


RAJASTHAN RAJYA VIDUT UTPADAN NIGAM LIMITED

2 X 660 MW SURATGARH STPS STAGE V

TECHNICAL SPECIFICATION  
FOR CONTROL VALVES WITH ACCESSORIES  
(Pneumatically operated)

JOB NO. 392	TITLE TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH ACCESSORIES (Pneumatically operated)	DOC. NO. PE-TS-392-145-1801			
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	DEPT CODE I	NAME DESN CHD APPD	SIGN MG SHK ABS	DATE 15.07.13 15.07.13 15.07.13

**RAJASTHAN RAJYA VIDUT UTPADAN NIGAM LIMITED**  
**2x660 MW Suratgarh STPS, Stage-V**


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

**VOLUME II-B & III**

SPECIFICATION No: **PE-TS-392-145-I801**



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

	<p style="text-align: center; color: magenta; font-weight: bold;">PREAMBLE</p>	SPECIFICATION NO. PE-SS-999-100-Q-001
		VOLUME
		SECTION
		REV. NO. _____ DATE _____
		SHEET _____ OF _____
<p>1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.</p>		
<p>1.1 <b><u>Volume-I (CONDITIONS OF CONTRACT)</u></b></p>		
<p>This consists of four parts as below :-</p>		
<p>Volume-IA : This part contains instructions to bidders for making bids to BHEL.</p>		
<p>Volume-IB : This part contains general commercial conditions of the tender &amp; includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.</p>		
<p>Volume-IC : This part contains special conditions of contract.</p>		
<p>Volume-ID : This part contains commercial conditions for erection &amp; commissioning site work, as applicable.</p>		
<p>1.2 <b><u>Volume-II TECHNICAL SPECIFICATIONS</u></b></p>		
<p>Technical requirements are stipulated in Volume-II which comprises of :-</p>		
<p>Volume-IIA : General Technical Conditions</p>		
<p>Volume-IIB : Technical Specification including Drawings, if any.</p>		
<p>1.2.1 <b><u>Volume-IIB</u></b></p>		
<p>This volume is sub-divided into following sections :-</p>		
<p>Section-A : This section outlines the scope of enquiry.</p>		
<p>Section-B : This section provides "Project Information".</p>		
<p>Section-C : This section indicates technical requirements specific to the contract, not covered in Section-D.</p>		
<p>Section-D : This section comprises of technical specifications of equipments complete with data sheet A, B and C.</p>		
<p style="text-align: center;"><b><u>Data Sheet - A</u></b> specifies data and other requirements pertaining to the Equipment.</p>		
<p style="text-align: center;"><b><u>Data Sheet - B</u></b> Specifies data to be filled by the bidder (Data Sheet-B is contained in Volume-III).</p>		
<p style="text-align: center;"><b><u>Data Sheet - C</u></b> Indicates data/documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).</p>		
<p>1.2.2 <b><u>Volume-III</u></b>                      <b><u>TECHNICAL SCHEDULES</u></b></p>		
<p>This volume contains technical schedules and Data Sheets-B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No. PE-SS-999-100-Q-002 in Volume-III.</p>		
<p>2.0 The requirements mentioned in Section-C / Data Sheets-A of section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section-D.</p>		



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B	Project Information
C	Specific Technical Requirements
	Typical Hook-up Diagram for Control valve
	Customer Specification
D	Equipment specification
	Data sheets A & B for Control Valves & Accessories
	Data sheets C for Control Valves & Accessories
	Quality Plan for Control Valves
	Bill of Quantity
	Spares
	Schedule of submission of drawings/ documents equipment manufacture, inspection and dispatch.



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**RAJASTHAN RAJYA VIDUT UTPADAN NIGAM LIMITED**  
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**TECHNICAL SPECIFICATION**  
**FOR**  
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**VOLUME II-B**

**SPECIFICATION No: PE-TS-392-145-I 801**



**BHARAT HEAVY ELECTRICALS LIMITED**  
**POWER SECTOR**  
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SPEC NO.: **PE-TS-392-145-I 801**

VOLUME II B

SECTION A

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# SECTION – A

## SCOPE OF ENQUIRY



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

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SECTION A

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## SCOPE OF ENQUIRY

### 1.0 SCOPE

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 and Mandatory Spares as mentioned in different sections of this specification for **2x660 MW Suratgarh STPS, Stage-V**

- .1 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder.
- .2 The enquiry shall be operated in "**COMPLAINE MODE**" means bidder to comply with the requirement of specification, quality plan, delivery schedule, quantities, start-up/commissioning spares, mandatory spares, recommended spares etc, and as a token of acceptance of the same, following formats to be signed, stamped with company seal and submitted for the project.
  - a) Compliance certificate
  - b) Quality plan
  - c) Schedule of price, unit prices, inspection schedule
  - d) Schedule of submission of drawings / documents, equipment manufacture inspection and dispatch
- .3 **No separate technical offer, data sheets to be submitted with the bid. Any such document shall not be taken cognizance of, and document (Compliance certificate) at 3 above shall be final and binding. Data sheets shall be furnished by the successful bidder (vendor), only after the award of contract & shall be subject to Purchaser's Approval.**
- .4 **Bidder to note that CV test is required to be conducted on one type per size, CV value. Bidder to group such valves and indicates the same along with the price bid. Unpriced portion to be submitted to engineering.**

### 2.0 GENERAL TECHNICAL INSTRUCTIONS

- 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 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.
- 3 BHEL's / Customer's representatives shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to them.
- 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 – B

### PROJECT INFORMATION

SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 1 OF 3

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001  Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	<b>Climatic conditions</b>	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	

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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 2 OF 3

	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:		
	a) Basic wind speed = 47 m/sec		
	b) Factor K1 = 1.07		
	c) Category of terrain = Category 2		
	d) K3 – as per IS 875		
8.0	Seismic data (As per IS: 1893 latest issue)		
	a) Zone	Zone II	
	Designs & design coefficients shall be based on IS 1893:2002		
	Design condenser cooling water inlet temperature	33 Deg C	
9.0	Auxiliary power supply:		
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:		
	a) For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.	
	b) For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed	
	c) For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed	
	d) For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.	
	e) DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed	
	f) AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.	
	g) Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC	

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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>		VOLUME II SECTION – B
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> GENERAL PROJECT INFORMATION		SHEET 3 OF 3

		supply (For all instrumentation and control system equipment and solenoid valves)
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g) Lighting fixtures and space heaters    240 V, 1 phase, 2 wire, 50Hz,solidly earthed system

h) Construction supply    415 V, 3 phase, 4 wire, 50Hz AC supply with neutral lead solidly earthed.

i) The above voltages may vary as follows :

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

AC supply	Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$
DC supply	Combined voltage & frequency variation 10% Voltage variation +10% , -15%

j) For instrument and control system of steam generator and steam turbine generator.    230 V  $\pm 5\%$  AC UPS, 1-phase, 50 Hz, 2-wire. The 24 V DC required for control system shall be generated from this UPS.

