BOQ for SIPAT FGD Control Valve

Sl. No.	Description	QTY for Station
1	FGD DMCW Pumps Recirculation Control Valve	1 no.
2	SS Tubing (15 meter/CV)	15 meter
3	SS Fittings - Conn. To AFR	1 Lot
4	SS Fittings - Conn. To IA HDR ISO valve	1 Lot
5	SS Fittings - Conn. To Air Lock Relay	1 Lot
6	SS Fittings - Equal Tee	1 Lot
7	SS 1/2 " NPT(M) X 1/4 " OD Tube Connector	1 Lot
8	Commissioning Spares (Gasket and Gland Packing)	1 Set

Cv Test Charges

Sl. No.	Description	QTY for Station
1	FGD DMCW Pumps Recirculation Control Valve	1 no.

MANDATORY SPARES BOQ

Sl.No.	ITEM DESCRIPTION	Quantity as per Project Spec.
1	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
2	Valve Trim (including cage, plug, stem & seat, seal rings, guide bushing etc.)	1 set of each type of control valve
3	Diaphrams, O'rings, Seals etc., of all type, make etc.	100%
4	Pressure Gauges of all types, make, rating etc.	10% or 2 no. of each type, whichever is more
5	Solenoid Valves (If applicable)	10% or 2 no. of each type, whichever is more
6	Positioner Units (Complete unit) & accessories (link assembly)	10% or 1 no. of each type, whichever is more
7	Pneumatic AFR of each type. Make rating etc.	10% or 2 nos., whichever is more
8	Air Lock Relays	10% or 2 no. of each type, whichever is more

1184403/2022/PS-PEM-C_I

	PRE-QUALIFICATION REQUIREMENTS	PE-PQ-491-145-I001
		REVISION NO. 00 DATE 30.11.2022
		SHEET NO. 1 OF 1

PACKAGE: **CONTROL VALVE** PROJECT: 2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)

1.0	
a.	Bidder should be Original equipment manufacturer (OEM) for CONTROL VALVE.
b.	In case bidder is not OEM, evaluation shall be done as following: 1. If bidder happens to be Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR. 2. If bidder happens to be Authorized channel partner or having a valid collaboration agreement / licensing agreement with some other company or being a Joint Venture Company, then the credentials of collaborator / licensing company / Principal company /JV partner can also be considered for meeting PQR as per scope of the work. The scope matrix shall include their respective roles including design vetting, manufacturing of critical component and warranty/guarantee. If bidder(s) qualifies on the basis of credentials of his principal/JV partner/Collaborator etc., then the principal/JV partner/Collaborator shall be responsible for overall design vetting and warranty/guarantee of the package.
2.0	The Product being offered by the bidder should be in use successfully in power plant or any other industrial application for at least 1 (One) year. Bidder to submit either of following supporting documents for the product (control valve) a. Copy of minimum **1 (One)** Performance Certificate from end user / customer certifying that product has been running satisfactorily for **1 (One)** year from date of commissioning to the date of application. The certificate should clearly indicate date of commissioning, date of issue of certificate and name/designation of the certificate issuer. Copy of purchase order & technical parameter to be attached along with the performance certificate. OR b. Copy of repeat orders from minimum **2 (Two)** different purchasers. Order received by bidder from same purchaser with a gap of minimum **2 (Two)** years shall be considered as repeat order. Copy of technical parameters for each order to be attached.
3.0	Bidder to furnish experience list of last 5 years indicating customer name, purchase order reference, item supplied & year of supply to establish the continuity of business.
4.0	Bidder to submit all documents in English. If documents submitted by bidder are in language other than English, a self-attested English Translated document should also be submitted.

Prepared by:	Checked by:	Approved by:
PRAG JAIN MGR-C&I	MAYANK KESHARWANI SR.MGR-C&I	S.C.SHARMA DGM-C&I

TECHNICAL SPECIFICATION

FOR

CONTROL VALVES WITH ACCESSORIES

(Pneumatically Operated)

2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)

VOLUME - IIB

SECTIONS-A, C & D

SPECIFICATION No: PE-TS-491-145-I801

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT DIVISION

NOIDA, INDIA

BHEL	**2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)** Technical specification for **Control Valves with Accessories** (Pneumatically Operated)	SPEC NO.: **PE-TS-491-145-I801**	
		DOCUMENT NO.	
		VOLUME II B	
		SECTION A	
		ISSUE NO. 2	
		REV. NO. 00	DATE 30.11.2022

CONTENTS

VOL-II B

SECTION – A

SCOPE OF ENQUIRY

	2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)	SPEC NO.: **PE-TS-491-145-I801**
		DOCUMENT NO.
		VOLUME II B
	Technical specification for **Control Valves with Accessories** (Pneumatically Operated)	SECTION A
		ISSUE NO. 2
		REV. NO. 00 / DATE 30.11.2022

SCOPE OF ENQUIRY

1. SCOPE

1.1 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 with Pneumatic Actuator along with Accessories, Start-up/Commissioning Spares & Mandatory spares** as mentioned in different sections of this specification for **2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)** project.

1.2 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.

1.3 Following signed & stamped documents with company seal to be submitted by bidder.

a) Complete offer including calculation sheets, catalogues etc.
b) Quality Plan
c) Datasheet A & B, duly filled
d) Schedule of prices & unit prices, inspection schedule
e) Schedule of submission of drawings/documents, equipment manufacture, inspection & dispatch.

2 GENERAL TECHNICAL INSTRUCTIONS

2.1 It is not the intent here to specify all the details of design and manufacture. 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.

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

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

2.4 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.

SECTION – C

- **SPECIFIC TECHNICAL REQUIREMENT**
- **CUSTOMER'S SPECIFICATION**
- **DATA SHEETS – A & B**
- **DATA SHEETS– A & B FOR ACCESSORIES**
- **DATA SHEETS – C**
- **QUALITY PLAN**
- **BOQ-MAIN SUPPLY**
- **BOQ- SPARES**

SPECIFIC TECHNICAL REQUIREMENTS

The requirements in this section are specific for this project and shall over-ride the specification under Section-D in case of any contradiction. However, in case of any contradiction between this SPECIFIC TECHNICAL REQUIREMENTS and customer SPECIFICATION attached further, the customer SPECIFICATION shall prevail and BHEL's decision shall be final. BIDDER to comply the stringent requirement as per BHEL decision without any commercial or time implication.

1. **All the formats, Data sheet, BOQ, QUALITY PLAN (BHEL Format) etc. should filled-up and furnished with the bid, complete in all respect. In the absence of those, the bid would be considered incomplete and liable for rejection.** Catalogue, Leaflets related with the models of Control Valves as well as each Accessory must be furnished with the offer.

2. Hook-up diagram for Control valve is attached in Section-D. The scope demarcation as indicated should be adhered. The connection details at Instrument Air valve, shall be furnished to successful bidder after the award of contract.

3. Valve Body Sizes shall be quoted to take care of the specification requirements like parameters, and limitations of Fluid outlet velocities, Noise Level etc. **However, Port (Trim) Sizes shall be selected to suit CV requirement for achieving percentage valve lift as per Technical Specification.**

4. Bidder to note that, **wherever downstream side of the valve is subjected to the Vacuum service, bidder to offer double Gland packing, and in that case, flow direction of working fluid shall be to close the valve**. Separate indication for the same has not been made in the data Sheets-A.

