
2	NORMAL	300	42	0.6	50
3	MAX	315	41.8	1.5	50

DATASHEET REFERENCE		A8			
SERVICE DESCRIPTION		MAIN CONDENSATE CONTROL			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	DESIGN POINT	1835	29.7	27.5	43
2	60% LOAD	937.11	34	23.9	39
3	100% MCR	1526.44	30.5	24.5	43
4	VWO	1648.06	30.5	27.5	43
5	MIN(10% LOAD)	152.6	37.3	10.6	40
6	HP-LP BYPASS	1506.35	27.9	16.3	52

DATASHEET REFERENCE		A8			
SERVICE DESCRIPTION		MAIN CONDENSATE CONTROL-30% LOW LOAD			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	55	17.45	3.5	48.5
2	30% MCR	215	17.29	6.59	48.5

DATASHEET REFERENCE		A8			
SERVICE DESCRIPTION		MAIN CONDENSATE CONTROL-100% LOAD			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	55	17.5	3.5	48.5
2	60% MCR	374	16.8	8.2	47.6
3	100% MCR	590	15.4	13	50.2
4	VWO	636	14.85	13.9	47.1

RATE CONTRACT FOR CONTROL VALVES

TYPICAL PROCESS PARAMETERS FOR DIFFERENT VALVE SERVICES

DATASHEET REFERENCE		A9			
SERVICE DESCRIPTION		EXCESS RETURN TO CST			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	40	36.5	4	50
2	MAX	400	32.5	5	43

DATASHEET REFERENCE		A9			
SERVICE DESCRIPTION		EXCESS RETURN TO CST-250MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	20	26.5	1.1	47
2	MAX	270	19	1.5	47

DATASHEET REFERENCE		A10			
SERVICE DESCRIPTION		CONDENSATE FOR VALVE GLAND SEALING			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MAX	4	31	3	50
2	NOR	3	34	3	43
3	MIN	2	36	3	50

DATASHEET REFERENCE		A10			
SERVICE DESCRIPTION		CONDENSATE FOR VALVE GLAND SEALING-250MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	4	16.1	3.5	47
2	MAX	4	14.9	3.5	47

DATASHEET REFERENCE		A11			
SERVICE DESCRIPTION		HPH-5 NORMAL DRAIN-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	124	14.75	6.4	168
2	100%	113.3	14.2	6.23	168
3	60%	61.2	8.73	4.07	150
4	30%	21.5	4.6	3.65	145

DATASHEET REFERENCE		A11			
SERVICE DESCRIPTION		HPH-6 NORMAL DRAIN-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	80.32	39.5	15.7	204
2	100%	73.1	38	15.18	203
3	60%	37.99	24.33	9.73	183
4	30%	16.65	13.01	5.61	158

DATASHEET REFERENCE		A11			
SERVICE DESCRIPTION		HPH-7A/7B NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	50.36	23.6	9.71	178
2	60% LOAD	89.47	35.4	14.3	175
3	100% MCR	195.09	58.79	23.4	198
4	VWO	215.62	62.9	25.01	225
5	BMCR	222.81	62.4	24.58	225

DATASHEET REFERENCE		A11			
SERVICE DESCRIPTION		HPH-7A/7B NORMAL DRAIN(9-HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	78.2	7.52	5.9	161
2	60% LOAD	142	13.79	9.37	175.09
3	100% MCR	257.76	21.8	12.2	198.3
4	VWO	283.7	23.4	12.8	225

DATASHEET REFERENCE		A11			
SERVICE DESCRIPTION		HPH-6A/6B NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	64.69	9.37	6.64	159.3
2	60% MCR	115.02	14.33	8.7	173.7
3	100% MCR	244.01	23.4	12.7	196.3
4	VWO	268.96	25.01	13.39	199.5
5	BMCR	278.24	24.58	13.01	198.3

DATASHEET REFERENCE		A11			
SERVICE DESCRIPTION		HPH-8A/8B NORMAL DRAIN(9-HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	61.37	24.72	10.76	182
2	60% MCR	114.46	39.37	16.73	200
3	100% MCR	206.84	59.82	26.78	226
4	VWO	228.5	63.76	28.56	230

RATE CONTRACT FOR CONTROL VALVES

TYPICAL PROCESS PARAMETERS FOR DIFFERENT VALVE SERVICES

DATASHEET REFERENCE		A12			
SERVICE DESCRIPTION		HPH-5 ALT DRAIN-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	124	16.72	0.2	168
2	100% MCR	113.3	16.17	0.2	169
3	60% MCR	61.2	10.74	0.2	149
4	30% MCR	21.5	6.62	0.2	145

DATASHEET REFERENCE		A12			
SERVICE DESCRIPTION		HPH-6 ALT DRAIN-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	80.32	40.45	0.2	204.4
2	100% MCR	73.1	38.99	0.2	202.7
3	60% MCR	37.99	25.29	0.2	182.7
4	30% MCR	16.65	14	0.2	157.9
5	MAX	100	40.45	0.2	204

DATASHEET REFERENCE		A12			
SERVICE DESCRIPTION		HPH-7A/7B ALT DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	50.36	23.6	0.3	219
2	60% MCR	89.47	35.04	0.3	235
3	100% MCR	195.09	58.79	0.3	272
4	VWO	215.62	62.9	0.3	275
5	BMCR	222.81	62.24	0.3	274

DATASHEET REFERENCE		A12			
SERVICE DESCRIPTION		HPH-7A/7B ALT DRAIN(9- HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	78.2	10.86	0.3	182.6
2	60% MCR	142	17.04	0.3	198.7
3	100% MCR	257.768	24.9	0.3	222.7
4	VWO	283.7	26.5	0.3	226

DATASHEET REFERENCE		A12			
SERVICE DESCRIPTION		HPH-6A/6B ALT DRAIN TO F/T-A			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	64.69	9.371	0.3	176
2	60% MCR	115.02	14.33	0.3	192
3	100% MCR	244.006	23.4	0.3	217
4	VWO	268.96	25.01	0.3	220
5	BMCR	278.24	24.58	0.5	218

DATASHEET REFERENCE		A12			
SERVICE DESCRIPTION		HPH-8A/8B ALT DRAIN (9- HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	61.37	25.15	0.3	223
2	60% MCR	114.46	39.77	0.3	249
3	100% MCR	206.84	60.2	0.3	275
4	VWO	228.5	64.13	0.3	279

DATASHEET REFERENCE		A13			
SERVICE DESCRIPTION		HPH-8A/8B NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	12.8	32.12	23.6	225
2	60% MCR	23.8	47.7	35.48	248
3	100% MCR	56.8	78.5	58.79	278
4	VWO	63.6	84.3	62.9	283

DATASHEET REFERENCE		A13			
SERVICE DESCRIPTION		HPH-8 NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	36.9	31.2	22.5	221
2	60% MCR	53.9	45.9	33.1	241
3	100% MCR	116.4	75.6	54.6	271
4	VWO	132.7	81.3	58.3	275

DATASHEET REFERENCE		A13			
SERVICE DESCRIPTION		HPH-9A/9B NORMAL DRAIN (9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	22.78	38.24	24.83	227
2	60% MCR	44.21	61.36	39.47	255
3	100% MCR	79.77	90.69	59.9	282
4	VWO	89.24	97.18	63.8	287

RATE CONTRACT FOR CONTROL VALVES

TYPICAL PROCESS PARAMETERS FOR DIFFERENT VALVE SERVICES

DATASHEET REFERENCE		A14			
SERVICE DESCRIPTION		HPH-8A/8B ALT DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	12.8	32.12	0.3	235
2	60% MCR	23.8	47.7	0.3	257
3	100% MCR	56.8	78.5	0.3	289
4	VWO	63.6	84.3	0.3	296

DATASHEET REFERENCE		A14			
SERVICE DESCRIPTION		HPH-8 ALT DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	36.9	32.2	0.3	238
2	60% MCR	53.9	46.7	0.3	259
3	100% MCR	116.4	76.2	0.3	290
4	VWO	132.7	81.7	0.3	295

DATASHEET REFERENCE		A14			
SERVICE DESCRIPTION		HPH-9A/9B ALT DRAIN (9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	22.78	38.64	0.3	247.14
2	60% MCR	44.21	61.73	0.3	276.13
3	100% MCR	79.77	90.04	0.3	302.7
4	VWO	89.24	97.52	0.3	307.7

DATASHEET REFERENCE		A15			
SERVICE DESCRIPTION		LPH-2 NORMAL DRAIN-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	50.9	0.94	0.48	79.4
2	100% MCR	46.7	0.91	0.47	78.8
3	60% MCR	26.5	0.6	0.33	68.9
4	30% MCR	13.66	0.35	0.21	56.3
5	MAX	54.16	1	0.52	81.3

DATASHEET REFERENCE		A15			
SERVICE DESCRIPTION		LPH-3 NORMAL DRAIN-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	30.1	2.33	0.96	98.9
2	100% MCR	27.7	2.27	0.93	98
3	60% MCR	15.94	1.49	0.61	86
4	30% MCR	8.4	0.89	0.37	71.7
5	MAX	35	2.33	0.96	98.8
DATASHEET REFERENCE		A15			
SERVICE DESCRIPTION		LPH-2 NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	65.6	0.4	0.2	57
2	60% MCR	106.1	0.5	0.3	65
3	100% MCR	200.5	0.7	0.4	74
4	VWO	218.2	0.7	0.5	75
DATASHEET REFERENCE		A15			
SERVICE DESCRIPTION		LPH-3 NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	47.3	0.7	0.3	77
2	60% MCR	75.9	1	0.6	87
3	100% MCR	143.5	1.5	1	99
4	VWO	156	1.5	1	100

DATASHEET REFERENCE		A16			
SERVICE DESCRIPTION		LPH-4 NORMAL DRAIN			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	22.33	2.31	1.24	106.5
2	60% MCR	36.03	3.26	1.73	116.9
3	100% MCR	68.62	5.08	2.68	131.4
4	VWO	74.83	5.4	2.85	133.5

DATASHEET REFERENCE		A16			
SERVICE DESCRIPTION		LPH-4 NORMAL DRAIN (9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	49.17	1.45	0.88	90.4
2	60% MCR	83.2	2.21	1.24	102.4
3	100% MCR	132.75	3.01	1.62	111.9
4	VWO	143.76	3.18	1.7	113.6

DATASHEET REFERENCE		A16			
SERVICE DESCRIPTION		LPH 2A & 2B NORMAL DRAIN TO DC-1			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	16.933	0.245	0.125	64
2	60% MCR	27.85	0.345	0.163	72
3	100% MCR	53.498	0.534	0.243	83
4	VWO	58.309	0.567	0.257	84
5	MAX	62	0.8	0.35	96

DATASHEET REFERENCE		A16			
SERVICE DESCRIPTION		LPH 5 NORMAL DRAIN TO LPH-4(9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	25.02	2.7	1.6	110
2	60% MCR	42.54	4.2	2.37	124
3	100% MCR	68.71	5.75	3.17	135
4	VWO	74.55	6.08	3.34	137

RATE CONTRACT FOR CONTROL VALVES

TYPICAL PROCESS PARAMETERS FOR DIFFERENT VALVE SERVICES

DATASHEET REFERENCE		A17			
SERVICE DESCRIPTION		LPH 2 ALT. DRAIN-250MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	50.9	1.38	0.2	79.5
2	100% MCR	46.7	1.36	0.2	79
3	60% MCR	26.5	1.04	0.2	69
4	30% MCR	13.66	0.8	0.2	56
5	MAX	70	1.38	0.25	79.5

DATASHEET REFERENCE		A17			
SERVICE DESCRIPTION		LPH 3 ALT. DRAIN-250MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	VWO	30.1	2.78	0.2	99
2	100% MCR	27.7	2.72	0.2	98
3	60% MCR	15.94	1.94	0.2	86
4	30% MCR	8.4	1.35	0.2	72
5	MAX	40	2.78	0.2	99

DATASHEET REFERENCE		A17			
SERVICE DESCRIPTION		LPH 2A&2B ALT. DRAIN TO DRAIN COOLER			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	16.933	0.245	0.2	64
2	60% MCR	27.85	0.345	0.2	72
3	100% MCR	53.498	0.534	0.2	83
4	VWO	58.309	0.567	0.2	84
5	MAX	62	0.8	0.25	96

DATASHEET REFERENCE		A17			
SERVICE DESCRIPTION		LPH 3 ALT. DRAIN (INCLUDING 9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	67.79	1.24	0.3	102
2	60% MCR	107.5	1.73	0.3	112
3	100% MCR	199.78	2.68	0.3	124
4	VWO	217.144	2.85	0.3	128

DATASHEET REFERENCE		A17			
SERVICE DESCRIPTION		LPH 4 ALT. DRAIN (INCLUDING 9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	22.33	2.31	1.24	122
2	60% MCR	36.03	3.26	1.73	131
3	100% MCR	68.62	5.08	2.68	149
4	VWO	74.83	5.4	2.85	152

DATASHEET REFERENCE		A17			
SERVICE DESCRIPTION		LPH 5 ALT. DRAIN (9 HEATER CYCLE)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	25.02	3.17	0.3	134.7
2	60% MCR	42.54	4.67	0.3	148.56
3	100% MCR	68.71	6.21	0.3	159.4
4	VWO	74.55	6.54	0.3	161.4

DATASHEET REFERENCE		A18			
SERVICE DESCRIPTION		DM WATER MAKE UP TO HOTWELL-250MW(NORMAL)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MINIMUM	4	5.7	0.2	45
2	MAXIMUM	40	4	0.2	45

DATASHEET REFERENCE		A18			
SERVICE DESCRIPTION		DM WATER MAKE UP TO HOTWELL-250MW(EMERGENCY)			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MINIMUM	15	4.5	0.2	45
2	MAXIMUM	55	3.5	0.2	45

DATASHEET REFERENCE		A18			
SERVICE DESCRIPTION		DM WATER MAKE UP TO HOTWELL			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN (0.5% MU)	13	4	0.5	33
2	1% MU	26	4	0.45	33
3	MAX (5% MU)	130	3	0.5	33

RATE CONTRACT FOR CONTROL VALVES

TYPICAL PROCESS PARAMETERS FOR DIFFERENT VALVE SERVICES

DATASHEET REFERENCE		A19			
SERVICE DESCRIPTION		DRIP PUMP DISCHARGE CONTROL			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	40% MCR	67.79	27	12	105.1
2	60% MCR	107.53	26	15	115.2
3	100% MCR	199.78	25	20.5	129.3
4	VWO	217.14	24.5	21.5	131.3

DATASHEET REFERENCE		A20			
SERVICE DESCRIPTION		DMCW RECIRCULATION			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	NORMAL	1135	7.8	3.9	38
2	MAXIMUM	1480	6.2	3.9	38
3	MINIMUM	340	9	3.9	38

DATASHEET REFERENCE		A21			
SERVICE DESCRIPTION		LOW LOAD FEED CONTROL			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	5%MCR (MIN SPEED)	130	167	21	111
2	15% MCR	390	165	32	111
3	30% MCR	780	155	115	111 TO 138

DATASHEET REFERENCE		A22			
SERVICE DESCRIPTION		FULL LOAD FEED CONTROL-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN	210	160	155	165
2	60% MCR	475	167	162	224
3	100% MCR	741	180	175	246
4	VWO	802	183	178	246
5	MAX.	828	185	180	247

DATASHEET REFERENCE		A23			
SERVICE DESCRIPTION		LOW LOAD FEED CONTROL-250 MW			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	MIN.	40	60	8	111
2	MAX.	260	160	155	138 to 201

SECTION-C

DATASHEET A

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
		DOCUMENT NO.
		VOLUME II B
		SECTION C
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. A1

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage	
	SERVICE	DEA PEGGING FROM AUX. STEAM HEADER	
	LOCATION	■ INDOOR ■ OUTDOOR	
	DUTY	☐ ON/OFF ■ MODULATING	
	$$PIPE SIZE (inlet / outlet)	273.9 x6.35 / 457x9.53 (Tentative)	323.9 x9.53 / 559x10 (Tentative)
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B / SA 672 GR B70 (Tentative)	
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage	
	TYPE OF BODY:GUIDING:NO. OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE	
	BODY SIZE : RANGE OF DESIGN Cv	8 " : 350 – 500 (Tentative)	10 " : 450 – 1000 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■#300	
	^BODY MATERIAL	■ A216 WCB/A216 WCC ■ A217 WC9	
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE	
	@ BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED	
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN	
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS	
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS	
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS	
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage	
	OUTLET VELOCITY	■ MAC NO.< 1/3 (STEAM)	
	## REQUIRED LEAKAGE CLASS	■ IV ■ V	
	^^ NOISE LEVEL (dBA)	LESS THAN 85 dBA	
	VACUUM SERVICE	☐ YES ■ NO	
	ANTI CAVITATION TRIM	☐ YES ■ NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage	
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)	
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.	
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT	
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT	
ACCESSORIES	SMART POSITIONER	REQUIRED	
	AIR FILTER REGULATOR	REQUIRED	
	AIR LOCK RELAY	REQUIRED	
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED	
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED	
	JUNCTION BOX	REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	REQUIRED	
	LOCAL POSITION INDICATOR	REQUIRED	

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
		DOCUMENT NO.
		VOLUME II B
		SECTION C
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. A1

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS	± 1%
	LINEARITY	± 2%
	SENSITIVITY	± 0.5%
	ACCURACY (Overall)	± 2%

SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									

	VALVE TYPE	☐ CAVITATION ☐ FLASHING ■ HIGH DP	
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**	20	
	BODY DESIGN : PRESS **(KG/CM^{2}g)** **| TEMP (DEG. C)**	20	350
	IBR FORM III-C ■ REQUIRED ☐ NOT REQUIRED		

NOTES:

1.$$The set of pipe sizes viz. 273.9 x6.35 / 457x9.53(Inlet/Outlet) and 323.9 x9.53 / 559x10(Inlet/Outlet) are tentative and correspond to control valves at CV1.1 and CV1.2 of the price format respectively.
2.@Type of bonnet shall be selected by the bidder as per the body design temperature of the control valve. Extended/finned type bonnets shall be provided when design temperature of the fluid is greater than 280 deg. C unless otherwise specified in the project specific enquiry without any commercial implication to BHEL.
2. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
3. *If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
4. ^ BHEL will select either of body material as per options in the datasheet. Bidder to quote for A216 WCB/WCC as the standard body material and also quote ADD-ON price for A217WC9 body material.
5.##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
6. **Bidder to include volume booster if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
7. $Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
8. (i) Refer Price Format CV1.1 - If the bidder wishes to offer a higher valve size (> 8") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
(ii) Refer Price Format CV1.2 - If the bidder wishes to offer a higher valve size (> 10") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
9.^^ Bidder to select the control valve with low-noise trim in order to keep the noise level < 85 dBA. If the noise level is still higher than the acceptable limit, bidder to offer a cartridge/low dB plate/diffuser of a suitable size. The expander between the valve and this cartridge shall be provided by the bidder. Bidder to include the expander and the cartridge within the quoted price of the control valve.

