

## BOQ

### (3x200+3x500+1x500) MW NTPC KORBA TPS Stage I, II & III –FGD (466) - CONTROL VALVES & MANDATORY SPARES BOQ

SR. NO.	Tag No.	Service/Item Description	Total Qty.	EX. WORKS Unit price	Total Ex Works Price	Freight%	GST%	TOTAL FOR PRICE
<b>[A]</b>	<b>VALVE DETAILS</b>							
<b>1</b>	PGB16AA101	CV ACROSS DMCW CKT FOR FGD AUX	1					
<b>[B]</b>	1/4 " SS TUBING		15 MTR					
<b>[C]</b>	<b>SS FITTINGS- FOR EACH TAG</b>							
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					
<b>[D]</b>	<b>CV TEST CHARGES</b>							
<b>1</b>	CV TEST CONTROL VALVE (Valve Body Size -3")		1 No.					
<b>[E]</b>	<b>COMMISIONING SPARES (Gland Packing &amp; Gasket- 01 set for each CV Tag)</b>		1 lot					
<b>[F]</b>	<b>MANDATORY SPARES (Refer Tech Spec)</b>							
1	Pneumatic and electro-hydraulic actuator assembly		1 No.					
2	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)		1 Set					
3	Diaphragms, O' rings, seals etc. of all types make etc.		1 Set					
4	Pressure Gauges of all types, make, rating etc.		2 Nos.					
5	Solenoid valves (if applicable)		2 Nos.					
6	Positioner units (complete unit)& accessories (link assembly)		1 No.					
6A	Feedback link assembly		1 No.					
7	Pneumatic air-filter/Regulator of each type, make rating		2 Nos.					
8	Air lock relays		2 Nos.					

## BOQ


### NPGCL Nabinagar (3x660 MW) FGD - CONTROL VALVES & MANDATORY SPARES BOQ

SR. NO.	Tag No.	Service/Item Description	Total Qty.	EX. WORKS Unit price	Total Ex Works Price	Freight%	GST%	TOTAL FOR PRICE
<b>[A]</b>	<b>VALVE DETAILS</b>							
<b>1</b>	PGB10AA101	ECW SYSYTEM RECIRCULATION CV	1 No.					
<b>[B]</b>	1/4 " SS TUBING		12 MTR					
<b>[C]</b>	<b>SS FITTINGS- FOR EACH TAG</b>							
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					
<b>[D]</b>	<b>CV TEST CHARGES</b>							
<b>1</b>	CV TEST CONTROL VALVE (Valve Body Size -10")		1 No.					
<b>[E]</b>	<b>COMMISIONING SPARES (Gland Packing &amp; Gasket- 01 set for each CV Tag)</b>		1 lot					
<b>[F]</b>	<b>MANDATORY SPARES (Refer Tech Spec)</b>							
1	Pneumatic and electro-hydraulic actuator assembly		1 No.					
2	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)		1 Set					
3	Diaphragms, O' rings, seals etc. of all types make etc.		1 Set					
4	Pressure Gauges of all types, make, rating etc.		2 Nos.					
5	Solenoid valves (if applicable)		2 Nos.					
6	Positioner units (complete unit)& accessories (link assembly)		1 No.					
6A	Feedback link assembly		1 No.					
7	Pneumatic air-filter/Regulator of each type, make rating		2 Nos.					
8	Air lock relays		2 Nos.					

## BOQ

### (4x210+3x500) MW NTPC KAHALGAON TPS Stage I & II –FGD - CONTROL VALVES & MANDATORY SPARES BOQ

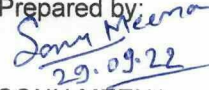
SR. NO.	Tag No.	Service/Item Description	Total Qty.	EX. WORKS Unit price	Total Ex Works Price	Freight%	GST%	TOTAL FOR PRICE
<b>[A]</b>	<b>VALVE DETAILS</b>							
1	1PGB15AA101	CV ACROSS ECW SYSYTEM FOR FGD AUX'S STAGE- I	1 No.					
2	2PGB15AA101	CV ACROSS ECW SYSYTEM FOR FGD AUX'S STAGE- II	1 No.					
<b>[B]</b>	1/4 " SS TUBING( 15 METER FOR EACH TAG)		30 MTR					
<b>[C]</b>	<b>SS FITTINGS- FOR EACH TAG</b>							
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					
<b>[D]</b>	<b>CV TEST CHARGES</b>							
1	CV TEST CHARGES for ECW SYSYTEM FOR FGD AUX'S STAGE- I (Valve Body Size 3")		1 No.					
2	CV TEST CHARGES for ECW SYSYTEM FOR FGD AUX'S STAGE- II (Valve Body Size 3")		1 No.					
<b>[E]</b>	<b>COMMISIONING SPARES (Gland Packing &amp; Gasket- 01 set for each CV Tag)</b>		1 lot					
<b>[F]</b>	<b>MANDATORY SPARES (Refer Tech Spec)</b>							
1	Pneumatic and electro-hydraulic actuator assembly		1 No.					
2	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)		1 Set					
3	Diaphragms, O' rings, seals etc. of all types make etc.		1 Set					
4	Pressure Gauges of all types, make, rating etc.		2 Nos.					
5	Solenoid valves (if applicable)		2 Nos.					
6	Positioner units (complete unit)& accessories (link assembly)		1 No.					
6A	Feedback link assembly		1 No.					
7	Pneumatic air-filter/Regulator of each type, make rating		2 Nos.					
8	Air lock relays		2 Nos.					

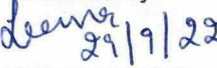
	<b>PRE-QUALIFICATION REQUIREMENTS</b>	PE-PQ-466-145-I001
		REVISION NO. 00 DATE 28.09.2022
		SHEET NO. 1 OF 1

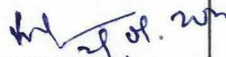
PACKAGE: CONTROL VALVE

PROJECT: (3x200+3x500+1x500) MW NTPC KORBA FGD


1.0	<p>a. Bidder should be Original equipment manufacturer (OEM) for CONTROL VALVE.</p> <p>b. In case bidder is not OEM, evaluation shall be done as following:</p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol>
2.0	<p>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)</p> <p>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 &amp; technical parameter to be attached along with the performance certificate.</p> <p style="text-align: center;">OR</p> <p>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.</p>
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:  
  
 29.09.22  
 SONU MEENA  
 Sr.EGR-C&I

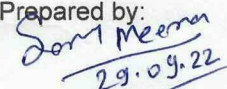
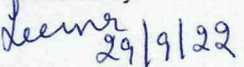
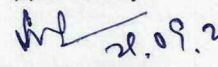
Checked by:  
  
 29/9/22  
 SEEMA KHATRI  
 MGR-C&I


Approved by:  
  
 29.09.22  
 S.C.SHARMA  
 DGM-C&I



	<b>PRE-QUALIFICATION REQUIREMENTS</b>	PE-PQ-481-145-I001
		REVISION NO. 00 DATE 28.09.2022
		SHEET NO. 1 OF 1

PACKAGE: CONTROL VALVE		PROJECT: (4x210+3x500) MW NTPC KAHALGAON FGD
1.0	<p>a. Bidder should be Original equipment manufacturer (OEM) for CONTROL VALVE.</p> <p>b. In case bidder is not OEM, evaluation shall be done as following:</p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol>	
2.0	<p>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)</p> <p>a. Copy of minimum <b>1 (One)</b> Performance Certificate from end user / customer certifying that product has been running satisfactorily for <b>1 (One)</b> 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 &amp; technical parameter to be attached along with the performance certificate.</p> <p style="text-align: center;">OR</p> <p>b. Copy of repeat orders from minimum <b>2 (Two)</b> different purchasers. Order received by bidder from same purchaser with a gap of minimum <b>2 (Two)</b> years shall be considered as repeat order. Copy of technical parameters for each order to be attached.</p>	
3.0	<p>Bidder to furnish experience list of last 5 years indicating customer name, purchase order reference, item supplied &amp; year of supply to establish the continuity of business.</p>	
4.0	<p>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.</p>	

Prepared by:  29.09.22 SONU MEENA Sr.EGR-C&I	Checked by:  29/9/22 SEEMA KHATRI MGR-C&I	Approved by:  28.09.2022 S.C.SHARMA DGM-C&I
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	<b><u>PRE-QUALIFICATION REQUIREMENTS</u></b>	PE-PQ-434-145-I001
		REVISION NO. 00    DATE 03.06.2022
		SHEET NO. 1 OF 1

PACKAGE: CONTROL VALVE		PROJECT: 3x660 MW NPGCPL NABINAGAR STPP (FGD PKG)
1.0	<p>a. Bidder should be Original equipment manufacturer (OEM) for CONTROL VALVE.</p> <p>b. In case bidder is not OEM, evaluation shall be done as following:</p> <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol>	
2.0	<p>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)</p> <p>a. Copy of minimum <b>1 (One)</b> Performance Certificate from end user / customer certifying that product has been running satisfactorily for <b>1 (One)</b> 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 &amp; technical parameter to be attached along with the performance certificate.</p> <p style="text-align: center;">OR</p> <p>b. Copy of repeat orders from minimum <b>2 (Two)</b> different purchasers. Order received by bidder from same purchaser with a gap of minimum <b>2 (Two)</b> years shall be considered as repeat order. Copy of technical parameters for each order to be attached.</p>	
3.0	<p>Bidder to furnish experience list of last 5 years indicating customer name, purchase order reference, item supplied &amp; year of supply to establish the continuity of business.</p>	
4.0	<p>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.</p>	

Prepared by:	Checked by:	Approved by:
RAVEESH KUMAR MGR-C&I	CHETAN MALIK SR.MGR-C&I	S S BANSALA DGM-C&I

**TECHNICAL SPECIFICATION**  
**FOR**  
**CONTROL VALVES WITH ACCESSORIES**  
**(Pneumatically Operated)**

**3 X 660 MW NABINAGAR STPP (FGD)**

**VOLUME - IIB**

**SECTIONS-A, C & D**

**SPECIFICATION No: PE-TS-457-145-I108**



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

1080346/2022/PS-PEM-C\_I

FORM NO. PEM-666-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-457-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 30.09.2022

## SECTION – A

### SCOPE OF ENQUIRY



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-457-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 30.09.2022

## 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 **3 X 660 MW NABINAGAR STPP FGD** 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.
- Complete offer including calculation sheets, catalogues etc.
  - Quality Plan
  - Datasheet A & B, duly filled
  - Schedule of prices & unit prices, inspection schedule
  - 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.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-457-145-1801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 30.09.2022

## SECTION – C

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



	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPEC NO.: PE-TS-457-145-1801	
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			DATE	30.09.2022

### **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 implication.

1. All the formats in Volume-III, SCHEDULE OF SUBMISSION OF DRG. /DOC. and QUALITY PLAN (BHEL Format) 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. The Hook-up diagram for Control valve, 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. BLANK
5. BLANK
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 nameplate to 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.

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPEC NO.: PE-TS-457-145-1801	
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			DATE	30.09.2022

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. BLANK
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. The smart positioner provided with Control Valves shall be compatible with Universal Hart Calibrator.  
In order to interface with METSO 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 (device type manager) / DTD (device type description) files for engineering.
19. Positioner shall have fail safe feature as indicated in datasheet.
20. Bidder to furnish compliance certificate duly signed and stamped by bidder attached further.
21. Tolerance on end to end, center to center, center 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, drawing and listing, etc. shall be submitted in English language.



	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPEC NO.: PE-TS-457-145-1801	
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			SECTION	C
			ISSUE NO.	2
			REV. NO.	00
			DATE	30.09.2022

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

24. BLANK

25. 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.

26. **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

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPEC NO.: PE-TS-457-145-1801	
			DOCUMENT NO.	
			VOLUME	II B
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			REV. NO.	00
			DATE	30.09.2022

**Approval:**

- Assembly (dimensional) drawings.
- Valve Edge preparation details.
- Datasheet-C completely filled-up.
- Hook-up diagram of Control Valve with Actuator & Accessories.
- Valve & Actuator assembly dimensional drawings with weights.
- Quality Plan duly signed and stamped.
- All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.
- All relevant catalogues for the models of the valves as well as accessories finalized.
- 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

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

**(C) Cv test:**

Cv test shall be conducted by the bidder for each type (same size, same Cv, same trim characteristics) of control valve.

Alternatively, Cv test certificate for a similar control valve (same size, same Cv, same trim characteristics) conducted by the bidder not before 14.09.2013 may be accepted, subject to acceptance by customer.

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPEC NO.: PE-TS-457-145-1801	
			DOCUMENT NO.	
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			SECTION	C
			ISSUE NO.	2
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			DATE	30.09.2022

## **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	

1080346/2022/PS-PEM-C I

FORM NO. PEM-6866-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-457-145-1801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 30.09.2022

## CUSTOMER SPECIFICATION




## **SUB-SECTION-III-C7**


### **CONTROL VALVES, ACTUATORS & ACCESSORIES**

**LOT-IA PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**


**TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(1A)-2**

2/PS-PEM-C-1


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	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.			
LOT-4A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 5

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	<b>VALVE CONSTRUCTION</b>			
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	<b>VALVE MATERIALS</b>  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.			
LOT-4A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 2 OF 5


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CLAUSE NO.	TECHNICAL REQUIREMENTS				
4.00.00	<b>END PREPARATION</b>  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	<b>VALVE ACTUATORS</b>  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	<b>CONTROL VALVE ACCESSORY DEVICES</b>				
6.01.00	All pneumatically 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	<b>SPECIFICATIONS FOR MICROPROCESSOR BASED POSITIONERS</b>				
	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	
LOT-4A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2		SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES	
PAGE 3 OF 5					



2/PS-PEM-C-1		TECHNICAL REQUIREMENTS		
CLAUSE NO.				
	2	Environment	a) Operating Temp	(-)30 To 80 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	Remote calibration, Auto & Manual calibration shall be possible. Universal HART Calibrator to be provided.	
	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	
LOT-4A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2		SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES
				PAGE 4 OF 5

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CLAUSE NO.	TECHNICAL REQUIREMENTS				
			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	<b>TEST AND EXAMINATION</b>  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	<b>CV Test:</b> As per ISA 72.05, NTPC approval is required for test certificate.				
9.00.00	<b>CONTROL VALVE QUANTITIES</b>  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.				
LOT-4A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE			TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2		SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES
					PAGE 5 OF 5

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FORM NO. PEM-6666-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-457-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 30.09.2022

## SECTION-C

### DATASHEET A&B

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1080346/2022/PS-PEM-C I

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>						SPECIFICATION NO.: PE-TS-457-145-I 104			
							VOLUME			
							SECTION			
							REV. NO.		DATE :30.09.2022	
							SHEET 2			
Tag No. : PGB16AA101      Qty.:1 No      Date Sheet No. PES-145-06-DS1-0 <b>DATA SHEET – A &amp; B</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 HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 1\%$			..... ..... ..... .....		
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	371	7.5	1.0	60.0				
	2.	MIMUMUM	111	9.5	1.0	60.0				
	3.	MAXIMUM	482	6.5	1.0	60.0				
	4.	AT 120% OF MAXIMUM FLOW	579	5.0	1.0	60.0				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g) 10.0 * BODY DESIGN: PRESS (KG/CM2g)   TEMP (DEG C) 10.0   60.0 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			