5. For valves subjected to cavitation service, anti-cavitation trim shall be provided.

6. In case during erection/commissioning of the control valve, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the bidder free of cost.

7. Facility to adjust the maximum travel of the stem & starting point of travel shall be incorporated.

8. SS name plate for control valve shall include Tag no./ KKS no./ Sl. No./ Body material/ size/ Press Rating/ Trim material/ Trim type/ action on air failure/ diaphragm air press at full open and close condition

9. Hand wheel shall have open/ close direction.

10. Limit switch shall be designed for 1,00,000 operations.

11. JB shall be 36 ways as per enclosed hook-up diagram.

12. The material of filter for Air Filter Regulator shall be ceramic/ Sintered bronze.

13. Bidder to indicate pick-up & drop out voltage for all solenoid valves.

14. Protection class for Limit switches, I/P converter and Position transmitter shall be IP-65 only.

15. All JBs and valves shall be with double compression type Ni plated brass cable glands.

16. Solenoid valve class of protection shall be IP-65, shall be of Plug and socket electrical connection.

17. All local cabling up to JBs shall be in Conduit (Flexible/Rigid).

18. Control valve accessories shall be fitted on the valve body. Junction box shall be mounted on the valve body.

19. The smart positioner provided with Control Valves shall be compatible with Universal Hart Calibrator.
    In order to interface with METSO/ MaxDNA/ Valmet system, the smart positioner of Control Valves has to be HART Compatible. Bidder to provide diagnostic software (for all tags) to be installed on 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 HART MANAGEMENT SYSTEM hardware of reputed makes like MTL, P&F etc. Additionally, Vendor to provide DTM (devise type manager) / DTD (device type description) files for engineering.

20. Positioner shall have fail freeze and fail safe feature.

21. Tolerances on end to end, centre to centre, centre to face shall be in accordance with ASME B16.10.

22. The final documentation including operating manuals, maintenance and service manuals, component documentation, assembly documentation, drawings and listing, etc. shall be submitted in English language.

23. Valve and actuator shall be designed for full differential pressure (Max. shut-off pressure).

24. In order to prevent the risk of fire or explosion pneumatic actuators shall be used in hazardous areas and associated equipment (e.g. positioners) must be intrinsically safe in accordance with IEC 60079-11.

25. Bidder to furnish ***compliance certificate*** duly signed and stamped by bidder attached further.

26. Instruments / equipment offered for this package shall have at least one year's satisfactory operation in one power station having unit rating of 200 MW or above.

27. SPARES: The following spares are required to be offered

(A) Recommended Spares:

The bidder shall furnish a List of Recommended spares for 3 years of normal operation of the Control valves / Accessories. The BHEL/Customer reserves the right to buy any or all of the recommended spares.

The prices of these spares will remain valid for a period of minimum 6 months after the placement of order.

(B) Start-up & Commissioning Spares:

Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Control Valves. All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III

The Start-up and commissioning spares indicated by the bidder shall be a part of the main Control valves supply. However, bidder to indicate prices separately. The list of these spares required is enclosed in the Section-C of this specification.

Bidder to indicate the service life expectancy period for the spare parts under normal working conditions. The spares shall be treated and packed for long storage, under climatic conditions prevailing at site. Small items shall be packed in sealed transparent plastic bags with desiccator's packs as necessary.

(C) Mandatory spares:

Bidder to supply mandatory spares as attached in specification.

20. Documentation:

(A) After the award of contract:

The documentation as listed below for the project
6 sets of the following documents + 3 sets of CDs to be enclosed with the bids for Approval:

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. Quality Plan duly signed and stamped.
g. All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.
h. All relevant catalogues for the models of the valves as well as accessories finalized.
i. Bar chart to indicate the time schedule for procurement, manufacture, testing and dispatch.

(B) Final documentation:

The documentation as listed below will separate for respective projects

1. Category –I & IV Approved final drawings/data sheets, – 20 sets with 4 CD-ROMS
   Valve sizing calculations, Noise level calculations and
   Valve Outlet Velocity calculations.

2. Test certificates – 20 sets.

3. Operation & Maintenance Manuals for Control Valve, Actuator and all the Accessories. – 20 sets with 4 CD-ROMS

COMPLIANCE CERTIFICATE

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. Calculation of CV, Noise level, Valve outlet velocity, Trim exit velocity, Actuator sizing, Data Sheet-C in line with Data sheet-A of specification, dimensional drawings / edge preparation details, etc shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of LOI.

4. Selection of valves and Actuators are our (bidder's) responsibility. Any change in selection of type of valve and Actuators / Sizing / percentage opening, calculations, QP, etc., if desired by BHEL / Customer during approval of the documents after award of contract, without major changes in process parameters as per tender Specification, shall be carried out without any commercial implication and time delay.

5. Body material and Trim material combinations offered will be equivalent or better than the material specified in data Sheet-A. Wherever Trim material combinations offered differ from the specification, its superiority shall be authenticated with documentary evidence and justification produced for BHEL / Customer's concurrence. BHEL / Customer reserves the right to accept/rejects any variation to the specification.

(To be Signed & Stamped by the Bidder)

Signature with date	
Name	
Company seal	

	2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)	SPEC NO.: **PE-TS-491-145-I801**
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		VOLUME II B
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CUSTOMER SPECIFICATION

CONTROL VALVES, ACTUATORS & ACCESSORIES

1.00.00 CONTROL VALVES & ACCESSORIES

1.01.00 General Requirements

1.01.01 The control valves and accessories equipment furnished by the Bidder shall be designed, constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the "Federal Occupational Safety and Health Standards, USA" or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.

1.01.02 All the control valves and accessories offered by the Bidder, shall be from reputed, experienced manufacturers of specified type and range of valves.

1.02.00 CONTROL VALVE SIZING & CONSTRUCTION

1.02.01 The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.

1.02.02 The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves trim exit outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer's approval during detailed engineering.

1.02.03 Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation/flashing service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished.

1.02.04 Control valves shall have leakage rate as per leakage Class-IV.

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.
2.00.00	**VALVE CONSTRUCTION**
2.01.00	All valves shall be of globe /Butterfly body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.
2.03.00	Cast Iron valves are not acceptable.
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing)
2.07.00	Valve characteristic shall match with the process characteristics.
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.
2.09.00	Flanged valves shall be rated at no less then ANSI press class of 300 lbs.
3.00.00	**VALVE MATERIALS** Refer mechanical sections for body and trim materials. The exact body and trim materials shall be finalised during detailed engineering depending on the service applications. However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.

4.00.00 END PREPARATION

Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalised during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.

5.00.00 VALVE ACTUATORS

All Control Valves shall be furnished with Pneumatic Actuators. The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.

Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.

The travel time of the pneumatic actuators shall not exceed 10 seconds.

6.00.00 CONTROL VALVE ACCESSORY DEVICES

6.01.00 All pneumatic**ally** actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, Microprocessor based Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.