10.0    All the electrical equipment shall be designed for 50° C reference ambient temperature.

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## SECTION – C

### SPECIFIC TECHNICAL REQUIREMENTS



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### **VOL-II B (SECTION-C)**

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- |    |   |
|----|---|
| 1. | Specific Technical Requirements                       |
| 2. | Hook-up Diagram for Control valve                     |
| 3. | Customer Specification ( <b>TCE-5750A-H-500-001</b> ) |



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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(TCE-5750A-H-500-001) shall override.

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, is attached. the scope demarcation as indicated should be adhered. The connection details at Instrument Air valve shall be furnished to successful bidder after the award of contract.
3. Valve Body Sizes shall be quoted to take care of the specification requirements like parameters, and limitations of Fluid outlet velocities, Noise Level etc. **However Port (Trim) Sizes shall be selected to suit CV requirement for achieving percentage valve lift as per Technical Specification.**
4. Bidder to note that, **wherever downstream side of the valve is subjected to the Vacuum service, bidder to offer double Gland packing, and in that case, flow direction of working fluid shall be to close the valve.** Separate indication for the same has not been made in the data sheets-A.
5. For valves subjected to cavitation service, anti-cavitation trim shall be provided.
6. In case during erection/commissioning of the control valve, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the bidder free of cost
7. Facility to adjust the maximum travel of the stem & starting point of travel shall be incorporated.
8. SS 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.
10. Limit switch shall be designed for 1,00,000 operations.
11. JB shall be 24 ways as per enclosed hook-up diagram.



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12. The material of filter for Air Filter Regulator shall be Sintered bronze.
13. Bidder to indicate pick-up & drop out voltage for all solenoid valves.
14. Protection class for Limit switches, I/P converter and Position transmitter shall be IP-65 only.
15. All JBs and valves shall be with double compression type Ni plated brass cable glands.
16. Solenoid valve class of protection shall be IP-65.
17. All local cabling up to JBs shall be in Conduit (Flexible/Rigid). If JB is not mounted near valve
18. Noise Reduction shall be made through inherent design and not through external means.
19. SPARES: The following spares are required to be offered

**(A) Mandatory Spares:**

The items listed in list of mandatory spares attached at section-D, of this specification, are the essential spares required to be offered by the bidder, and the price for which (Lump sum as well as individual) for each item to be quoted separately under the separate heading. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III

The prices for Mandatory spares indicated by the bidder shall be used for bid evaluation purposes.

Each Case / Container containing Mandatory spares shall be clearly marked or labelled on the outside with the description of the spares contained in it. When more than one items of spare parts are packed in a single Case / Carton, a general description of the contents shall be shown outside of such case, and detailed list enclosed. All Cases, Containers and Packages must be suitably marked and numbered for the purpose of identification.

**(B) Recommended Spares:**

In addition to the Mandatory spares mentioned, the bidder shall also 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.





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**(C) 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-D 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 desiccators packs as necessary.

**20. Documentation:**

**(A) Along with the bids: following documents for the project**

- a) Signed and stamped compliance certificates in attached format(VOL.-III).
- b) "Schedule of prices" and "Schedule of unit Prices" in attached format (VOL.-III).
- c) Schedule of submission of Drg. / Doc, Equip. Manufacture, Inspection and Dispatch.
- d) Inspection schedule
- e) Quality Plan Duly signed and Stamped

**(B) After the award of contract:**

The documentation as listed below for the project

6 sets of the following documents + 3 sets of CDs to be enclosed with the bids for Approval:

- a. Assembly (dimensional) drawings.
- b. Valve Edge preparation details.
- c. Data sheet-C completely filled-up.
- d. Hook-up diagram of Control Valve with Actuator & Accessories.
- e. Valve & Actuator assembly dimensional drawings with weights.
- f. Quality Plan duly signed and stamped.
- g. All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.
- h. All relevant catalogues for the models of the valves as well as accessories finalized.
- i. Bar chart to indicate the time schedule for procurement, manufacture, testing and dispatch.



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**(B) Final documentation:**

The documentation as listed below will separate for respective projects

1. Category -I & IV Approved final drawings/data sheets, - 20 sets with 4 CD-ROMS  
Valve sizing calculations, Noise level calculations and  
Valve Outlet Velocity calculations.
2. Test certificates - 20 sets.
3. Operation & Maintenance Manuals - 20 sets with 4 CD-ROMS  
for Control Valve, Actuator and all the  
Accessories.

**NOTES :** 1. For point no 1.37 mentioned in customer specification on sheet no. 13 of 42,  
**VOLUME V SECTION :D5:4** the accuracy of AFR should be read as +/- 1% instead  
of +/- 0.1%

**2. Packing instructions :-** Packing boxes shall have clear marking "To be stored  
indoor, away from water and dust."



## SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART )

SPECIFICATION NO.: PES – 145 – 06A

VOLUME

SECTION

REV. NO.

01

DATE : 30.09.2009

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### 1.0 Electrical :

Input Signal	4-20mA
Power Supply	Loop Powered from the output card of Control System (12-30 V DC)
Hart Protocol	Compatibility for Remote Calibration & Diagnostic (Super-Imposed HART Signal on Input Signal to positioner (4-20mA)
Valve Position Feedback	4-20mA output signal for Position Feedback is to be provided to control system.