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**	
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Data Sheet No. A2

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage	
	SERVICE	DEA PEGGING FROM CRH LINE	
	LOCATION	■ INDOOR ■ OUTDOOR	
	DUTY	□ ON/OFF ■ MODULATING	
	$$ PIPE SIZE (inlet / outlet)	273 x 9.27 / 508 x 12.7 (Tentative)	406.4 x 16 / 965 x 34 (Tentative)
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C (Tentative)	
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage	
	TYPE OF BODY:GUIDING:NO. OF PORTS	■ GLOBE □ ANGLE : □ TOP ■ CAGE : ONE	
	BODY SIZE : RANGE OF DESIGN Cv	8 " : 350 – 600 (Tentative)	12 " : 475 – 1200 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE □SWE □FLANGED : ■#600	
	^BODY MATERIAL	■ A216 WCB/A216 WCC ■ A217 WC9	
	PACKING MATERIAL : SINGLE / DOUBLE	□ PTFE ■ GRAFOIL : ■ DOUBLE □ SINGLE	
	@ BONNET TYPE	□ STD ■ EXTENDED □ FINNED	
	*TRIM FORM	■ LINEAR □ EQ. PERCENTAGE □ QUICK OPEN	
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS	
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS	
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS	
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage	
	OUTLET VELOCITY	■ MAC NO.< 1/3 (STEAM)	
	## REQUIRED LEAKAGE CLASS	■ IV ■ V	
	^^ NOISE LEVEL (dBA)	LESS THAN 85 dBA	
	VACUUM SERVICE	□ YES ■ NO	
	ANTI CAVITATION TRIM	□ YES ■ NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage	
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)	
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.	
	VALVE POSN. ON SIGNAL AIR FAILURE	□ TO OPEN ■ TO CLOSE □ STAYPUT	
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT	
ACCESSORIES	SMART POSITIONER	REQUIRED	
	AIR FILTER REGULATOR	REQUIRED	
	AIR LOCK RELAY	REQUIRED	
	$ POSITION LIMIT SWITCH	□ REQUIRED ■ NOT REQUIRED	
	$ SOLENOID VALVE	□ REQUIRED ■ NOT REQUIRED	
	JUNCTION BOX	REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	REQUIRED	
	LOCAL POSITION INDICATOR	REQUIRED	

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
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Data Sheet No. A2

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS	± 1%
	LINEARITY	± 2%
	SENSITIVITY	± 0.5%
	ACCURACY (Overall)	± 2%

SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ■ HIGH DP		
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**						75		
	BODY DESIGN : PRESS **(KG/CM^{2}g)** **| TEMP (DEG. C)**						75		380
	IBR FORM III-C ■ REQUIRED ☐ NOT REQUIRED								

NOTES:

1.$$The set of pipe sizes viz. 273 x 9.27 / 508 x 12.7 (Inlet/Outlet) and 406.4 x 16 / 965 x 34 (Inlet/Outlet) are tentative and correspond to control valves at CV2.1 and CV2.2 of the price format respectively.
2.@Type of bonnet shall be selected by the bidder as per the body design temperature of the control valve. Extended/finned type bonnets shall be provided when design temperature of the fluid is greater than 280 deg. C unless otherwise specified in the project specific enquiry without any commercial implication to BHEL.
3. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
4. *If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
5. ^ BHEL will select either of body material as per options in the datasheet. Bidder to quote for A216 WCB/WCC as the standard body material and also quote ADD-ON price for A217WC9 body material.
6.##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
7. ** Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
8. $Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
9. (i) Refer Price Format CV2.1 - If the bidder wishes to offer a higher valve size (> 8") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
(ii) Refer Price Format CV2.2 - If the bidder wishes to offer a higher valve size (> 12") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
10.^^Bidder to select the control valve with low-noise trim in order to keep the noise level < 85 dBA. If the noise level is still higher than the acceptable limit, bidder to offer a cartridge/low dB plate/diffuser of a suitable size. The expander between the valve and this cartridge shall be provided by the bidder. Bidder to include the expander and the cartridge within the quoted price of the control valve.

Data Sheet No. A3

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	CRH TO AUX. STEAM SYSTEM BYPASS LINE
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	114.3 x6.02 / 219.1x12.7(Tentative)
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B / SA 106 GR C (Tentative)
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO. OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 50 – 100(Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■#300
	BODY MATERIAL	■ A217 WC9
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	@ BONNET TYPE	☐ STD ■ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 410
	# TRIM MATERIAL : PLUG	■ SS 410
	# TRIM MATERIAL : CAGE	■ SS 410
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ MAC NO.< 1/3 (STEAM)
	## REQUIRED LEAKAGE CLASS	■ V
	^^ NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
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Data Sheet No. A3

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ■ HIGH DP			
	MAX SHUT OFF PRESS (**(KG/CM^{2}g)**						75			
	BODY DESIGN : PRESS (**(KG/CM^{2}g)**					**| TEMP (DEG. C)**	75		365	
	IBR FORM III-C ■ REQUIRED ☐ NOT REQUIRED									

NOTES:

1. @Type of bonnet shall be selected by the bidder as per the body design temperature of the control valve. Extended/finned type bonnets shall be provided when design temperature of the fluid is greater than 280 deg. C unless otherwise specified in the project specific enquiry without any commercial implication to BHEL.
2. # Bidder to offer trim material as per the data sheet –A. Alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
3. *If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
4. ** Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
5. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
6. If the bidder wishes to offer a higher valve size (> 3") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
7. ^^Bidder to select the control valve with low-noise trim in order to keep the noise level < 85 dBA. If the noise level is still higher than the acceptable limit, bidder to offer a cartridge/low dB plate/diffuser of a suitable size. The expander between the valve and this cartridge shall be provided by the bidder. Bidder to include the expander and the cartridge within the quoted price of the control valve.

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**	
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Data Sheet No. A4

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	CONDENSATE SPRAY TO FLASH TANK
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	■ ON/OFF ☐ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ■ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	1 " : 3.5 – 5 (Tentative)
	END CONNECTION : RATING (ANSI)	☐ BWE ■SWE ☐FLANGED : ■ #300
	BODY MATERIAL	■ A217 WC6
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ☐ EQ. PERCENTAGE ■ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	■ YES ☐ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	NOT REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	POSITION LIMIT SWITCH	REQUIRED
	SOLENOID VALVE	REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A4

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			NA					
	LINEARITY			NA					
	SENSITIVITY			NA					
	ACCURACY (Overall)			NA					
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						■ CAVITATION ☐ FLASHING ■ HIGH DP		
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**						47		
	BODY DESIGN : PRESS **(KG/CM^{2}g)** | **TEMP (DEG. C)**						47/VACUUM	60	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED								

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. ** Bidder to offer volume booster in order to achieve the stroking time (travel time) < 10 secs. The same shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification as per the project requirement without any commercial implication.
3. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
4. If the bidder wishes to offer a higher valve size (> 1”) so as to meet the Cv requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A5

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	DEARATOR OVERFLOW DRAIN TO FLASH TANK
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	■ ON/OFF ☐ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 80 - 150 (Tentative) / 6 " : 130 - 450 (Tentative)
	END CONNECTION : RATING (ANSI)	■ BWE ☐SWE ☐FLANGED : ■ #900
	BODY MATERIAL	■ A217 WC9
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ☐ EQ. PERCENTAGE ■ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 440C
	# TRIM MATERIAL : PLUG	■ SS 440C
	# TRIM MATERIAL : CAGE	■ SS 440C
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	■ YES ☐ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	NOT REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	POSITION LIMIT SWITCH	REQUIRED
	SOLENOID VALVE	REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A5

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			NA						
	LINEARITY			NA						
	SENSITIVITY			NA						
	ACCURACY (Overall)			NA						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP			
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**						20			
	BODY DESIGN : PRESS **(KG/CM^{2}g)** | **TEMP (DEG. C)**						20/VACUUM		200	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder. Bidder to quote one price for 17-4 PH SS/SS 316 STELLITED as the standard trim material combination. Alternative field proven trim material combination, superior to the specified trim material (17-4 PH SS/SS 316 STELLITED) can be offered by the bidder subject to approval by the end Customer, without any commercial implication to BHEL. Bidder to also quote ADD-ON price for SS440C trim material combination in the price format.
2. ** Bidder to offer volume booster in order to achieve the stroking time (travel time) < 10 secs. The same shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification as per the project requirement without any commercial implication.
3. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
4. (i) Refer Price Format CV5.1 - If the bidder wishes to offer a higher valve size (> 3”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
   (ii) Refer Price Format CV5.2 - If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

Data Sheet No. A6

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	GSC MIN. FLOW RECIRCULATION
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	!TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ■ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	6 " : 80 – 130 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300
	BODY MATERIAL	■ A217 WC6
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE +	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	■ YES ☐ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A6

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS	± 1%
	LINEARITY	± 2%
	SENSITIVITY	± 0.5%
	ACCURACY (Overall)	± 2%

SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									

	VALVE TYPE	■ CAVITATION ☐ FLASHING ■ HIGH DP	
	MAX SHUT OFF PRESS (**(KG/CM^{2}g)**	50	
	BODY DESIGN : PRESS (**(KG/CM^{2}g)** | **TEMP (DEG. C)**	50	75
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED		

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * (i) Bidder to provide multi-stage, multi-path trim design.
   (ii) If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. + If the multi-stage, multi-path valve design comprises of multiple discs/disc stack, the material of the disc stack shall be same as that of cage material as specified in the datasheet.
4. ! BHEL will select either of “Globe” type or “Angle” type valve during the project specific enquiry. Bidder to supply the same without any commercial implication to BHEL.
5. ** Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
6. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
7. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

Data Sheet No. A7

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	CEP-A/B/C MIN. FLOW RECIRCULATION
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	!TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ■ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	6 " : 80 – 130 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300
	BODY MATERIAL	■ A217 WC6
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE +	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	■ YES ☐ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

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Data Sheet No. A7

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						■ CAVITATION ☐ FLASHING ■ HIGH DP			
	MAX SHUT OFF PRESS ((**KG/CM^{2}g)**						50			
	BODY DESIGN : PRESS ((**KG/CM^{2}g)** | **TEMP (DEG. C)**						50	75		
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. *(i) BHEL may select multi-stage, multi-path trim design during project specific enquiry and bidder to provide the same. Bidder to quote ADD-ON price for multi-stage, multi-path trim design in the price format.
   (ii) If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. + If the multi-stage, multi-path valve design comprises of multiple discs/disc stack, the material of the disc stack shall be same as that of cage material as specified in the datasheet.
4. ! BHEL will select either of “Globe” type or “Angle” type valve during the project specific enquiry. Bidder to supply the same without any commercial implication to BHEL.
5. ** Bidder to include volume booster,if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
6. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
7. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A8

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage		
	SERVICE	MAIN CONDENSATE CONTROL		
	LOCATION	■ INDOOR ■ OUTDOOR		
	DUTY	☐ ON/OFF ■ MODULATING		
	$$ PIPE SIZE (inlet / outlet)	114.3X6.02/114.3X6.02 (Tentative)	323.9X9.53/323.9X9.53 (Tentative)	457X12.7/457X12.7 (Tentative)
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C (Tentative)		
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage		
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE		
	BODY SIZE : RANGE OF DESIGN Cv	4 " : 100 –200(Tentative)	10 " : 850 –1100(Tentative)	14 ":1000 – 2000(Tentative)
	END CONNECTION : RATING (ANSI)	■ BWE ☐ SWE ☐ FLANGED : ■ #300		
	BODY MATERIAL	■ A216 WCB/A216 WCC		
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE		
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED		
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN		
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS		
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS		
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS		
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage		
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)		
	## REQUIRED LEAKAGE CLASS	■ IV ■ V		
	^^NOISE LEVEL (dBA)	LESS THAN 85 dBA		
	VACUUM SERVICE	☐ YES ■ NO		
	ANTI CAVITATION TRIM	■ YES ☐ NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage		
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)		
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.		
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ TO CLOSE ■ STAYPUT		
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT		
ACCESSORIES	SMART POSITIONER	REQUIRED		
	AIR FILTER REGULATOR	REQUIRED		
	AIR LOCK RELAY	REQUIRED		
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED		
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED		
	JUNCTION BOX	REQUIRED		
	HAND WHEEL (SIDE MOUNTED)	REQUIRED		
	LOCAL POSITION INDICATOR	REQUIRED		

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Data Sheet No. A8

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						■ CAVITATION ☐ FLASHING ■ HIGH DP			
	MAX SHUT OFF PRESS (**(KG/CM^{2}g)**						50			
	BODY DESIGN : PRESS (**(KG/CM^{2}g)**			**| TEMP (DEG. C)**			50		75	
	IBR FORM III-C		☐ REQUIRED		■ NOT REQUIRED					

NOTES:

1.$$The set of pipe sizes viz. 114.3X6.02 (Inlet/Outlet),323.9x9.53(Inlet/Outlet) and 457x12.7(Inlet/Outlet) are tentative and correspond to control valves at CV8.1, CV8.2 and CV8.3 of the price format respectively.

2.# BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.

3. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.

4.##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.

5. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.

6. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.

7. (i) Refer Price Format CV8.1 - If the bidder wishes to offer a higher valve size (> 4") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
(ii) Refer Price Format CV8.2 - If the bidder wishes to offer a higher valve size (> 10") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.
(iii) Refer Price Format CV8.3 - If the bidder wishes to offer a higher valve size (> 14") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

8.^^Bidder to select the control valve with low-noise trim in order to keep the noise level < 85 dBA. If the noise level is still higher than the acceptable limit, bidder to offer a cartridge/low dB plate/diffuser of a suitable size. The expander between the valve and this cartridge shall be provided by the bidder. Bidder to include the expander and the cartridge within the quoted price of the control valve.

Data Sheet No. A9

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	EXCESS RETURN TO CST
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	!TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ■ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	6 " : 70 – 160 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300
	^BODY MATERIAL	■ A216 WCB/WCC ■ A217 WC6
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A9

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%					
	LINEARITY			± 2%					
	SENSITIVITY			± 0.5%					
	ACCURACY (Overall)			± 2%					
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM² (A)**	**OUTLET PR. (KG/CM² (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						■ CAVITATION ☐ FLASHING ■ HIGH DP		
	MAX SHUT OFF PRESS (**(KG/CM²g)**						50		
	BODY DESIGN : PRESS (**(KG/CM²g)**		**| TEMP (DEG. C)**				50		75
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED								

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ^ BHEL will select either of body material as per options in the datasheet. Bidder to quote for A217 WC6 as the standard body material and also quote ADD-ON price for A217WC9 body material.
4. ! BHEL will select either of “Globe” type or “Angle” type valve during the project specific enquiry. Bidder to supply the same without any commercial implication to BHEL.
5. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
6. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
7. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
8. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
9. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A10

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	Shall be furnished during project enquiry stage
	LOCATION	CONDENSATE FOR VALVE GLAND SEALING
	DUTY	■ INDOOR ■ OUTDOOR
	PIPE SIZE (inlet / outlet)	☐ ON/OFF ■ MODULATING
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Shall be furnished during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ■ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	1 " : 1.5 – 12 (Tentative)
	END CONNECTION : RATING (ANSI)	☐ BWE ■SWE ☐FLANGED : ■ #300
	BODY MATERIAL	■ A216 WCB/WCC
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

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Data Sheet No. A10

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS	± 1%
	LINEARITY	± 2%
	SENSITIVITY	± 0.5%
	ACCURACY (Overall)	± 2%

SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM² (A)**	**OUTLET PR. (KG/CM² (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									

	VALVE TYPE	☐ CAVITATION ☐ FLASHING ■ HIGH DP
	MAX SHUT OFF PRESS **(KG/CM²g)**	50
	BODY DESIGN : PRESS **(KG/CM²g)** | **TEMP (DEG. C)**	50 / 60
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED	

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. *If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ** Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
4. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
5. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
6. If the bidder wishes to offer a higher valve size (> 1”) so as to meet the Cv., the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A11

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage		
	SERVICE	HPH-6 NORMAL DRAIN, HPH-5 NORMAL DRAIN HPH-7A/7B NORMAL DRAIN, HPH-7A/7B NORMAL DRAIN (9-HEATER CYCLE) HPH-6A/6B NORMAL DRAIN, HPH-8A/8B NORMAL DRAIN (9-HEATER CYCLE)		
	LOCATION	■ INDOOR ■ OUTDOOR		
	DUTY	☐ ON/OFF ■ MODULATING		
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage		
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage		
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage		
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE		
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 25 – 70 (Tentative)	4 " : 60 – 100 (Tentative)	6 " : 50 – 300 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #600		
	BODY MATERIAL	■ A217 WC6		
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE		
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED		
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN		
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS		
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS		
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS		
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage		
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)		
	## REQUIRED LEAKAGE CLASS	■ IV ■ V		
	NOISE LEVEL (dBA)	LESS THAN 85 dBA		
	VACUUM SERVICE	☐ YES ■ NO		
	ANTI CAVITATION TRIM	☐ YES ■ NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage		
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)		
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.		
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ■ TO CLOSE ☐ STAYPUT		
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT		
ACCESSORIES	SMART POSITIONER	REQUIRED		
	AIR FILTER REGULATOR	REQUIRED		
	AIR LOCK RELAY	REQUIRED		
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED		
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED		
	JUNCTION BOX	REQUIRED		
	HAND WHEEL (SIDE MOUNTED)	REQUIRED		
	LOCAL POSITION INDICATOR	REQUIRED		