7.00.00 SPECIFICATIONS FOR MICROPROCESSOR BASED POSITIONERS

1	Electrical	a) Input signal	4-20 mA
		b) Power Supply	Loop powered from the output card of control system.
		c) Hart Protocol	Compatibility for remote calibration & diagnostics (Super-imposed Hart signal on input signal (4-20 mA)
		d) Valve position sensing	Non contact type position sensing **with** 4-20 mA output signal

2	Environment	a) Operating Temp	0 - 60 Deg. C
		b) Humidity	0-95 %
		c) Protection Class	IP-65 Minimum
4	Test reports/ certificates	Factory Valve Signature Tests reports (Pr vs Valve travel and Travel vs I/P signal) are to be provided.	
		Test certificates as per Manufacture Standard/Relevant Standard are To Be Submitted	
5	Configuration/ calibration	Universal hand held HART Calibrator to be provided. (BHEL Scope)	
6	Operating	Operating Range	Full range & split range signal.
7	Modes	Valve Action	Direct & Reverse valve action(selectable)
		Flow Characterization	Possible to fit valve characteristic curve - Linear & Equal Percentage.
8.	Fail Safe/Fail Freeze	Fail safe/Fail freeze feature is to be provided. (In case, the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the same externally through solenoid valve connected in the pneumatic circuit).	
9	Pneumatic	Air capacity	Sufficient to handle the valves selected/ boosters to be supplied if required.
		Air supply pressure	To suit air supply pressure/quality available.
		Process connection	1/4 inch NPT
10	Electrical Cable Entry	1/2-NPT, side or bottom entry to avoid water ingress.	
11	Performance	Characteristic Deviation	<=0.5 % Of Span

		Ambient Temp Effect	<=0.01 %/Deg C Or Better
12	EMC & CE Compliance	Required To International Standard Like EN/IEC.	En50081-2& En50082 Or Equivalent
13	Accessories	In-built operator panel	Display with push buttons for configuration and display on the Positioner itself (password protected/hardware lock).
		Press gauge block	For supply & output pressure.
		Mounting assembly	On as required basis.

8.00.00 **TEST AND EXAMINATION**

All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:

8.01.00 Non Destructive Test as per ANSI B-16.34.

8.02.00 Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.

8.03.00 Valve closure test and seat leakage test in accordance with ANSI-B 16.34 and as per the leakage class indicated above.

8.04.00 Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.

8.05.00 **CV Test**: Refer **Cl.no 3.00.00 (8) Subsection IIIC-06 (Type test requirements)**

9.00.00 **CONTROL VALVE QUANTITIES**

Bidder shall furnish all the control valves under this package as finalised during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.

BHEL	**2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)** Technical specification for **Control Valves with Accessories** (Pneumatically Operated)	SPEC NO.: **PE-TS-491-145-I801** DOCUMENT NO. VOLUME II B SECTION C ISSUE NO. 2 REV. NO. 00 DATE 30.11.2022

SECTION-C

DATASHEET A&B

BHEL PEM	2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6) DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPEC NO. : PE-TS-491-145-I801 VOLUME II B SECTION C REV. NO. 0 DATE : 30.11.22 SHEET OF

Tag No. : ECW-21 Qty : 1 Nos Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

		DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)	DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	NTPC– 2X500 MW SIPAT STAGE-II FGD	.....
	SERVICE	ECW SYSTEM FOR FGD AUX'S	.....
	LOCATION	[■] INDOOR [ ] OUTDOOR	.....
	DUTY	[ ] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	115 x 5.4 | 115 x 5.4	.....
	PIPE MATERIAL (inlet / outlet)	CS TO IS 1239 Heavy Grade) | CS TO IS 1239 (Heavy Grade)	..... | .....
BODY*	MODEL NO.		.....
	TYPE OF BODY : GUIDING : NO. OF PORTS	[■] GLOBE [ ] ANGLE | [ ] TOP [■] CAGE | ONE	..... | ..... | ..... | .....
	BODY SIZE : PORT SIZE : DESIGN CV		..... | ..... | .....
	END CONNECTION & RATING (ANSI)	[■] BWE [ ] SWE [ ] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [ ] A217 WC6 [ ] SS [ ] A217 CS [ ] A351 CF8M	.....
	PACKING : MATERIAL SINGLE / DOUBLE	[ ] PTFE [ ] GRAFOIL [ ] DOUBLE [■] SINGLE	..... | .....
	BONNET TYPE	[■] STD [ ] EXTENDED [ ] FINNED	.....
	TRIM FORM	[■] LINEAR [ ] EQ. PERCENTAGE	.....
		[ ] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL : SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	..... | .....
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	..... | .....
	FLOW	[ ] BELOW SEAT [ ] ABOVE SEAT	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [ ] MAC NO. < 1/3 (STM)	.....
	REQUIRED LEAKAGE CLASS	[ ] II [ ] III [■] IV [ ] V	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[ ] YES [■] NO	.....
	ANTI CAVITATION TRIM	[ ] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	|	..... | .....
	CLOSE AT : OPEN AT (KG/CM2g)	<10 SEC	..... | .....
	*TRAVEL TIME FOR	|	.....
	OPEN TO CLOSE, CLOSE TO OPEN	[■] STAYPUT	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] STAYPUT	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE		.....
ACCESSORIES	SMART POSITIONER	[■] REQUIRED [ ] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [ ] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [ ] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[■] REQUIRED [ ] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[ ] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [ ] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[ ] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6) DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPEC NO. : PE-TS-491-145-I801 VOLUME II B SECTION C REV. NO. 0 DATE:30.11.22 SHEET OF

Tag No.: ECW-21 Qty: 1 Nos. Date Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	....

SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2 (G)	OUTLET PR. KG/CM2 (G)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	NORMAL	45	3.5	1.5	38			
	2.	MIMIMUM	13.5	4.0	1.5	38			
	3.	MAXIMUM	58.5	3.0	1.5	38			
	VALVE TYPE						[] CAVITATION [] FLASHING [■] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 9 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10 | 60 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						.....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		

1184405/2022/PS-PEM-C I

FORM NO. PEM-6666-0

Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO.:	PE-TS-491-145-I801
VOLUME	II-B
SECTION	C
REV. NO. 00	DATE: 21.08.19

Tag No..... Quantity.....