### 2.0 Environment :

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

### 3.0 Diagnostic Features :

<b>Diagnostic / Test Features</b> (to be available in Smart Positioner and shall be accessible through any HMS software)	<b>Minimum Diagnostic Features Like</b> <ul style="list-style-type: none"> <li>• Measurement of Valve positioning timing,</li> <li>• Detection of actuator leakage,</li> <li>• Display of fault alarm.</li> <li>• Logging of alarms and history.</li> <li>• Valve friction/jamming detection.</li> <li>• Detection of valve wear &amp; tear,</li> <li>• Valve stroke length and timing.</li> </ul>
	<b>Advanced Diagnostic Features Like (OPTIONAL, if specified in customer's specification)</b> <ul style="list-style-type: none"> <li>• On line partial closure test.</li> <li>• Valve signature analysis (online graphical/tabular representation of input signal Vs valve travel).</li> <li>• Step response test.</li> </ul>

### 4.0 Software :

<b>Software</b> (to be supplied alongwith smart positioner)	<ul style="list-style-type: none"> <li>• Windows based software to meet the requirement for configuration, diagnostics, calibration and testing of Valve and actuator.</li> <li>• Easily up-gradable with same hardware and compatible with any Hart Management Systems (HMS).</li> <li>• Shall be capable to cater to all the tags in the specification at the same time.</li> </ul>
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## SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART )

SPECIFICATION NO.: PES – 145 – 06A

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### 5.0 Hardware :

<b>Hardware</b> (As required)	1. PC with software for configuring and accessing diagnostic features of the positioners.
	2. Multiplexers for interfacing smart positioner with PC.
	3. Communication cable for interconnecting multiplexers with PC.
	4. RS232/RS485 converter (if required)

**Note :** Power supply for Multiplexer shall be arranged by the owner.

### 6.0 Valve Action :

<b>Valve Action</b>	<b>Direct &amp; Reverse.</b> (Same positioner for Single Acting or Double Acting And no separate relays required for changing from Single acting to double).
	During Failure of input Electrical signal (4-20 mA), valve to attain fail Freeze position without any external hardware. (Sol valve, Power Supply etc.)

### 7.0 Flow Characterization :

<b>Flow Characterization</b>	Possible to fit valve characteristic curve linear & Equal percentage
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### 8.0 Performance:

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

### 9.0 Test Certificates:

Test Certificates/Test Reports for degree of protection, Accuracy and calibration test (as a minimum) to be submitted as per Manufacture Standard / Relevant Standard.

### 10.0 EMC & CE compliance

International Standard Like EN/IEC.

To EN 50081-2 & EN 50082 or equivalent



**SPECIFICATION FOR MICROPROCESSOR BASED  
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SPECIFICATION NO.: PES – 145 – 06A

VOLUME

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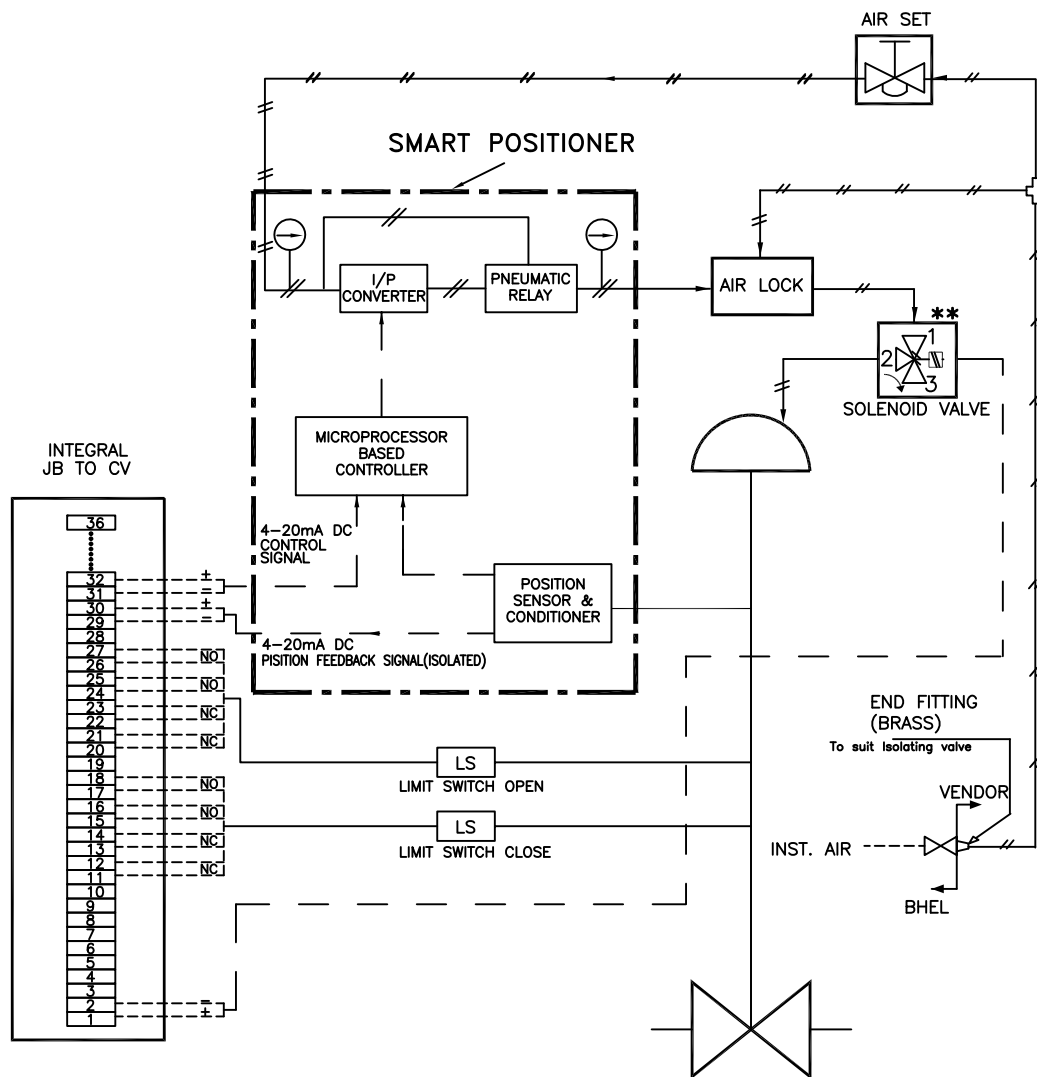
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## 11.0 Accessories

In Built Operator Panel	Display with push buttons for Configuration and display on the positioner itself
Hand Held Hart Calibrator (Optional)	Universal Hart Calibrator To Be Provided, One Per Unit.
Press Gauge Block	For Supply & Output Pr., Filter Regulator Other Accessories Shall Be Provided As per Control valve hook-up diagram.
Electrical cable entry	½ - NPT, side or bottom entry to avoid water Ingress.