Data Sheet No. A11

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%					
	LINEARITY			± 2%					
	SENSITIVITY			± 0.5%					
	ACCURACY (Overall)			± 2%					
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP		
	MAX SHUT OFF PRESS ((**KG/CM^{2}g)**						75		
	BODY DESIGN : PRESS ((**KG/CM^{2}g)** | **TEMP (DEG. C)**						75	235	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED								

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
4. ** Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
5. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
6. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
7. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A12

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage	
	SERVICE	HPH-6 ALTERNATE DRAIN, HPH-5 ALTERNATE DRAIN HPH-7A/7B ALTERNATE DRAIN, HPH-7A/7B ALTERNATE DRAIN (9-HEATER CYCLE), HPH-6A/6B ALTERNATE DRAIN, HPH-8A/8B ALT DRAIN(9-HEATER CYCLE)	
	LOCATION	■ INDOOR ■ OUTDOOR	
	DUTY	☐ ON/OFF ■ MODULATING	
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage	
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage	
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage	
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE	
	BODY SIZE : RANGE OF DESIGN Cv	4 " : 40 – 100 (Tentative)	6 " : 70 – 650 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #600	
	BODY MATERIAL	■ A217 WC9	
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE	
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED	
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN	
	# TRIM MATERIAL : SEAT RING	■ SS 440C	
	# TRIM MATERIAL : PLUG	■ SS 440C	
	# TRIM MATERIAL : CAGE	■ SS 440C	
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage	
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)	
	REQUIRED LEAKAGE CLASS	■ V	
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	
	VACUUM SERVICE	■ YES ☐ NO	
	ANTI CAVITATION TRIM	☐ YES ■ NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage	
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)	
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.	
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT	
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT	
ACCESSORIES	SMART POSITIONER	REQUIRED	
	AIR FILTER REGULATOR	REQUIRED	
	AIR LOCK RELAY	REQUIRED	
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED	
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED	
	JUNCTION BOX	REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	REQUIRED	
	LOCAL POSITION INDICATOR	REQUIRED	

Data Sheet No. A12

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM² (A)**	**OUTLET PR. (KG/CM² (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP			
	MAX SHUT OFF PRESS ((**KG/CM²g)**						75			
	BODY DESIGN : PRESS ((**KG/CM²g)**			**| TEMP (DEG. C)**			75/VACUUM		280	
	IBR FORM III-C		☐ REQUIRED		■ NOT REQUIRED					

NOTES:

1. **Bidder to offer volume booster in order to achieve the stroking time (travel time) < 10 secs. The same shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification as per the project requirement without any commercial implication.
2. $Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
3. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
4. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

Data Sheet No. A13

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	HPH-8A/8B NORMAL DRAIN, HPH-8 NORMAL DRAIN HPH-9A/9B NORMAL DRAIN(9-HEATER CYCLE)
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 25 – 65 (Tentative) | 4 " : 40 – 80 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #900
	^BODY MATERIAL	■ A217 WC6 ■ A217 WC9
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	☐ STD ■EXTENDED ☐ FINNED
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■BWE ☐SWE ☐FLANGED : ■ #900
	## REQUIRED LEAKAGE CLASS	■ IV ■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ■ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
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Data Sheet No. A13

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP			
	MAX SHUT OFF PRESS (**(KG/CM^{2}g)**						110			
	BODY DESIGN : PRESS (**(KG/CM^{2}g)**			**| TEMP (DEG. C)**			110		290	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ^ BHEL will select either of body material as per options in the datasheet. Bidder to quote for A217 WC6 as the standard body material and also quote ADD-ON price for A217WC9 body material.
4. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
5. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
6. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
7. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
8. If the bidder wishes to offer a higher valve size (> 4”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A14

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	HPH-8A/8B ALTERNATE DRAIN, HPH-8 ALTERNATE DRAIN HPH-9A/9B ALTERNATE DRAIN(9-HEATER CYCLE)
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 25 – 90 (Tentative) / 4 " : 40 – 100 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #900
	BODY MATERIAL	■ A217 WC9
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	☐ STD ■ EXTENDED ☐ FINNED
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 440C
	# TRIM MATERIAL : PLUG	■ SS 440C
	# TRIM MATERIAL : CAGE	■ SS 440C
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	■ YES ☐ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A14

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%					
	LINEARITY			± 2%					
	SENSITIVITY			± 0.5%					
	ACCURACY (Overall)			± 2%					
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP		
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**						110		
	BODY DESIGN : PRESS **(KG/CM^{2}g)** | **TEMP (DEG. C)**						110/VACUUM	310	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED								

NOTES:

1. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
2. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
3. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
4. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
5. If the bidder wishes to offer a higher valve size (> 4”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A15

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage				
	SERVICE	LPH-2 NORMAL DRAIN, LPH-3 NORMAL DRAIN				
	LOCATION	■ INDOOR ■ OUTDOOR				
	DUTY	☐ ON/OFF ■ MODULATING				
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage				
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage				
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage				
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE				
	BODY SIZE : RANGE OF DESIGN Cv	3" : 60 –120 (Tentative)	4" : 110– 250 (Tentative)	6" : 230–400 (Tentative)	8" : 300– 700 (Tentative)	10" : 600–1000 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300				
	BODY MATERIAL	■ A217 WC6				
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE				
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED				
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN				
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS				
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS				
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS				
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage				
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)				
	## REQUIRED LEAKAGE CLASS	■ IV ■ V				
	NOISE LEVEL (dBA)	LESS THAN 85 dBA				
	VACUUM SERVICE	■ YES ☐ NO				
	ANTI CAVITATION TRIM	☐ YES ■ NO				
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage				
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)				
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.				
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ■ TO CLOSE ☐ STAYPUT				
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT				
ACCESSORIES	SMART POSITIONER	REQUIRED				
	AIR FILTER REGULATOR	REQUIRED				
	AIR LOCK RELAY	REQUIRED				
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED				
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED				
	JUNCTION BOX	REQUIRED				
	HAND WHEEL (SIDE MOUNTED)	REQUIRED				
	LOCAL POSITION INDICATOR	REQUIRED				

Data Sheet No. A15

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP			
	MAX SHUT OFF PRESS (**(KG/CM^{2}g)**						7			
	BODY DESIGN : PRESS (**(KG/CM^{2}g)**			**| TEMP (DEG. C)**			7/VACUUM		130	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet–A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.

3.##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.

4. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
5. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
6. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
7. Refer Price Format CV15.5 - If the bidder wishes to offer a higher valve size (> 10”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A16

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage			
	SERVICE	LPH-4 NORMAL DRAIN, LPH-4 NORMAL DRAIN (9 HEATER CYCLE), LPH-2A/2B NORMAL DRAIN TO DC-1, LPH-5 NORMAL DRN TO LPH-4 (9 HEATER CYCLE)			
	LOCATION	■ INDOOR ■ OUTDOOR			
	DUTY	☐ ON/OFF ■ MODULATING			
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage			
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage			
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage			
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE			
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 45 – 110 (Tentative)	4 " : 55 – 150 (Tentative)	6":130–400 (Tentative)	8 " : 380 – 600 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300			
	BODY MATERIAL	■ A217 WC6			
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE			
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED			
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN			
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS			
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS			
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS			
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage			
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)			
	## REQUIRED LEAKAGE CLASS	■ IV ■ V			
	NOISE LEVEL (dBA)	LESS THAN 85 dBA			
	VACUUM SERVICE	■ YES ☐ NO			
	ANTI CAVITATION TRIM	☐ YES ■ NO			
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage			
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)			
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.			
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ■ TO CLOSE ☐ STAYPUT			
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT			
ACCESSORIES	SMART POSITIONER	REQUIRED			
	AIR FILTER REGULATOR	REQUIRED			
	AIR LOCK RELAY	REQUIRED			
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED			
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED			
	JUNCTION BOX	REQUIRED			
	HAND WHEEL (SIDE MOUNTED)	REQUIRED			
	LOCAL POSITION INDICATOR	REQUIRED			

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Data Sheet No. A16

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP			
	MAX SHUT OFF PRESS ((**KG/CM^{2}g)**						7			
	BODY DESIGN : PRESS ((**KG/CM^{2}g)** | **TEMP (DEG. C)**						7/VACUUM		150	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
5. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
6. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
7. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
8. If the bidder wishes to offer a higher valve size (> 8”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A 17

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	LPH-2 ALT DRAIN, LPH-2A/2B ALT DRAIN TO DRAIN COOLER LPH-3 ALT DRAIN (INCLUDING 9 HEATER CYCLE), LPH-4 ALT DRAIN (INCLUDING 9 HEATER CYCLE), LPH-5 ALT DRAIN (9 HEATER CYCLE)
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	3":40–180 (Tentative) / 4":160–200 (Tentative) / 6":190–400 (Tentative) / 8":350–900 (Tentative) / 10":750–1000 (Tentative) / 12":800–1500 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300
	^BODY MATERIAL	■ A217 WC6 ■ A217 WC9
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 440C
	# TRIM MATERIAL : PLUG	■ SS 440C
	# TRIM MATERIAL : CAGE	■ SS 440C
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	REQUIRED LEAKAGE CLASS	■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	■ YES ☐ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A17

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%					
	LINEARITY			± 2%					
	SENSITIVITY			± 0.5%					
	ACCURACY (Overall)			± 2%					
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						☐ CAVITATION ■ FLASHING ☐ HIGH DP		
	MAX SHUT OFF PRESS (**(KG/CM^{2}g)**						7		
	BODY DESIGN : PRESS (**(KG/CM^{2}g)**			**| TEMP (DEG. C)**			7/VACUUM	170	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED								

NOTES:

1. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
2. ^ BHEL will select either of body material as per options in the datasheet. Bidder to quote for A217 WC6 as the standard body material and also quote ADD-ON price for A217WC9 body material.
3. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
4. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
5. If the project specific requirement asks for valve with high FL(FL>0.985), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.
6. If the bidder wishes to offer a higher valve size (> 12”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
		DOCUMENT NO.
		VOLUME II B
		SECTION C
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. A18

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage		
	SERVICE	DM WATER MAKE UP TO HOTWELL		
	LOCATION	■ INDOOR ■ OUTDOOR		
	DUTY	☐ ON/OFF ■ MODULATING		
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage		
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage		
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage		
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE		
	BODY SIZE : RANGE OF DESIGN Cv	3 " : 40 – 120 (Tentative)	4 " : 90 – 150 (Tentative)	6 " : 140 – 400 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300		
	BODY MATERIAL	■ A351 CF8M		
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE		
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED		
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN		
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS		
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS		
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS		
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage		
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)		
	REQUIRED LEAKAGE CLASS	■ V		
	NOISE LEVEL (dBA)	LESS THAN 85 dBA		
	VACUUM SERVICE	■ YES ☐ NO		
	ANTI CAVITATION TRIM	■ YES ☐ NO		
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage		
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)		
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.		
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT		
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT		
ACCESSORIES	SMART POSITIONER	REQUIRED		
	AIR FILTER REGULATOR	REQUIRED		
	AIR LOCK RELAY	REQUIRED		
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED		
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED		
	JUNCTION BOX	REQUIRED		
	HAND WHEEL (SIDE MOUNTED)	REQUIRED		
	LOCAL POSITION INDICATOR	REQUIRED		

Data Sheet No. A18

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						■ CAVITATION ☐ FLASHING ☐ HIGH DP			
	MAX SHUT OFF PRESS ((**KG/CM^{2}g)**						10			
	BODY DESIGN : PRESS ((**KG/CM^{2}g)**			**| TEMP (DEG. C)**			10/VACUUM		60	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. **Bidder to include volume booster,if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
4. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
5. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A19

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	DRIP PUMP DISCHARGE CONTROL
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	6 " : 250 – 325 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #300
	BODY MATERIAL	■ A216 WCB/A216 WCC
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	## REQUIRED LEAKAGE CLASS	■ IV ■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	☐ YES ■ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ■ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A19

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS	± 1%
	LINEARITY	± 2%
	SENSITIVITY	± 0.5%
	ACCURACY (Overall)	± 2%

SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									

	VALVE TYPE	☐ CAVITATION ☐ FLASHING ☐ HIGH DP
	MAX SHUT OFF PRESS ((**KG/CM^{2}g)**	50
	BODY DESIGN : PRESS ((**KG/CM^{2}g)** | **TEMP (DEG. C)**	50/VACUUM | 150
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED	

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. *If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
5. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
6. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
7. If the bidder wishes to offer a higher valve size (> 6”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

Data Sheet No. A20

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage				
	SERVICE	DMCW RECIRCULATION				
	LOCATION	■ INDOOR ■ OUTDOOR				
	DUTY	☐ ON/OFF ■ MODULATING				
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage				
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage				
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage				
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE				
	BODY SIZE : RANGE OF DESIGN Cv	4 " : 150 – 200 (Tentative)	6 " : 180 – 320 (Tentative)	8 " : 280 – 800 (Tentative)	10": 600 – 1200 (Tentative)	12": 1000–1500 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■#300				
	BODY MATERIAL	■ A216 WCB/A216 WCC				
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE				
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED				
	*TRIM FORM	■ LINEAR ☐ EQ. PERCENTAGE ☐ QUICK OPEN				
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS				
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS				
	# TRIM MATERIAL : CAGE	■ SS 316 STELLITED ■ 17-4 PH SS				
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage				
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)				
	## REQUIRED LEAKAGE CLASS	■ IV ■ V				
	NOISE LEVEL (dBA)	LESS THAN 85 dBA				
	VACUUM SERVICE	☐ YES ■ NO				
	ANTI CAVITATION TRIM	☐ YES ■ NO				
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage				
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)				
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.				
	VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ■ TO CLOSE ☐ STAYPUT				
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT				
ACCESSORIES	SMART POSITIONER	REQUIRED				
	AIR FILTER REGULATOR	REQUIRED				
	AIR LOCK RELAY	REQUIRED				
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED				
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED				
	JUNCTION BOX	REQUIRED				
	HAND WHEEL (SIDE MOUNTED)	REQUIRED				
	LOCAL POSITION INDICATOR	REQUIRED				

Data Sheet No. A20

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A))**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ■ HIGH DP			
	MAX SHUT OFF PRESS ((**KG/CM^{2}g)**						12			
	BODY DESIGN : PRESS ((**KG/CM^{2}g)**			**| TEMP (DEG. C)**			12		60	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. * If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.
3. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
4. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
5. $ Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.
6. If the bidder wishes to offer a higher valve size (> 12”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A 21

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	LOW LOAD FEED CONTROL
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	12 " : 250 – 600 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #3000 SPL
	BODY MATERIAL	■ A217 WC9
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE+	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	## REQUIRED LEAKAGE CLASS	■ IV ■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Open)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	☐ REQUIRED ■ NOT REQUIRED
	$ SOLENOID VALVE	☐ REQUIRED ■ NOT REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A21

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%						
	LINEARITY			± 2%						
	SENSITIVITY			± 0.5%						
	ACCURACY (Overall)			± 2%						
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**	
(Shall be furnished during project enquiry stage)										
	VALVE TYPE						■ CAVITATION ☐ FLASHING ■ HIGH DP			
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**						525			
	BODY DESIGN : PRESS **(KG/CM^{2}g)** **| TEMP (DEG. C)**						525		200	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED									

NOTES:

1.# BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.

2. * (i) Bidder to provide multi-stage, multi-path trim design.
(ii) If the bidder wishes to offer alternative trim form/trim characteristic so as to meet Cv. v/s % lift requirement, the same shall be subject to approval by the end Customer without any commercial implication to BHEL.

.3 + If the multi-stage, multi-path valve design comprises of multiple discs/disc stack, the material of the disc stack shall be same as that of cage material as specified in the datasheet

4.##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL

5.**Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.

6. $Position limit switch, solenoid valve if required for a specific project; shall be provided by the bidder at an additional cost quoted against these items as mentioned in the price format.

7. If the project specific requirement asks for valve with high FL(FL>0.995), bidder to consider this requirement and quote ADD-ON prices for the same in column “P” of the price format.