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FORM NO. PEM-5666-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO.:

VOLUME **II-B**SECTION **C**

REV. NO. 00

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)
<b>POSITIONER</b>	MFR. & MODEL NUMBER		
	BYPASS	GAUGES	ENCL. CLASS
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> THREE <input checked="" type="checkbox"/> TWO <input checked="" type="checkbox"/> IP-65
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )		TO SUIT ACTUATOR
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER		
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)		<input checked="" type="checkbox"/> 5.0 – 8.0 <input type="checkbox"/>
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)		TO SUIT ACTUATOR
	FILTER SIZE		5 MICRON
	OUTPUT GAUGE		<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED
<b>AIR LOCK</b>	MFR. & MODEL NUMBER		
	SET PRESS (Kg / Cm <sup>2</sup> )		
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )		<input checked="" type="checkbox"/> 5.0 – 8.0 <input type="checkbox"/>
	RESET TYPE		AUTO
	VENT PLUG		REQUIRED
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER		
	OPEN posn	INT posn	CLOSE posn
	CONTACT TYPE		SPDT 2 NO + 2 NC
	RATING (AC / DC)		5A 240V AC AND 0.2A 220V DC
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>
<b>POSITION TRANSMITTER</b>	MFR. & MODEL NUMBER		<input checked="" type="checkbox"/> Electronic (2-Wire) Contactless <input type="checkbox"/> OTHER
	TYPE		PART OF SMART POSITIONER
	SUPPLY		
	OUTPUT RATING		
	ACCURACY		
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER		
	RATING		<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 240V AC <input type="checkbox"/>
	TYPE		3-WAY (UNIVERSAL OPERATION TYPE)
	OPERATION	QUANTITY	<input type="checkbox"/> Stayput <input checked="" type="checkbox"/> Interlock AS PER DATASHEET & HOOK UP
	COIL INSULATION CLASS		CLASS - H
<b>HANDWHEEL</b>	ORIENTATION		<input type="checkbox"/> TOP MOUNTED <input checked="" type="checkbox"/> SIDE MOUNTED
	NO. OF WAYS		<input type="checkbox"/> 24-WAYS <input type="checkbox"/> AS REQUIRED <input checked="" type="checkbox"/> 36-Ways
<b>JUNCTION BOX</b>	SIZE		AS REQUIRED
	CABLE GLANDS (Size / Quantity)		AS REQUIRED (Double Compression Type).
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>
	BODY MATERIAL		<input checked="" type="checkbox"/> FRP <input type="checkbox"/> SS <input type="checkbox"/> METAL SHEET
<b>I/P CONVERTER</b>	INPUT SIGNAL	POWER SUPPLY	PART OF SMART POSITIONER
	SPLIT RANGE		
	ENCLOSURE CLASS		
	LINEARITY		
	HYSTERESIS		
<b>Tubing &amp; Fittings / per CV</b>	This is in addition to Tubing and fittings which are integral part of CV		12 Meters of 1/4 " 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.
<b>PAINTING</b>	COLOUR/SHADE		<input checked="" type="checkbox"/> RED <input type="checkbox"/> GREEN <input type="checkbox"/>
	THICKNESS (DFT) – in microns		
	TYPE		<input checked="" type="checkbox"/> EPOXY <input type="checkbox"/> ENAMEL <input type="checkbox"/>
			COMPANY SEAL
			NAME
			SIGNATURE
			DATE

1080346/2022/PS-PEM-C\_I

FORM NO. PEM-6686-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-457-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

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**SECTION-C**  
**DATASHEET C**

1080346/2022/PS-PEM-C I

FORM NO. PEM-5666-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-457-145-1801**

DOCUMENT NO.

VOLUME IIB

SECTION **C**

ISSUE NO. 2

REV. NO. 00

DATE: 30.09.2022

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)

<b>GENERAL *</b>	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
<b>BODY</b>	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	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm <sup>2</sup> g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
<b>ACCESSORIES</b>	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	



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FORM NO. PEM-5666-0



Technical specification for  
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SPECIFICATION NO. **PE-TS-457-145-1801**

DOCUMENT NO.

VOLUME IIB

SECTION **C**

ISSUE NO. 2

REV. NO. 00

DATE: 30.09.2022

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<sup>2</sup> (A))OUTLET PR. (KG/CM<sup>2</sup> (A))

TEMP DEG. C

CALCULATED CV

% VALVE LIFT

VALVE O/L VELOCITY

VALVE TYPE

\* MAX SHUT OFF PRESS ((KG/CM<sup>2</sup>g)\* BODY DESIGN : PRESS ((KG/CM<sup>2</sup>g) | TEMP (DEG. C)

\* IBR FORM III-C

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.

**SEA WORTHY PACKING****APPLICABLE / NOT APPLICABLE**

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### Technical specification for Control Valves with Accessories (Pneumatically Operated)

SPECIFICATION NO.: **PE-TS-457-145-I801**

DOCUMENT NO.:

VOLUME **II-B**SECTION **C**

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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)

<b>POSITIONER</b>	MFR. & MODEL NUMBER		
	BYPASS	GAUGES	ENCL. CLASS
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )		
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )		
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER		
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)		
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)		
	OUTPUT GAUGE		
	FILTER SIZE		
	AUTO DRAIN FEATURE		
<b>AIR LOCK</b>	MFR. & MODEL NUMBER		
	SET PRESS (Kg / Cm <sup>2</sup> )		
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )		
	RESET TYPE		
	VENT PLUG		
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER		
	OPEN posn	INT posn	CLOSE posn
	CONTACT TYPE		
	RATING (AC / DC)		
	ENCLOSURE CLASS		
<b>POSITION TRANSMITTER</b>	MFR. & MODEL NUMBER		
	TYPE		
	SUPPLY		
	OUTPUT RATING		
	ACCURACY		
	ENCLOSURE CLASS		
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER		
	RATING		
	OPERATION	QUANTITY	
	COIL INSULATION CLASS		
	ENCLOSURE CLASS		
<b>HANDWHEEL</b>	ORIENTATION		
<b>JUNCTION BOX</b>	NO. OF WAYS		
	SIZE		
	CABLE GLANDS (Size / Quantity)		
	ENCLOSURE CLASS		
	BODY MATERIAL		
<b>I/P CONVERTER</b>	INPUT SIGNAL	POWER SUPPLY	
	SPLIT RANGE		
	ENCLOSURE CLASS		
	LINEARITY		
	HYSTERESIS		
<b>Cu./SS Tubing &amp; Fittings / per CV</b>	12 Meters of 1/4" 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.		
<b>PAINTING</b>	COLOUR/SHADE		
	THICKNESS (DFT)		
	TYPE		
			COMPANY SEAL
			NAME
			SIGNATURE
			DATE

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FORM NO. PEM-6686-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-457-145-I801**

DOCUMENT NO. PE-QP-999-145-I006


VOLUME **II-B**SECTION **C**

ISSUE NO. 2

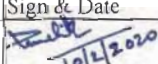
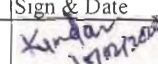
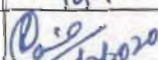
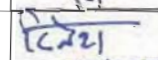
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DATE : 30.09.2022

**SECTION-C**  
**QUALITY PLAN**

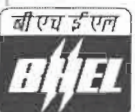
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				CUSTOMER :--				QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 1 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

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.

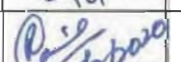
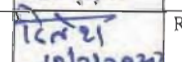
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ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
		CHETAN MALIK			KUNDAN PRASAD
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
		R.K. RAINA			R.K. JAISWAL


BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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				CUSTOMER :--				QP NO.: PE-QP-999-145-1 006		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	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
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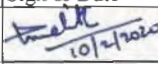
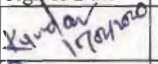
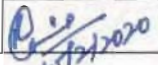
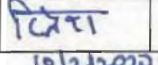
1.2	Diaphragm	1.Surface Quality	MA	Visual	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V	
		2.Hardness	MA	Measurement	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V	
		3.Endurance/ Life cycle	MA	Cyclic Test 10,000 cycles	One/ type	One/ type	10,000 cycles/Mfr. standard	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	

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Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL			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
1	2	3	4	5	6	7	8	9	* D	** M C N	
					M	C/N					

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 accessi ble 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	

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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL

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Sign & Date	
Seal	

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SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
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COMPLETED VALVE	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(Over all)	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	W	On assembled

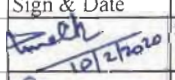
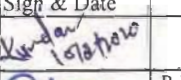

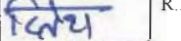
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Reviewed by:	10/1/2020	CHETAN MALIK	Reviewed by:	10/1/2020	KUNDAN PRASAD
	10/1/2020	R.K. RAJNA		10/1/2020	R.K. JAISWAL

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				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 5 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
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		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	

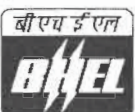
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	Sign & Date	Name		Sign & Date	Name
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Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL

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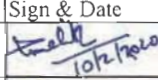
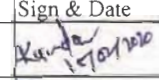
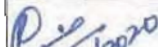
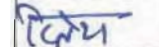
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				CUSTOMER :--				QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 7 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
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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. Hysteresis	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. Hysteresis	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/W		

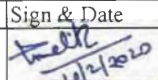
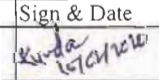
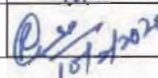
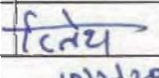
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ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL

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Seal	

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				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 8 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
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		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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHE TAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

		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:

- 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.
- 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.
- Sea worthy packing shall be provided, if called for in the Data sheets. Vendor to provide the following to BHELPEM for verification:
  - Photographs of valves duly placed inside the wooden box just before final packing.
  - 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.
- 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.
- 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.
- BHEL reserves the right to conduct repeat tests, if required.
- 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, IDENTIFIED 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:	<i>Amal</i> 10/12/2020	CHETAN MALIK	Checked by:	<i>Kundan</i> 10/01/2020	KUNDAN PRASAD						
Reviewed by:	<i>R.K.</i> 10/01/2020	R.K. RAINA	Reviewed by:	<i>R.K.</i> 10/01/2020	R.K. JAISWAL						

NOTE: Minimum requirement has been given in QP, Vendor to submit QP for end user approval.



## **SUB-SECTION-V-QC6**

# **CONTROL VALVE ACTUATORS AND ACCESSORIES**

LOT-IA PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(1A)-2

CLAUSE NO.		QUALITY ASSURANCE & INSPECTION												एनटीपीसी NTPC	
<b>CONTROL VALVE ACTUATORS AND ACCESSORIES.</b>															
TESTS	ITEMS	Make, model, tag (r)	Dimension®	Surface finish®	Heat treatment®	Material test certificates®	lbr certificates®	Hydraulic test®	Ultradiography for >900 lb rating®	Mpi/dp®	Pressure resistance®	Seat leakage®	Timing open/close®	Linearity/hysteresis®	Functional test, review for make and tc of accessories®
<b>CONTROL VALVE AND ACTUATOR</b>															
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) Detailed procedure of environmental stress screening test shall be as per quality assurance programme general technical conditions															
2) 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.															
LOT-IA PROJECTS FLUE GAS DESULPHURISATION SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC. NO CS-0011-109(1A)-2						SUB-SECTION-V-QC6 CONTROL VALVE ACTUATORS AND ACCESSORIES				PAGE 1 OF 1			



**SUB-SECTION-III-C6****TYPE TEST REQUIREMENTS**


LOT-IA PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(1A)-2

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
<p style="text-align: center;"><b>TYPE TEST REQUIREMENTS</b></p> <p><b>1.00.00 TYPE TEST REQUIREMENTS</b></p> <p><b>1.01.00 General Requirements</b></p> <p><b>1.01.01</b> 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. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&amp;I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.</p> <p>(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.</p> <p>(b) For the rest, submission of type test results and certificate shall be acceptable provided.</p> <p>i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.</p> <p>ii. There has been no change in the components from the offered equipment &amp; tested equipment.</p> <p>iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening but not more than five (5) year back.</p> <p>(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.</p> <p><b>1.01.02</b> As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.</p> <p><b>1.01.03</b> The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.</p>			
<p style="text-align: center;">LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</p>		<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2</p>	
<p style="text-align: center;">SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS</p>		<p style="text-align: center;">PAGE 1 OF 7</p>	



022/PS-PEM-C-I

CLAUSE NO.	TECHNICAL REQUIREMENTS	
1.01.04	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.	
1.01.05	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 test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.	
2.00.00	<b>SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS</b>	
2.01.00	<p>The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&amp;I systems Analyzer instruments, various PLCs etc. shall be as indicated below:</p> <p>i) Surge Protections for Solid State Equipments/ Systems</p> <p>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 37.90a/ IEEE-472. Hence, all front end cards which receive external signals like Analog input &amp; output modules, Binary input &amp; 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 37.90a/ IEEE-472. 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 alongwith the proposal. As an alternative to above, suitable class of IEC-60255-4 which is equivalent to ANSI 37.90a/ IEEE-472 may also be adopted for SWC test.</p> <p>ii) Dry Heat test as per IEC-68-2-2 or equivalent.</p> <p>iii) Damp Heat test as per IEC-68-2-3 or equivalent.</p> <p>iv) Vibration test as per IEC-68-2-6 or equivalent.</p> <p>v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent.</p> <p>vi) Radio frequency immunity test as per EN 50082-2 or equivalent.</p>	
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS
PAGE 2 OF 7		

022/PS-PEM-C_I			
CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>
	<p>vii) Electromagnetic immunity as per EN 61131-2 or equivalent.</p> <p>Test listed at item no. v, vi, vii, above are applicable for front end cards only as defined under item (i) above.</p>		
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS
PAGE 3 OF 7			


3.00.00

## TYPE TEST REQUIREMENT FOR C&amp;I SYSTEMS

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
2	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
3	INSTRUMENTATION CABLES TWISTED & SHIELDED			No	Yes	
4	Pressure gauge	Degree of protection test	IS-2147	No	No	
		Temp interference test	IS -3624	No	No	
5	Temperature gauge	Degree of protection test	IS-2147	No	No	
6	Pressure & DP switch	Degree of protection test	IS-2147	No	No	
		As per standard (col 4)	BS 6134	No	No	
7	Level switch	Degree of protection test	IS-2147	No	No	
8	Control valves	CV Test	ISA 75.02	No	Yes	
9	Flow Nozzles & Orifice plate	Calibration	ASME PTC , BS 1042	No	Yes	
10	PLCs	All tests as per IEC-1131	IEC-601131	No	Yes	

Sl No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
11	Junction Box	Degree of protection test	IS-13947	No	Yes	
12	Battery charger (Not required for inbuilt chargers)	Degree of protection test	IS-13947	No	No	
		Short circuit current capability	IEC-60146-2	No	Yes	
		Temp rise test without redundant fans	Approved procedure, IEC 60146-2	No	Yes	
		SWC test	Approved procedure	No	Yes	
		Burn-in-test	Approved procedure	No	Yes	
		Efficiency	IEC-60146-2,	No	Yes	
		Audible Noise Test	IEC 60146-2	No	Yes	
		Fuse Clearing Capability	Approved procedure	No	Yes	
		Relative harmonic content	Approved procedure	No	Yes	

LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 5 OF 7
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	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-457-145-I801	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 30.09.2022

## SECTION – C

### BILL OF QUANTITY-MAIN SUPPLY

1080346/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-457-145-1801	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
			REV. NO.	00
			DATE	30.09.2022

### **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	ACW10	ECW SYSTEM RECIR VLV	1
<b>[B]</b>	<b>1/4 " SS TUBING(12 METER FOR EACH TAG)</b>		<b>12 METER</b>
<b>[C]</b>	<b>SS FITTINGS- FOR EACH TAG</b>		<b>1 LOT</b>
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
<b>[D]</b>	<b>Cv TEST CHARGES</b>		<b>1 LOT</b>

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-457-145-I801	
			DOCUMENT NO.	
			VOLUME	II B
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			DATE 30.09.2022	

## SECTION – C

### BILL OF QUANTITY-SPARES

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-457-145-1801	
			DOCUMENT NO.	
			VOLUME	II B
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### 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

SNO.	PARTICULARS	SPEC	QTY
1	Pneumatic and electro-hydraulic actuator assembly.	10% or 1 no. of each type, model and rating, whichever is more.	1
2	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type of control valve.	1
3	Diaphragms, O' rings, seals etc. of all types make etc.	1 set for each type of control valve.	1
4	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more	2
5	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more	2
6	Positioner units (complete unit)& accessories (link assembly)	10% or 1 no. of each type whichever is more	1
7	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more	2
8	Air lock relays	10% or 2 nos. of each type whichever is more	2

#### NOTE

- 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.
- 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.