## CONTROL VALVE HOOK-UP DIAGRAM WITH SMART POSITIONER

2x660 MW Suratgarh STPS, Stage-V



NOTE:—

1. SOLENOID VALVE WILL BE PROVIDED AS INDICATED IN RESPECTIVE DATA SHEETS.
2. SOLENOID VALVES PORT CONDITION:  
PORT 1 & 2 SHAL BE CONNECTED UNDER DE-ENERGISED CONDITION.  
PORT 2 & 3 SHAL BE CONNECTED UNDER ENERGISED CONDITION.
3. FOR ONLY ON/OFF DUTY PNEUMATIC CONTROL VALVE, SMART POSITIONER SHALL NOT BE APPLICABLE.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
5. 25 METERS 1/4 " PVC COATED COPPER TUBING AND 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END.
6. VOLUME BOOSTER IF REQUIRED SHALL BE PROVIDED.

\*\*\* AS PER DATASHEET.

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Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> DESIGN, PERFORMANCE AND FUNCTIONAL REQUIREMENTS	SHEET 19 OF 55
<p>provided and also makeup line for filling up the constant level vessel shall be provided.</p> <p>(a) The instrument shall be Radar type for all low pressure and vacuum applications involving two phase media viz: condenser, hotwell and LP heaters level measurements.</p> <p>(b) The instrument shall be differential pressure type or Ultrasonic type for other applications.</p> <p>(c) Radar type level transmitter shall be used for fuel oil storage tanks.</p> <p>(d) Admittance or Radar type shall be for sludge and slurry applications.</p> <p>14.11 Flow Glasses shall be provided at the outlet of the pipe lines of cooling water side of coolers / heat exchangers and shall meet the following requirements:</p> <p>(a) The instrument shall be rotary type with glass mounted for indication</p> <p>(b) Upto 6 inch on-line flow glasses shall be supplied and above 6 inch bypass type flow glasses shall be provided.</p> <p>14.12 Speed Measurement shall be provided, where variable speed drives are to be controlled from remote (e.g. BFPs, feeders, ID fans etc).</p> <p>14.13 Flow elements shall be provided as required.</p> <p>14.14 Digital Display Unit (DDU) shall be provided for main-steam pressure, temperature, fuel flow, MW Export, MW Target, MVAR and frequency, condenser vacuum, Instrument air pressure, GPS Time, Weather Report (Room Temperature, Humidity, Barometer, Air purity etc).</p> <p>14.15 Pneumatically Operated Control Valves</p> <p>14.15.1 Pneumatically Operated Control Valves shall be provided for all control application. If the process demands any other control, then control valves shall be provided for those applications also. Where a single control valve can not meet the turn down ratio as dictated by the process, control valves with split range application shall be provided. All bypass valves of control valves shall be motor operated valves suitable for inching operation provided with position transmitters. All integrated bypass valves shall be motor operated. Electro-pneumatic positioners shall be used for all pneumatic control valves. Pressure test points &amp; drains shall be provided across each control valve .</p> <p>14.15.2 In case during detailed engineering, pneumatic control elements get converted to electrically operated items, thyristor reversing unit based electronic power positioner (EPP) are in Bidder's scope. In case, for these EPPs, power supply other than what is</p>		
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<p>available if required, the same shall be supplied, by the Bidder.</p> <p>14.15.3 The pneumatically operated control valves shall be provided with Smart Positioners, diagnostics and HART compatibility. Control Valve diagnostics shall be transmitted through this HART Protocol to DCS/PLC.</p> <p>14.16 Solenoid Valves shall be provided for all pneumatic control valves hooked up with process interlock requirements and where direct tripping is involved. All solenoid valves shall be uniformly rated for 24VDC. The number of ways for solenoid valve shall be provided as indicated below :</p> <p>(a) On line two (2) way solenoid valves shall be provided, where process line of less than 2 inch with low pressure &amp; temperature application is involved.</p> <p>(b) Three (3) way solenoid valves shall be provided commonly, where the pressure is admitted or exhausted from a diaphragm valve or single acting cylinder. E.g.: Pneumatic operated spray water block valve.</p> <p>(c) Four (4) way solenoid valves shall be provided for operating double acting cylinders. If applicable. E.g.: Pneumatically operated on-off type dampers.</p> <p>(d) Dual coil, latch/unlatch type Solenoid valves shall be supplied for equipment trips/critical applications.</p> <p>(e) Five-way, dual coil solenoid valves shall be used for Oil guns.</p> <p>14.17 Position Transmitters shall be provided for all motorised inching valves .Position transmitters shall be 24 VDC, 2 wire, non-contact type.</p> <p>14.18 Electro-Pneumatic positioners shall be provided for all pneumatically operated control valves, power cylinders etc., for converting controller output of 4-20 mA to appropriate pneumatic signal.</p> <p>14.19 Air Filter Regulators along with gauges shall be provided in each of the:</p> <p>(a) Air supply line to valve positioners /power cylinders</p> <p>(b) Air supply line to pneumatic interlocked block valves</p> <p>(c) Transmitter Racks</p> <p>14.20 Interposing relay (To be mounted in Control room cabinet) for interface to the following:-</p> <p>(a) Solenoid valve (two relays per valve) - Relays with contact rating of 2 Amps.</p> <p>(b) <del>DC Starter(two relays per drive) - Relays with contact rating of 0.2Amps.</del></p>		
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Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> <b>DESIGN, PERFORMANCE AND FUNCTIONAL REQUIREMENTS</b>	SHEET 53 OF 55