8. If the bidder wishes to offer a higher valve size (> 12”) so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

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Data Sheet No. A22

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	FULL LOAD FEED CONTROL(250 MW)
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	12 " : 600-900 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #2500
	BODY MATERIAL	■ A217 WC6
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE+	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	## REQUIRED LEAKAGE CLASS	■ IV ■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	REQUIRED
	$ SOLENOID VALVE	REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

Data Sheet No. A22

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS			± 1%					
	LINEARITY			± 2%					
	SENSITIVITY			± 0.5%					
	ACCURACY (Overall)			± 2%					
SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									
	VALVE TYPE						■ CAVITATION ☐ FLASHING ■ HIGH DP		
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**						290		
	BODY DESIGN : PRESS **(KG/CM^{2}g)** | **TEMP (DEG. C)**						290	260	
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED								

NOTES:

1.# BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
3.**Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
4. $ Bidder to include Position limit switch and solenoid valve within the quoted price of control valve, while submitting their offer.
5. If the bidder wishes to offer a higher valve size (> 12") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**	
		DOCUMENT NO.	
		VOLUME II B	
		SECTION C	
		REV. NO. 00	DATE: 28.04.2017

Data Sheet No. A23

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER)

GENERAL	PROJECT	Shall be furnished during project enquiry stage
	SERVICE	LOW LOAD FEED CONTROL(250 MW)
	LOCATION	■ INDOOR ■ OUTDOOR
	DUTY	☐ ON/OFF ■ MODULATING
	PIPE SIZE (inlet / outlet)	Shall be furnished during project enquiry stage
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project enquiry stage
BODY	MODEL NUMBER	Bidder to specify during project enquiry stage
	TYPE OF BODY:GUIDING:NO.OF PORTS	■ GLOBE ☐ ANGLE : ☐ TOP ■ CAGE : ONE
	BODY SIZE : RANGE OF DESIGN Cv	6 " : 600-900 (Tentative)
	END CONNECTION : RATING (ANSI)	■BWE ☐SWE ☐FLANGED : ■ #2500
	BODY MATERIAL	■ A217 WC6
	PACKING MATERIAL : SINGLE / DOUBLE	☐ PTFE ■ GRAFOIL : ■ DOUBLE ☐ SINGLE
	BONNET TYPE	■ STD ☐ EXTENDED ☐ FINNED
	*TRIM FORM	☐ LINEAR ■ EQ. PERCENTAGE ☐ QUICK OPEN
	# TRIM MATERIAL : SEAT RING	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : PLUG	■ SS 316 STELLITED ■ 17-4 PH SS
	# TRIM MATERIAL : CAGE+	■ SS 316 STELLITED ■ 17-4 PH SS
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project enquiry stage
	OUTLET VELOCITY	■ < 7 M/SEC (WATER)
	## REQUIRED LEAKAGE CLASS	■ IV ■ V
	NOISE LEVEL (dBA)	LESS THAN 85 dBA
	VACUUM SERVICE	☐ YES ■ NO
	ANTI CAVITATION TRIM	■ YES ☐ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify during project enquiry stage
	CLOSE AT : OPEN AT (Kg / Cm^2g)	To suit actuator (Air To Close)
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.
	VALVE POSN. ON SIGNAL AIR FAILURE	■ TO OPEN ☐ TO CLOSE ☐ STAYPUT
	VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT
ACCESSORIES	SMART POSITIONER	REQUIRED
	AIR FILTER REGULATOR	REQUIRED
	AIR LOCK RELAY	REQUIRED
	$ POSITION LIMIT SWITCH	REQUIRED
	$ SOLENOID VALVE	REQUIRED
	JUNCTION BOX	REQUIRED
	HAND WHEEL (SIDE MOUNTED)	REQUIRED
	LOCAL POSITION INDICATOR	REQUIRED

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO. **PE-TS-20-145-I 104**
		DOCUMENT NO.
		VOLUME II B
		SECTION C
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. A23

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY PURCHASER

PERFORMANCE OF VALVE	HYSTERSIS	± 1%
	LINEARITY	± 2%
	SENSITIVITY	± 0.5%
	ACCURACY (Overall)	± 2%

SERVICE CONDITION	**SL. NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCU-LATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
(Shall be furnished during project enquiry stage)									

	VALVE TYPE	■ CAVITATION ☐ FLASHING ■ HIGH DP	
	MAX SHUT OFF PRESS **(KG/CM^{2}g)**	290	
	BODY DESIGN : PRESS **(KG/CM^{2}g)** | **TEMP (DEG. C)**	290	260
	IBR FORM III-C ☐ REQUIRED ■ NOT REQUIRED		

NOTES:

1. # BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial implication to BHEL.
2. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial implication to BHEL.
3. **Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required without any commercial implication to BHEL.
4. $Bidder to include Position limit switch and solenoid valve within the quoted price of control valve, while submitting their offer.
5. If the bidder wishes to offer a higher valve size (> 6") so as to meet the Cv. vs. % Lift requirement, the same can be accepted without any commercial implication to BHEL.

SECTION-C

DATASHEET-A FOR ACCESSORIES

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO.:**PE-TS-20-145-I104**
		VOLUME **II-B**
		SECTION **C**
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. B1

APPLICABLE FOR MAIN VALVES WHEREVER OPTION "REQUIRED" INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEETS

DATA SHEET – A FOR ACCESSORIES FOR CONTROL VALVE - MODULATING DUTY (TO BE FILLED BY PURCHASER)

SMART POSITIONER	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage			
	BYPASS	GAUGES	ENCL. CLASS	■ YES ☐ NO	■ TWO* ■ THREE*		■ IP-65
	INPUT SIGNAL			4-20 mA DC, HART			
	OUTPUT SIGNAL (Kg / Cm^2)			TO SUIT ACTUATOR			
	TYPE OF POSITION TRANSMITTER (INTEGRAL PART OF POSITIONER)			Electronic,2-Wire with 4-20 mA DC Output operated at 24 V DC			
AIR FILTER REGULATOR	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage			
	AIR SUPPLY PRESS (Kg / Cm^2 g)			5.0 – 8.0			
	OUTPUT PRESS (Kg / Cm^2 g)			TO SUIT ACTUATOR			
	FILTER SIZE/ FILTER MATERIAL			5 MICRON/SINTERED BRONZE			
	OUTPUT GAUGE			■ REQUIRED ☐ NOT REQUIRED			
	AUTO DRAIN FEATURE			■ REQUIRED ☐ NOT REQUIRED			
AIR LOCK RELAY	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage			
	SET PRESS (Kg / Cm^2)			3.5(tentative)			
	SUPPLY PRESS (Kg / Cm^2)			5.0 – 8.0			
	RESET TYPE			AUTO			
	VENT PLUG			REQUIRED			
LIMIT SWITCH	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage			
	OPEN posn	INT posn	CLOSE posn	**1 NO.**	**---**		**1 NO.**
	CONTACT TYPE			SPDT 2 NO + 2 NC			
	RATING (AC / DC)			5A,240 V AC AND 0.2A,220 V DC			
	ENCLOSURE CLASS			IP 65			
SOLENOID VALVE	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage			
	RATING			24V DC			
	TYPE			3-WAY (UNIVERSAL OPERATION TYPE)			
	QUANTITY			AS PER VALVE DATASHEET & HOOK-UP DIAGRAM			
	COIL INSULATION CLASS			CLASS - H			
	ENCLOSURE/BODY MATERIAL			■ SS ■ BRASS			
	ENCLOSURE CLASS			IP 65			
HANDWHEEL	ORIENTATION			SIDE MOUNTED			
JUNCTION BOX	NO. OF WAYS			36-Ways			
	TYPE OF TERMINAL BLOCKS			CAGE CLAMP			
	ELECTRICAL CONNECTION			■ THROUGH CABLE GLAND ■ PLUG-IN SOCKET			
	CABLE GLANDS (Qty/Type/Material)			As required /Double Compression Type/SS or Nickel Plated Brass			
	ENCLOSURE CLASS			IP 65			
	BODY MATERIAL			■ FRP ■ SHEET STEEL			
Cu./SS Tubing & Fittings / per CV	This is in addition to pneumatic Tubing and fittings which are integral part of CV			12 Meters of ¼ " PVC coated Cu./SS Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.			
PAINTING	COLOUR/SHADE			Shall be informed during project specific enquiry			
	THICKNESS (DFT) – in microns			Shall be informed during project specific enquiry			
	TYPE			EPOXY			

COMPANY SEAL
NAME
SIGNATURE
DATE

NOTES:

1.*All the single acting smart positioners shall be provided with two(02) no. of gauges. Double acting positioners shall be provided with three(03) gauges.
2. Wherever in data sheet more than one options are marked, bidder to comply for all the options. BHEL will select any one option for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO.:**PE-TS-20-145-I104**	
		VOLUME **II-B**	
		SECTION **C**	
		REV. NO. 00	DATE: 28.04.2017

Data Sheet No. B2

APPLICABLE FOR MAIN VALVES WHEREVER OPTION "REQUIRED" INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEETS

DATA SHEET – A FOR ACCESSORIES FOR CONTROL VALVE – ON/OFF DUTY (TO BE FILLED BY PURCHASER)

AIR FILTER REGULATOR	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage		
	AIR SUPPLY PRESS (Kg / Cm^2 g)			5.0 – 8.0		
	OUTPUT PRESS (Kg / Cm^2 g)			TO SUIT ACTUATOR		
	FILTER SIZE/ FILTER MATERIAL			5 MICRON/SINTERED BRONZE		
	OUTPUT GAUGE			■ REQUIRED ☐ NOT REQUIRED		
	AUTO DRAIN FEATURE			■ REQUIRED ☐ NOT REQUIRED		
AIR LOCK RELAY	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage		
	SET PRESS (Kg / Cm^2)			3.5(tentative)		
	SUPPLY PRESS (Kg / Cm^2)			5.0 – 8.0		
	RESET TYPE			AUTO		
	VENT PLUG			REQUIRED		
LIMIT SWITCH	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage		
	OPEN posn	INT posn	CLOSE posn	**1 NO.**	**---**	**1 NO.**
	CONTACT TYPE			SPDT 2 NO + 2 NC		
	RATING (AC / DC)			5A,240V AC AND 0.2A,220V DC		
	ENCLOSURE CLASS			IP 65		
SOLENOID VALVE	MFR. & MODEL NUMBER			Bidder to specify during project enquiry stage		
	RATING			24V DC		
	TYPE			3-WAY (UNIVERSAL OPERATION TYPE)		
	QUANTITY			AS PER VALVE DATASHEET & HOOK-UP DIAGRAM		
	COIL INSULATION CLASS			CLASS - H		
	ENCLOSURE/BODY MATERIAL			■ SS ■ BRASS		
	ENCLOSURE CLASS			IP 65		
HANDWHEEL	ORIENTATION			SIDE MOUNTED		
JUNCTION BOX	NO. OF WAYS			36-Ways		
	SIZE			AS REQUIRED		
	TYPE OF TERMINAL BLOCKS			CAGE CLAMP		
	ELECTRICAL CONNECTION			■ THROUGH CABLE GLAND ■ PLUG-IN SOCKET		
	CABLE GLANDS (Qty/Type/Material)			As required /Double Compression Type/SS or Nickel Plated Brass		
	ENCLOSURE CLASS			IP 65		
	BODY MATERIAL			■ FRP ■ SHEET STEEL		
Cu./SS Tubing & Fittings / per CV	This is in addition to pneumatic Tubing and fittings which are integral part of CV			12 Meters of ¼ " PVC coated Cu./SS Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.		
PAINTING	COLOUR/SHADE			Shall be informed during project specific enquiry		
	THICKNESS (DFT) – in microns			Shall be informed during project specific enquiry		
	TYPE			EPOXY		

COMPANY SEAL
NAME
SIGNATURE
DATE

NOTES:

1. Wherever in data sheet more than one options are marked, bidder to comply for all the options. BHEL will select any one option for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.

SECTION-C

DATASHEET C

Datasheet No. CX

DATA SHEET C

DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)

GENERAL*	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
BODY	MODEL NUMBER	
	TYPE OF BODY : GUIDING : NO. OF PORTS	
	BODY SIZE : PORT SIZE : DESIGN CV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE	
	TRIM FORM	
	TRIM MATERIAL : SEAT | PLUG	
	TRIM MATERIAL : CAGE | GUIDE	
	FLOW	
	OUTLET VELOCITY	
	REQUIRED LEAKAGE CLASS	
	NOISE LEVEL (dBA)	
	VACUUM SERVICE	
	ANTI CAVITATION TRIM	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm^2g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
ACCESSORIES	SMART POSITIONER	
	AIR FILTER REGULATOR	
	AIR LOCK RELAY	
	POSITION LIMIT SWITCH	
	POSITION TRANSMITTER	
	SOLENOID VALVE	
	JUNCTION BOX	
	HAND WHEEL (SIDE MOUNTED)	
	LOCAL POSITION INDICATOR	

Datasheet No. CX

DATA SHEET C

DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)

PERFORMANCE OF VALVE	HYSTERSIS								
	LINEARITY								
	SENSITIVITY								
	ACCURACY (Overall)								
SERVICE CONDITION*	**SL.+ NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCULATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**
	VALVE TYPE								
	* MAX SHUT OFF PRESS ((**KG/CM^{2}g)**								
	* BODY DESIGN : PRESS ((**KG/CM^{2}g)**		**| TEMP (DEG. C)**						
	* IBR FORM III-C								

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO.:**PE-TS-20-145-I104**
		VOLUME **II-B**
		SECTION **C**
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. ACM

APPLICABLE FOR MAIN VALVES WHEREVER OPTION "REQUIRED" INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEETS

DATA SHEET – A FOR ACCESSORIES FOR CONTROL VALVE - MODULATING DUTY (TO BE FILLED BY PURCHASER)

SMART POSITIONER	MFR. & MODEL NUMBER					
	BYPASS	GAUGES	ENCL. CLASS			
	INPUT SIGNAL					
	OUTPUT SIGNAL (Kg / Cm^2)					
	TYPE OF POSITION TRANSMITTER (INTEGRAL PART OF POSITIONER)					
AIR FILTER REGULATOR	MFR. & MODEL NUMBER					
	AIR SUPPLY PRESS (Kg / Cm^2 g)					
	OUTPUT PRESS (Kg / Cm^2 g)					
	FILTER SIZE/ FILTER MATERIAL					
	OUTPUT GAUGE					
	AUTO DRAIN FEATURE					
AIR LOCK RELAY	MFR. & MODEL NUMBER					
	SET PRESS (Kg / Cm^2)					
	SUPPLY PRESS (Kg / Cm^2)					
	RESET TYPE					
	VENT PLUG					
LIMIT SWITCH	MFR. & MODEL NUMBER					
	OPEN posn	INT posn	CLOSE posn			
	CONTACT TYPE					
	RATING (AC / DC)					
	ENCLOSURE CLASS					
SOLENOID VALVE	MFR. & MODEL NUMBER					
	RATING					
	TYPE					
	QUANTITY					
	COIL INSULATION CLASS					
	ENCLOSURE/BODY MATERIAL					
	ENCLOSURE CLASS					
HANDWHEEL	ORIENTATION					
JUNCTION BOX	NO. OF WAYS					
	TYPE OF TERMINAL BLOCKS					
	ELECTRICAL CONNECTION					
	CABLE GLANDS (Qty/Type/Material)					
	ENCLOSURE CLASS					
	BODY MATERIAL					
Cu./SS Tubing & Fittings / per CV	This is in addition to pneumatic Tubing and fittings which are integral part of CV					
PAINTING	COLOUR/SHADE					
	THICKNESS (DFT) – in microns					
	TYPE					

COMPANY SEAL
NAME
SIGNATURE
DATE

NOTES:

1.*All the single acting smart positioners shall be provided with two(02) no. of gauges. Double acting positioners shall be provided with three(03) gauges.
2. Wherever in data sheet more than one options are marked, bidder to comply for all the options. BHEL will select any one option for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **(RATE CONTRACT)**	SPECIFICATION NO.:**PE-TS-20-145-I104**
		VOLUME **II-B**
		SECTION **C**
		REV. NO. 00 / DATE: 28.04.2017

Data Sheet No. ACO

APPLICABLE FOR MAIN VALVES WHEREVER OPTION "REQUIRED" INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEETS

DATA SHEET – A FOR ACCESSORIES FOR CONTROL VALVE – ON/OFF DUTY (TO BE FILLED BY PURCHASER)

AIR FILTER REGULATOR	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm^2 g)				
	OUTPUT PRESS (Kg / Cm^2 g)				
	FILTER SIZE/ FILTER MATERIAL				
	OUTPUT GAUGE				
	AUTO DRAIN FEATURE				
AIR LOCK RELAY	MFR. & MODEL NUMBER				
	SET PRESS (Kg / Cm^2)				
	SUPPLY PRESS (Kg / Cm^2)				
	RESET TYPE				
	VENT PLUG				
LIMIT SWITCH	MFR. & MODEL NUMBER				
	OPEN posn	INT posn	CLOSE posn		
	CONTACT TYPE				
	RATING (AC / DC)				
	ENCLOSURE CLASS				
SOLENOID VALVE	MFR. & MODEL NUMBER				
	RATING				
	TYPE				
	QUANTITY				
	COIL INSULATION CLASS				
	ENCLOSURE/BODY MATERIAL				
	ENCLOSURE CLASS				
HANDWHEEL	ORIENTATION				
JUNCTION BOX	NO. OF WAYS				
	SIZE				
	TYPE OF TERMINAL BLOCKS				
	ELECTRICAL CONNECTION				
	CABLE GLANDS (Qty/Type/Material)				
	ENCLOSURE CLASS				
	BODY MATERIAL				
Cu./SS Tubing & Fittings / per CV	This is in addition to pneumatic Tubing and fittings which are integral part of CV				
PAINTING	COLOUR/SHADE				
	THICKNESS (DFT) – in microns				
	TYPE				

COMPANY SEAL
NAME
SIGNATURE
DATE

NOTES:

1. Wherever in data sheet more than one options are marked, bidder to comply for all the options. BHEL will select any one option for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.