Data Sheet No. PES-145-06-DS1-1

APPLICABLE FOR TAG Nos.WHEREVER STATEMENT "REQUIRED" INDICATED IN THE INDIVIDUAL CV DATA SHEETS

DATA SHEET – A & B for ACCESSORIES

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)							DATA SHEET – B (TO BE FILLED-UP BY BIDDER)
POSITIONER	MFR. & MODEL NUMBER						
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ■ NO	☐ THREE ■TWO	■ IP-65	
	INPUT SIGNAL (Kg / Cm^2)			■ 0.2 – 1.0	☐ 0.2 – 0.6	☐ 0.6 – 1.0	
	OUTPUT SIGNAL (Kg / Cm^2)			TO SUIT ACTUATOR			
AIR FILTER REGULATOR	MFR. & MODEL NUMBER						
	AIR SUPPLY PRESS (Kg / Cm^2 g)			■ 5.0 – 8.0 ☐			
	OUTPUT PRESS (Kg / Cm^2 g)			TO SUIT ACTUATOR			
	FILTER SIZE			5 MICRON			
	OUTPUT GAUGE			■ REQUIRED	☐ NOT REQUIRED		
	AUTO DRAIN FEATURE			■ REQUIRED	☐ NOT REQUIRED		
AIR LOCK	MFR. & MODEL NUMBER						
	SET PRESS (Kg / Cm^2)						
	SUPPLY PRESS (Kg / Cm^2)			■ 5.0 – 8.0 ☐			
	RESET TYPE			AUTO			
	VENT PLUG			REQUIRED			
LIMIT SWITCH	MFR. & MODEL NUMBER						
	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 ☐			
POSITION TRANSMITTER	MFR. & MODEL NUMBER			■ Electronic (2-Wire) Contactless ☐ OTHER			
	TYPE			PART OF SMART POSITIONER			
	SUPPLY						
	OUTPUT RATING						
	ACCURACY						
	ENCLOSURE CLASS						
SOLENOID VALVE	MFR. & MODEL NUMBER						
	RATING			■ 24V DC ☐ 220V DC ☐ 240V AC ☐			
	TYPE			3-WAY (UNIVERSAL OPERATION TYPE)			
	OPERATION	QUANTITY		☐ Stayput ■ Interlock	AS PER DATASHEET & HOOK UP		
	COIL INSULATION CLASS			CLASS - H			
	ENCLOSURE CLASS			■ IP 65 ☐ NEMA 4 ☐			
HANDWHEEL	ORIENTATION			☐ TOP MOUNTED ■ SIDE MOUNTED			
JUNCTION BOX	NO. OF WAYS			☐ 24-WAYS ☐ AS REQUIRED ■ 36-Ways			
	SIZE			AS REQUIRED			
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).			
	ENCLOSURE CLASS			■ IP 65 ☐			
	BODY MATERIAL			■ FRP ☐ SS ☐ METAL SHEET			
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY		PART OF SMART POSITIONER			
	SPLIT RANGE						
	ENCLOSURE CLASS						
	LINEARITY						
	HYSTERISIS						
Tubing & Fittings / per CV	**This is in addition to Tubing and fittings which are integral part of CV**			15 Meters of ¼ " 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**			■ RED ☐ GREEN ☐			
	THICKNESS (DFT) – in microns						
	TYPE			■ EPOXY ☐ ENAMEL ☐			
							COMPANY SEAL
							NAME
							SIGNATURE
							DATE

SECTION-C

DATASHEET C

Tag No…… **Quantity**…… Data Sheet No. PES-145-06-DS2-1

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	2 x 500 MW NTPC SIPAT TPS, STAGE-II – FGD (LOT-6)
	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	POSITIONER(SMART)	
	AIR FILTER REGULATOR	
	AIR LOCK RELAY	
	POSITION LIMIT SWITCH	
	POSITION TRANSMITTER	
	SOLENOID VALVE	
	E / P CONVERTER	
	JUNCTION BOX	
	HAND WHEEL (SIDE MOUNTED)	
	LOCAL POSITION INDICATOR	

	2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6) Technical specification for **Control Valves with Accessories** (Pneumatically Operated)	SPECIFICATION NO. **PE-TS-491-145-I801** DOCUMENT NO. VOLUME IIB SECTION **C** ISSUE NO. 2 REV. NO. 00 DATE: 30.11.2022

Tag No…… **Quantity**…… Data Sheet No. PES-145-06-DS2-1

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

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.

SEA WORTHY PACKING **APPLICABLE / NOT APPLICABLE**

FORM NO. PEM-6666-0

2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6)

Technical specification for

Control Valves with Accessories

(Pneumatically Operated)

SPECIFICATION NO.:	**PE-TS-491-145-I801**
DOCUMENT NO.:	
VOLUME	**II-B**
SECTION	**C**
ISSUE NO. 2	
REV. NO. 00	DATE: 30.11.2022

Tag No…… Quantity…… Data Sheet No. PES-145-06-DS2-1

DATA SHEET C FOR ACCESSORIES

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

POSITIONER	MFR. & MODEL NUMBER			
	BYPASS	GAUGES	ENCL. CLASS	
	INPUT SIGNAL (Kg / Cm^2)			
	OUTPUT SIGNAL (Kg / Cm^2)			
AIR FILTER REGULATOR	MFR. & MODEL NUMBER			
	AIR SUPPLY PRESS (Kg / Cm^2 g)			
	OUTPUT PRESS (Kg / Cm^2 g)			
	OUTPUT GAUGE			
	FILTER SIZE			
	AUTO DRAIN FEATURE			
AIR LOCK	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			
POSITION TRANSMITTER	MFR. & MODEL NUMBER			
	TYPE			
	SUPPLY			
	OUTPUT RATING			
	ACCURACY			
	ENCLOSURE CLASS			
SOLENOID VALVE	MFR. & MODEL NUMBER			
	RATING			
	OPERATION	QUANTITY		
	COIL INSULATION CLASS			
	ENCLOSURE CLASS			
HANDWHEEL	ORIENTATION			
JUNCTION BOX	NO. OF WAYS			
	SIZE			
	CABLE GLANDS (Size / Quantity)			
	ENCLOSURE CLASS			
	BODY MATERIAL			
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY		
	SPLIT RANGE			
	ENCLOSURE CLASS			
	LINEARITY			
	HYSTERISIS			
SS Tubing & Fittings / per CV	15 Meters of ¼ " PVC coated 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**			
	THICKNESS (DFT)			
	TYPE			

COMPANY SEAL
NAME
SIGNATURE
DATE

SECTION-C

QUALITY PLAN

Note: Quality requirement mentioned herewith are bare minimum. Bidder to submit the in line QAP for end user approval.

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :-		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 1 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9					
1.0	RAW MATERIAL													
1.1	Body & Bonnet castings/forgings ,plug,valve stem, seat ring/cage	1.Physical, Chemical properties	MA	Physical, Chemical tests	100%	10%	Approved drg/ datasheet	Approved drg/data sheet	Test Certificate	√	P/ W	V		TC for body/bonnet from foundry only
		2.Heat Treatment	MA	Review of H.T. Chart	100%	10%	Approved drg/datasheet	Approved drg/data sheet	Test Certificate	√	P/ W	V		1.IBR Certification (if applicable) to be verified by BHEL. 2.Applicable for body /bonnet only
		3.Internal quality of castings/forgings	MA	RT for Body & UT for Bonnet	100%	10%	ASME B 16.34	ASME B 16.34	Test Report/ Film	√	P/ W	V		Applicable for body and bonnet for rating ANSI 900 and above.
		4.Surface Quality	MA	1.Visual	100%	10%	ANSI/ MSS-SP-55	ANSI/ MSS-SP-55	Inspection Report	√	P/ W	V		
				2. MT/PT	100%	10%	ASME B 16.34	ASME B 16.34	Inspection Report	√	P/ W	V		After Machining on machined surface only
		5.Pressure Test for shell	MA	Hyd. Test	100%	10%	ISA-S-75.19/ ASMEB16.34	ISA-S-75.19/ ASME B 16.34	Inspection Report	√	P/ W	V		For Body and Bonnet after machining.