<p>31.9 For all HT drives alarm and trip signals for bearing and winding temperatures shall be considered through soft LVM from temperature element signal only. No temperature transmitters are required for these signals.</p> <p>31.10 All Critical control valves shall be provided with anti-cavitation trim. Control valves / dampers shall be supplied with all accessories including non-contact type position transmitters and E/P Positioners. Combination of I/P + Pneumatic positioner is not acceptable. All inching valves shall be supplied with position transmitters integral with the valve positioner.</p> <p>31.11 All transmitters shall be SMART type with integral local LCD indication and HART protocol.</p> <p>31.12 All Temperature sensors shall be Duplex type and field mounted temperature transmitter shall be provided for all temperature measurement applications. Direct wiring of RTD or T/C to DCS or PLC is not preferred. (Except for Winding and bearing temperature sensors ).</p> <p>31.13 Switches (pressure, temperature, level &amp; flow etc.) shall be provided only for critical equipment trip such as BFP/ CEP trip etc. Wherever possible, transmitters shall be provided with required redundancies for all other purposes.</p> <p>31.14 Similar make and model shall be provided for same type of I&amp;C system equipment. This shall specifically apply for field transmitters, control valves etc.</p> <p>31.15 Smart positioners shall be provided for all control valves/ dampers.</p> <p>31.16 Where multiple functions like monitoring /control/alarm etc. are sought to be performed based on a parameter value, in minimum dual sensor shall type be provided.</p> <p>31.17 All outdoor field equipment shall be provided with epoxy painting.</p> <p>31.18 Individual continuous purging shall be provided for all Air and Flue gas transmitters. The tap points for these services shall be "Y" shaped. The purging line shall be connected near the root valve only and not at the Transmitter end.</p> <p>31.19 All local cabinets / utility plant control panels with bottom cable entry shall be provided with suitable pedestals for easy cabling. The panels shall be designed for ease of operation of operating hardware and monitoring the indicators.</p> <p>31.20 All local panel indicating lamp/indicating type Push button should be of cluster LED type only. All local panels shall be of double door type instead of double leaf type to avoid ingress of dust in dust prone areas.</p> <p>31.21 All motorised bypass valves shall be inching type and shall be provided with position transmitters of non-contact type.</p>		
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.3
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> DESIGN, PERFORMANCE AND FUNCTIONAL REQUIREMENTS	SHEET 49 OF 55
<p>29.12.1 All regulating type final control elements shall have actuators of pneumatic type excepting LP/HP bypass and Turbine governor valve, which shall be hydraulic type. Actuators shall be provided with air failure lock to obtain the required fail safe condition, control contacts as warranted, adjustable minimum / maximum stops, local position indication and two (2) wire electronic position transmitters with solenoid valves wherever necessary and air filter regulator. Fail safe action of the final actuator shall be as follows:</p> <p>(a) Modulating control- Stay put</p> <p>(b) ON/OFF control -Move to safe-end-position</p> <p>29.12.2 All actuators shall be provided with hand wheel for local operation.</p> <p><b>29.13 CONTROL VALVES:</b></p> <p>29.13.1 The control valves shall be capable of handling at least 130 percent of required maximum flow at full open condition. Control valves shall be provided with manual isolating and bypass valves for facilitating maintenance wherever alternative flow paths are not available.</p> <p>29.13.2 SMART Positioners shall be used for all regulating services. Two wire electronic position transmitters and limit switches shall be provided on the valve wherever required depending upon the system requirement. SMART Positioners shall be provided with HART protocol and Diagnostic features.</p> <p>29.13.3 Bidder shall note that in case of Ash Control valves, if Spiess valve is offered, the Bidder shall confirm the following:</p> <p>(a) If patented design of the OEM, Local spare/service support shall be confirmed.</p> <p>(b) Adequate Technical details required for understanding the Trim internal functionality and maintaining Valve shall be provided.</p> <p>(c) The Thyristor based Electronic Power Positioner electronics shall not be mounted in the hot Combustor zone because of the dusty and hot conditions.</p> <p>29.13.4 Bidder's shall quote the Pneumatic operated valve which has been proven in the subject application for more than 2 years.</p> <p>29.13.5 Also Bidder shall list out clearly the material considered for Trim with a proof that the material shall not be worn out under the severe hot Ash conditions it is subjected to. Bidder shall also give an Extended warranty of 5 years for this valve since the application is critical.</p>		
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Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 10 OF 42
<p>1.27.2 All the Terminal Blocks shall be rust proof and corrosive resistant for outdoor mounted panels. Terminal Blocks housing material shall be 6.6 polyamide and metallic portion shall be coated against rust/corrosion.</p> <p>1.27.3 In each Local Panel, a 24 V DC Voltmeter shall be provided to check the Field Interrogation voltage.</p> <p>1.28 Vibration Monitoring And Analysis System Refer TABLE-13.</p> <p>1.29 230 V AC Distribution Board  The function of the 230V AC distribution is sub distribution of 230V AC power supply from UPS to all the utilities viz., system cabinets, HMI and peripherals. Redundant feeders shall be provided for each utility. The cabinets shall be free standing vertical cabinets, designed for indoor location. Material of construction shall be 2mm thick CRCA. Fluorescent lighting, fire detector and space heater shall be provided for each cabinet. Isolating switches and HRC cartridge fuses shall be provided for individual feeder isolation. Ammeter and voltmeter shall be provided for incoming feeders to the distribution boards. Each terminal shall have LED indication with fuses to indicate and isolate earth faults.