SECTION-C

QUALITY PLAN

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
VOLUME	II B
SECTION	C
REV. NO. 00	DATE: 28.04.2017

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1.0	**INCOMING MATERIAL**											
1.1	Body & Bonnet casting / forgings, plug, valve stem, seat ring/cage.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3	---	2,1	TC for body/bonnet from foundry only
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3/2	2	1	1.IBR Certification (if applicable) to be verified by BHEL. 2.Applicable for body /bonnet only
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1	Applicable for body and bonnet for rating ANSI 900 and above.
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	After Machining on machined surface only
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1	For Body & Bonnet after machining.
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2	

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.
1 - BHEL; 2 - Vendor; 3 - Sub-vendor

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
VOLUME	II B
SECTION	C
REV. NO. 00	DATE: 28.04.2017

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2	---	2,1	
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Mfr. standard	Record	3	---	2	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Relevant Standards	Relevant Standards	Test Certificate	3	---	2	
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1	

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test.; W - Agency Witnessing the Test.; V - Agency Verifying the Test.
1 - BHEL; 2 - Vendor; 3 - Sub-vendor

PEM :: C&I

QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
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SECTION	C
REV. NO. 00	DATE: 28.04.2017

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2	
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2	
2.0	**IN PROCESS INSPECTION**											
2.1	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1	
3.0	**TESTS ON COMPLETED VALVE**											
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19/ ASME B16.34	No Leakage	Test Certificate	2	1	1	Refer Note-4
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1	1	Refer Note-4
4.0	**OPERATION TEST ON COMPLETED VALVE (Final inspection)**	1. Valve Travel	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		3. Linearity/cam characteristic	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test.; W - Agency Witnessing the Test.; V - Agency Verifying the Test.
1 - BHEL; 2 - Vendor; 3 - Sub-vendor

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-999-145-I 006**
VOLUME	II B
SECTION	C
REV. NO. 00	DATE: 28.04.2017

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
		4. Repeatability	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		7. Accuracy (Overall)	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		8. Control Valve characteristics / CV Test	MA	♦Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	Mfr. Procedure	Approved drg. / data sheet	Test Certificate	2	--	1	♦Size = Body & port size Or Body size & CV for non std port. Refer Note 1.
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Mfr. Procedure	Approved drg./ data sheet	Test Report	2	1	1	On assembled valve Refer Note-4
		10. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	Approved drg./ data sheet	Records	2	1	1	Refer Note-4
		11. Pre defined valve position in case of air failure	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	1	1	
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional, paint thickness	100%	Mfr. Procedure	Approved drg./ data sheet	Test Certificate	2	1	1	
		13. Surface Quality	MA	Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1	

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1 - BHEL; 2 - Vendor; 3 - Sub-vendor

PEM :: C&I	QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)	QUALITY PLAN NO.: **PE-QP-999-145-I 006**
		VOLUME II B
		SECTION C
		REV. NO. 00 DATE: 28.04.2017

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
5.0	**AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)**											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	Certificate of Conformance (C.O.C)
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	---	(C.O.C)
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
5.6	Smart Positioner	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
	(As Applicable)	2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Mfr. Standard	Mfr. Standard	Test Certificate	2	---	---	(C.O.C)
6.0	**PAINTING**	Soundness of Painting	MA	Visual and Measurement	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-2
7.0	**PACKING**	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

NOTES:
1. Cv test shall be conducted at FCRI/any laboratory approved by Govt. Of India/BHEL approved Laboratory. Alternatively, valid Cv test certificate as mentioned in Section-C(Clause No. XII) for a similar control valve (same size, same CV, same trim characteristics) can be accepted for a specific project subject to acceptance by Customer.
2. Customer's specification for painting shall be included during project specific enquiry. In the absence of Customer's spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, if called for in the Data sheets.
4. The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet. For overseas projects where Indian standards like IBR are not acceptable to Customer, bidder to follow equivalent codes/standards followed in the respective country.
6. Copies of all TC's(Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests(Leak/Operation), C.O.C's(Certificates of Conformance) shall be submitted to BHEL for verification and acceptance.

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SECTION – C

BILL OF QUANTITY

BOQ FOR RATE CONTRACT - CONTROL VALVES

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Sl no.	Item no.	Item Description	DATA SHEET NO.	Accessory data sheet no.	Valve size	Std Body material	Std Trim material	Qty of valves with std body material (col. G) & std trim material (col. H)	Special body material	Qty of valves with special body material (as per Col. J)	Special trim requirement	Qty of valves with special trim requirement (as per Col. L)	REMARKS
1	CV1.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A1 and B1	A1	B1	8"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	WC9	1	NIL		
2	CV1.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A1 and B1	A1	B1	10"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	14	WC9	7	NIL		
3	CV2.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A2 and B1	A2	B1	8"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	WC9	1	NIL		
4	CV2.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A2 and B1	A2	B1	12"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	14	WC9	7	NIL		
5	CV3.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A3 and B1	A3	B1	3"	WC9	SS410	7	NIL		NIL		
6	CV4.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A4 and B2	A4	B2	1"	WC6	SS316 STELLITED/ 17-4PH SS	11	NIL		Trim with HIGH FL($\geq$0.985)	2	
7	CV5.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A5 and B2	A5	B2	3"	WC9	SS 440 C	1	NIL		NIL		
8	CV5.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A5 and B2	A5	B2	6"	WC9	SS 440 C	15	NIL		NIL		
9	CV6.1	CONTROL VALVE with MULTI STAGE , MULTI PATH TRIM DESIGN; COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A6 AND B1	A6	B1	6"	WC6	SS316 STELLITED/ 17-4PH SS	15	NIL		Trim with HIGH FL($\geq$0.985)	2	
10	CV7.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A7 and B1	A7	B1	6"	WC6	SS316 STELLITED/ 17-4PH SS	9	NIL		NIL		
11	CV8.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A8 and B1	A8	B1	4"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
12	CV8.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A8 and B1	A8	B1	10"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
13	CV8.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A8 and B1	A8	B1	14"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	28	NIL		NIL		
14	CV9.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A9 and B1	A9	B1	6"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	15	WC6	1	Trim with HIGH FL($\geq$0.985)	2	
15	CV10.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A10 and B1	A10	B1	1"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	15	NIL		Trim with HIGH FL($\geq$0.985)	2	
16	CV11.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A11 and B1	A11	B1	3"	WC6	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
17	CV11.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A11 and B1	A11	B1	4"	WC6	SS316 STELLITED/ 17-4PH SS	2	NIL				
18	CV11.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A11 and B1	A11	B1	6"	WC6	SS316 STELLITED/ 17-4PH SS	52	NIL		Trim with HIGH FL($\geq$0.985)	2	
19	CV12.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A12 and B1	A12	B1	4"	WC9	SS 440 C	3	NIL				
20	CV12.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A12 and B1	A12	B1	6"	WC9	SS 440 C	52	NIL		Trim with HIGH FL($\geq$0.985)	2	
21	CV13.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A13 and B1	A13	B1	3"	WC6	SS316 STELLITED/ 17-4PH SS	26	WC9	1	Trim with HIGH FL($\geq$0.985)	2	
22	CV13.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A13 and B1	A13	B1	4"	WC6	SS316 STELLITED/ 17-4PH SS	2	WC9	1	Trim with HIGH FL($\geq$0.985)	2	
23	CV14.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A14 and B1	A14	B1	3"	WC9	SS 440 C	24	NIL		Trim with HIGH FL($\geq$0.985)	2	
24	CV14.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A14 and B1	A14	B1	4"	WC9	SS 440 C	2	NIL		Trim with HIGH FL($\geq$0.985)	2	

BOQ FOR RATE CONTRACT - CONTROL VALVES

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Sl no.	Item no.	Item Description	DATA SHEET NO.	Accessory data sheet no.	Valve size	Std Body material	Std Trim material	Qty of valves with std body material (col. G) & std trim material (col. H)	Special body material	Qty of valves with special body material (as per Col. J)	Special trim requirement	Qty of valves with special trim requirement (as per Col. L)	REMARKS
25	CV15.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A15 and B1	A15	B1	3"	WC6	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
26	CV15.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A15 and B1	A15	B1	4"	WC6	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
27	CV15.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A15 and B1	A15	B1	6"	WC6	SS316 STELLITED/ 17-4PH SS	2	NIL		NIL		
28	CV15.4	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A15 and B1	A15	B1	8"	WC6	SS316 STELLITED/ 17-4PH SS	2	NIL		Trim with HIGH FL($\geq$0.985)	2	
29	CV15.5	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A15 and B1	A15	B1	10"	WC6	SS316 STELLITED/ 17-4PH SS	2	NIL		Trim with HIGH FL(>0.985)	2	
30	CV16.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A16 and B1	A16	B1	3"	WC6	SS316 STELLITED/ 17-4PH SS	9	NIL		Trim with HIGH FL($\geq$0.985)	2	
31	CV16.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A16 and B1	A16	B1	4"	WC6	SS316 STELLITED/ 17-4PH SS	5	NIL		NIL		
32	CV16.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A16 and B1	A16	B1	6"	WC6	SS316 STELLITED/ 17-4PH SS	5	NIL		NIL		
33	CV16.4	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A16 and B1	A16	B1	8"	WC6	SS316 STELLITED/ 17-4PH SS	7	NIL		NIL		
34	CV17.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A17 and B1	A17	B1	3"	WC6	SS 440 C	2	WC9	1	NIL		
35	CV17.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A17 and B1	A17	B1	4"	WC6	SS 440 C	19	WC9	2	NIL		
36	CV17.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A17 and B1	A17	B1	6"	WC6	SS 440 C	5	WC9	1	Trim with HIGH FL($\geq$0.985)	2	
37	CV17.4	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A17 and B1	A17	B1	8"	WC6	SS 440 C	9	WC9	1	Trim with HIGH FL($\geq$0.985)	2	
38	CV17.5	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A17 and B1	A17	B1	10"	WC6	SS 440 C	7	WC9	1	NIL		
39	CV17.6	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A17 and B1	A17	B1	12"	WC6	SS 440 C	5	WC9	1	NIL		
40	CV18.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A18 and B1	A18	B1	3"	CF8M	SS316 STELLITED/ 17-4PH SS	18	NIL		NIL		
41	CV18.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A18 and B1	A18	B1	4"	CF8M	SS316 STELLITED/ 17-4PH SS	7	NIL		NIL		
42	CV18.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A18 and B1	A18	B1	6"	CF8M	SS316 STELLITED/ 17-4PH SS	5	NIL		NIL		
43	CV19.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A19 and B1	A19	B1	6"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	12	NIL		NIL		
45	CV20.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A20 and B1	A20	B1	4"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
46	CV20.2	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A20 and B1	A20	B1	6"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
47	CV20.3	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A20 and B1	A20	B1	8"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
48	CV20.4	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A20 and B1	A20	B1	10"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
49	CV20.5	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A20 and B1	A20	B1	12"	WCB/WCC	SS316 STELLITED/ 17-4PH SS	4	NIL		NIL		
50	CV21.1	CONTROL VALVE with MULTI STAGE , MULTI PATH TRIM DESIGN; COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A21 AND B1	A21	B1	12"	WC9	SS316 STELLITED/ 17-4PH SS	16	NIL		Trim with HIGH FL($\geq$0.995)	2	
51	CV22.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A22 and B1	A22	B1	12"	WC6	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
52	CV23.1	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A23 and B1	A23	B1	6"	WC6	SS316 STELLITED/ 17-4PH SS	1	NIL		NIL		
								461		26		32	PLEASE REFER **NOTE 4**

NOTE :-

1. The bidder shall include one set of packing and gasket (all types including body, bonnet) along with each control valve within the valve's quoted price.

2. The bidder shall include pneumatic tubing viz. integral tubing as well as additional 12 metres tubing per control valve, upto the instrumentation air header;along with the fittings as per hook-up diagram and accessories' datasheets along with each control valve within the valve's quoted price.

3. ADD-ON price indicates the additional price bidder will quote w.r.t. special trim material, special body material in additon to the price quoted for the main valve.

4. Total quantity of valves is 461, which is inclusive of valves with special body/trim requirement.

BOQ FOR RATE CONTRACT - VALVE TRIMS									
{Refer BOQ FOR RATE CONTRACT-CONTROL VALVES}									
A	B	C	D	E	F	G	H	I	J
Sl no.	Item no.	Item Description	DATA SHEET NO.	Valve size	Std Trim material	Qty of std trims	Trim with special requirement	Qty of trims with special requirement (as per Col. H)	REMARKS
1	TRM 1.1	VALVE TRIM FOR CV1.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A1	A1	8"	SS316 STELLITED/ 17-4PH SS	1	NIL		
2	TRM 1.2	VALVE TRIM FOR CV1.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A1	A1	10"	SS316 STELLITED/ 17-4PH SS	10	NIL		
3	TRM 2.1	VALVE TRIM FOR CV2.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A2	A2	8"	SS316 STELLITED/ 17-4PH SS	1	NIL		
4	TRM 2.2	VALVE TRIM FOR CV2.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A2	A2	12"	SS316 STELLITED/ 17-4PH SS	10	NIL		
5	TRM 3.1	VALVE TRIM FOR CV3.1(MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A3	A3	3"	SS410	4	NIL		
6	TRM 4.1	VALVE TRIM FOR CV4.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A4	A4	1"	SS316 STELLITED/ 17-4PH SS	6	Trim with HIGH FL(≥0.985)	2	
7	TRM 5.1	VALVE TRIM FOR CV5.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A5	A5	3"	SS 440 C	1	NIL		
8	TRM 5.2	VALVE TRIM FOR CV5.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A5	A5	6"	SS 440 C	10	NIL		
9	TRM 6.1	MULTI STAGE , MULTI PATH VALVE TRIM FOR CV6.1(MAIN BOQ)INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, AS PER DATASHEET A6	A6	6"	SS316 STELLITED/ 17-4PH SS	10	Trim with HIGH FL(≥0.985)	2	
10	TRM 7.1	VALVE TRIM FOR CV7.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A7	A7	6"	SS316 STELLITED/ 17-4PH SS	3	NIL		
11	TRM 8.1	VALVE TRIM FOR CV8.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A8	A8	4"	SS316 STELLITED/ 17-4PH SS	1	NIL		
12	TRM 8.2	VALVE TRIM FOR CV8.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A8	A8	10"	SS316 STELLITED/ 17-4PH SS	1	NIL		
13	TRM 8.3	VALVE TRIM FOR CV8.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A8	A8	14"	SS316 STELLITED/ 17-4PH SS	10	NIL		
14	TRM 9.1	VALVE TRIM FOR CV9.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A9	A9	6"	SS316 STELLITED/ 17-4PH SS	10	Trim with HIGH FL(≥0.985)	2	
15	TRM 10.1	VALVE TRIM FOR CV10.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A10	A10	1"	SS316 STELLITED/ 17-4PH SS	10	Trim with HIGH FL(≥0.985)	2	
16	TRM 11.1	VALVE TRIM FOR CV11.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A11	A11	3"	SS316 STELLITED/ 17-4PH SS	1	NIL		
17	TRM 11.2	VALVE TRIM FOR CV11.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A11	A11	4"	SS316 STELLITED/ 17-4PH SS	1	NIL		
18	TRM 11.3	VALVE TRIM FOR CV11.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A11	A11	6"	SS316 STELLITED/ 17-4PH SS	26	Trim with HIGH FL(≥0.985)	2	
19	TRM 12.1	VALVE TRIM FOR CV12.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A12	A12	4"	SS 440 C	1	NIL		
20	TRM 12.2	VALVE TRIM FOR CV12.2(MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A12	A12	6"	SS 440 C	26	Trim with HIGH FL(≥0.985)	2	
21	TRM 13.1	VALVE TRIM FOR CV13.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A13	A13	3"	SS316 STELLITED/ 17-4PH SS	13	Trim with HIGH FL(≥0.985)	2	
22	TRM 13.2	VALVE TRIM FOR CV13.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A13	A13	4"	SS316 STELLITED/ 17-4PH SS	2	Trim with HIGH FL(≥0.985)	2	
23	TRM 14.1	VALVE TRIM FOR CV14.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A14	A14	3"	SS 440 C	13	Trim with HIGH FL(≥0.985)	2	
24	TRM 14.2	VALVE TRIM FOR CV14.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A14	A14	4"	SS 440 C	2	Trim with HIGH FL(≥0.985)	2	
25	TRM 15.1	VALVE TRIM FOR CV15.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A15	A15	3"	SS316 STELLITED/ 17-4PH SS	1	NIL		
26	TRM 15.2	VALVE TRIM FOR CV15.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A15	A15	4"	SS316 STELLITED/ 17-4PH SS	1	NIL		
27	TRM 15.3	VALVE TRIM FOR CV15.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A15	A15	6"	SS316 STELLITED/ 17-4PH SS	1	NIL		
28	TRM 15.4	VALVE TRIM FOR CV15.4 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A15	A15	8"	SS316 STELLITED/ 17-4PH SS	2	Trim with HIGH FL(≥0.985)	2	
29	TRM 15.5	VALVE TRIM FOR CV15.5 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A15	A15	10"	SS316 STELLITED/ 17-4PH SS	2	Trim with HIGH FL(>0.985)	2	