	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPECIFICATION NO.
			DOCUMENT NO.
			VOLUME <b>II-B</b>
			SECTION <b>D</b>
			ISSUE NO. 2
			REV. NO. 00      DATE: 30.09.2022

## **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

1080346/2022/PS-PEM-C\_I

FORM NO. PEM-6686-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

DOCUMENT NO.

VOLUME **II-B**SECTION **D**


ISSUE NO. 2

REV. NO. 00

DATE : 30.09.2022

## **SECTION-D**

### **EQUIPMENT SPECIFICATION (PES-145-06)**

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
			DOCUMENT NO.: PES – 145 - 06	
			VOLUME	II B
			SECTION	D
			ISSUE NO.	2
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## 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)	:	FCI-70.2
Allowable Seat leakage	:	ANSI-B16.34
Pressure & Temperature ratings	:	IEC-144 / NEMA / IS-13947
Enclosure class	:	ISA S-75
Control Valves Sizing	:	IS-9334
Electric Motor operated Actuators	:	


## 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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
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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.
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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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
			DOCUMENT NO.: PES – 145 - 06	
			VOLUME	II B
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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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
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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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
			DOCUMENT NO.: PES – 145 - 06	
			VOLUME	II B
			SECTION	D
			ISSUE NO.	2
			REV. NO.	01
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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 |

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FORM NO. PEM-6686-0



3x800 MW PATRATU STPP

Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. PE-TS-434-145-I801B

DOCUMENT NO.

VOLUME **II-B**SECTION **D**

ISSUE NO. 2

REV. NO. 00

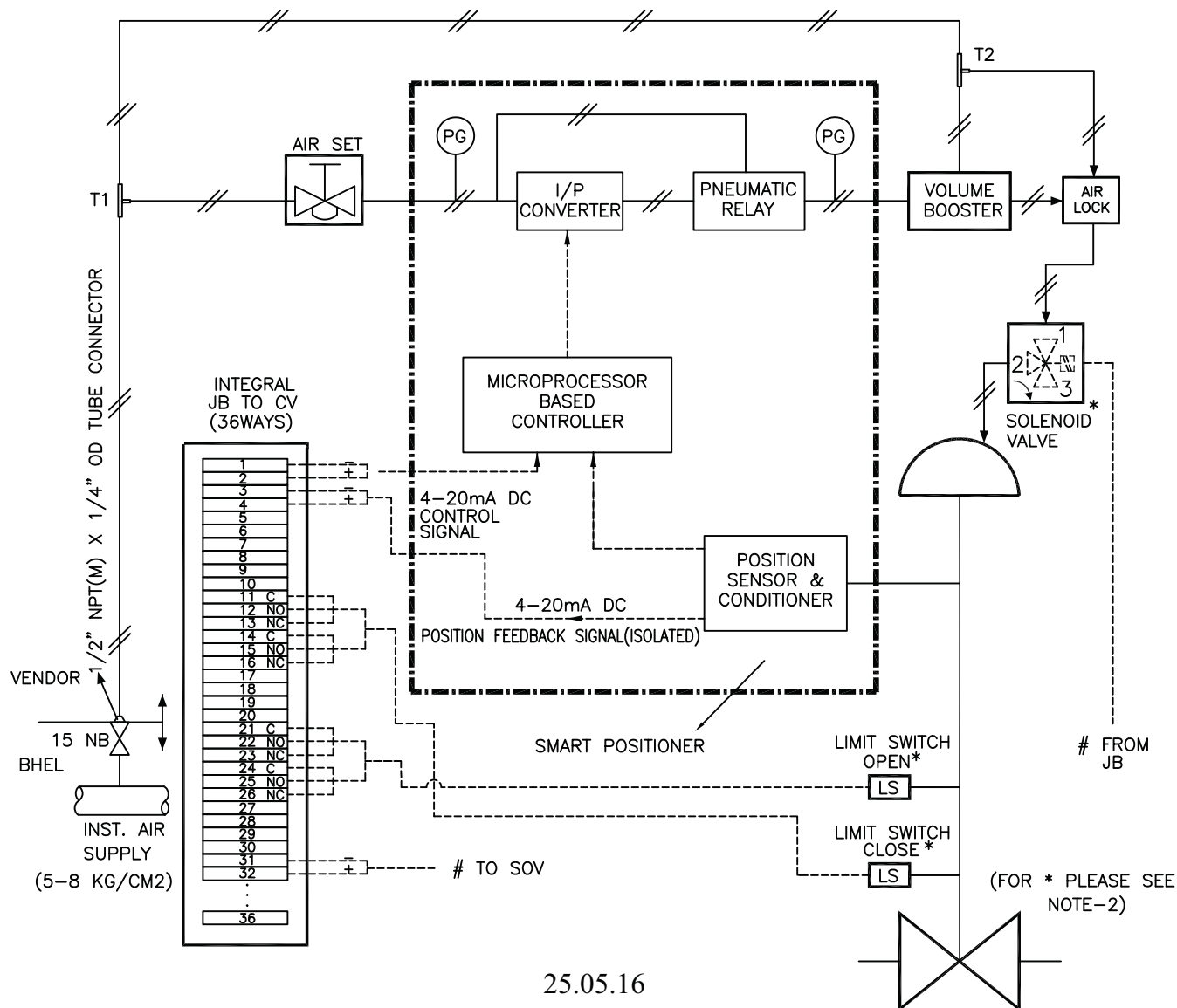
DATE : 10.05.2022

## **SECTION-D**

### **HOOK-UP DIAGRAM (PES-145-06B)**



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



25.05.16

### 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 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 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.



SPECIFICATION NO.: PE-TS-XXX-145-I104

DRG.  
No.

PES-145-06B

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

ISSUE NO. 2  
REV. 01

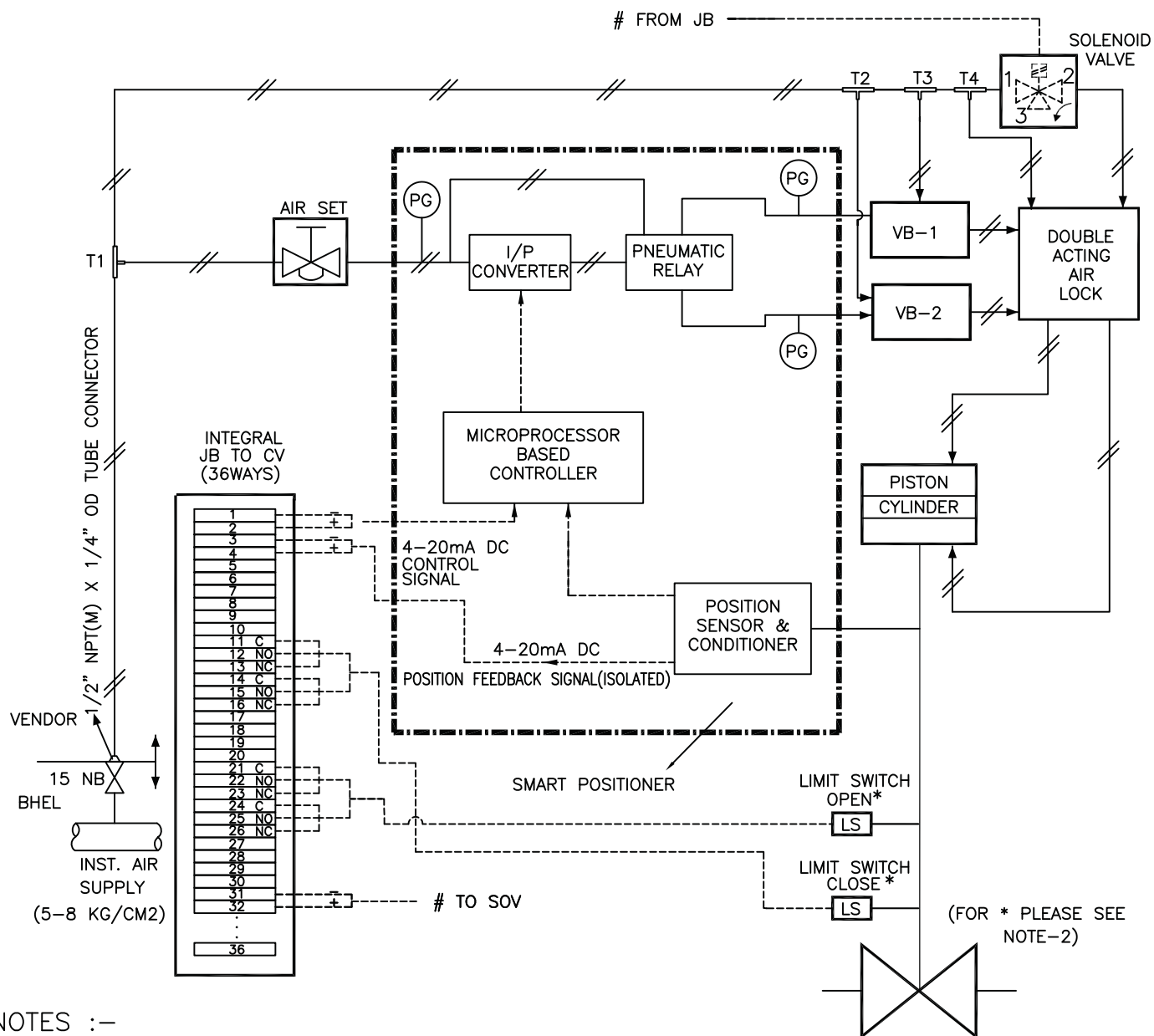
DATE

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## 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. 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 DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 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 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 & TEE-T3 SHALL BE PROVIDED.



SPECIFICATION NO.: PE-TS-XXX-145-I104

DRG.  
No.

PES-145-06B

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

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3x800 MW PATRATU STPP  
Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. PE-TS-434-145-I801B	
DOCUMENT NO.	
VOLUME <b>II-B</b>	
SECTION <b>D</b>	
ISSUE NO. 2	
REV. NO. 00	DATE: 10.05.2022

## **SECTION – D**

### **GUIDELINES FOR PACKING (PES-145-06C)**



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-XXX-145-I104

DOCUMENT NO.: PES-145-06C

VOLUME II B

SECTION D

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### 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)

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3x800 MW PATRATU STPP

Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. PE-TS-434-145-I801B

DOCUMENT NO.

VOLUME **II-B**SECTION **D**

ISSUE NO. 2

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## **SECTION-D**

### **SUB-VENDOR LIST**

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FORM NO. PEM-6686-0

**3X800 MW PATRATU STPP**

Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-434-145-I801B

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**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, AHMEDABAD KEMROK VARODARA AJMERA, MUMBAI TRINITY TOUCH, PALWAL

**TECHNICAL SPECIFICATION**

**FOR**

**CONTROL VALVES WITH ACCESSORIES**

**(Pneumatically Operated)**

**(4x210+3x500) MW NTPC KAHALGAON TPS**

**Stage I & II – FGD**

**VOLUME - IIB**

**SECTIONS-A, C & D**

**SPECIFICATION No: PE-TS-481-145-I104**




**BHARAT HEAVY ELECTRICALS LIMITED**

**POWER SECTOR**

**PROJECT ENGINEERING MANAGEMENT DIVISION**


**NOIDA, INDIA**

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-481-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
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## **SECTION – A**

### **SCOPE OF ENQUIRY**



	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-481-145-I104	
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## 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 **(4x210+3x500) MW NTPC KAHALGAON TPS Stage I & II –FGD** 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.
- Complete offer including calculation sheets, catalogues etc.
  - Quality Plan
  - Datasheet A & B, duly filled
  - Schedule of prices & unit prices, inspection schedule
  - 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.

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## **SECTION – C**


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

	<b>Technical specification for Control Valves with Accessories</b> (Pneumatically Operated)	SPEC NO.: PE-TS-481-145-I104	
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### **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 implication.

1. All the formats in Volume-III, SCHEDULE OF SUBMISSION OF DRG. /DOC. and QUALITY PLAN (BHEL Format) 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. The Hook-up diagram for Control valve, 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. Blank.
5. Blank.
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 nameplate to 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

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPEC NO.: PE-TS-481-145-I104	
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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. Blank.
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. The smart positioner provided with Control Valves shall be compatible with Universal Hart Calibrator.  
In order to interface with METSO 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 (device type manager) / DTD (device type description) files for engineering.
19. Positioner shall fail safe feature as indicated in the datasheet.
20. Bidder to furnish compliance certificate duly signed and stamped by bidder attached further.
21. Tolerance on end to end, center to center, center to face shall be in accordance with ASME B16.10

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22. The final documentation including, operating manuals, maintenance and service manuals, component documentation, assembly documentation, drawing 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. CV test shall be conducted by the bidder per each type (same size, same CV, same trim characteristics) of control valve.