</p> <p>1.30 Control Valves</p> <p>1.30.1 Multistage, anti-cavitation, balanced, modulating, globe type, cage guided, single ported, diaphragm type of actuator with hand wheel, SMART positioner, air filter regulator, air lock device, solenoid valve as applicable, limit switches and position transmitters completely tubed with junction box. Smart positioner shall be suitable for accepting 4-20mADC signal. Pneumatic (PVC coated copper) tubing complete with accessories, fittings, If any up-gradation of the offered system is envisaged before completion of the job to meet the specified requirements, the same shall be incorporated in the system, with the approval of the OWNER without any additional cost. Positioner shall be provided with input/output/bypass gauges. Local position indicator &amp; Non-contact type position transmitter with 2 wire, 4-20mA DC output. All limit switches/position transmitters, E/P converter signals etc., shall be wired out to external block of actuator and respective junction boxes.</p> <p>1.30.2 Control valves shall be sized to have an opening of 15% at minimum flow condition and 85% at maximum flow condition. Noise level shall not exceed 85 dB at a distance of about 1.5 M from the valve. In case of predicted noise level above 85dBA, suitable low noise trim shall be provided. Noise reduction shall be achieved through an inherent Trim design and not through external means.</p>		
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.4
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 11 OF 42
<p>1.30.3 All control valves shall have a leakage class of V and tight shut off application class VI shall be provided.</p> <p>1.30.4 Either extended type bonnet or cooling fin type bonnet shall be provided for service above 200 Degree C and for other service the bonnet type shall be standard.</p> <p>1.30.5 The end connections shall be socket welded for sizes below 50 NB and butt welded for sizes 50 NB and above. Flanged connection shall be provided for DM water services, with suitable rubber lined interfaces.</p> <p>1.30.6 Water seal shall be provided for valves that could be subjected to below atmospheric conditions.</p> <p>1.30.7 Generally stem and guide material(trim) shall be SS 316 stellited, and plug and seat material shall be 17-4 PH SS, except for specific applications like DM water, HP bypass services. Refer to mechanical section of this specification for selection of control valve body material and actuator type.. The trims supplied shall be suitable for quick changing. Actuator housing shall be of pressed steel construction.</p> <p>1.30.8 Trim shall be designed such that trim exit velocity shall be limited to avoid cavitation.</p> <p>1.30.9 The action of valves on failure of operating media shall be determined by the process requirements with regard to safe operation and emergency shut down requirements.</p> <p>1.30.10 Control valve sizing shall be accompanied with data sheets. Following size calculation details shall be furnished for Control valves:</p> <p>1.31 Pneumatic block valves</p> <p>Balanced, on off, plug type, single ported, gate valve. End connection socket welded for sizes 50 NB and below &amp; butt welded for sizes above 50 NB and flow direction shall be horizontal.</p> <p>For body and bonnet material refer mechanical section of this specification.</p> <p>Packing material GRAFOIL.</p> <p>Trim : Cage guided, metal seated with flow characteristic of quick opening with stem, plug, seat and guide material of SS 316.</p> <p>Actuator : Diaphragm (Nitrile) type with handwheel &amp; travel indicator and adjustable stop. It shall be sized for shut off differential pressure.</p> <p>Accessories like air filter regulator, solenoid valve, limit switch with Nema4 enclosure, etc. shall be supplied. Actuators &amp; accessories requiring tubing shall be mounted and tubed.</p>		
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.4
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 12 OF 42
<p>1.32 Control Damper Drives</p> <p>Pneumatic actuator type, located in flue gas/air area with damper shaft bearings mounted externally. Bearings are grease lubricated. Blades(SS) shall be linked together. Accessories like position transmitters (2 wire) with 4-20mA DC output, Local Position indicator, position locks, limit/torque switches, etc. shall be supplied, after integrating, calibrating &amp; testing at works. Smart Positioners with all required accessories, required for the positioning of control damper drives shall be provided. Spare cams for accommodating any change in characteristic to achieve better process control during commissioning shall be supplied as required.</p> <p>All the field mounted Damper accessories ( position indicator, limit switches etc.,) shall comply to IP 65.</p> <p>1.33 SMART Positioners of Control Valves.</p> <p>1.33.1 Positioner shall be microprocessor based with digital communication by means of HART protocol. Positioner has to be 2-wire, 4-20 mA loop powered by the control system and capable of split ranging operation.</p> <p>1.33.2 The SMART positioner shall be suitable for both single acting and double acting actuators. The SMART positioner shall be fully modular in construction with Encapsulated printed wiring board and pressure gauges inside the positioner cover to protect from transit/site damage.</p> <p>1.33.3 SMART positioner shall preferably be of the same make as the Control Valve, to ensure repeatability in Calibration, serviceability and proper maintenance of the Control System.</p> <p>1.33.4 The SMART positioner shall have pressure sensors to measure the pneumatic outputs to the actuator.</p> <p>1.33.5 The control algorithm for the positioner shall use feedback signal from the motion of the pneumatic relay beam instead of pressure feedback to minimize pneumatic related effects and for stable and smooth response of the control valve. The SMART positioner shall have user adjustable tuning sets to identify the optimum tuning for the total valve assembly. SMART Positioner with HART Communication facility shall communicate all the valve diagnostics to DCS.</p> <p>1.33.6 The electrical housing shall be designed to meet NEMA 4X, IEC 60529 IP66.</p> <p>1.34 Void</p> <p>1.35 Void</p> <p>1.36 Void</p>		
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.4
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 13 OF 42