BOQ FOR RATE CONTRACT - VALVE TRIMS									
{Refer BOQ FOR RATE CONTRACT-CONTROL VALVES}									
A	B	C	D	E	F	G	H	I	J
Sl no.	Item no.	Item Description	DATA SHEET NO.	Valve size	Std Trim material	Qty of std trims	Trim with special requirement	Qty of trims with special requirement (as per Col. H)	REMARKS
30	TRM 16.1	VALVE TRIM FOR CV16.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A16	A16	3"	SS316 STELLITED/ 17-4PH SS	6	Trim with HIGH FL(≥0.985)	2	
31	TRM 16.2	VALVE TRIM FOR CV16.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A16	A16	4"	SS316 STELLITED/ 17-4PH SS	4	NIL		
32	TRM 16.3	VALVE TRIM FOR CV16.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A16	A16	6"	SS316 STELLITED/ 17-4PH SS	4	NIL		
33	TRM 16.4	VALVE TRIM FOR CV16.4 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A16	A16	8"	SS316 STELLITED/ 17-4PH SS	4	NIL		
34	TRM 17.1	VALVE TRIM FOR CV17.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A17	A17	3"	SS 440 C	1	NIL		
35	TRM 17.2	VALVE TRIM FOR CV17.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A17	A17	4"	SS 440 C	12	NIL		
36	TRM 17.3	VALVE TRIM FOR CV17.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A17	A17	6"	SS 440 C	4	Trim with HIGH FL(≥0.985)	2	
37	TRM 17.4	VALVE TRIM FOR CV17.4 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A17	A17	8"	SS 440 C	6	Trim with HIGH FL(≥0.985)	2	
38	TRM 17.5	VALVE TRIM FOR CV17.5 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A17	A17	10"	SS 440 C	4	NIL		
39	TRM 17.6	VALVE TRIM FOR CV17.6 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A17	A17	12"	SS 440 C	4	NIL		
40	TRM 18.1	VALVE TRIM FOR CV18.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A18	A18	3"	SS316 STELLITED/ 17-4PH SS	10	NIL		
41	TRM 18.2	VALVE TRIM FOR CV18.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A18	A18	4"	SS316 STELLITED/ 17-4PH SS	6	NIL		
42	TRM 18.3	VALVE TRIM FOR CV18.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A18	A18	6"	SS316 STELLITED/ 17-4PH SS	4	NIL		
43	TRM 19.1	VALVE TRIM FOR CV19.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A19	A19	6"	SS316 STELLITED/ 17-4PH SS	10	NIL		
44	TRM 20.1	VALVE TRIM FOR CV20.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A20	A20	4"	SS316 STELLITED/ 17-4PH SS	1	NIL		
45	TRM 20.2	VALVE TRIM FOR CV20.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A20	A20	6"	SS316 STELLITED/ 17-4PH SS	1	NIL		
46	TRM 20.3	VALVE TRIM FOR CV20.3 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A20	A20	8"	SS316 STELLITED/ 17-4PH SS	1	NIL		
47	TRM 20.4	VALVE TRIM FOR CV20.4 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A20	A20	10"	SS316 STELLITED/ 17-4PH SS	1	NIL		
48	TRM 20.5	VALVE TRIM FOR CV20.5 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A20	A20	12"	SS316 STELLITED/ 17-4PH SS	2	NIL		
49	TRM 21.1	MULTI STAGE , MULTI PATH VALVE TRIM FOR CV21.1(MAIN BOQ)INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, AS PER DATASHEET A21	A21	12"	SS316 STELLITED/ 17-4PH SS	10	Trim with HIGH FL(≥0.995)	2	
50	TRM 22.1	TRIM FOR CV22.1(MAIN BOQ)INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, AS PER DATASHEET A22	A22	12"	SS316 STELLITED/ 17-4PH SS	1	NIL		
51	TRM 23.1	TRIM FOR CV23.1(MAIN BOQ)INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, AS PER DATASHEET A23	A23	6"	SS316 STELLITED/ 17-4PH SS	1	NIL		
						277		32	PLEASE REFER **NOTE 1**

NOTE :-

1. Total quantity of trims is 277, which is inclusive of trim with special requirement.

BOQ FOR RATE CONTRACT - CONTROL VALVES COMPONENTS & ACCESSORIES

A	B	C	D	E	F
Sl no.	Item no	ITEM DESCRIPTION	QTY	UOM	REMARKS
1	AC1	ADVANCE DIAGNOSTIC SOFTWARE (FOR min 40 TAGS) FOR CONFIGURATION, DIAGNOSTIC, CALIBRATION & TESTING (refer spec for SMART POSITIONER)	15	NOS.	
2	AC2	UNIVERSAL HAND HELD HART CALIBRATOR	15	NOS.	
3	AC3	DESKTOP PC (INDUSTRIAL GRADE)	10	NOS.	
4	AC4	COMPUTER furniture (table & chair as per spec)	10	NOS.	
5	AC5	DIAPHRAGM - upto 14 " size	80	NOS.	
6	AC6	DIAPHRAGM - 15 " to 18 " size	340	NOS.	
7	AC7	DIAPHRAGM - > 18" size	5	NOS.	
8	AC8	ACTUATOR ASSEMBLY for Diaphragm Actuator - upto 14" diaphragm size	20	NOS.	
9	AC9	ACTUATOR ASSEMBLY for Diaphragm Actuator - 15" to 18" diaphragm size	35	NOS.	
10	AC10	ACTUATOR ASSEMBLY for Diaphragm Actuator - > 18" diaphragm size	5	NOS.	
11	AC11	ACTUATOR ASSEMBLY for Piston Cylinder Actuator - upto 16" dia. Piston	10	NOS.	
12	AC12	ACTUATOR ASSEMBLY for Piston Cylinder Actuator - 16" to 20" dia. Piston	10	NOS.	
13	AC13	ACTUATOR ASSEMBLY for Piston Cylinder Actuator - > 20" dia. Piston	5	NOS.	
14	AC14	'O' rings, seal kit for piston actuator - upto 16" dia. Piston	20	NOS.	
15	AC15	'O' rings, seal kit for piston actuator - 17" to 20" dia. Piston	10	NOS.	
16	AC16	'O' rings, seal kit for piston actuator - > 20" dia. dia. Piston	5	NOS.	
17	AC17	Complete set of packing for each control valve	220	SETS	
18	AC18	Complete set of gaskets for each control valve	220	SETS	
19	AC19	AIR LOCK RELAY	100	NOS.	
20	AC20	AIR FILTER REGULATOR/PRESSURE REGULATOR	100	NOS.	
21	AC21	VOLUME BOOSTER	30	NOS.	
22	AC22	PRESSURE GAUGES	20	NOS.	
23	AC23	SOLENOID VALVE	110	NOS.	
24	AC24	LIMIT SWITCH ASSEMBLY	300	NOS.	
25	AC25	FEED BACK LINKAGE	140	NOS.	
26	AC26	MOISTURE SEPARATOR	90	NOS.	
27	AC27	SMART positioner (single acting type) - both fail safe and fail freeze	155	NOS.	
28	AC28	SMART positioner (double acting type) - both fail safe and fail freeze	15	NOS.	
29	AC29	O rings kit for smart positioner	15	NOS.	
30	AC30	Bonnet for feed control valve - 12" VALVE SIZE	5	NOS.	

BOQ FOR RATE CONTRACT - CONTROL VALVES COMPONENTS & ACCESSORIES

A	B	C	D	E	F
Sl no.	Item no	ITEM DESCRIPTION	QTY	UOM	REMARKS
31	AC31	Actuator piston with rod and seal	20	NOS.	
32	AC32	Coupling nut	20	NOS.	
33	AC33	1/4 " SS or PVC INSULATED COPPER TUBING (per meter)	120	METRES	
34	AC34	Valve spindle/valve stem (upto 6" valve size)	40	NOS.	
35	AC35	Valve spindle/valve stem (8" to 10" valve size)	20	NOS.	
36	AC36	Valve spindle/valve stem (above 10" valve size)	20	NOS.	
37	AC37	Valve spindle for feed control valve - 12" VALVE SIZE	10	NOS.	
38	AC38	Metal Seat ring for feed control valve - 12" VALVE SIZE	10	NOS.	
39	AC39	1/2" NPT (M) X 1/4" OD Tube Connector - SS	20	NOS.	Double compression type fittings to be provided.
40	AC40	1/4" NPT (M) X 1/4" OD Tube Connector - SS	20	NOS.	Double compression type fittings to be provided.
41	AC41	SS Tee suitable for 1/4" OD Tube	20	NOS.	Double compression type fittings to be provided.
42	AC42	1/2" NPT (M) X 1/4" OD Tube Connector - Brass	20	NOS.	Double compression type fittings to be provided.
43	AC43	1/4" NPT (M) X 1/4" OD Tube Connector - Brass	20	NOS.	Double compression type fittings to be provided.
44	AC44	Brass Tee suitable for 1/4" OD Tube	20	NOS.	Double compression type fittings to be provided.

BOQ FOR RATE CONTRACT - CV test/FL test FOR CONTROL VALVES

A	B	C	D	E	F
Sl no.	Item no.	Item Description	Valve body size	Qty	REMARKS
1	TT1	CV test of control valve(1" to 2")	1" to 2"	15	
2	TT2	CV test of control valve(3" to 6")	3" to 6"	120	
3	TT3	CV test of control valve(8")	8"	15	
4	TT4	CV test of control valve(10")	10"	15	
5	TT5	CV test of control valve(12")	12"	12	
6	TT6	CV test of control valve(14" and above)	14" and above	8	
7	TT7	FL test of control valve(upto 4")	Upto 4"	20	

NOTE :-

1. Cv test and FL test shall be conducted at Fluid Control Research Institute(FCRI),Palakkad/laboratory approved by Govt. of India/BHEL approved laboratory.

SECTION – D

- **EQUIPMENT SPECIFICATION**
- **SPECIFICATION FOR SMART POSITIONER**
- **HOOK-UP DIAGRAMS**
- **GUIDELINES FOR PACKING**
- **SUB-VENDOR LIST**
- **COMPLIANCE CERTIFICATE**

SECTION-D

EQUIPMENT SPECIFICATION

1.0 SCOPE

1.1 This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Control valve (with Pneumatic Actuator as identified in the datasheet-A) for use in Utility/Captive Power Station/Combined Cycle Station.

1.2 Expander/Reducer between valve body & pipe shall be in BHEL's scope of supply. However, any other expander/reducer required shall be in bidder's scope of supply.

2.0 CODES AND STANDARDS

2.1 As a minimum requirement, the latest revision/version of the following (or equivalent) standards shall be complied as a minimum requirement :-

Indian Boiler Regulation (IBR)		
Allowable Seat leakage	:	FCI-70.2
Pressure & Temperature ratings	:	ANSI-B16.34
Enclosure class	:	IEC-144 / NEMA / IS-13947
Control Valves Sizing	:	ISA S-75

3.0 TECHNICAL REQUIREMENTS

The Control valve, Actuator and the accessories shall be suitable for continuous operation under an ambient temperature of 0-60°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB Section-B or Section-C.

3.1 **Control Valve**

The control valve shall be suitably designed for the process operating conditions and system characteristics as specified in the Data Sheet-A.

3.1.1 The control valve shall be of globe/angle body design, as per datasheet, with single port. Valve trim shall be cage guided balanced type for valve sizes $\geq$ 3" and above. The valve trim shall be suitable for quick replacement without any cutting or welding. Anti-cavitation trims shall be provided for valves with cavitation service and hardened trims for flashing services.

3.1.2 The trim material and body material has been specified in the Datasheet-A. Bidder to offer body material and trim material combination as per the datasheet. Wherever there is a deviation from the datasheets, bidder to furnish the documentary proof for confirming superior trim material/body material selection along with their offer. BHEL/Customer reserves the right to accept/reject any variation in the specification.

3.1.3 Asbestos shall not be used for the packing or any other component.

3.1.4 The valve bonnet and packing shall be suitable for the service conditions as in Data Sheet-A. Gland sealed type bonnets are not acceptable. Double packing is mandatory for applications involving vacuum service. For valves where downstream is subjected to vacuum, flow action shall be "flow to close" (over the seat). Bonnets having Teflon packing shall have valve stem finished to 2-4 microns. Packing material requiring lubrication will not be acceptable.

Type of bonnet shall be according to the service condition. Extension bonnets shall be provided when the maximum temperature of the flowing fluid is greater than 280 or unless otherwise specified.
Cast Steel (CS) yokes shall be offered for CEP Minimum Recirculation valve/GSC minimum recirculation control valve. Cast Iron (CI) yokes are not acceptable for these services.

3.1.5 The valve end connection as specified in Data Sheet-A shall conform to ANSI B16.25 for Butt Weld connection, ANSI B16.11 for Socket Weld connection and ANSI B16.5 for flanged ends. Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10. The end connections shall be Socket Welded for sizes up to 50 NB and Butt Welded for sizes above 50 NB.

3.1.6 The valve seat leakage shall be as per FCI-70.2. The leakage class shall be as per Data Sheet-A.

3.1.7 The valve body shall have the direction of flow embossed on all valves.

3.1.8 The sizing shall conform to the requirements of ISA S75.01, and the valve capacity shall be selected so as to meet the following:

Valve with Linear Characteristic	-	Normal Flow (Design Point)	:	70-75% valve lift.
	-	Max. Flow	:	90% valve lift.
	-	Min. Flow	:	>10% valve lift.
Valve with Equal percentage Characteristic	-	Normal Flow (Design Point)	:	75-85% valve lift.
	-	Max. Flow	:	90% valve lift.
	-	Min. Flow	:	>10% valve lift.
ON/OFF Quick open Characteristic	-	1.1 times the CV calculated on the basis of maximum flow condition.		

The valve offered shall be capable of handling 120 % of the required maximum flow.

3.1.9 Calculation for valve sizing, velocity and noise shall be subject to purchaser's approval during contract stage. However, responsibility of proper selection and design for the duties specified lies with the vendor. Any modifications required to be done on the valves or actuators & accessories to achieve satisfactory performance of the control system shall be done without any commercial & delivery implication.

3.1.10 The valve outlet velocities shall be limited to the following values, unless otherwise specified in the Data sheet-A.

i)	Liquid service	<=	7 m/sec
ii)	Steam service	<=	150 m/sec
iii)	Flashing service	<=	50% of sonic velocity for flashing services.

3.1.11 For flashing duty, trim design shall be such that the vapour bubbles are kept away from valve body.

3.1.12 For cavitation service, the trim design shall be of multistage pressure drop type, so as to avoid cavitation altogether, instead of keeping cavitation away from valve parts.

3.1.13 The equivalent weighted sound level measured at 1.5 metre above floor level in elevation and 1 metre horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA (without pipe insulation).The offer shall include noise prediction calculations for each valve.

3.1.14 In case of predicted noise level above 85 dBA, same shall be brought down to acceptable noise level i.e. below 85 dBA through Source treatment (proper valve trim & valve body selection). Path treatment (LNP/ Diffuser/ Cartridge/ Silencer etc.), if any shall be subject to Customer's/Owner's approval.

3.1.15 In case of wrong selection/mal operation of valve and for associated actuator during guarantee period, the vendor shall replace the valve suitably with a modified/new valve of design as approved by purchaser and all the expenses for replacement, rectification/modification including transportation both ways will be at vendor's expenses.

3.2 **ACTUATORS-** The control valves shall be operated pneumatically (with pneumatic actuator)

3.2.1 **Pneumatic Actuator**
The actuator shall be designed for a thrust of 120% of valve's shut-off pressure at an airline supply pressure of 5 Kg/Sq. cm.

The pneumatic actuators shall be employed for modulating or open/close duty, as specified in Data Sheet-A. The bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drops, shut off pressure and valve travel. The pneumatic spring opposed diaphragm actuator or piston actuator as the case may be for modulating duty shall be capable of positioning the associated valve at desired opening for all the operating conditions specified. If the project specific requirement calls for multi-spring opposed diaphragm actuator, the same shall be provided by the bidder without any commercial implication to BHEL.

3.2.2 The pneumatic actuator for open/close duty shall be suitable for fast opening/closing of the associated valve.

3.2.3 The actuator design shall allow valve assembly to be mounted at 45° inclination on either side in the vertical plane.

3.2.4 The actuators shall be suitably sized to ensure that the associated valve travel time from full open to full closed position and vice versa is less than 10 seconds or as specified in the datasheet under the most stringent service conditions.

3.2.5 The actuator's hand wheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve.

3.2.6 Each actuator shall be provided with a mechanical pointer attached to stem, moving over a graduated scale with markings, for OPEN, 25%, 50%, 75%, CLOSE positions.

3.3 **Accessories for Control valve with Pneumatic Actuator**

The bidder shall offer all the accessories as specified in the Data Sheet - A for the Pneumatic Actuators under modulating or OPEN/CLOSE duty. The accessories specified shall be supplied duly mounted on the valve actuator and piped with PVC insulated copper/ SS tube and flare-less brass/ SS fittings etc. as per the hook up diagram enclosed in this specification.

3.3.1 Moisture Separator - Separate moisture separator unit, if required, shall be provided for ensuring dryness of air entering I/P as well as the pneumatic actuator/power cylinder shall be supplied with each control valve, as per the hook-up diagram enclosed in the specification. The moisture separator unit shall be based on coalescence/leverage & buoyancy/other equivalent principle for its operation.

3.3.2 PC and furniture - Industry standard PC and Furniture shall be provided. Same shall be approved by Owner during detailed Engineering.

Desktop Computer:

1. Processor:	Latest, minimum Intel Core i7
2. Configuration:	Tower
3. Internal clock:	3.2 GHz (min.)
4. Architecture:	32 bit
5. Video Card:	PCI
6. RAM:	4 GB (Minimum) DDR
7. Hard drive:	1000 GB SATA
8. Cache:	512 KB Level 2
9. CD/DVD Drive:	CD - Both Read & Write for OWS. Both CD & DVD Read & Write for ES
10. Audio controller:	16-bit
11. Operating system:	Latest, Window
12. Graphic accelerator:	8MB (min.)
13. Communication ports:	2nos. (min.) Ethernet ports (1000 MB), 4 nos. USB ports (min.)
14. Optical Mouse:	1 no.
15. Keyboard:	1 no.

Monitor

1. Type :	TFT monitor
2. Screen diagonal :	24 inch flat
3. Display :	XGA or better
4. Resolution :	1024 X 768 or better
5. Degree of protection :	IP-30
6. External Controls :	Brightness, contrast, Horizontal / Vertical amplification & shift
7. Power supply :	240 V, 50 Hz, 1 phase
8. Ambient temperature :	0-50 O C
9. Humidity :	95% non-condensing
10. Version :	To suit industrial application

Bidder shall provide following industrial grade furniture The furniture shall be modular and latest with ease of operational features. The furniture shall be modern, aesthetically designed, modular, flexible, space saving and future safe:

CHAIRS

Industry standard revolving chairs with wheels and with provision for adjustment of height (hydraulically/gas lift) shall be provided. These shall be designed for sitting for long duration such that these are comfortable for the back.

TABLE

Industry standard computer tables shall be provided & shall be as approved by Owner during detailed Engineering.

3.4 **Painting** of the control valve assembly shall be as per the Customer's Painting Specification, to be furnished during project specific enquiry. In the absence of specification for painting, bidder to submit their standard painting procedure/specification for BHEL's approval.