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	17/02/2020	KUNDAN PRASAD		
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	19/2/2020	R.K. JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 2 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
1.2	Diaphragm	1.Surface Quality	MA	Visual	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		
		2.Hardness	MA	Measurement	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		
		3.Endurance/ Life cycle	MA	Cyclic Test 10,000 cycles	One/ type	One/ type	10,000 cycles/Mfr. standard	No damage	Test Certificate	√	P/W	V		
1.3	Spring	1. Composition	MA	Chemical-Analysis	One Sample/ Heat	One Sample/ Heat	Mfr. standard	Mfr. standard	Test Certificate	√	P/W	V		
		2. Mech. Properties	MA	Mech. Test	One Sample/ Heat	One Sample/ Heat	Mfr. standard	Mfr. standard	Test Certificate	√	P/W	V		
		3. Performance	MA	1.Stiffness Ratio	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		
				2.Scragging	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		
				3.Cyclic Test (Endurance)	One/ type	One/ type	10,000 cycles	Mfr. standard	Test Certificate	√	P W	V		
				4. Dimension (Measurement)	One sample/ Lot	One sample /Lot	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/01/2020	KUNDAN PRASAD
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 3 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
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)	10%	ASME B 16.34	ASME B 16.34	Inspection Report	√	P/W	V		Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		
		3. Hard Facing (wherever applicable)	MA	Hardness Measurement	One sample/ Lot	One sample /Lot	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V		
FINAL TESTING/INSPECTION														
3.0	**TESTS ON COMPLETED VALVE**													
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic Test	100%	10%	Mfr. standard	No Leakage	Test Certificate	√	P/W	W		
3.2	Body	Leakage & Strength(Body Mount Leakage)	MA	Hydro Test	100%	10%	ISA-S-75.19/ ASMEB16.34	No Leakage	Test Certificate	√	P/W	W		
3.3	Seat Leakage	Seat Leakage	MA	Pneumatic Test	100%	10%	FCI-70.2	FCI-70.2	Test Certificate	√	P/W	W		
4.0	**OPERATION TEST ON**	1. Valve Travel	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data	Inspection Report	√	P/W	W		

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/2/2020	KUNDAN PRASAD		
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 4 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
					M	C/N			* D	** M	C	N	
1	2	3	4	5	6		7	8	9				
	COMPLETED VALVE							sheet					
		2. Opening/ Closing Time	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data sheet	Inspection Report	√	P/ W	W	
		3. Linearity/Cam characteristic	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data sheet	Inspection Report	√	P/ W	W	
		4. Repeatability	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data sheet	Inspection Report	√	P/ W	W	
		5. Hysterisis	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data sheet	Inspection Report	√	P/ W	W	
		6. Sensitivity	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data sheet	Inspection Report	√	P/ W	W	
		7. Accuracy(Overall)	MA	Measurement	100%	10%	Mfr. procedure	Approved drg/data sheet	Inspection Report	√	P/ W	W	
		8. Control Valve characteristics / CV Test	MA	♦Measurement (Press. vs. discharge and discharge vs opening 0-100% in steps of 10%)	One per type	One per type	Mfr. Procedure	Approved drg/data sheet	Test Certificate	√	P/ W	V	♦Size = Body & port size or Body size & CV for non std port. Refer Note 1.
		9. Operation of	MA	Function	100%	10%	Mfr. Procedure	Approved	Inspection	√	P/	W	On assembled

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/2/2020	KUNDAN PRASAD		
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 5 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9					

		limit switch & solenoids and other accessories						drg/data sheet	Report		W			Valve.
		10.Overall dimensions	MI	Visual and dimensional	100%	10%	Approved drg/data sheet	Approved drg./ data sheet	Inspection Report	√	P/ W	W		
		11.Pre defined valve position in case of air failure	MI	Visual and dimensional	100%	10%	Approved drg. / data sheet	Approved drg./ data sheet	Inspection Report	√	P/ W	W		
		12.Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional, paint thickness	100%	10%	Mfr. Procedure	Approved drg/data sheet	Test Certificate	√	P/ W	W		
		13. Surface Quality	MA	Visual	100%	10%	ANSI/ MSS-SP-55	ANSI/ MSS-SP-55	Test Certificate	√	P/ W	W		

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/2/2020	KUNDAN PRASAD		
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 6 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9					
5.0	**AUXILIARY ITEMS(Performance test of auxiliary items shall be performed on the completely assembled valve)** – Refer NOTE-7													
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	10%	Mfr. Standard	No leakage	--	√	P/ W			
5.2	Air Filter Regulator	1.Normal air consumption	MA	Measurement	Each type	Each type	Mfr. Standard	No leakage	--	√	P/ W			
		2.Overall leakage	MA	Visual(soap solution)	100 %	10%	Mfr. Standard	No leakage	--	√	P/ W			
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	10%	Mfr. Standard	No leakage	--	√	P/ W			
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/2/2020	KUNDAN PRASAD			Reviewed by:			
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL			Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 7 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	**			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9					
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			
		2. Degree of Protection	MA	IP/NEMA test	Each type	Each type	Relevant Standard	Relevant Standard	--	√	P/ W			
		3. Linearity	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			
		2. Hysterisis	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			
5.6	Smart Positioner (As Applicable)	1. Physical Verification Make/Model	MA	Visual	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			
		2. Degree of Protection	MA	IP/NEMA test	Each type	Each type	Relevant Standard	Relevant Standard	--	√	P/ W			
		3. Linearity	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			
		4. Hysterisis	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/ W			

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/2/2020	KUNDAN PRASAD			Reviewed by:			
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL			Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 8 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9					
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Each type	Mfr. Standard	Mfr. Standard	--	√	P/ W			
5.7	**Electrical items** (i) Limit Switches	1.Routine Test	MA	HV, IR, Continuity function	100%	10%	Approved Data sheet	Approved Data sheet	--	√	P/ W			
		2.Degree of protection	MA	IP/NEMA Tests	One sample/ type	One sample/ Lot	Approved Data sheet	Approved Data sheet	--	√	P/ W			
	(ii) Solenoids	1.Routine Test	MA	HV, IR, Continuity function	100%	10%	Approved Data sheet	Approved Data sheet	--	√	P/ W			
		2.Degree of protection	MA	IP/NEMA Tests	One sample/ type	One sample /Lot	Approved Data sheet	Approved Data sheet	--	√	P/ W			
	(iii)Position Transmitter(if provided externally)	1.Routine Test	MA	HV, IR, Continuity function	100%	10%	Approved Data sheet	Approved Data sheet	--	√	P/ W			
		2.Degree of protection	MA	IP/NEMA Tests	One sample/ type	One sample /Lot	Approved Data sheet	Approved Data sheet	--	√	P/ W			
6.0	**PAINTING**	Soundness of	MA	Visual and	100%	10%	Mfr. Standard	Mfr.	Inspection	√	P/ W			Refer Note-2

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/2/2020	KUNDAN PRASAD		
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/2/2020	R.K. JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : --	DATE: --
	CUSTOMER :--		QP NO.: PE-QP-999-145-I 006	DATE: 10.01.2020
	PROJECT: --		PO NO.: --	DATE: --
	ITEM: CONTROL VALVE	SYSTEM: C&I	SECTION: C	SHEET 9 OF 9

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	**			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9					
		Painting		Measurement				Standard	Report					
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	100%	Mfr. Standard	Mfr. Standard	Inspection Report	√	P/ W	V		Refer Note-3

NOTES:

1. Cv test shall be conducted at FCRI/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. Vendor to provide the following to BHELPEM for verification:
   a) Photographs of valves duly placed inside the wooden box just before final packing.
   b) Photographs of the wooden box (along with P.O. details mentioned) in which valves have been finally packed just before dispatch

   Clearance for dispatch of valves will be given only after receipt of the photos of valves in satisfactory condition as mentioned above.
4. 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.
5. 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.
6. BHEL reserves the right to conduct repeat tests, if required.
7. Valve manufacturer to arrange for C.O.C's(Certificates of Conformance) for the tests w.r.t. control valve accessories mentioned at Sl. No. 5 of the QAP.