Alternatively, CV test certificate for a similar control valve (same size, same CV, same trim characteristics) conducted by the bidder not before 07/01/2015, may be accepted subject to acceptance by customer.

25. 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.

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## 26. 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:

- Assembly (dimensional) drawings.
- Valve Edge preparation details.
- Datasheet-C completely filled-up.
- Hook-up diagram of Control Valve with Actuator & Accessories.
- Valve & Actuator assembly dimensional drawings with weights.
- Quality Plan duly signed and stamped.
- All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.
- All relevant catalogues for the models of the valves as well as accessories finalized.
- 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

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

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-481-145-I104	
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## **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/reject any variation to the specification.

**(To be Signed &  
Stamped by the Bidder)**

Signature with date	
Name	
Company seal	

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## CUSTOMER SPECIFICATION






## SUB-SECTION-III-C7

### CONTROL VALVES, ACTUATORS & ACCESSORIES

LOT-4 PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(4)-9

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
		<p style="text-align: center;"><b>CONTROL VALVES, ACTUATORS &amp; ACCESSORIES</b></p> <p><b>1.00.00 CONTROL VALVES &amp; ACCESSORIES</b></p> <p>1.01.00 General Requirements</p> <p>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 &amp; 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.</p> <p>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.</p> <p><b>1.02.00 CONTROL VALVE SIZING &amp; CONSTRUCTION</b></p> <p>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.</p> <p>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.</p> <p>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.</p> <p>1.02.04 Control valves shall have leakage rate as per leakage Class-IV.</p>		
<p style="text-align: center;">LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</p>		<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(4)-9</p>	<p style="text-align: center;">PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS &amp; ACCESSORIES</p>	<p style="text-align: center;">PAGE 1 OF 5</p>


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.		
<b>2.00.00</b>	<b>VALVE CONSTRUCTION</b>		
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 than ANSI press class of 300 lbs.		
<b>3.00.00</b>	<p><b>VALVE MATERIALS</b></p> <p>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.</p> <p>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.</p>		
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(4)-9	PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES  PAGE 2 OF 5

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CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
4.00.00	<b>END PREPARATION</b>  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	<b>VALVE ACTUATORS</b>  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	<b>CONTROL VALVE ACCESSORY DEVICES</b>			
6.01.00	All pneumatically 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	<b>SPECIFICATIONS FOR MICROPROCESSOR BASED POSITIONERS</b>			
	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
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(4)-9		PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 3 OF 5				

CLAUSE NO.	<div> <div>एनटीपीसी</div> <div>NTPC</div> </div> <b>TECHNICAL REQUIREMENTS</b>			
	2	Environment	a) Operating Temp	(-)30 To 80 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	Remote calibration, Auto & Manual calibration shall be possible. Universal HART Calibrator to be provided.	
	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
<b>LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</b>		<b>TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(4)-9</b>		<b>PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS &amp; ACCESSORIES</b>
<b>PAGE 4 OF 5</b>				

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CLAUSE NO.	TECHNICAL REQUIREMENTS				
8.00.00			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.	
	<b>TEST AND EXAMINATION</b>				
	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	<b>CV Test: Refer Cl.no 3.00.00 (8) Subsection IIIC-06 (Type test requirements)</b>				
9.00.00	<b>CONTROL VALVE QUANTITIES</b>				
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.					
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(4)-9		PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES
					PAGE 5 OF 5

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)	SPEC NO.: PE-TS-481-145-I104	
		DOCUMENT NO.	
		VOLUME	II B
		SECTION	C
		ISSUE NO.	2
		REV. NO.	00
		DATE 28.09.2022	

## SECTION-C

### DATASHEET A&B

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<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>	SPECIFICATION NO.: PE-TS-481-145-I 104	
		VOLUME	IIB
		SECTION	C
		REV. NO.	00
		SHEET	1 OF 4
Tag No. : 1PGB15AA101      Qty.:1 No      Data Sheet No. A1  <b>DATA SHEET – A &amp; B</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	KAHALGAON Stage-I (4X210 MW) + Stage-II (3X500 MW) FGD	.....
	SERVICE	ECW SYSYTEM FOR FGD AUX'S STAGE- I	.....
	LOCATION	<input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR	.....
	DUTY	<input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING	.....
	PIPE SIZE (inlet / outlet)	89.5X4.8             89.5X4.8	..... .....
	PIPE MATERIAL (inlet / outlet)	CS (IS 1239 HEAVY GRADE / CS (IS 1239 HEAVY GRADE	
BODY*	MODEL NO.	Bidder to specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	<input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE   <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE   ONE	..... ..... ..... .....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to specify	..... ..... ..... .....
	END CONNECTION & RATING (ANSI)	<input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED	.....
	BODY MATERIAL	<input checked="" type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC6 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS	.....
		<input type="checkbox"/> A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE	..... .....
	BONNET TYPE	<input checked="" type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED	.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE	.....
	TRIM MATERIAL: SEAT   PLUG	<input type="checkbox"/> QUICK OPEN (ON/OFF)	.....
	: CAGE   GUIDE BUSH	SS316 STELLITED   SS316 STELLITED	..... .....
		SS316 STELLITED   SS316 STELLITED	..... .....
	FLOW : TO CLOSE / TO OPEN	Bidder to specify	.....
	OUTLET VELOCITY	<input checked="" type="checkbox"/> < 7 M/SEC(WATER)   <input type="checkbox"/> MAC NO. < 1/3 (STM)	.....
	REQUIRED LEAKAGE CLASS	<input type="checkbox"/> II <input type="checkbox"/> III <input checked="" type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	.....
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to specify	..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	To suit actuator (ATO)	..... .....
	*TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT	.....
ACCESSORIES	SMART POSITIONER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	.....
	AIR FILTER REGULATOR	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	.....
	AIR LOCK RELAY	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	.....
	POSITION LIMIT SWITCH	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	<input checked="" type="checkbox"/> REQUIRED	.....
	LOCAL POSITION INDICATOR	<input checked="" type="checkbox"/> REQUIRED	.....



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<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>						SPECIFICATION NO.: PE-TS-481-145-I 104			
							VOLUME IIB			
							SECTION C			
							REV. NO. 00		DATE :28.09.22	
							SHEET 2		OF 4	
<p>Tag No. : 1PGB15AA101                      Qty.:1 No                      Date Sheet No. A1</p> <p style="text-align: center;"><b>DATA SHEET – A &amp; B</b></p>										
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 HYSTERESIS SENSITIVITY ACCURACY (OVERALL)			$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 1\%$			..... ..... ..... .....			
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.	MIMIMUM	2.7	6.4 to 7.5	1	38 DEG C				
	2.	NORMAL	9	6.4 to 7.5	1	38 DEG C				
	3	MAXIMUM	30	6.4 to 7.5	1	38 DEG C				
	4	AT 120% OF MAXIMUM	36	6.4 to 7.5	1	38 DEG C				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                      9.5 * BODY DESIGN : PRESS (KG/CM2 g)   TEMP (DEG C)    10 KG/CM2 g   60 deg C * IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			

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<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>					SPECIFICATION NO.: PE-TS-481-145-I 104				
						VOLUME IIB				
						SECTION C				
						REV. NO. 00		DATE :28.09.22		
					SHEET 4		OF 4			
Tag No. : 2PGB15AA101                      Qty.:1 No                      Data Sheet No. A2  <b>DATA SHEET – A &amp; B</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 HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 1\%$			..... ..... ..... .....		
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.	MIMIMUM	2.43	6.5	1.1	38 DEG C				
	2.	NORMAL	8.1	6.5	1.1	38 DEG C				
	3	MAXIMUM	27	6.5	1.1	38 DEG C				
	4	AT 120% OF MAXIMUM	32.4	6.5	1.1	38 DEG C				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                      9.5 * BODY DESIGN : PRESS (KG/CM2 g)   TEMP (DEG C)    10 KG/CM2 g   60 deg C * IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			

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FORM NO. PEM-5666-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO.:

VOLUME **II-B**SECTION **C**

REV. NO. 00

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)
<b>POSITIONER</b>	MFR. & MODEL NUMBER		
	BYPASS	GAUGES	ENCL. CLASS
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> THREE <input checked="" type="checkbox"/> TWO <input checked="" type="checkbox"/> IP-65
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )		TO SUIT ACTUATOR
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER		
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)		<input checked="" type="checkbox"/> 5.0 – 8.0 <input type="checkbox"/>
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)		TO SUIT ACTUATOR
	FILTER SIZE		5 MICRON
	OUTPUT GAUGE		<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED
<b>AIR LOCK</b>	MFR. & MODEL NUMBER		
	SET PRESS (Kg / Cm <sup>2</sup> )		
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )		<input checked="" type="checkbox"/> 5.0 – 8.0 <input type="checkbox"/>
	RESET TYPE		AUTO
	VENT PLUG		REQUIRED
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER		
	OPEN posn	INT posn	CLOSE posn
	CONTACT TYPE		SPDT 2 NO + 2 NC
	RATING (AC / DC)		5A 240V AC AND 0.2A 220V DC
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>
<b>POSITION TRANSMITTER</b>	MFR. & MODEL NUMBER		<input checked="" type="checkbox"/> Electronic (2-Wire) Contactless <input type="checkbox"/> OTHER
	TYPE		PART OF SMART POSITIONER
	SUPPLY		
	OUTPUT RATING		
	ACCURACY		
	ENCLOSURE CLASS		
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER		
	RATING		<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 240V AC <input type="checkbox"/>
	TYPE		3-WAY (UNIVERSAL OPERATION TYPE)
	OPERATION	QUANTITY	<input type="checkbox"/> Stayput <input checked="" type="checkbox"/> Interlock    AS PER DATASHEET & HOOK UP
	COIL INSULATION CLASS		CLASS - H
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/> NEMA 4 <input type="checkbox"/>
<b>HANDWHEEL</b>	ORIENTATION		<input type="checkbox"/> TOP MOUNTED <input checked="" type="checkbox"/> SIDE MOUNTED
<b>JUNCTION BOX</b>	NO. OF WAYS		<input type="checkbox"/> 24-WAYS <input type="checkbox"/> AS REQUIRED <input checked="" type="checkbox"/> 36-Ways
	SIZE		AS REQUIRED
	CABLE GLANDS (Size / Quantity)		AS REQUIRED (Double Compression Type).
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>
<b>I/P CONVERTER</b>	INPUT SIGNAL		PART OF SMART POSITIONER
	POWER SUPPLY		
	SPLIT RANGE		
	ENCLOSURE CLASS		
	LINEARITY		
<b>Tubing &amp; Fittings / per CV</b>	HYSTERISIS		
	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.
<b>PAINTING</b>	COLOUR/SHADE		<input checked="" type="checkbox"/> RED <input type="checkbox"/> GREEN <input type="checkbox"/>
	THICKNESS (DFT) – in microns		
			COMPANY SEAL
			NAME
			SIGNATURE
			DATE

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FORM NO. PEM-6666-0



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-481-145-I104

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 28.09.2022

**SECTION-C**

**DATASHEET C**



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-481-145-I104**

DOCUMENT NO.

VOLUME IIB

SECTION **C**

ISSUE NO. 2

REV. NO. 00

DATE: 28.09.2022


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)

<b>GENERAL*</b>	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
<b>BODY</b>	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	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm <sup>2</sup> g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
<b>ACCESSORIES</b>	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	

	<b>Technical specification for Control Valves with Accessories</b> (Pneumatically Operated)				SPECIFICATION NO. <b>PE-TS-481-145-I104</b>														
					DOCUMENT NO.														
					VOLUME IIB														
					SECTION <b>C</b>														
					ISSUE NO. 2														
REV. NO. 00				DATE: 28.09.2022															
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 <sup>2</sup> (A)	OUTLET PR. (KG/CM <sup>2</sup> (A)	TEMP DEG. C	CALCULA TED CV	% VALVE LIFT	VALVE O/L VELOCITY										
		VALVE TYPE																	
		* MAX SHUT OFF PRESS ((KG/CM <sup>2</sup> g)																	
		* BODY DESIGN : PRESS ((KG/CM <sup>2</sup> g)   TEMP (DEG. C)																	
		* IBR FORM III-C																	
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.																			
SEA WORTHY PACKING      APPLICABLE / NOT APPLICABLE																			


	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPECIFICATION NO.: <b>PE-TS-481-145-I104</b>	
			DOCUMENT NO.:	
			VOLUME <b>II-B</b>	
			SECTION <b>C</b>	
			ISSUE NO. 2	
REV. NO. 00		DATE: 28.09.2022		

Tag No.....		Quantity.....		Data Sheet No. PES-145-06-DS2-1	
<b>DATA SHEET C FOR ACCESSORIES</b>					
<b>DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)</b>					
<b>POSITIONER</b>	MFR. & MODEL NUMBER				
	BYPASS	GAUGES	ENCL. CLASS		
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )				
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )				
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)				
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)				
	OUTPUT GAUGE				
	FILTER SIZE				
	AUTO DRAIN FEATURE				
<b>AIR LOCK</b>	MFR. & MODEL NUMBER				
	SET PRESS (Kg / Cm <sup>2</sup> )				
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )				
	RESET TYPE				
	VENT PLUG				
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER				
	OPEN posn	INT posn	CLOSE posn		
	CONTACT TYPE				
	RATING (AC / DC)				
	ENCLOSURE CLASS				
<b>POSITION TRANSMITTER</b>	MFR. & MODEL NUMBER				
	TYPE				
	SUPPLY				
	OUTPUT RATING				
	ACCURACY				
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER				
	RATING				
	OPERATION	QUANTITY			
	COIL INSULATION CLASS				
	ENCLOSURE CLASS				
<b>HANDWHEEL</b>	ORIENTATION				
<b>JUNCTION BOX</b>	NO. OF WAYS				
	SIZE				
	CABLE GLANDS (Size / Quantity)				
	ENCLOSURE CLASS				
<b>I/P CONVERTER</b>	INPUT SIGNAL		POWER SUPPLY		
	SPLIT RANGE				
	ENCLOSURE CLASS				
	LINEARITY				
	HYSTERESIS				
<b>Cu./SS Tubing &amp; Fittings / per CV</b>	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.				
<b>PAINTING</b>	COLOUR/SHADE				
	THICKNESS (DFT)				
	TYPE				
					COMPANY SEAL
					NAME
					SIGNATURE
					DATE




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FORM NO. PEM-6666-0


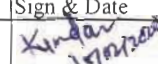
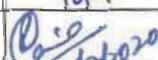
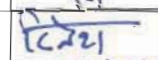
	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)	SPECIFICATION NO. <b>PE-TS-481-145-I104</b>	
		DOCUMENT NO. PE-QP-999-145-I006	
		VOLUME <b>II-B</b>	
		SECTION <b>C</b>	
		ISSUE NO. 2	
		REV. NO. 00	DATE : 28.09.2022

# **SECTION-C**

## **QUALITY PLAN**

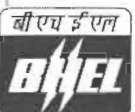
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				CUSTOMER : --				QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 1 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