<p>1.37     <b>Air Filter Regulator (AFR)</b></p> <p>Constant bleed type AFR with an accuracy of <math>\pm 0.1\%</math>, inlet pressure range of 5-8 kg /sq.cm and suitable spring ranges (AFR) for use with positioners in control valves, control damper, E/P converters and shut off valves, transmitter purging lines etc; Filtering particles above five microns having phosphor bronze filter element. Material of accessories shall be SS. Built in blow down valve shall be provided. AFR shall have automatic drain feature. All accessories shall be supplied. Degree of protection shall be IP65.</p> <p>1.38     <b>Position Transmitters</b></p> <p>24VDC operated Non contact LVDT type with 4-20 mA DC 2 wire system with an accuracy of <math>\pm 1\%</math>; range adjustment and zero adjustment to be provided; IP65 degree of protection for casing. The output shall be linear. All accessories shall be SS.</p> <p>1.39     <b>Solenoid Valves</b></p> <p>Direct operated solenoid valves, pilot operated for higher sizes with shut off class (leakage) VI, body material of bronze, plunger material of 316 SS rated for continuous duty. IP 65 class for enclosure. Insulation class of 'F' for the solenoid. Body ratings shall suit the pressure and temperature conditions.</p> <p>1.40     <b>Void</b></p> <p>1.41     <b>Bunker level monitoring system:</b></p> <p>Radar type shall be provided. 230V UPS shall be utilised for the instruments. The system shall provide 4-20mA for connecting to DCS and CHS PLC.</p> <p>1.42     <b>Furnace Temperature Probe</b></p> <p>Duplex k-type thermocouple with mineral insulation &amp; SS sheath located in furnace below SH panels; minimum of 2 nos. Probe housing shall be weather proof &amp; corrosion resistant. Accuracy shall be <math>\pm 0.5\%</math> of span. The junction shall be ungrounded with response time of 2 to 5 seconds. Starter box shall be provided with IP65 enclosure &amp; 3 mm thick sheet. Electric motor with chain drive shall be provided for the lance. The traverse of the probes from opposite sidewalls shall cover the full cross section of the furnace. Automatically controlled cooling system shall be provided for the lance. Loss of cooling water shall be detected &amp; provided as a contact. Accessories like limit/torque switches position transmitters, etc. shall be provided. All the field mounted accessories (limit switches etc.,) shall comply to NEMA-4.</p>		
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION :TABLE 5
Package: EPC	<b>RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> CODES AND STANDARDS	SHEET 1 OF 1
<div> <div> Instrumentation Symbols and identification.  Binary Logic Diagrams for Process Operation  Graphic symbols for DCS, shared display inst. logic &amp; Comp. System  Annunciator sequences and spec.  Environmental Conditions  Control Valve Sizing  Control Valve Procedure Capacity Test  Uniform Face – Two Face Dimensions for Flanged Globe Style CV Bodies  Diagrams, Charts, Tables  Industrial Process Control Valves  Graphical Symbols for Diagrams, Binary Logic Elements  Operating Conditions for Industrial Process Meas. &amp; Control Equipment.  Electromagnetic Compatibility for Industrial Process Measurement  Preparation of Function Chart for Control System  Industrial Measurement &amp; Control – Terms &amp; definition  Vibration, Axial Position &amp; Bearing Temperature Monitoring Systems  Plain End Steel Tubes, Welded &amp; Seamless General Table – Dimensions  &amp; Masses / Length  Measurement of Fluid Flow by Means of Orifice Plates &amp; Nozzles  Pipe Threads  Quality Control Standard for Control  Valves Seat Leakage  Thermocouples   Measurement &amp; Control, Electrical sensors, Elec. Position sensors &amp; Sig.  Converters for IS two wire DC systems.  Industrial Platinum. RTD   Air Purge System   Measurement of Fluid Flow by Meter Run  Temperature Measurement   Degree of Protection by Enclosure  Electrical Apparatus for Explosive Gas  Standards for Cables  Process control security requirements </div> <div> ISA S 5.1  ISA S 5.2  ISA S 5.3  ISA S 18.1  ISA S 71.04  ISA S 75.01  ISA S 75.02  ISA S 75.03  IEC 113  IEC 534  IEC 617-12  IEC 654  IEC 801  IEC 848  IEC 902  API 670  ISO 4200   ISO 5167  ANSI B 2.1  ANSI FCI 70.02  ANSI B 16.104  ISA MC 96.1 /  ASTM E 230-  03/DIN 43710/IEC  60584  DIN 19243   DIN 43760/ IEC  751  ISA S 12.4 / NFPA  496  ISO 5167  ANSI MC 96.1 /  IEC 751  IEC 529  IEC  IEC  IEC 62443 </div> </div>		
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED		VOLUME V SECTION : TABLE14
Package: EPC	RRVUNL, 2 x 660 MW,Super-Critical TPS,Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan  INSTRUMENTATION AND CONTROL EQUIPMENT  TESTS	SHEET 2 OF 13	
PART-A: TESTS FOR I&C EQUIPMENT			
SL. NO	INSTRUMENT / EQUIPMENT	TESTS TO BE CONDUCTED	
13.	Interposing relay	Functional test/temperature rise test/high voltage test/ limits of operation test/insulation test.	
14.	Level gauges	Hydrostatic test/Material test/Seat leakage test / Ball check test	
15.	Level switches (magnetic)	Material test/Contact rating test/Hydro test / Calibration test	
16.	Level gauges (Probe)	Material test /Contact rating test /Hydro test / Calibration test	
17.	Flow switch	Material test / Hydro test/ (1.5 time max. pr) / function test	
18.	Flow glasses	Material test /Hydro test/ (1.5 time max. pr) / function test	
19.	Variable are flow metes	Calibration test / Material test / Hydrostatic test (1.5 time max. pr)	
20.	Flow element	100% Radiography test / Hydro test / Calibration test / IBR certificate	
21.	Control valves	(a) IBR certificate Form III C (b) Hydrostatic test : IBR/MSS-SP-61/ANSI B 16.34 (Note 1) (c) Seat leakage test : As per ANSI B 16-104 (Note-1) (d) CV test : As per ISA procedure (Note 1) (e) Magnetic particle test : As per ANSI B 16.34 special class (applicable for pr.> 70 bar & tem < 400°C (f) Liquid penetration test : As per ANSI B 16.34 special class (applicable for pr > 70 bar & temp < 400°C (g) Calibration and Hysteresis test (Note-1)  NOTE-1: These tests shall be witnessed by PURCHASER / CONSULTANT	
22.	Pneumatic Block Valves:	(a) IBR certificate Form III C (b) Hydrostatic test : ANSI B 16.34 (Note 1) (c) Seat leakage test : As per ANSI B 16-104 (Note-1) (d) CV test : As per ISA procedure (Note 1)	
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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME V SECTION : D5.4
Package: EPC	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>INSTRUMENTATION AND CONTROL EQUIPMENT</b> SPECIFICATION FOR INSTRUMENTATION & CONTROL EQUIPMENT	SHEET 7 OF 42