LEGENDS:
*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**:SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**:MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**:CUSTOMER(OWNER/END CLIENT), **P**:PERFORM,**W**:WITNESS, **V**:VERIFICATION,AS APPROPRIATE **MA**:MAJOR,**MI**:MINOR,**CR**:CRITICAL,**RT**-RADIOGRAPHIC TEST,UT-ULTRASONIC TEST,**PT**-DYE PENETRANT TEST,**MT**-MAGNETIC PARTICLE TEST

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	10/2/2020	CHETAN MALIK	Checked by:	10/02/2020	KUNDAN PRASAD			Reviewed by:			
Reviewed by:	10/2/2020	R.K. RAINA	Reviewed by:	10/02/2020	R.K. JAISWAL			Approved by:			

CONTROL VALVE ACTUATORS AND ACCESSORIES.														
TESTS / ITEMS	MAKE,MODEL, TAG (R)	DIMENSION®	SURFACE FINISH®	HEAT TREATMENT®	MATERIAL TEST CERTIFICATES®	IBR CERTIFICATES®	HYDRAULIC TEST®	UT/RADIOGRAPHY FOR >900 LB RATING®	MPI/DP®	PRESSURE RESISTANCE®	SEAT LEAKAGE®	TIMING OPEN/CLOSE®	LINEARITY/HYSTERISIS®	FUNCTIONAL TEST, REVIEW FOR MAKE AND TC OF ACCESSORIES®
CONTROL VALVE AND ACTUATOR														
OVERALL	Y	Y	Y			Y	Y				Y	Y	Y	Y
BODY		Y	Y	Y	Y			Y	Y	Y				
BONNET		Y	Y	Y	Y									
TRIM		Y			Y			Y*						
PNEUMATIC ACTUATOR	Y	Y								Y				
ELECTRO PNEUMATIC POSITIONER	Y													Y
R- ROUTINE TEST		A - ACCEPTANCE TEST								Y - TEST APPLICABLE				

Y* - **UT ON SPINDLE DIA >= 40 MM.**

NOTE : **1)** THIS IS AN INDICATIVE LIST OF TESTS/CHECKS. THE MANUFACTURE IS TO FURNISH A DETAILED QUALITY PLAN INDICATING HIS PRACTICE & PROCEDURE ALONG WITH RELEVANT SUPPORTING DOCUMENTS DURING QP FINALISATION FOR ALL ITEM.

SUB-SECTION-III-C6

TYPE TEST REQUIREMENTS

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.00.00	**TYPE TEST REQUIREMENTS**
1.01.00	General Requirements
1.01.01	The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. If the bidder proposes a different standard/code from that indicated at clause no 2.01.00 and at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS' at the end of this chapter and under the item "Special Requirement for Solid State Equipments/Systems". (a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests. (b) For the rest, submission of type test results and certificate shall be acceptable provided. i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. ii. There has been no change in the components from the offered equipment & tested equipment. iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening. (c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.
1.01.02	The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.
1.01.03	For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.
1.01.04	The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.
2.00.00	**SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS**
2.01.00	The type test reports which are to be submitted for each of the C&I systems(indicated in clause 2.01.01) shall be as indicated below: i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems All solid state systems/ equipments shall be able to withstand the electrical noise

and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI / IEEE C37.90.1.. Hence, all front end cards/ devices which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI / IEEE C37.90.1. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to compliance to ANSI / IEEE C37.90.1, the system shall comply to IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18.

ii) Dry Heat test as per IEC-60068-2-2 or equivalent.

iii) Damp Heat test as per IEC-60068-2-30 or IEC-60068-2-78 or equivalent.

iv) Vibration test as per IEC-60068-2-6 or equivalent.

v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent.

vi) Radio frequency immunity test as per IEC 61000-4-6 or equivalent.

vii) Electromagnetic Field immunity as per IEC 61000-4-3 or equivalent.

2.01.01 **C&I Systems-**

Sl. No	Item	Remark	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
1	Control System of DDCMIS		No	Yes
2	PLC, excluding its HMI	Not applicable for integral PLCs and PLCs which are governed by standard practice of OEM	No	Yes
3	VMS System (Applicable for each module of VMS)		No	Yes
4	Main Turbine & BFP Drive Turbine TSI System (Applicable for each module of TSI System)		No	Yes
5	Vibration Analysis System (Applicable for each module of Vibration Analysis System)		No	Yes

6	TG related Special modules like Auto synchronizer, Load transducer module and speed measurement module		No	Yes
7	Master Clock		No	Yes

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.

3.00.00 **TYPE TEST REQUIREMENT FOR OTHER C&I SYSTEMS**

Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
1	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes
2	Instrumentation Cables Twisted & Shielded*				
	-Conductor	Resistance test	VDE-0815	No	Yes
		Diameter test	IS-10810	No	Yes
		Tin Coating test (Persul-phate test)	IS-8130	No	Yes
	-Insulation	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes

		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Cold bend/ cold impact test	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
		Colour fastness to water	IS-5831	No	Yes
		Cold bend/ cold impact test	VDE-0472	No	Yes
		Oxygen index test	ASTMD-2863	No	Yes
		Smoke Density Test	ASTMD-2843	No	Yes
		Acid gas generation test	IEC-60754-1	No	Yes

-fillers	Oxygen index test	ASTMD-2863	No	Yes
	Acid gas generation test	IEC-60754-1	No	Yes
-AL-MYLAR shield	Continuity test		No	Yes
	Shield thickness		No	Yes
	Overlap test		No	Yes
-Over all cable	Flammability Test	IEEE 383	No	Yes
	Swedish Chimney Test	SEN 4241475	No	Yes
	Noise interference	IEEE Trans-actions	No	Yes
	Dimensional checks	IS 10810	No	Yes
	Cross talk	VDE-0472	No	Yes
	Mutual capacitance	VDE-0472	No	Yes
	HV test	VDE-0815	No	Yes
	Drain wire continuity		No	Yes

* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.