Epoxy based paint (corrosion-resistant) to be provided for control valves for coastal environment. This shall be informed during the project specific enquiry and bidder to comply the same without any commercial implication to BHEL.

3.5 **Sub-vendor list** –
The sub-vendor list has been enclosed in this specification. Bidder may propose sub-vendors other than those listed in the specification, with supporting documents/credentials for their proven track record. However, all sub-vendors are subjected to BHEL's/Customer's approval without any commercial implication to BHEL.

4.0 TESTING AND INSPECTION

4.1 The testing and inspection of the equipment/items shall be in line with the approved QAP

4.2 The cost of all tests as per the approved QAP will be deemed to have been included in the bid.

4.3 In case, the bidder is supplying the valve from outside India, the third party inspection shall be arranged and considered by the bidder in their offer.

5.0 SPARES AND CONSUMABLES

5.1 **Start-up/Commissioning Spares**

The bidder shall include one set of packing and gasket (all types including body, bonnet) along with each control valve within the valve's quoted price.

5.2 **Parts of Control valve assembly, valve accessories**

The bidder shall quote for all the other items viz. Control valve sub-assembly items and other accessories in their offer, in the price format. The requirement shall be given during project specific enquiry.

6.0 DRAWINGS AND DOCUMENTS
6.1 The bidder shall furnish the following documents along with the bid : 4 Sets

6.1.1 Schedule of prices in the Price Format.

6.1.3 Quality Plan - duly signed & stamped.

6.1.4 Compliance certificate duly signed & stamped.

6.1.5 List of Alternate trim material offered against each datasheet - supported by documentary evidence authenticating superiority of trim material.

6.1.6 The following documents for low load feed control valve :-
(i) Credentials/proven track record of the valve model supplied by the bidder.
(ii) Catalog along with other required technical details of the valve model offered.

6.2 **The successful bidder shall furnish the following documents to BHEL during the contract stage viz. after the award of contract**:
5 sets of the following documents for approval + 2 sets of CDs:

6.2.1 CONTROL VALVE DOCUMENTS including the following :-

(a) Assembly (dimensional) drawings.

(b) Valve Edge preparation details.

(c) Data sheet-C completely filled-up.

(d) Hook-up diagram of Control Valve with Actuator & Accessories.

(e) Valve & Actuator assembly dimensional drawings with weights.

(f) All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.

(g) All relevant catalogues for models of the valves as well as accessories finalized.

6.2.2 QUALITY PLAN duly signed and stamped.

6.3 **Final documentation:**

Documents / drawings to be furnished by the successful bidder shall be as follows:
15 sets with 6 CD–ROMS of :-

6.3.1 Category I & IV approved CONTROL VALVE DOCUMENTS
6.3.2 Test certificates
6.3.3 Operation & maintenance manuals for Control Valve, Actuator and all accessories

7.0 MARKING AND PACKING

7.1 **Marking**

A stainless steel metal nameplate should be permanently fixed on each equipment giving its tag number and technical specifications.

7.2 **Packing**

All equipment / materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea water spray (where applicable) as well as rough handling and delays in transit and storage in open. Guidelines for packing are enclosed.

8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms:

- Data Sheet A for Control Valve with Pneumatic Actuator : Data Sheet No. AX; X=1 to 22
- Data Sheet A for Accessories (Modulating Duty) : Data Sheet No. B1
- Data Sheet A for Accessories (ON/OFF Duty) : Data Sheet No. B2

SECTION-D

SPECIFICATION FOR SMART POSITIONER

1.0 Electrical

Input Signal	4-20mA
Power Supply	Loop Powered from the output card of Control System (12-30 V DC)
Hart Protocol	Compatibility For Remote Calibration & Diagnostic (Super-Imposed HART Signal On Input Signal (4-20mA)
Valve Position Feedback (4-20mA)	Position Sensing 4-20mA O/P Signal For Control System To Be Provided.

2.0 Environment

Operating Temperature	(-) 30 To 80 Deg.C
Humidity	0-95%
Protection Class	IP-65 (Minimum)

3.0 Software For Configuration & Diagnostic

Software	Windows Based Software, Software Shall Meet The Requirement For Configuration, Diagnostics, Calibration And Testing Of the Actuator. Valve positioning timing, actuator leakage, and Valve Wear & tear, fault alarm to be offered as a minimum. Easily up gradable with same hardware and compatible with any HART management systems /AMS.
Diagnostic/Test Features	Advanced Diagnostic Features Like Stroke On Line Partial Closure Test, Valve Signature Analysis (Online graphical representation), Step Response Test, Valve Friction/Jamming Detection Etc To Be Provided.

Factory Valve Signature Tests Reports (Pr Vs Valve Travel And Travel Vs I/P Signal) Are To Be Provided.

Hardware	PC (Industrial Grade)	For Configuration/Software (OPTIONAL)
Test Certificates		Test certificates as per relevant standard are to be submitted.

Configuration / Remote Calibration, Auto & Manual Calibration Shall Be Possible.

One(01) P.F. contact for Smart positioner "FAILED" to be provided.

4.0 Modes

Valve Action	Direct & Reverse, Valve Action. (Same positioner for Single Acting or Double Acting And no separate relays required for changing from Single acting to double).
Flow Characterization	Possible to fit valve characteristic curve linear & Equal percentage
Fail Safe/Fail Freeze	Fail Safe/Fail Freeze feature is to be provided as per requirement in Data sheet-A.

5.0 Performance

Characteristic Deviation	<=0.75% of span
Ambient temp effect	<=0.01%/Deg C or better.
Dead Band	Adjustable 0.1 to 10%.
Scan Time	10ms
Resolution	<=0.05%
Sensitivity/Linearity	0.3-0.4% of FS
Repeatability	0.32% of FS
Auto-Tune	Yes

Leak Test	Yes

7.0 EMC & CE compliance

Required International Standard Like EN/IEC.	To En50081-2&En50082 or equivalent

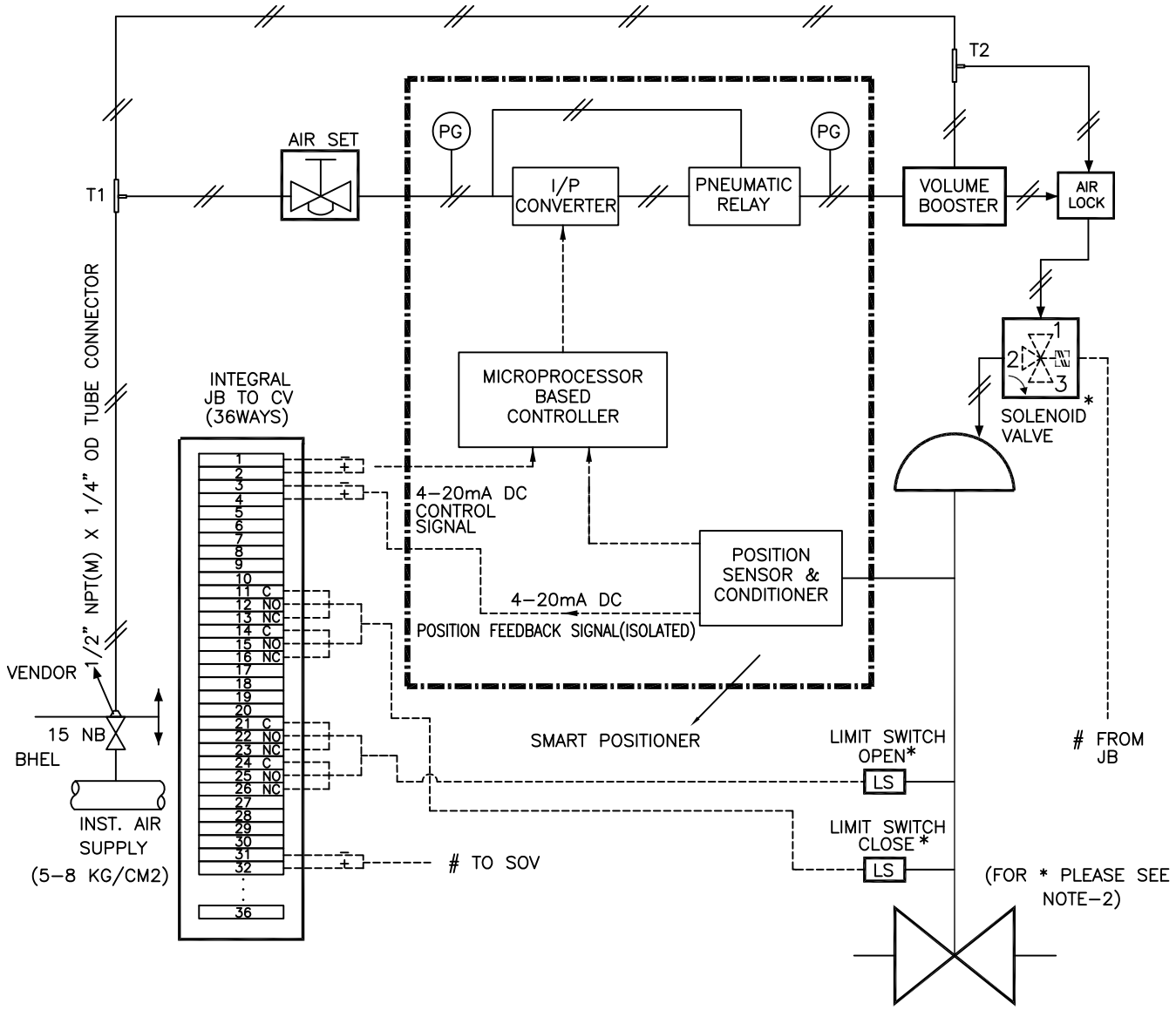
8.0 Accessories

In Built Operator Panel	Display With Push Buttons For Configuration And Display On The Positioner Itself
Hand Held Hart Calibrator	Universal HART Calibrator to be provided as per project specific requirement.
Press Gauge Block	For Supply & Output Pr., Filter Regulator Other Accessories Shall Be Provided As On Required Basis For Making System Complete.
Electrical cable entry	½-Npt, side or bottom entry to avoid water Ingress.

SECTION-D

HOOK-UP DIAGRAM

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(WITH SMART POSITIONER)

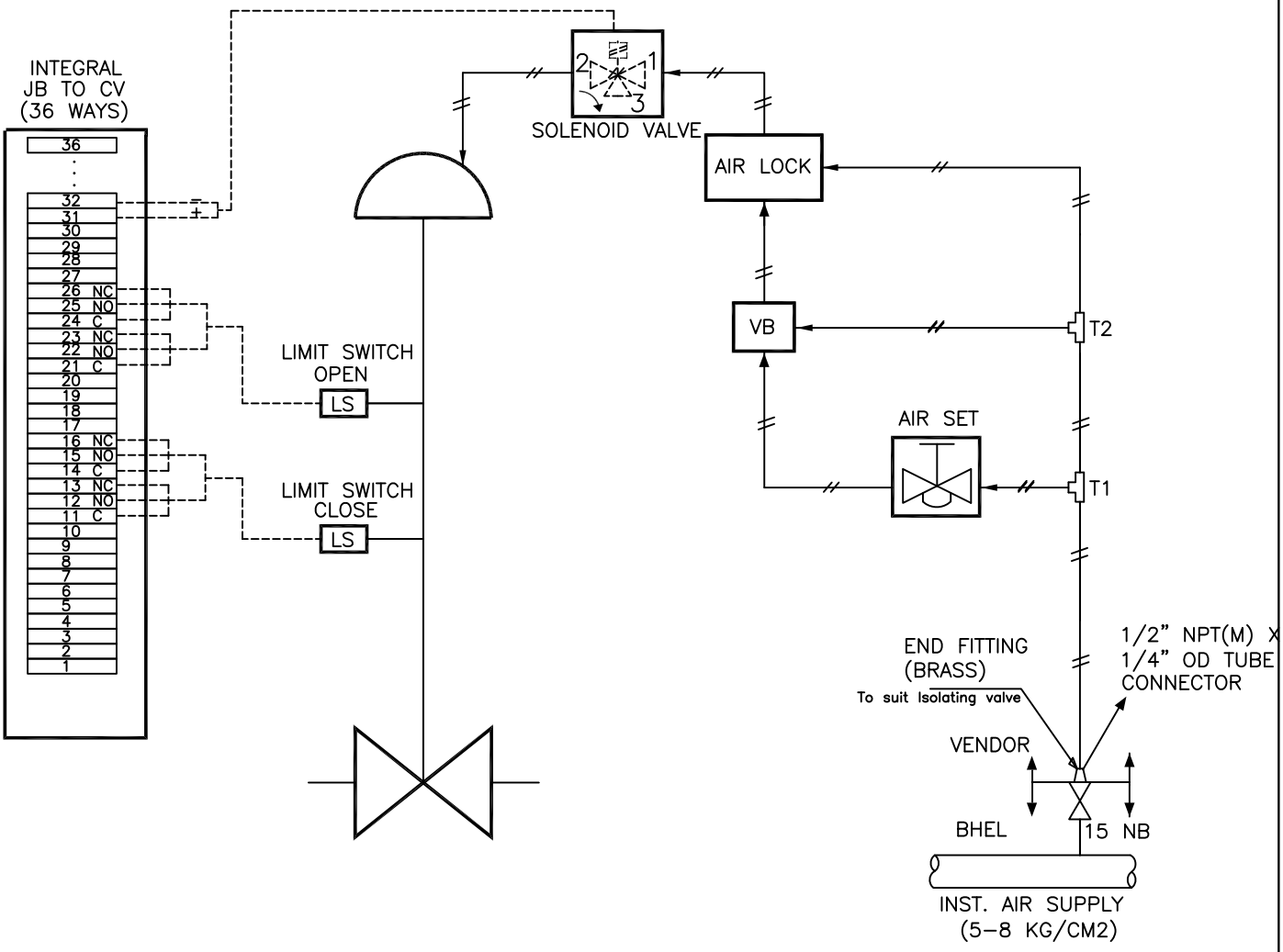


NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET-A
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4–20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER ACCESSORY DATA SHEET.
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS I/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISOLATION VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE–T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE–T2 SHALL BE PROVIDED.

BHEL	SPECIFICATION NO.: PE-TS-20-145-I104	DRG. No.	HOOK-UP No. 1
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. 00	DATE 28.04.17

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(FOR ON / OFF TYPE)

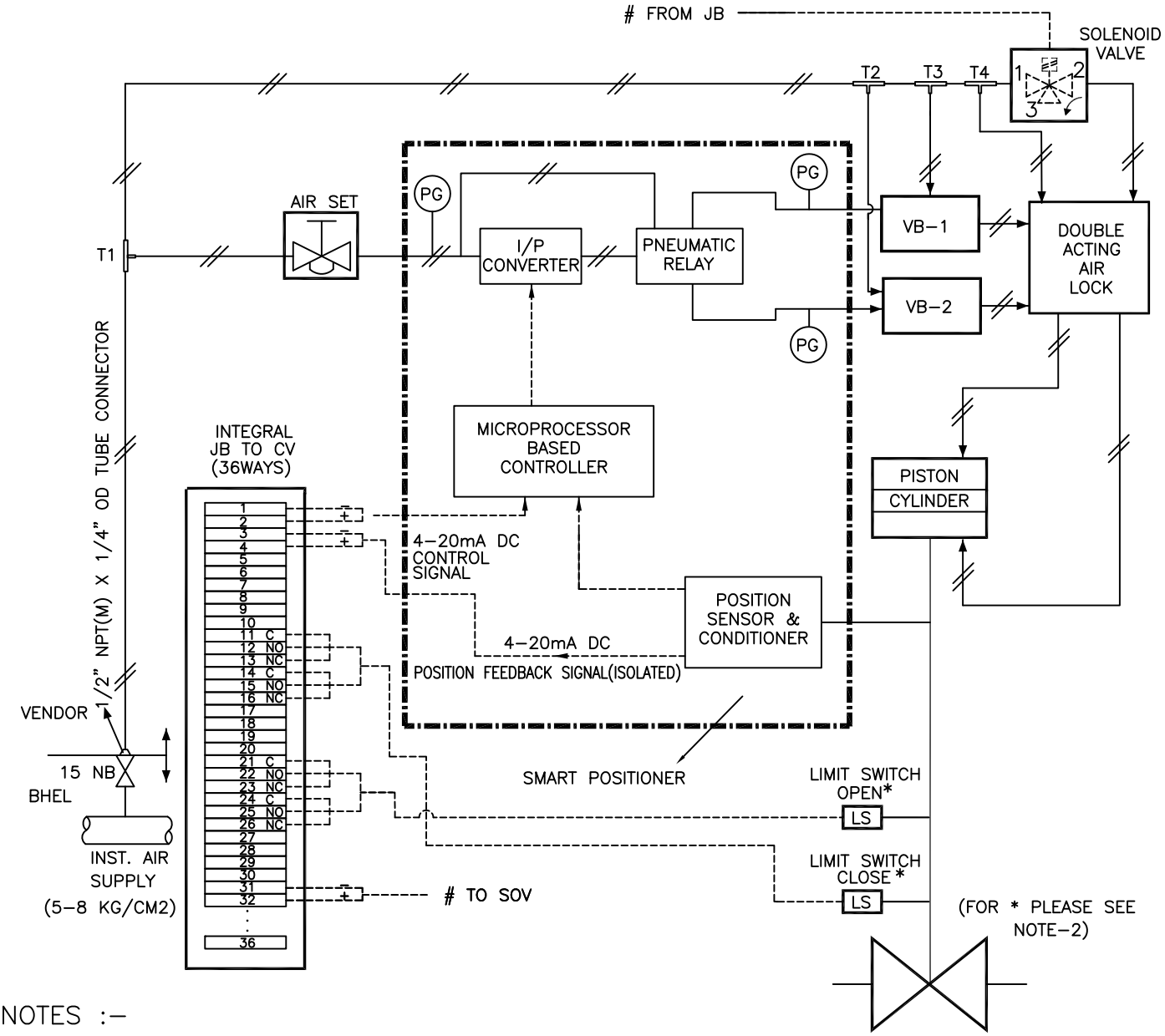


NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRIC SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET-A
2. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
3. MOUNTING ACCESSORIES AS REQUIRED.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER ACCESSORY DATA SHEET.
5. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
6. 12 METERS I/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISOLATION VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.