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					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
		CHETAN MALIK			KUNDAN PRASAD
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
		R.K. RAINA			R.K. JAISWAL


BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

	MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO : --		DATE: --	
				CUSTOMER :--				QP NO.: PE-QP-999-145-1 006		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	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

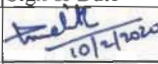
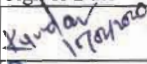

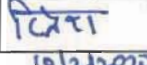
1.2	Diaphragm	1.Surface Quality	MA	Visual	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V	
		2.Hardness	MA	Measurement	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V	
		3.Endurance/ Life cycle	MA	Cyclic Test 10,000 cycles	One/ type	One/ type	10,000 cycles/Mfr. standard	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	

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ENGINEERING			QUALITY			Sign & Date		Doc No:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal			Sign & Date	Name	Seal
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL						

		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
1	2	3	4	5	6	7	8	9	* D	** M C N	
					M	C/N					


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 accessi ble 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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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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
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					


COMPLETED VALVE	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(Over all)	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	W	On assembled

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Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	10/12/2020	CHETAN MALIK	Reviewed by:	10/12/2020	KUNDAN PRASAD
		R.K. RAJNA			R.K. JAISWAL

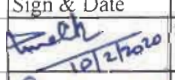
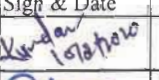

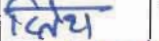
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		MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN				SPEC. NO : --		DATE: --	
				CUSTOMER :--				QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 5 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
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					M	C/N					

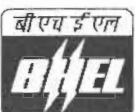
		limit switch & solenoids and other accessories						drg/data sheet	Report		W		Valve.
		10. Overall dimensions	MI	Visual and dimensional	100%	10%	Approved drg/data sheet	Approved drg./ data sheet	Inspection Report	√	P/W	W	
		11. Pre defined valve position in case of air failure	MI	Visual and dimensional	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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL


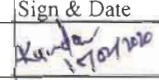


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Sign & Date	
Seal	

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Doc No:			
	Sign & Date	Name	Seal
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		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	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					


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. Hysteresis	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. Hysteresis	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/W		

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

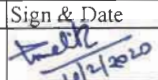
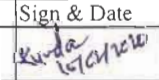
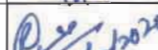
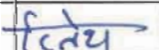
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Doc No:			
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	MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO : --		DATE: --	
				CUSTOMER :--				QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 8 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

		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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		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-999-145-1 006		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	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N

		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:

- 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 for a similar control valve (same size, same Cv, same trim characteristics) can be accepted for a specific project subject to acceptance by Customer.
- 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.
- Sea worthy packing shall be provided, if called for in the Data sheets. Vendor to provide the following to BHELPEM for verification:
  - Photographs of valves duly placed inside the wooden box just before final packing.
  - 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.
- 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.
- 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.
- BHEL reserves the right to conduct repeat tests, if required.
- 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, IDENTIFIED 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:	<i>Amal</i> 10/12/2020	CHETAN MALIK	Checked by:	<i>Kundan</i> 10/01/2020	KUNDAN PRASAD				Reviewed by:		
Reviewed by:	<i>R.K.</i> 10/01/2020	R.K. RAINA	Reviewed by:	<i>R.K.</i> 10/01/2020	R.K. JAISWAL				Approved by:		

NOTE: Minimum requirement has been given in QP, Vendor to submit QP for end user approval.



## **SUB-SECTION-V-QC3**

# **CONTROL VALVE ACTUATORS AND ACCESSORIES**

**LOT-4 PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE**

**TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(4)-9**

CLAUSE NO.		QUALITY ASSURANCE & INSPECTION										<div>एनटीपीसी</div> <div>NTPC</div>				
CONTROL VALVE ACTUATORS AND ACCESSORIES.																
TESTS	<div>ITEMS</div>	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																





**SUB-SECTION-III-C6**


**TYPE TEST REQUIREMENTS**

LOT-4 PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE


TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(4)-9


CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	TYPE TEST REQUIREMENTS			
1.01.00	General Requirements			
1.01.01	<p>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&amp;I SYSTEMS' at the end of this chapter and under the item "Special Requirement for Solid State Equipments/Systems".</p> <p>(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.</p> <p>(b) For the rest, submission of type test results and certificate shall be acceptable provided.</p> <p>i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.</p> <p>ii. There has been no change in the components from the offered equipment &amp; tested equipment.</p> <p>iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening.</p> <p>(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.</p>			
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	<p>The type test reports which are to be submitted for each of the C&amp;I systems( indicated in clause 2.01.01) shall be as indicated below:</p> <p>i) Surge Withstand Capability ( SWC) for Solid State Equipments/ Systems</p> <p>All solid state systems/ equipments shall be able to withstand the electrical noise</p>			
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9	SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS	PAGE 1 OF 8


CLAUSE NO.	TECHNICAL REQUIREMENTS																																		
2.01.01	<p>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 &amp; output modules, Binary input &amp; 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.</p> <p>ii) Dry Heat test as per IEC-60068-2-2 or equivalent.</p> <p>iii) Damp Heat test as per IEC-60068-2-30 or IEC-60068-2-78 or equivalent.</p> <p>iv) Vibration test as per IEC-60068-2-6 or equivalent.</p> <p>v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent.</p> <p>vi) Radio frequency immunity test as per IEC 61000-4-6 or equivalent.</p> <p>vii) Electromagnetic Field immunity as per IEC 61000-4-3 or equivalent.</p> <p><b>C&amp;I Systems-</b></p> <table><tr><th>Sl. No</th><th>Item</th><th>Remark</th><th>Test To Be Specifically Conducted</th><th>NTPC's Approval Req. On Test Certificate</th></tr><tr><td>1</td><td>Control System of DDCMIS</td><td></td><td>No</td><td>Yes</td></tr><tr><td>2</td><td>PLC, excluding its HMI</td><td>Not applicable for integral PLCs and PLCs which are governed by standard practice of OEM</td><td>No</td><td>Yes</td></tr><tr><td>3</td><td>VMS System (Applicable for each module of VMS)</td><td></td><td>No</td><td>Yes</td></tr><tr><td>4</td><td>Main Turbine &amp; BFP Drive Turbine TSI System (Applicable for each module of TSI System)</td><td></td><td>No</td><td>Yes</td></tr><tr><td>5</td><td>Vibration Analysis System (Applicable for each module of Vibration Analysis System)</td><td></td><td>No</td><td>Yes</td></tr></table>					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
	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																														
	LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9		SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS	PAGE 2 OF 8																													


CLAUSE NO.	TECHNICAL REQUIREMENTS				
6	TG related Special modules like Auto synchronizer, Load transducer module and speed measurement module		No	Yes	
7	Master Clock		No	Yes	
<p><b>Note:</b></p> <p>Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.</p>					
<b>LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</b>		<b>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9</b>		<b>SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS</b>	
<b>PAGE 3 OF 8</b>					




CLAUSE NO.	TECHNICAL REQUIREMENTS						
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 (Persulphate 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	VDE 0472	No	Yes	
	LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9		SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS		PAGE 4 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS					
		deformation				
	-Outer sheath	Shrinkage	VDE 0472	No	Yes	
		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	
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9		SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS		PAGE 5 OF 8


CLAUSE NO.	TECHNICAL REQUIREMENTS				
	-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
	<p>* 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.</p> <p>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.</p> <p>**These tests shall be carried out as per VDE0207 Part 6 &amp; ASTM-D-2116 for TEFLON insulated &amp; outer sheathed cables</p> <p>***Applicable for armoured cables only</p>				
	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 No 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
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9	SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS		PAGE 6 OF 8

CLAUSE NO.	<div style="text-align: center;"> <b>TECHNICAL REQUIREMENTS</b>  </div>			
	<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;">4</div> <div style="width: 15%;">Battery ##</div> <div style="width: 40%;"> <p>Damp Heat test IEC-60068-2-30 No Yes or IEC-60068-2-78 or equivalent</p> <p>Vibration test IEC-60068-2-6 No Yes or equivalent</p> <p>Electrostatic discharge test IEC 61000-4-2 No Yes or equivalent</p> <p>Radio frequency immunity test IEC-61000-4-6 No Yes or equivalent</p> <p>Electromagnetic field immunity IEC 61000-4-3 No Yes or equivalent</p> <p>Degree of Protection IS-13947 or No Yes equivalent</p> <p>As per standard (col 4) IS-10918 (Ni-Cd Batteries) No Yes</p> <p>IS-1652 (Lead Acid Plante Batteries) No</p> </div> <div style="width: 15%;"></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 15%;">5</div> <div style="width: 15%;">UPS ( Applicable for each model and rating )</div> <div style="width: 40%;"> <p>1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable.</p> <p>2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.</p> <p>Surge Withstand Capability( SWC) (ANSI / IEEE No C37.90.1)or (IEC-61000-4-4, IEC-61000-4-5 and IEC-61000-4-18). Yes</p> <p>Dry Heat Test IEC-60068-2-2 No Yes or equivalent</p> <p>Damp Heat test IEC-60068-2-30 No Yes or IEC-60068-2-78 or equivalent</p> <p>Vibration test IEC-60068-2-6 No Yes or equivalent</p> </div> <div style="width: 15%;"></div> </div>			
<b>LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</b>		<b>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9</b>	<b>SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS</b>	<b>PAGE 7 OF 8</b>

CLAUSE NO.	TECHNICAL REQUIREMENTS					
		Electrostatic discharge test	IEC 61000-4-2 No or equivalent		Yes	
		Radio frequency immunity test	IEC-61000-4-6 No or equivalent		Yes	
		Electromagnetic field immunity	IEC 61000-4-3 No or equivalent		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 75.11	75.02& No	Yes	
8	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes	
<p>## 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.</p> <p><b>Note:</b></p> <p>Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.</p>						
LOT-4 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-0011-109(4)-9		SUB-SECTION-IIIC-6 TYPE TEST REQUIREMENTS		PAGE 8 OF 8

1080334/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-481-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

## SECTION – C

### BILL OF QUANTITY-MAIN SUPPLY

1080334/2022/PS-PEM-C I


FORM NO. PEM-6666-0

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-481-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

### **BILL OF QUANTITY-MAIN SUPPLY**

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


<b>[A]</b>	<b>MAIN SUPPLY</b>		
SR. NO.	TAG NO	DESCRIPTION	TOTAL QTY
1	ECW23	ECW SYSYTEM FOR FGD AUX'S STAGE- I	1
2	ECW67	ECW SYSYTEM FOR FGD AUX'S STAGE- II	1
<b>[B]</b>	<b>1/4 " SS TUBING( 15 METER FOR EACH TAG)</b>		<b>15 METER</b>
<b>[C]</b>	<b>SS FITTINGS- FOR EACH TAG</b>		<b>1 LOT</b>
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
<b>[D]</b>	<b>Cv TEST CHARGES FOR ECW SYSYTEM FOR FGD AUX'S STAGE- I</b>		<b>1 LOT</b>
<b>[E]</b>	<b>Cv TEST CHARGES FOR ECW SYSYTEM FOR FGD AUX'S STAGE- II</b>		<b>1 LOT</b>

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-481-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

## SECTION – C

### BILL OF QUANTITY-SPARES



	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-481-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

### 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

SNO.	PARTICULARS	SPEC	QTY
1	Pneumatic and electro-hydraulic actuator assembly.	10% or 1 no. of each type, model and rating, whichever is more.	1
2	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type of control valve.	1
3	Diaphragms, O' rings, seals etc. of all types make etc.	1 set for each type of control valve.	1
4	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more	2
5	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more	2
6	Positioner units (complete unit)& accessories (link assembly)	10% or 1 no. of each type whichever is more	1
7	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more	2
8	Air lock relays	10% or 2 nos. of each type whichever is more	2

#### NOTE

- 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.
- 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.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-481-145-I104**

DOCUMENT NO.

VOLUME **II-B**

SECTION **D**

ISSUE NO. 2

REV. NO. 00


DATE: 28.09.2022

## **SECTION – D**

- **EQUIPMENT SPECIFICATION  
(PES-145-06)**
- **HOOK-UP DIAGRAM(PES-145-06B)**
- **GUIDELINES FOR PACKING(PES-145-06C)**
  - **SUB-VENDOR LIST**


1080334/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPECIFICATION NO. <b>PE-TS-481-145-I104</b>	
			DOCUMENT NO.	
			VOLUME <b>II-B</b>	
			SECTION <b>D</b>	
			ISSUE NO. 2	
			REV. NO. 00	DATE : 28.09.2022

## **SECTION-D**

### **EQUIPMENT SPECIFICATION (PES-145-06)**

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
			DOCUMENT NO.: PES – 145 - 06	
			VOLUME	II B
			SECTION	D
			ISSUE NO.	2
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## 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)	:	FCI-70.2
Allowable Seat leakage	:	ANSI-B16.34
Pressure & Temperature ratings	:	IEC-144 / NEMA / IS-13947
Enclosure class	:	ISA S-75
Control Valves Sizing	:	IS-9334
Electric Motor operated Actuators	:	


## 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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>	SPECIFICATION NO.: PE-TS-XXX-145-I104		
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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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
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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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
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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.

	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		SPECIFICATION NO.: PE-TS-XXX-145-I104	
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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 |



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FORM NO. PEM-6686-0



3x800 MW PATRATU STPP

Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. PE-TS-434-145-I801B

DOCUMENT NO.