**These tests shall be carried out as per VDE0207 Part 6 & ASTMD-2116 for TEFLON insulated & outer sheathed cables

***Applicable for armoured cables only

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	3 DC Power Supply System (Applicable for each model and rating) 1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable			
		Surge Withstand Capability(SWC)	(ANSI / IEEE C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).	No Yes
		Dry Heat Test	IEC-60068-2-2 or equivalent	No Yes
		Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No Yes
		Vibration test	IEC-60068-2-6 or equivalent	No Yes
		Electrostatic discharge test	IEC 61000-4-2 or equivalent	No Yes
		Radio frequency immunity test	IEC-61000-4-6 or equivalent	No Yes
		Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No Yes
		Degree of Protection	IS-13947 or equivalent	No Yes
	4 Battery ##	As per standard (col 4)	IS-10918 (Ni-Cd Batteries)	No Yes
			IS-1652 (Lead Acid Plante Batteries)	No
	5 UPS (Applicable for each model and rating) 1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable. 2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.			
		Surge Withstand Capability(SWC)	(ANSI / IEEE C37.90.1)or	No Yes

			(IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18).		
		Dry Heat Test	IEC-60068-2-2 or equivalent	No	Yes
		Damp Heat test	IEC-60068-2-30 or IEC-60068-2-78 or equivalent	No	Yes
		Vibration test	IEC-60068-2-6 or equivalent	No	Yes
		Electrostatic discharge test	IEC 61000-4-2 or equivalent	No	Yes
		Radio frequency immunity test	IEC-61000-4-6 or equivalent	No	Yes
		Electromagnetic field immunity	IEC 61000-4-3 or equivalent	No	Yes
		Degree of protection test	IS-13947	No	Yes
		Fuse Clearing Capability	Approved procedure	No	Yes
		Short Circuit current capability	IEC 60146-2	No	Yes
6	Public Address System				
	IP based PA system components	As per Standard	IEC 60268-16	No	Yes
7	Control Valves	CV test	ISA 75.02& 75.11	No	Yes
8	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes

The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence of owner's representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.

SECTION – C

BILL OF QUANTITY-MAIN SUPPLY

BILL OF QUANTITY-MAIN SUPPLY

[A] CONTROL VALVES COMPLETE WITH POSITIONER AND ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB

[A]	**MAIN SUPPLY**		
SR. NO.	TAG NO	DESCRIPTION	TOTAL QTY
1	ECW-21	FGD DMCW Pumps Recirculation Control Valve	1
[B]	**1/4 " SS TUBING(15 METER FOR EACH TAG)**		**15 METER**
[C]	**SS FITTINGS- FOR EACH TAG**		
1	SS FITTINGS for connection to Air Filter Regulator- FOR EACH TAG		1 LOT
2	SS FITTINGS for connection to Air Lock Relay- FOR EACH TAG		1 LOT
3	SS FITTINGS for connection to IA Header Isolation Valve - FOR EACH TAG		1 LOT
4	SS EQUAL TEE - FOR EACH TAG		1 LOT
5	SS 1/2 " NPT(M) X 1/4 " OD TUBE CONNECTOR- FOR EACH TAG		1 LOT
[D]	**Cv TEST CHARGES**		**1 NO**

SECTION – C

BILL OF QUANTITY-SPARES

LIST OF COMMISSIONING SPARES

S NO	ITEM DESCRIPTION	QUANTITY FOR STATION
1	Gaskets	One(1) set with each control valve tag
2	Gland Packing	One(1) set with each control valve tag

LIST OF MANDATORY SPARES

Sr. No.	Description	Qty FOR STATION
1	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
2	Valve Trim (including cage, plug, stem & seat, seal rings, guide bushing etc.)	1 set of each type of control valve
3	Diaphragms, O-rings, Seals etc., of all type, make etc.	100%
4	Pressure Gauges of all types, make, rating etc.	10% or 2 no. of each type, whichever is more
5	Solenoid Valves (If applicable)	10% or 2 no. of each type, whichever is more
6	Positioner Units (Complete unit) & accessories (link assembly)	10% or 1 no. of each type, whichever is more
7	Pneumatic AFR of each type. Make rating etc.	10% or 2 nos., whichever is more
8	Air Lock Relays	10% or 2 no. of each type, whichever is more

NOTE

1. Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%)of the total population of the plant. In case the quantity so calculated happens to be a fraction, the same shall be rounded off to next higher whole number.
2. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

	2 X 500 MW NTPC SIPAT TPS, STAGE-II - FGD (LOT-6) Technical specification for **Control Valves with Accessories (Pneumatically Operated)**	SPECIFICATION NO. **PE-TS-491-145-I801**	
		DOCUMENT NO.	
		VOLUME **II-B**	
		SECTION **D**	
		ISSUE NO. 2	
		REV. NO. 00	DATE: 30.11.2022

SECTION – D

1) EQUIPMENT SPECIFICATION (PES-145-06)
2) SPECIFICATION FOR SMART POSITIONER (PES-145-06A)
3) HOOK-UP DIAGRAM (PES-145-06B)
4) GUIDELINES FOR PACKING (PES-145-06C)
5) SUB-VENDOR LIST

SECTION-D

EQUIPMENT SPECIFICATION (PES-145-06)

FORM NO. PEM-6666-0

	SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)	SPECIFICATION NO.: PE-TS-XXX-145-I104	
		DOCUMENT NO.: PES – 145 - 06	
		VOLUME II B	
		SECTION D	
		ISSUE NO. 2	
		REV. NO. 01	DATE : 16.03.2019
		SHEET 29 OF 51	

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/Electric 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
Electric Motor operated Actuators	:	IS-9334

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 Deaerator Level Control/Main Condensate Control Valves for Super-Critical Sets (660 MW & above) – Bidder to offer control valve with minimum 14" valve size for all super-critical power plants of 660 MW & above rating. The plug-stem assembly for these valves shall be a single-piece construction.

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

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3.1.5 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 this service.

3.1.6 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.

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

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

3.1.9 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 Equipercentage 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.

3.1.10 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.

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

i)	Liquid service	<=	8 m/sec
ii)	Steam service	<=	150 m/sec
iii)	Flashing service	<=	50% of sonic velocity for flashing services.

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

3.1.13 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.

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3.1.14 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.

3.1.15 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.

3.1.16 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 either pneumatically (with pneumatic actuator) or electrically (with electric actuator).
For pneumatic actuator, clause nos. 3.2.1 through 3.2.6 to be followed.

For electric actuator, please refer the technical specification for electric actuator (Refer Document No. PES-145-06D).

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.

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.

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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 covered copper/ SS tube and flare-less brass/ SS fittings etc. as per the hook up diagram (Refer drawing no. PES-145

3.4 **Painting** of the control valve assembly shall be as per the Painting Specification attached elsewhere in this technical specification. In the absence of specification for painting, vendor to submit their standard painting procedure for painting for BHEL's approval. Epoxy based paint (corrosion-resistant) to be provided for control valves for coastal environment.

3.5 **Sub-vendor list** –

The sub-vendors shall be as per the list enclosed elsewhere in this specification. In case the bidder proposes sub-vendors other than those listed in the specification, the same shall be subject to BHEL's/Customer's approval.

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 supply all the start-up/commissioning spares as per the BOQ given in the technical specification.

5.2 **Mandatory Spares**

The bidder shall supply all the mandatory spares as per the BOQ given in the technical specification.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents along with the bid: 4 Sets

6.1.1 Data sheet-B, completely filled-up along with all enclosures.

6.1.2 Schedule of prices in attached format (VOL.-III).

6.1.3 Quality Plan duly signed & stamped.

6.1.4 All relevant Catalogs with detailed technical information.

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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 (Drg. No. PE-VO-XXX-145-I004) 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 (Drg. No. PE-QP-XXX-145-I006) 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 (Refer specification no. PES-145-06C).