BHEL	SPECIFICATION NO.: PE-TS-20-145-I104	DRG. No.	HOOK-UP No. 2
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. 00	DATE 28.04.17

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)

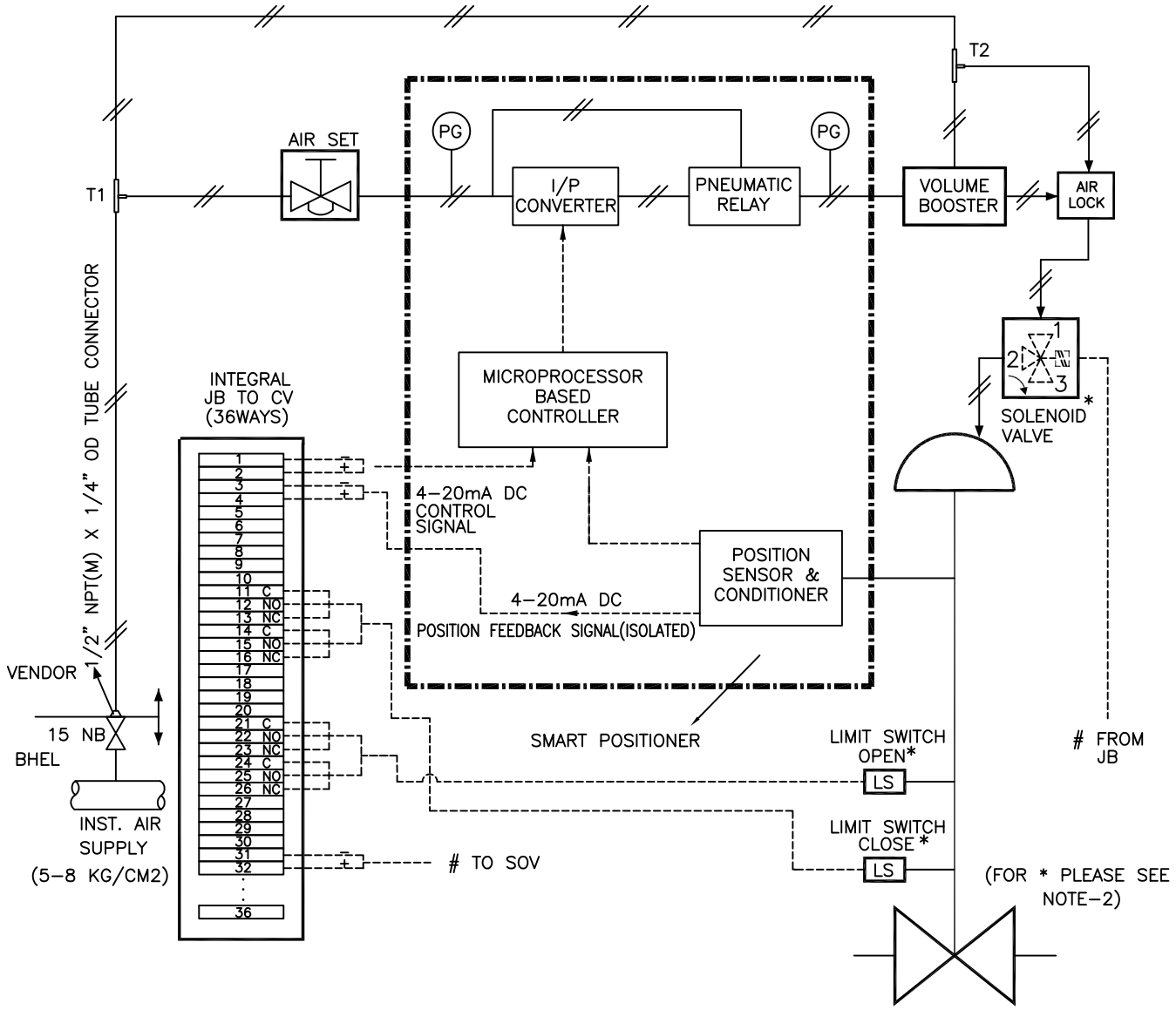


NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION /DATA SHEET-A. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4–20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER ACCESSORY DATA SHEET.
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS I/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISOLATION VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE–T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE–T2 & TEE–T3 SHALL BE PROVIDED.

BHEL	SPECIFICATION NO.: PE-TS-20-145-I104	DRG. No.	HOOK-UP No. 3		
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. No.	0	DATE	28.04.17

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(WITH SMART POSITIONER)

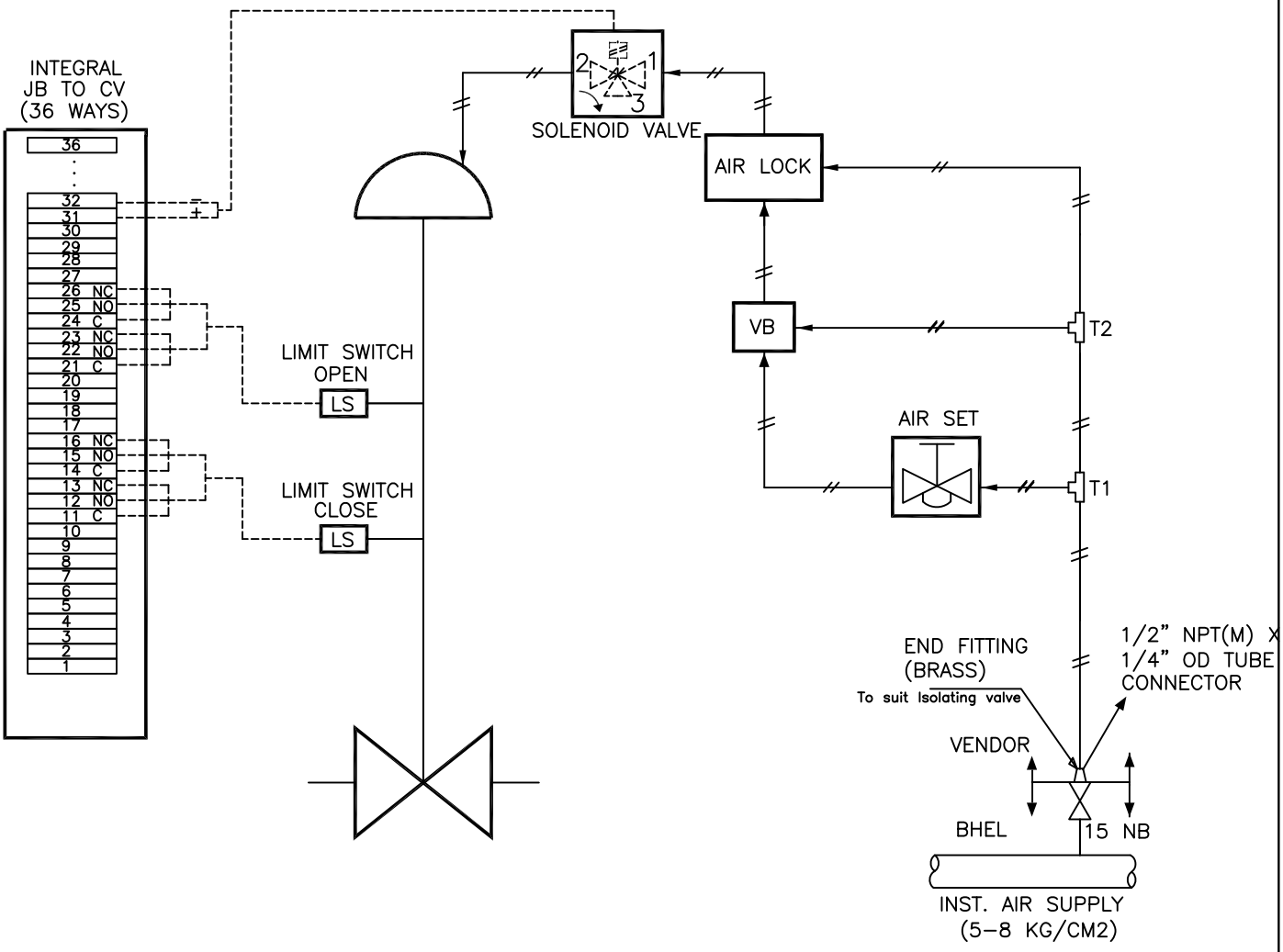


NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET-A
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4–20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER ACCESSORY DATA SHEET.
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS I/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISOLATION VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE–T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE–T2 SHALL BE PROVIDED.

BHEL	SPECIFICATION NO.: PE-TS-20-145-I104	DRG. No.	HOOK-UP No. 1
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. 00	DATE 28.04.17

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(FOR ON / OFF TYPE)

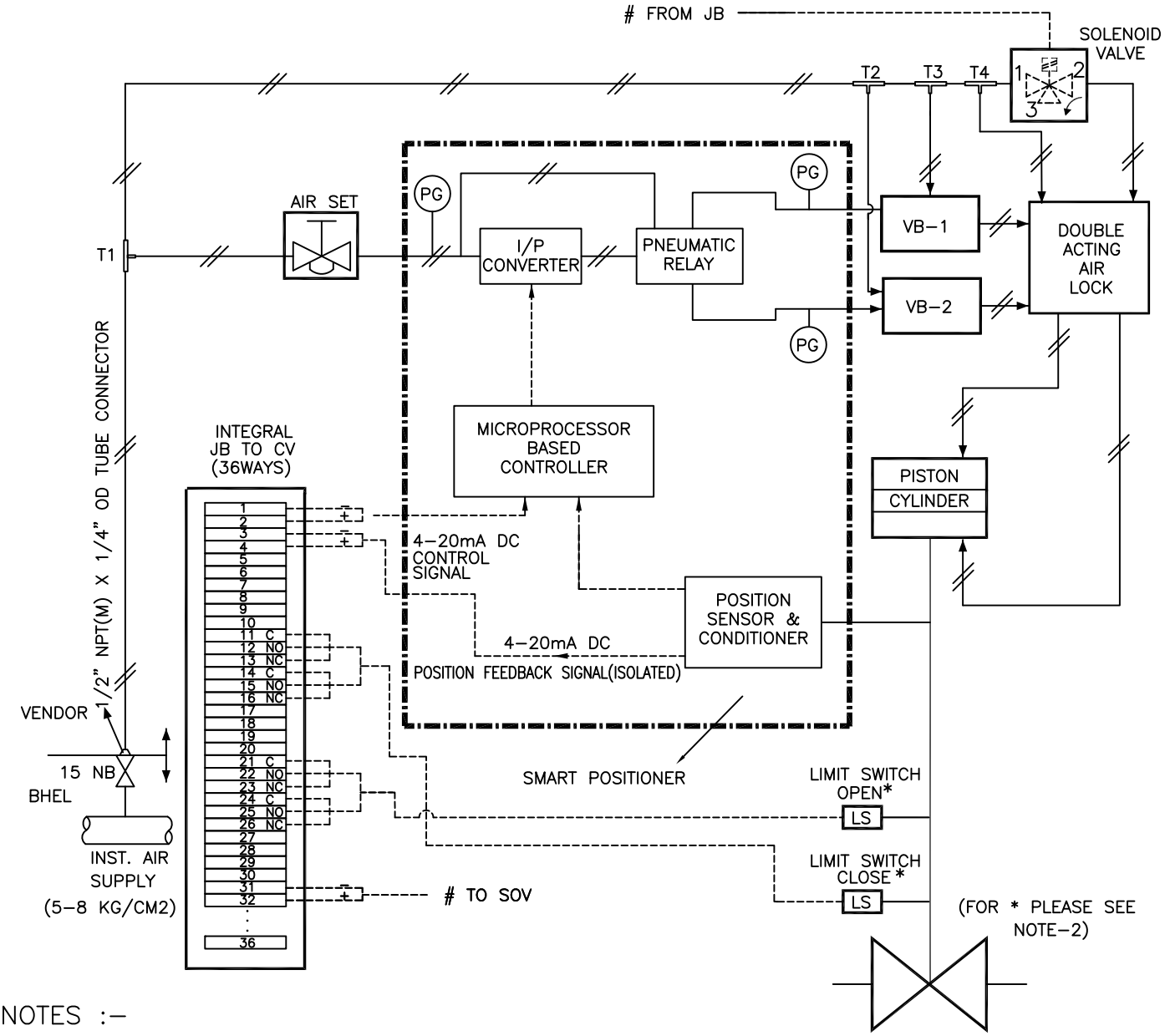


NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRIC SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET-A
2. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
3. MOUNTING ACCESSORIES AS REQUIRED.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER ACCESSORY DATA SHEET.
5. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
6. 12 METERS 1/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISOLATION VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.

BHEL	SPECIFICATION NO.: PE-TS-20-145-I104	DRG. No.	HOOK-UP No. 2
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. 00	DATE 28.04.17

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION /DATA SHEET-A. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4–20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER ACCESSORY DATA SHEET.
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS I/4" PVC COATED COPPER / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISOLATION VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE–T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE–T2 & TEE–T3 SHALL BE PROVIDED.

BHEL	SPECIFICATION NO.: PE-TS-20-145-I104	DRG. No.	HOOK-UP No. 3		
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. No.	0	DATE	28.04.17

SECTION – D

GUIDELINES FOR PACKING

Guidelines for Packing

- ✓ After inspection of control valves assembly. Smart Positioner along with Pressure Gauge shall be disassembled & packed separately.
- ✓ Threaded connection of Smart Positioner & Pressure Gauge shall be shipped with the end caps fitted to avoid any damage.
- ✓ Instructions with sketch for mounting the Smart Positioner & Pressure Gauge shall be sent along with the aforesaid accessories.
- ✓ Packing of the control valves and Smart Positioner along with Pressure Gauge shall be done in separate wooden boxes/cases in order to avoid damage during transit and also during storage at site in tropical climatic conditions for a period of 18-24 months.
- ✓ All valves & smart positioner along with pressure gauges shall be packed properly with quality wooden planks with proper wooden frame support. Moreover the valves are internally covered with polythene sheets to protect from the water and moisture entry.
- ✓ Stronger shock absorbing cover material like expanded Polyurethane which can take any direct impact on it shall be used for packing
- ✓ Proper reaper support to be provided in the packing and Valve assembly to be aligned properly to avoid the damage of accessories during transit due to vibration effect.
- ✓ Marking for Fragile & Condensing environment shall be done on the packing box.

The Following Details are to be marked on the Packing Cases

- ✓ Address of consignee
- ✓ Purchase order no.
- ✓ Description of items or title of packing list
- ✓ Weight
- ✓ Dimension of the Box
- ✓ Marking showing upright position
- ✓ Marking showing sling position
- ✓ Marking showing umbrella (i.e. for machines/components to be stored under covered storage)

SECTION-D

SUB-VENDOR LIST

SUB VENDOR LIST

(FOR ACCESSORIES)

Sl. No.	ITEM DESCRIPTION	SUB-VENDORS
1.	SMART POSITIONER	(a)SIEMENS,GERMANY (b)ABB, USA (c)EMERSON(FISHER ROSEMOUNT),USA (d)MASONEILAN(DRESSER),FRANCE (e)YAMATAKE, JAPAN (f)FLOW SERVE, USA (g)FOX BORO, GERMANY (h)METSO,USA
2.	AIR FILTER REGULATOR	(a)SHAVO-NORGREN, INDIA(MUMBAI) (b)FAIRCHILD, USA (c)SMC PNEUMATICS, INDIA(NOIDA) (d)PLACKA, INDIA(CHENNAI)
3.	AIR LOCK RELAY	(a)PLACKA, INDIA(CHENNAI) (b)SHAVO-NORGREN, INDIA(MUMBAI) (c)SCHRADER SCHORILL DUNCAN LTD., INDIA(MUMBAI) (d)FAIRCHILD, USA (e)SMC PNEUMATICS, INDIA(NOIDA)
4.	SOLENOID VALVE	(a)ASCO, USA (b)ROTEX, INDIA(VADODARA) (c)SCHRADER, INDIA(PUNE) (d)AVCON, INDIA(PUNE) (e)HERION-NORGREN, GERMANY (f)IMI-NORGREN, GERMANY (g)JAFFERSON, ARGENTINA
5.	VOLUME BOOSTER	(a) FAIRCHILD, USA (b) RK CONTROLS, INDIA(THANE)
6.	JUNCTION BOX	(a) K.S. INSTRUMENTS PVT.LTD., INDIA (Bangalore) (b) Shrenik & Company, INDIA(Ahmedabad) (c) SUCHITRA INDUSTRIES, INDIA (Bangalore) (d) FLEXPRO ELECTRICALS PVT. LTD., INDIA(Gujarat) (e) AJMERA INDUSTRIAL & ENGINEERING WORKS, INDIA(Mumbai)

SECTION-D

COMPLIANCE CERTIFICATE

COMPLIANCE CERTIFICATE
For
Control Valve with accessories
(To be Signed & Stamped by the Bidder)

Specification no.: PE-TS-20-145-I104

We shall comply with the following :-

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / Drawings, BHEL quality plan etc. as enclosed in the tender, shall be fully complied **without any deviation**.

2. BHEL Quality Plan (enclosed with the specification) duly signed and stamped is submitted herewith **without any deviation.**

3. All the price formats have been duly endorsed and filled-up.

4. Wherever there is a deviation in datasheets w.r.t. trim material, body material; the same has been listed herewith along with documentary evidence for authenticating superiority of trim material and body material for acceptance by BHEL.

Signature with date	
Name	
Company seal	