VOLUME **II-B**SECTION **D**

ISSUE NO. 2

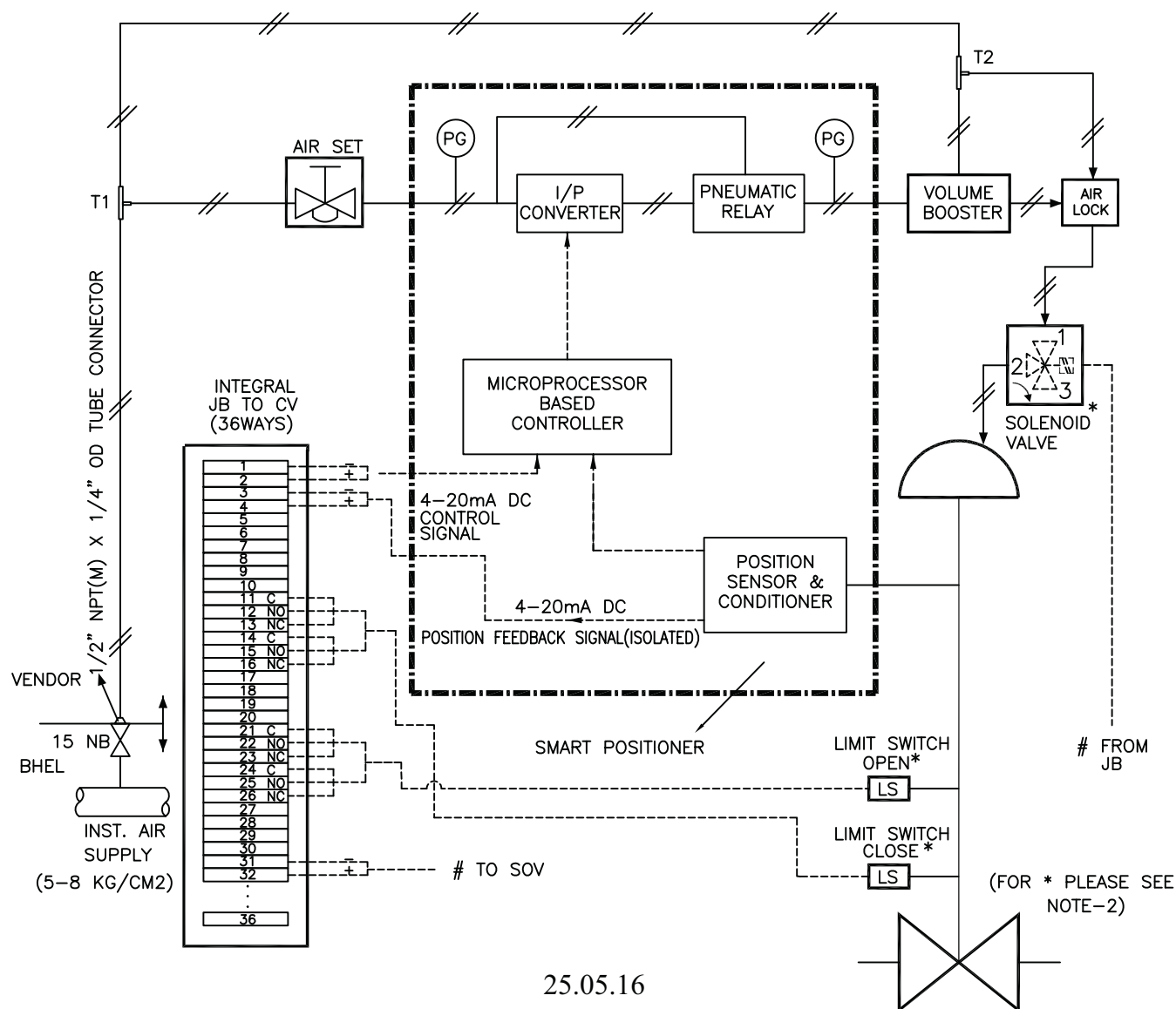
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## **SECTION-D**

### **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 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 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.



SPECIFICATION NO.: PE-TS-XXX-145-I104

TITLE:-

### CONTROL VALVE HOOK-UP DIAGRAM

DRG.  
No.

**PES-145-06B**

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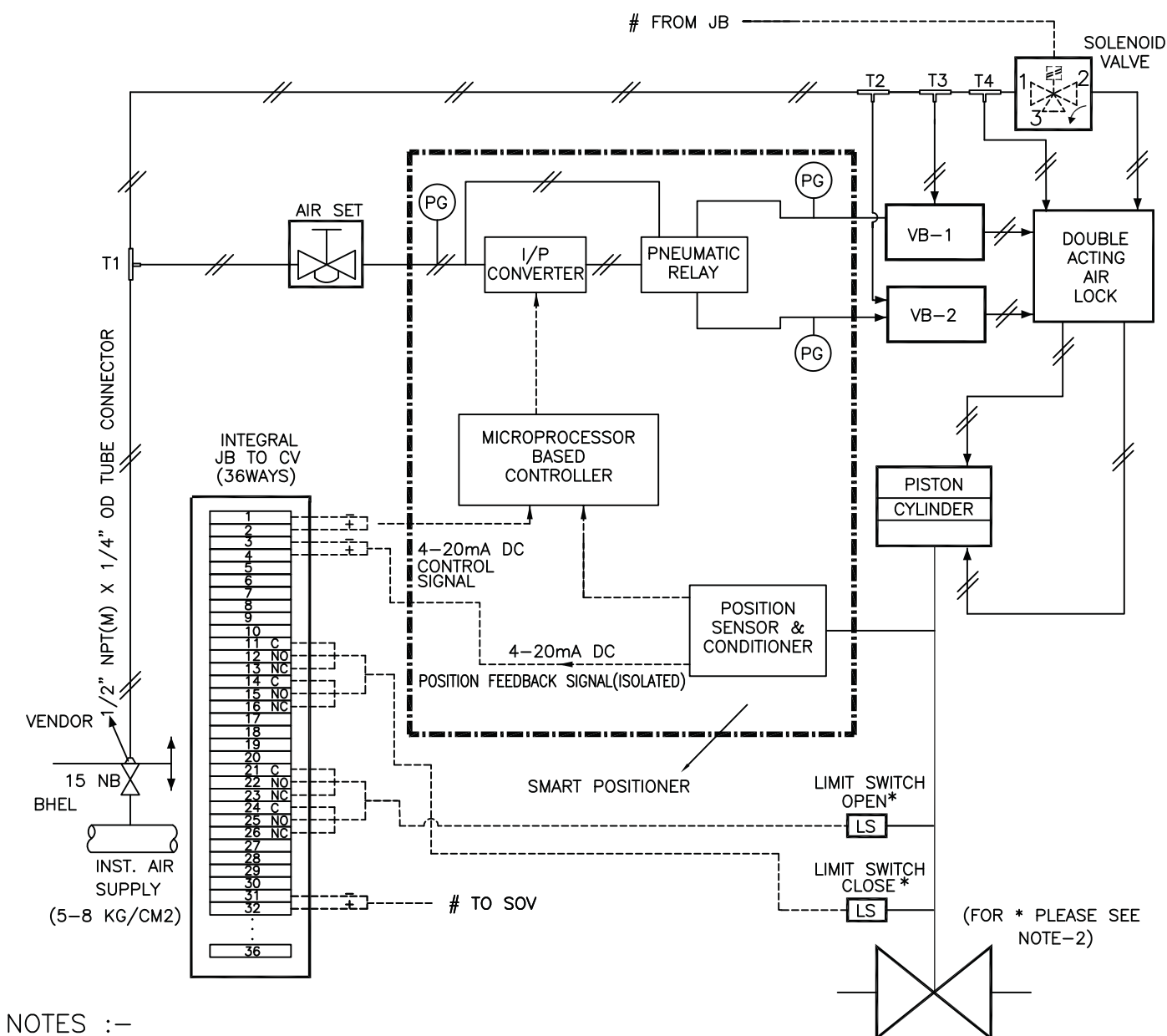
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## STANDARD CONTROL VALVE HOOK-UP DIAGRAM (DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



### NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. 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 DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 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 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 & TEE-T3 SHALL BE PROVIDED.



SPECIFICATION NO.: PE-TS-XXX-145-I104

DRG.  
No.

PES-145-06B

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

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3x800 MW PATRATU STPP  
 Technical specification for  
**Control Valves with Accessories**  
 (Pneumatically Operated)

SPECIFICATION NO. <b>PE-TS-434-145-I801B</b>	
DOCUMENT NO.	
VOLUME <b>II-B</b>	
SECTION <b>D</b>	
ISSUE NO. 2	
REV. NO. 00	DATE: 10.05.2022

## **SECTION – D**

### **GUIDELINES FOR PACKING (PES-145-06C)**



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-XXX-145-I104

DOCUMENT NO.: PES-145-06C

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### 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)

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FORM NO. PEM-6686-0



3x800 MW PATRATU STPP

Technical specification for  
**Control Valves with Accessories**  
 (Pneumatically Operated)

SPECIFICATION NO. PE-TS-434-145-I801B

DOCUMENT NO.

VOLUME **II-B**SECTION **D**

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## **SECTION-D**

### **SUB-VENDOR LIST**



### 3X800 MW PATRATU STPP

Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPEC NO.: PE-TS-434-145-I801B

DOCUMENT NO.

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### 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 NORGENT, MUMBAI SMC PNEUMATICS, NOIDA EMERSON(ASCO) CHENNAI FESTO, BANGALORE PLAKA,CHENNAI
3.	SOLENOID VALVE	ROTEX, VARODARA AVCON MUMBAI HERION, GERMANY IMI NORGENT, GERMANY JAFFERSON, ARGENTNA ASCO, CHENNAI/USA FESTO, BANGALORE SMC PNEUMATICS ,NOIDA
4.	JUNCTION BOX	SUMIP COMPOSITES, AHMEDABAD KEMROK VARODARA AJMERA, MUMBAI TRINITY TOUCH, PALWAL

**TECHNICAL SPECIFICATION**

**FOR**

**CONTROL VALVES WITH ACCESSORIES**

**(Pneumatically Operated)**

**(3x200 + 3x500 + 1x500) MW KORBA TPP**

**Stage I ,II & III – FGD**

**VOLUME - IIB**

**SECTIONS-A, C & D**

**SPECIFICATION No: PE-TS-466-145-I104**



**BHARAT HEAVY ELECTRICALS LIMITED**

**POWER SECTOR**


**PROJECT ENGINEERING MANAGEMENT DIVISION**

**NOIDA, INDIA**




1080316/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-466-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
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			ISSUE NO.	2
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## SECTION – A

### SCOPE OF ENQUIRY

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-466-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
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## 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 **(3x200+3x500+1x500) MW NTPC KORBA TPP Stage I, II & III – FGD** 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.
- Complete offer including calculation sheets, catalogues etc.
  - Quality Plan
  - Datasheet A & B, duly filled
  - Schedule of prices & unit prices, inspection schedule
  - 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.

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## **SECTION – C**


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

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### **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 implication.

1. All the formats in Volume-III, SCHEDULE OF SUBMISSION OF DRG. /DOC. and QUALITY PLAN (BHEL Format) 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. The Hook-up diagram for Control valve, 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. Blank.
5. Blank.
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 nameplate to 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

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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. Blank.
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. The smart positioner provided with Control Valves shall be compatible with Universal Hart Calibrator.  
In order to interface with METSO 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 (device type manager) / DTD (device type description) files for engineering.
19. Positioner shall fail safe feature as indicated in the datasheet.
20. Bidder to furnish compliance certificate duly signed and stamped by bidder attached further.
21. Tolerance on end to end, center to center, center to face shall be in accordance with ASME B16.10

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22. The final documentation including, operating manuals, maintenance and service manuals, component documentation, assembly documentation, drawing 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. CV test shall be conducted by the bidder per each type (same size, same CV, same trim characteristics) of control valve.

Alternatively, CV test certificate for a similar control valve (same size, same CV, same trim characteristics) conducted by the bidder not before 25/04/2014, may be accepted subject to acceptance by customer.

25. 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.

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## 26. 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:

- Assembly (dimensional) drawings.
- Valve Edge preparation details.
- Datasheet-C completely filled-up.
- Hook-up diagram of Control Valve with Actuator & Accessories.
- Valve & Actuator assembly dimensional drawings with weights.
- Quality Plan duly signed and stamped.
- All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.
- All relevant catalogues for the models of the valves as well as accessories finalized.
- 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

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

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## **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/reject any variation to the specification.


**(To be Signed &  
Stamped by the Bidder)**

Signature with date	
Name	
Company seal	



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## CUSTOMER SPECIFICATION




**SUB-SECTION-III-C7**

**CONTROL VALVES, ACTUATORS & ACCESSORIES**

LOT-3 PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE


TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(3)-9

CLAUSE NO.	TECHNICAL REQUIREMENTS	
<b>1.00.00</b>  1.01.00  1.01.01        1.01.02    <b>1.02.00</b>  1.02.01        1.02.02           1.02.03           1.02.04	<p style="text-align: center;"><b>CONTROL VALVES, ACTUATORS &amp; ACCESSORIES</b></p> <p><b>CONTROL VALVES &amp; ACCESSORIES</b></p> <p>General Requirements</p> <p>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 &amp; 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.</p> <p>All the control valves and accessories offered by the Bidder, shall be from reputed, experienced manufacturers of specified type and range of valves.</p> <p><b>CONTROL VALVE SIZING &amp; CONSTRUCTION</b></p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Control valves shall have leakage rate as per leakage Class-IV.</p>	
	<p style="text-align: center;">LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9</p>
		<p style="text-align: center;">PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS &amp; ACCESSORIES</p>
		<p style="text-align: center;">PAGE 1 OF 5</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
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.			
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 2 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
4.00.00	<b>END PREPARATION</b>  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	<b>VALVE ACTUATORS</b>  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	<b>CONTROL VALVE ACCESSORY DEVICES</b>			
6.01.00	All pneumatically 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	<b>SPECIFICATIONS FOR MICROPROCESSOR BASED POSITIONERS</b>			
	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
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9		PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES
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CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC
	2	Environment	a) Operating Temp	(-)30 To 80 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	Remote calibration, Auto & Manual calibration shall be possible. Universal HART Calibrator to be provided.		
	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	
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9		PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
			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	<b>TEST AND EXAMINATION</b>  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	<b>CV Test: Refer Cl.no 3.00.00 (8) Subsection IIIC-06 (Type test requirements)</b>				
9.00.00	<b>CONTROL VALVE QUANTITIES</b>  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.				
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9		PART-B SUB-SECTION-III-C7 CONTROL VALVES, ACTUATORS & ACCESSORIES  PAGE 5 OF 5

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## SECTION-C

### DATASHEET A&B



3

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<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>						SPECIFICATION NO.: PE-TS-466-145-I 104			
							VOLUME			
							SECTION			
							REV. NO.	00	DATE : 28.09.22	
							SHEET	1	OF 2	
<p>Tag No. : PGB16AA101                      Qty.:1 No                      Date Sheet No. A1</p> <p align="center"><b>DATA SHEET – A &amp; B</b></p>										
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 HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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.	MIMIMUM	1.62	6.5	1.1	38 DEG C				
	2.	NORMAL	5.4	6.5	1.1	38 DEG C				
	3	MAXIMUM	18.0	6.5	1.1	38 DEG C				
	4	AT 120% OF MAXIMUM	21.6	6.5	1.1	38 DEG C				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                      9.5 * BODY DESIGN : PRESS (KG/CM2 g)   TEMP (DEG C)    10 KG/CM2 g   60 deg C * IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			

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Control Valves with Accessories  
(Pneumatically Operated)**

SPECIFICATION NO.:

VOLUME **II-B**SECTION **C**

REV. NO. 00

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			
<b>DATA SHEET – A &amp; B for ACCESSORIES</b>			
<b>DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)</b>			<b>DATA SHEET – B (TO BE FILLED-UP BY BIDDER)</b>
<b>POSITIONER</b>	MFR. & MODEL NUMBER		
	BYPASS	GAUGES	ENCL. CLASS
	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input type="checkbox"/> THREE <input checked="" type="checkbox"/> TWO <input checked="" type="checkbox"/> IP-65
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )		<input checked="" type="checkbox"/> 0.2 – 1.0 <input type="checkbox"/> 0.2 – 0.6 <input type="checkbox"/> 0.6 – 1.0
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )		TO SUIT ACTUATOR
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER		
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)		<input checked="" type="checkbox"/> 5.0 – 8.0 <input type="checkbox"/>
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)		TO SUIT ACTUATOR
	FILTER SIZE		5 MICRON
	OUTPUT GAUGE		<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED
	AUTO DRAIN FEATURE		<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED
<b>AIR LOCK</b>	MFR. & MODEL NUMBER		
	SET PRESS (Kg / Cm <sup>2</sup> )		
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )		<input checked="" type="checkbox"/> 5.0 – 8.0 <input type="checkbox"/>
	RESET TYPE		AUTO
	VENT PLUG		REQUIRED
<b>LIMIT SWITCH</b>	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		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>
<b>POSITION TRANSMITTER</b>	MFR. & MODEL NUMBER		<input checked="" type="checkbox"/> Electronic (2-Wire) Contactless <input type="checkbox"/> OTHER
	TYPE		<b>PART OF SMART POSITIONER</b>
	SUPPLY		
	OUTPUT RATING		
	ACCURACY		
	ENCLOSURE CLASS		
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER		
	RATING		<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> 220V DC <input type="checkbox"/> 240V AC <input type="checkbox"/>
	TYPE		3-WAY (UNIVERSAL OPERATION TYPE)
	OPERATION	QUANTITY	<input type="checkbox"/> Stayput <input checked="" type="checkbox"/> Interlock AS PER DATASHEET & HOOK UP
	COIL INSULATION CLASS		CLASS - H
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/> NEMA 4 <input type="checkbox"/>
<b>HANDWHEEL</b>	ORIENTATION		<input type="checkbox"/> TOP MOUNTED <input checked="" type="checkbox"/> SIDE MOUNTED
<b>JUNCTION BOX</b>	NO. OF WAYS		<input type="checkbox"/> 24-WAYS <input type="checkbox"/> AS REQUIRED <input checked="" type="checkbox"/> 36-Ways
	SIZE		AS REQUIRED
	CABLE GLANDS (Size / Quantity)		AS REQUIRED (Double Compression Type).
	ENCLOSURE CLASS		<input checked="" type="checkbox"/> IP 65 <input type="checkbox"/>
	BODY MATERIAL		<input checked="" type="checkbox"/> FRP <input type="checkbox"/> SS <input type="checkbox"/> METAL SHEET
<b>I/P CONVERTER</b>	INPUT SIGNAL	POWER SUPPLY	<b>PART OF SMART POSITIONER</b>
	SPLIT RANGE		
	ENCLOSURE CLASS		
	LINEARITY		
	HYSTERESIS		
<b>Tubing &amp; Fittings / per CV</b>	This is in addition to Tubing and fittings which are integral part of CV		15 Meters of 1/4 " 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.
<b>PAINTING</b>	COLOUR/SHADE		<input checked="" type="checkbox"/> RED <input type="checkbox"/> GREEN <input type="checkbox"/>
	THICKNESS (DFT) – in microns		
	TYPE		<input checked="" type="checkbox"/> EPOXY <input type="checkbox"/> ENAMEL <input type="checkbox"/>
			COMPANY SEAL
			NAME
			SIGNATURE
			DATE

1080316/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)	SPEC NO.: <b>PE-TS-466-145-I104</b>	
		DOCUMENT NO.	
		VOLUME	II B
		SECTION	C
		ISSUE NO.	2
		REV. NO.	00
		DATE 28.09.2022	

# SECTION-C

## DATASHEET C



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-466-145-I104**

DOCUMENT NO.

VOLUME IIB

SECTION **C**

ISSUE NO. 2

REV. NO. 00

DATE: 28.09.2022


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)

<b>GENERAL*</b>	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
<b>BODY</b>	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	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm <sup>2</sup> g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
<b>ACCESSORIES</b>	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	


	<b>Technical specification for Control Valves with Accessories</b> (Pneumatically Operated)				SPECIFICATION NO. <b>PE-TS-466-145-I104</b>						
					DOCUMENT NO.						
					VOLUME IIB						
					SECTION <b>C</b>						
					ISSUE NO. 2						
REV. NO. 00				DATE: 28.09.2022							
Tag No..... Quantity.....										Data Sheet No. PES-145-06-DS2-1	
<b>DATA SHEET C</b>											
<b>DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)</b> (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)											
<b>PERFORMANCE OF VALVE</b>	HYSTERSIS										
	LINEARITY										
	SENSITIVITY										
	ACCURACY (Overall)										
<b>SERVICE CONDITION*</b>	<b>SL.+ NO.</b>	<b>LOAD</b>	<b>FLOW (T/HR)</b>	<b>INLET PR. (KG/CM<sup>2</sup> (A))</b>	<b>OUTLET PR. (KG/CM<sup>2</sup> (A))</b>	<b>TEMP DEG. C</b>	<b>CALCULATED CV</b>	<b>% VALVE LIFT</b>	<b>VALVE O/L VELOCITY</b>		
VALVE TYPE											
* MAX SHUT OFF PRESS ((KG/CM <sup>2</sup> g)											
* BODY DESIGN : PRESS ((KG/CM <sup>2</sup> g)   TEMP (DEG. C)											
* IBR FORM III-C											
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.											
SEA WORTHY PACKING      APPLICABLE / NOT APPLICABLE											

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPECIFICATION NO.: <b>PE-TS-466-145-I104</b>	
			DOCUMENT NO.:	
			VOLUME <b>II-B</b>	
			SECTION <b>C</b>	
			ISSUE NO. 2	
REV. NO. 00		DATE: 28.09.2022		

Tag No.....		Quantity.....		Data Sheet No. PES-145-06-DS2-1	
<b>DATA SHEET C FOR ACCESSORIES</b>					
<b>DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)</b>					
<b>POSITIONER</b>	MFR. & MODEL NUMBER				
	BYPASS	GAUGES	ENCL. CLASS		
	INPUT SIGNAL (Kg / Cm <sup>2</sup> )				
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )				
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)				
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)				
	OUTPUT GAUGE				
	FILTER SIZE				
	AUTO DRAIN FEATURE				
<b>AIR LOCK</b>	MFR. & MODEL NUMBER				
	SET PRESS (Kg / Cm <sup>2</sup> )				
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )				
	RESET TYPE				
	VENT PLUG				
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER				
	OPEN posn	INT posn	CLOSE posn		
	CONTACT TYPE				
	RATING (AC / DC)				
	ENCLOSURE CLASS				
<b>POSITION TRANSMITTER</b>	MFR. & MODEL NUMBER				
	TYPE				
	SUPPLY				
	OUTPUT RATING				
	ACCURACY				
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER				
	RATING				
	OPERATION	QUANTITY			
	COIL INSULATION CLASS				
	ENCLOSURE CLASS				
<b>HANDWHEEL</b>	ORIENTATION				
<b>JUNCTION BOX</b>	NO. OF WAYS				
	SIZE				
	CABLE GLANDS (Size / Quantity)				
	ENCLOSURE CLASS				
<b>I/P CONVERTER</b>	INPUT SIGNAL		POWER SUPPLY		
	SPLIT RANGE				
	ENCLOSURE CLASS				
	LINEARITY				
	HYSTERESIS				
<b>Cu./SS Tubing &amp; Fittings / per CV</b>	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.				
<b>PAINTING</b>	COLOUR/SHADE				
	THICKNESS (DFT)				
	TYPE				
					COMPANY SEAL
					NAME
					SIGNATURE
					DATE

1080316/2022/PS-PEM-C I


FORM NO. PEM-6666-0

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPECIFICATION NO. <b>PE-TS-466-145-I104</b>	
			DOCUMENT NO. PE-QP-999-145-I006	
			VOLUME <b>II-B</b>	
			SECTION <b>C</b>	
			ISSUE NO. 2	
		REV. NO. 00	DATE : 28.09.2022	


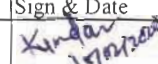
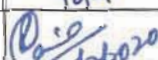
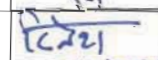
## **SECTION-C**

### **QUALITY PLAN**



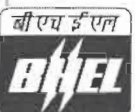
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				CUSTOMER : --				QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 1 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		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-999-145-1 006		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	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

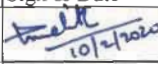
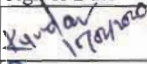

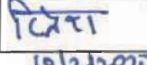
1.2	Diaphragm	1.Surface Quality	MA	Visual	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V	
		2.Hardness	MA	Measurement	100%	10%	Mfr. standard	Mfr. standard	Inspection Report	√	P/W	V	
		3.Endurance/ Life cycle	MA	Cyclic Test 10,000 cycles	One/ type	One/ type	10,000 cycles/Mfr. standard	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	

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ENGINEERING			QUALITY			Sign & Date		Doc No:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal		Sign & Date		Name	Seal
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL			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
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					


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 accessi ble 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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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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
1	2	3	4	5	6	7	8	9	* D	** M C N
					M C/N					


COMPLETED VALVE	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(Over all)	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	W	On assembled

BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	10/12/2020	CHETAN MALIK	Reviewed by:	10/12/2020	KUNDAN PRASAD
		R.K. RAJNA			R.K. JAISWAL

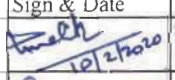
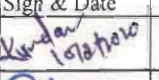

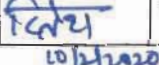
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Sign & Date	
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		MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN			SPEC. NO : --		DATE: --		
				CUSTOMER :--			QP NO.: PE-QP-999-145-I 006		DATE: 10.01.2020		
				PROJECT: --			PO NO.: --		DATE: --		
				ITEM: CONTROL VALVE		SYSTEM: C&I		SECTION: C		SHEET 5 OF 9	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
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					M	C/N					

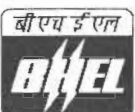
		limit switch & solenoids and other accessories						drg/data sheet	Report		W		Valve.
		10. Overall dimensions	MI	Visual and dimensional	100%	10%	Approved drg/data sheet	Approved drg./ data sheet	Inspection Report	√	P/W	W	
		11. Pre defined valve position in case of air failure	MI	Visual and dimensional	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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		R.K. JAISWAL


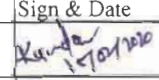


BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
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Reviewed by:			
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[illegible]Page 88 of 122


		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	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

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. Hysteresis	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. Hysteresis	CR	Measurement	100%	10%	Approved drg/datasheet	Approved drg/data sheet	--	√	P/W		

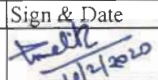
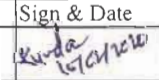
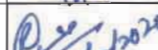
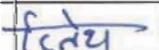
BHEL					
ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
		CHETAN MALIK			KUNDAN PRASAD
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
		R.K. RAINA			R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
Reviewed by:	Sign & Date	Name	Seal
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	CATEGORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					


		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					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		CHETAN MALIK	Checked by:		KUNDAN PRASAD
Reviewed by:		R.K. RAINA	Reviewed by:		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-999-145-1 006		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	AGENCY	REMARKS
1	2	3	4	5	6		7	8	9	* D	** M C N
					M	C/N					

		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:

- 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 for a similar control valve (same size, same Cv, same trim characteristics) can be accepted for a specific project subject to acceptance by Customer.
- 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.
- Sea worthy packing shall be provided, if called for in the Data sheets. Vendor to provide the following to BHELPEM for verification:
  - Photographs of valves duly placed inside the wooden box just before final packing.
  - 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.
- 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.
- 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.
- BHEL reserves the right to conduct repeat tests, if required.
- 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, IDENTIFIED 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:	<i>Amal</i> 10/12/2020	CHETAN MALIK	Checked by:	<i>Kundan</i> 10/01/2020	KUNDAN PRASAD				Reviewed by:		
Reviewed by:	<i>R.K.</i> 10/01/2020	R.K. RAINA	Reviewed by:	<i>R.K.</i> 10/01/2020	R.K. JAISWAL				Approved by:		

NOTE: Minimum requirement has been given in QP, Vendor to submit QP for end user approval.



**SUB-SECTION-V-QC6**

**CONTROL VALVE ACTUATORS AND ACCESSORIES**

LOT-3 PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(3)-9

CLAUSE NO.		QUALITY ASSURANCE & INSPECTION													एनटीपीसी NTPC	
<b>CONTROL VALVE ACTUATORS AND ACCESSORIES.</b>																
TESTS																
ITEMS		Make, model, tag (r)	Dimension®	Surface finish®	Heat treatment®	Material test certificates®	Ibr certificates®	Hydraulic test®	Utradiography for >900 lb rating®	Mpi/dp®	Pressure resistance®	Seat leakage®	Timing open/close®	Linearity/hysteresis®	Functional test, review for make and tc of accessories®	
<b>CONTROL VALVE AND ACTUATOR</b>																
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* - <b>UT ON SPINDLE DIA &gt;= 40 MM.</b>																
NOTE :		1) Detailed procedure of environmental stress screening test shall be as per quality assurance programme general technical conditions 2) 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.														
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(3)-9					PART-B SUB-SECTION-V-QC6 CONTROL VALVE ACTUATORS AND ACCESSORIES					PAGE 1 OF 1				





**SUB-SECTION-III-C6**


**TYPE TEST REQUIREMENTS**

LOT-3 PROJECTS  
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOCUMENT NO.: CS-0011-109(3)-9

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	TYPE TEST REQUIREMENTS			
1.00.00	TYPE TEST REQUIREMENTS			
1.01.00	General Requirements			
1.01.01	<p>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. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&amp;I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.</p> <p>(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.</p> <p>(b) For the rest, submission of type test results and certificate shall be acceptable provided.</p> <p>i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.</p> <p>ii. There has been no change in the components from the offered equipment &amp; tested equipment.</p> <p>iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening but not more than five (5) year back.</p> <p>(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.</p>			
1.01.02	As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.			
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 1 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS		
1.01.03	The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.		
1.01.04	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.		
1.01.05	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 test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.		
2.00.00	<b>SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS</b>		
2.01.00	<p>The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&amp;I systems Analyzer instruments, various PLCs etc. shall be as indicated below:</p> <p>i) Surge Protections for Solid State Equipments/ Systems</p> <p>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 37.90a/ IEEE-472. Hence, all front end cards which receive external signals like Analog input &amp; output modules, Binary input &amp; 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 37.90a/ IEEE-472. 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 alongwith the proposal. As an alternative to above, suitable class of IEC-60255-4 which is equivalent to ANSI 37.90a/ IEEE-472 may also be adopted for SWC test.</p> <p>ii) Dry Heat test as per IEC-68-2-2 or equivalent.</p> <p>iii) Damp Heat test as per IEC-68-2-3 or equivalent.</p> <p>iv) Vibration test as per IEC-68-2-6 or equivalent.</p>		
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS
			PAGE 2 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<p>v) Electrostatic discharge tests as per IEC 61000-4-2 or equivalent.</p> <p>vi) Radio frequency immunity test as per EN 50082-2 or equivalent.</p> <p>vii) Electromagnetic immunity as per EN 61131-2 or equivalent.</p> <p>Test listed at item no. v, vi, vii, above are applicable for front end cards only as defined under item (i) above.</p>			
LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 3 OF 6	