8.0 APPLICABLE DATA SHEET FORMS

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

- Data sheet A&B for Control Valve with Pneumatic Actuator : Data sheet no. PES-145-06-DS1-1
- Data sheet C for Control Valve with Pneumatic Actuator : Data sheet no. PES-145-06-DS2-1
- Data sheet A&B for Control Valve with Electric Actuator : Data sheet no. PES-145-06-DS3-1
- Data sheet C for Control Valve with Electric Actuator : Data sheet no. PES-145-06-DS4-1

SECTION-D

SPECIFICATION FOR SMART POSITIONER (PES-145-06A)

FORM NO. PEM-6666-0

	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)	SPECIFICATION NO.: PE-TS-XXX-145-I104 DOCUMENT NO.: PES-145-06A VOLUME. II B SECTION D ISSUE NO. 2 , REV.01 DATE : 16.03.19 SHEET 35 OF 51

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. If non contact type of Position feedback signal is required, Position transmitter to be separately 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 (Optional)	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	For Configuration/Software (OPTIONAL)
Test Certificates		Test Certificates As Per Manufacture Standard/Relevant Standard Are To Be Submitted.

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

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 (Optional)	Fail Safe/Fail Freeze feature is to be provided.

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

FORM NO. PEM-6666-0

BHEL	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)	SPECIFICATION NO.: PE-TS-XXX-145-I104 DOCUMENT NO.: PES-145-06A VOLUME. II B SECTION D ISSUE NO. 2 , REV.01 DATE : 16.03.19 SHEET 37 OF 51

Leak Test	Yes

7.0 EMC & CE compliance

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

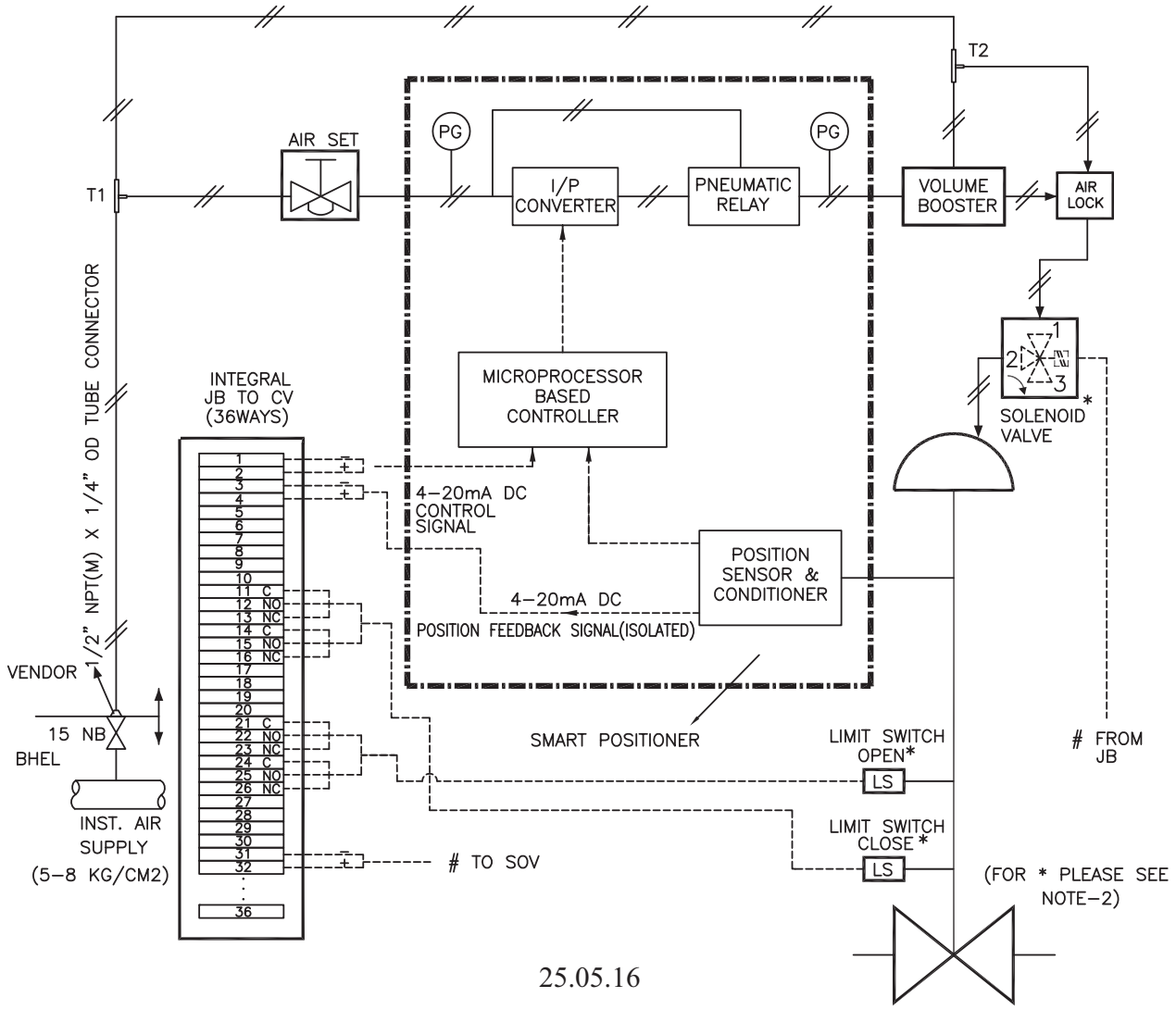
8.0 Accessories

In Built Operator Panel	Display With Push Buttons For Configuration And Display On The Positioner Itself
Hand Held Hart Calibrator (Optional)	Universal Hart Calibrator To Be Provided, One Per Unit.
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 (PES-145-06B)

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.
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 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 ISO VLV 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.

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	TITLE:- CONTROL VALVE HOOK-UP DIAGRAM	ISSUE NO. 2 REV. 01	DATE 16.03.19
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SECTION – D

GUIDELINES FOR PACKING (PES-145-06C)

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	ABB MASOLENIEN SIEMENS SAMR YOKOGAWA EMERSON (FISHER ROSEMOUNT) METSO YAMALKE MOORE
2.	AIR FILTER REGULATOR	FAIR CHILD, USA SHAVO NORGEN, MUMBAI SMC PNEUMATICS, NOIDA EMERSON(ASCO) CHENNAI FESTO, BANGALORE PLAKA,CHENNAI
3.	SOLENOID VALVE	ROTEX, VARODARA AVCON MUMBAI HERION, GERMANY IMI NORGEN, GERMANY JAFFERSON, ARGENTNA ASCO, CHENNAI/USA FESTO, BANGALORE SMC PNEUMATICS ,NOIDA
4.	JUNCTION BOX	SUMIP COMPOSITES, AHEMDABAD KEMROK VARODARA AJMERA, MUMBAI TRINITY TOUCH, PALWAL

Note: This is subject to end user approval.