## 3.00.00 TYPE TEST REQUIREMENT FOR C&amp;I SYSTEMS

SI No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
2	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
3	INSTRUMENTATION CABLES TWISTED & SHIELDED			No	Yes	
4	Pressure gauge	Degree of protection test	IS-2147	No	No	
		Temp interference test	IS -3624	No	No	
5	Temperature gauge	Degree of protection test	IS-2147	No	No	
6	Pressure & DP switch	Degree of protection test	IS-2147	No	No	
		As per standard (col 4)	BS 6134	No	No	
7	Level switch	Degree of protection test	IS-2147	No	No	
8	Control valves	CV Test	ISA 75.02	No	Yes	
9	Flow Nozzles & Orifice plate	Calibration	ASME PTC , BS 1042	No	Yes	
10	PLCs	All tests as per IEC-1131	IEC-601131	No	Yes	
11	Junction Box	Degree of protection test	IS-13947	No	Yes	

LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 4 OF 6
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SI No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
12	Battery charger (Not required for inbuilt chargers)	Degree of protection test	IS-13947	No	No	
		Short circuit current capability	IEC-60146-2	No	Yes	
		Temp rise test without redundant fans	Approved procedure, IEC 60146-2	No	Yes	
		SWC test	Approved procedure	No	Yes	
		Burn-in-test	Approved procedure	No	Yes	
		Efficiency	IEC-60146-2,	No	Yes	
		Audible Noise Test	IEC 60146-2	No	Yes	
		Fuse Clearing Capability	Approved procedure	No	Yes	
		Relative harmonic content	Approved procedure	No	Yes	
		ESD immunity test	IEC-61000-4-2-9(1)	No	Yes	
		Radio interference	IEC 60146-2	No	Yes	

LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 5 OF 6
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SI No	Item	Test requirement	Standard	Test to be specifically conducted	NTPC's approval req. On test certificate	Remarks
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
		Over Load Test on Inverter & charger	Approved procedure	No	Yes	
		Restart Test	IEC 60146-2	No	Yes	
		Output voltage tolerance	Approved	No	Yes	
		Output voltage Harmonic content	Approved procedure	No	Yes	
		Insulation test	IEC 60146	No	Yes	
		Load Tests	Approved procedure	No	Yes	
		Preliminary light load test	IEC 60146	No	Yes	
		Current division / Voltage division	IEC 60146-2	No	Yes	
13	Battery	As per standard (col 4)	IEC –623 / IS 10918 for Ni-Cd IS-1652 for Plante Lead Acid	No	Yes	
14	Voltage stabilizers	Over Load Test	Approved procedure	No	Yes	
		Temp rise test without redundant fans	Approved procedure	No	Yes	

LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-III-C6 TYPE TEST REQUIREMENTS	PAGE 6 OF 6
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1080316/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-466-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

## SECTION – C

### BILL OF QUANTITY-MAIN SUPPLY

1080316/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-466-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
			REV. NO.	00
			DATE	28.09.2022


### **BILL OF QUANTITY-MAIN SUPPLY**

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

<b>[A] MAIN SUPPLY</b>			
SR. NO.	TAG NO	DESCRIPTION	TOTAL QTY
1	ECW71	ECW SYSYTEM FOR FGD AUX'S	1
<b>[B]</b>	<b>1/4 " SS TUBING( 15 METER FOR EACH TAG)</b>		<b>15 METER</b>
<b>[C]</b>	<b>SS FITTINGS- FOR EACH TAG</b>		<b>1 LOT</b>
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
<b>[D]</b>	<b>Cv TEST CHARGES FOR ECW SYSYTEM FOR FGD AUX'S</b>		<b>1 LOT</b>


1080316/2022/PS-PEM-C I

FORM NO. PEM-6666-0

	Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)		SPEC NO.: PE-TS-466-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

## SECTION – C

### BILL OF QUANTITY-SPARES

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)</b>		SPEC NO.: PE-TS-466-145-I104	
			DOCUMENT NO.	
			VOLUME	II B
			SECTION	C
			ISSUE NO.	2
		REV. NO.	00	DATE 28.09.2022

### 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

SNO.	PARTICULARS	SPEC	QTY
1	Pneumatic and electro-hydraulic actuator assembly.	10% or 1 no. of each type, model and rating, whichever is more.	1
2	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type of control valve.	1
3	Diaphragms, O' rings, seals etc. of all types make etc.	1 set for each type of control valve.	1
4	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more	2
5	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more	2
6	Positioner units (complete unit)& accessories (link assembly)	10% or 1 no. of each type whichever is more	1
7	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more	2
8	Air lock relays	10% or 2 nos. of each type whichever is more	2

#### NOTE

- 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.
- 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.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-466-145-I104**

DOCUMENT NO.

VOLUME **II-B**

SECTION **D**

ISSUE NO. 2

REV. NO. 00


DATE: 28.09.2022

## **SECTION – D**

- **EQUIPMENT SPECIFICATION  
(PES-145-06)**
- **HOOK-UP DIAGRAM(PES-145-06B)**
- **GUIDELINES FOR PACKING(PES-145-06C)**
  - **SUB-VENDOR LIST**

1080316/2022/PS-PEM-C I


FORM NO. PEM-6666-0

	<p>Technical specification for <b>Control Valves with Accessories</b> (Pneumatically Operated)</p>		SPECIFICATION NO. <b>PE-TS-466-145-I104</b>	
			DOCUMENT NO.	
			VOLUME <b>II-B</b>	
			SECTION <b>D</b>	
			ISSUE NO. 2	
			REV. NO. 00	DATE : 28.09.2022

## **SECTION-D**

### **EQUIPMENT SPECIFICATION (PES-145-06)**



	<b>SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)</b>		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
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## 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)	:	FCI-70.2
Allowable Seat leakage	:	ANSI-B16.34
Pressure & Temperature ratings	:	IEC-144 / NEMA / IS-13947
Enclosure class	:	ISA S-75
Control Valves Sizing	:	IS-9334
Electric Motor operated Actuators	:	


## 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 |

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FORM NO. PEM-6686-0



3x800 MW PATRATU STPP

Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

SPECIFICATION NO. PE-TS-434-145-I801B

DOCUMENT NO.

VOLUME **II-B**SECTION **D**

ISSUE NO. 2

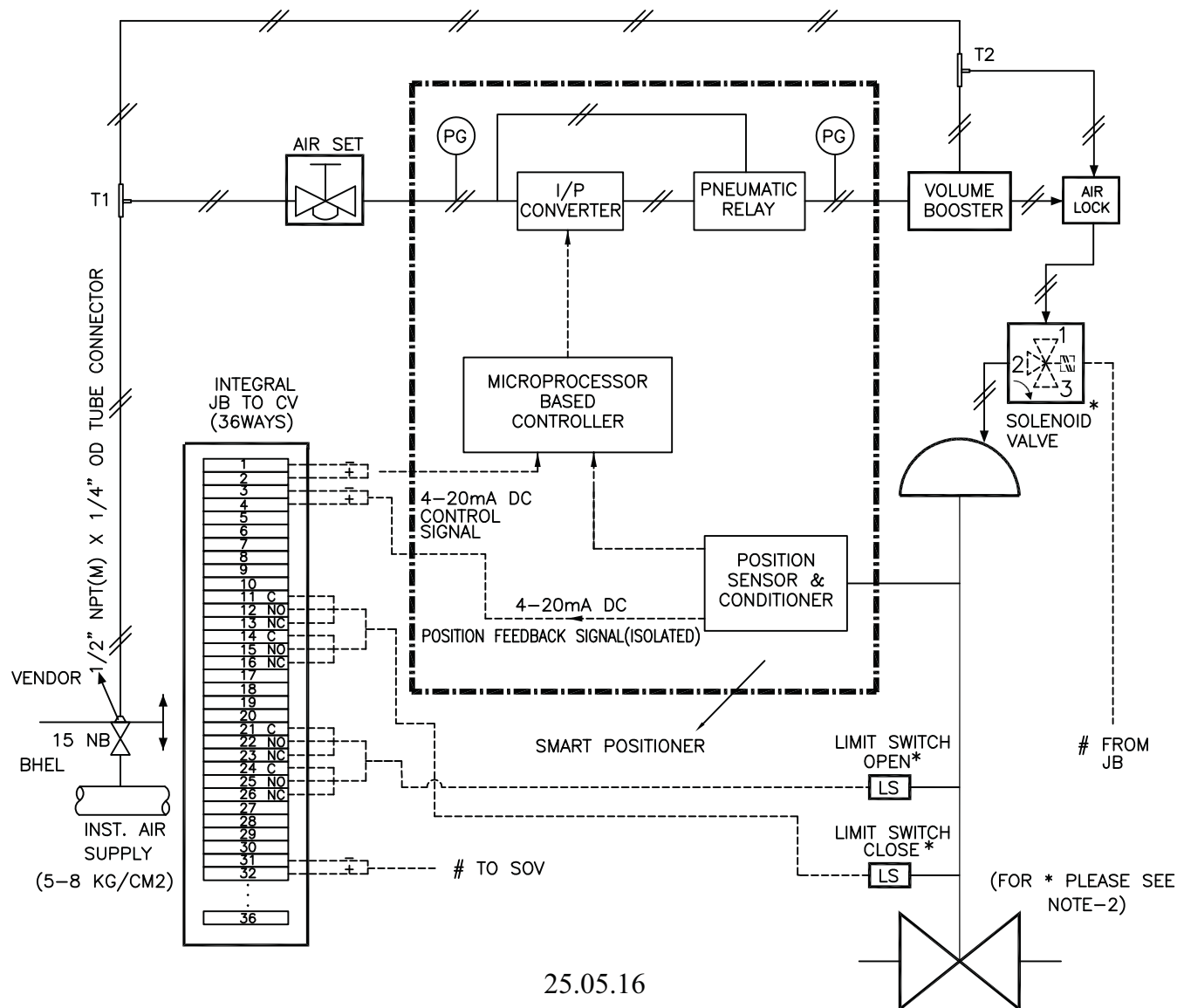
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## **SECTION-D**

### **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 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 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.



SPECIFICATION NO.: PE-TS-XXX-145-I104

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

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No.

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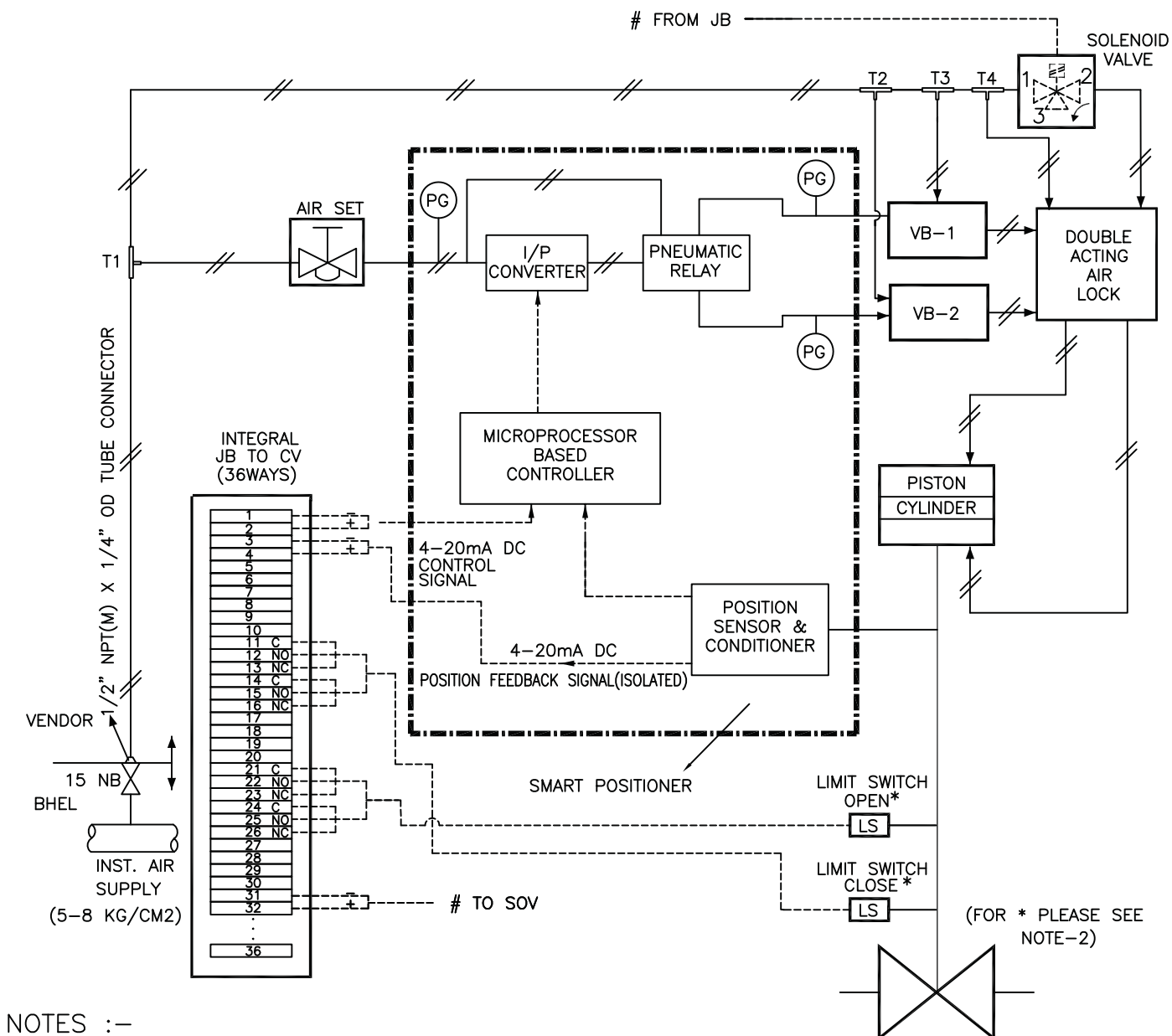
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## STANDARD CONTROL VALVE HOOK-UP DIAGRAM (DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



### NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. 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 DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 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 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 & TEE-T3 SHALL BE PROVIDED.



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3x800 MW PATRATU STPP  
 Technical specification for  
**Control Valves with Accessories**  
 (Pneumatically Operated)

SPECIFICATION NO. <b>PE-TS-434-145-I801B</b>	
DOCUMENT NO.	
VOLUME <b>II-B</b>	
SECTION <b>D</b>	
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## **SECTION – D**

### **GUIDELINES FOR PACKING (PES-145-06C)**



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### 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)

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3x800 MW PATRATU STPP

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## **SECTION-D**

### **SUB-VENDOR LIST**



### 3X800 MW PATRATU STPP

Technical specification for  
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### 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, AHMEDABAD KEMROK VARODARA AJMERA, MUMBAI TRINITY TOUCH, PALWAL