coloured LCD or fluorescent tube with user selectable span; programmability (selection of input & scan/storage rate) shall be through Front panel keyboard; the recorder shall have the capability of being drawn out from the front side of the housing for maintenance and shall have electrical connection of plug-in type; material of casing shall be die-cast aluminium with epoxy coating and with a non-glare shatter proof Glass; enclosure shall be IP32 The quantity of Hybrid recorders shall be 4 nos.

#### 1.21 Pressure and Differential Pressure Transmitter Racks

Open type transmitter racks to mount all pressure, differential pressure and flow transmitters with vibration dampener: air supply lines and header shall be provided with bulk head fittings to receive impulse lines; Also provided with blow down/drain header. The material of accessories shall be SS. Drains shall be connected upto suitable Owner / Project Manager's drain header. The quantity shall be as required for the specified Pressure and Diff. Pressure transmitter.

#### 1.22 Junction Boxes (JB)

All JB's shall be Galvanised. Wall/column mounted junction boxes having 32 (2x16) terminals and cable entry only at the bottom and sealed with fireproof compound; Screwed terminal type; IP 65 or equivalent degree of protection for enclosure. Separate terminal blocks shall be used for analog and digital signal and also for signals with different voltages. Removable gland plate shall be supplied. JB shall have single lockable door with gasket, able to open side ways, with common keys. Painting inside shall be glossy white & outside - IS-5 shade 631. Shield bus for screw connection shall be provided. Terminal size shall be suitable for 0.5 sq.mm to 2.5 sq.mm wire. Terminal blocks shall be vertical. JB shall have provision to add 10% additional terminals. Accessories like metal tag (SS), clamps, fixtures, bolts (SS), nuts (SS), gaskets (neoprene), lock & key, fireproof compound for sealing, etc. shall be supplied. The grouping of instruments in JB's is subject to Owner / Project Manager's approval. All the field Junction boxes shall have single doors and provision for locking. The doors shall not have screwed type of locking, but turnable hinge based. The JB's are subject to approval prior to manufacturing All JB's shall be provided with individual canopies to avoid ingress of water.

All the TB's used shall be 6.6polymide to withstand corrosion and the metallic portion shall be coated against rust / corrosion.

#### 1.23 Programmable Logic controller (PLC)-Refer Cl.no. 9.0 & Table-15

#### 1.24 Interposing Relays (IPR)

Electro magnetic type IPRs with plug-in type connections, suitable for channel/rail mounting in cabinets; coil rating 24V D.C; 2 set of silver plated Change over contacts rated for 0.2A 220 V DC. Freewheeling diode across relay coil (copper) and self reset type status indicator flag (electronic) shall be provided. All relays

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SPEC.NO. TCE.5750A-H-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b>	VOLUME II SECTION – C 13
	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>PAINTING REQUIREMENTS</b>	SHEET 1 OF 14
<p><b>PAINTING</b></p> <p>13.0</p> <p>13.0.1 This section defines the technical requirements for surface preparation selection and application of paints on equipment, vessels, machinery, piping, ducts etc. However, manufacturers shall follow their standard procedures for painting their equipment. The Bidder shall submit a detailed painting procedure for approval of OWNER / OWNER'S representative after the award of contract.</p> <p>13.0.2 The following surface and material shall require painting:</p> <ol style="list-style-type: none"> <li>All un-insulated carbon steel and alloy steel equipment like columns, vessels, drums, storage tanks, heat exchangers etc.</li> <li>All un-insulated carbon steel and low alloy piping, fitting and valves (including painting of identification marks)</li> <li>All pipe structural steel supports, walkways, platforms, hand rails, ladders etc.</li> </ol> <p>13.0.3 The following surfaces and material shall not require painting:</p> <ol style="list-style-type: none"> <li>Non-ferrous materials</li> <li>Austenitic stainless steel</li> <li>Plastic and / or plastic coated materials</li> <li>Insulated surface of equipment and pipes except colour coating wherever required</li> <li>Painted equipment like blowers, pumps, valves, etc., with finishing coats in good condition and with matching colour-code</li> </ol> <p>13.1.0 <b>Codes and Standards</b></p> <p>13.1.0.1 Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS specification for the material and workmanship.</p> <p>13.1.0.2 The following Indian Standards may be referred to carrying out the painting job.</p> <p>IS : 5 : Colours for ready mixed paints and enamels</p> <p>IS : 1303 : Glossary of terms relating to paints</p> <p>IS : 2379 : Colour code for identification of pipelines.</p> <p>IS : 1477 : Code of practice for painting of ferrous</p>		
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	<b>RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 &amp; 8 at Suratgarh, Rajasthan</b> <b>PAINTING REQUIREMENTS</b>	SHEET 2 OF 14
<p>metals in buildings (Parts I &amp; II)</p> <p>IS: 2524 : Code of practice for painting of non-ferrous metals in buildings (Parts I &amp; II)</p> <p>IS : 2395 : Code of practice for finishing of concrete, masonry and plaster surfaces (Parts I and II)</p> <p>IS : 2338 : Code of practice for finishing of wood and wood based materials (Parts I &amp; II)</p> <p>IS : 158 : Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting</p> <p>IS : 2074 : Ready mixed paint, air drying, red oxide zinc chrome, and priming.</p> <p>IS : 104 : Ready mixed paint, brushing, zinc chrome, priming</p> <p>IS : 2932 : Enamel, synthetic, exterior</p> <p>(a) undercoating (b) Finishing.</p> <p>SIS : 55900 : Swedish standard for blasting</p> <p>IS: 14506 : Epoxy Red oxide Zinc Phosphate Weldable Primer, Two Component Specification</p> <p>IS: 14209 : Epoxy Enamel, Two Component, Glossy Specification</p> <p>IS: 14589 : Zinc priming paint, Epoxy based, Two-pack-specification</p> <p><b>13.2.0 SURFACE PREPARATION</b></p> <p>The surface shall be prepared in a manner suitable for coatings. Chemical de-rusters or rust converters shall not be applied. Acid cleaning is subject to approval of PURCHASER / PURCHASER'S representative.</p> <p><b>13.2.1 Blasting</b></p>		
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<p>The surface of the part / component shall be blasted before the coating material is applied.  Unless otherwise specified in the documents, the surface shall satisfy the following requirements after blasting:  Primer paint shall be zinc silicate of approved brand. Dry film thickness of each primer coat shall be 15 – 25 µm</p>		
13.2.2	<b>Manual Rust Removal</b>	
	Manual rust removal shall be allowed for welded zones and for touching up installed components.	
13.2.3	<b>Cleaning</b>	
	Removal of impurity	
	Impurity	Removal
(a)	Dust, loose deposits	Vacuum-cleaning, brushing
(b)	Adhesive deposits	Power brushing
(c)	Oils, greasy impurities	Wet blasting, use of detergent additives by agreement
(d)	Salt deposits	Rinsing
(e)	Markings (e.g., felt tip pen)	Organic solvents to manufacturer's specifications e.g., Trichloro- trifluoro -ethane and solvents containing acetone (renew solvent and rag frequently).
13.3.0	<b>PROCESSING</b>	
13.3.1	<b>General</b>	
13.3.1.1	<b>Application Conditions</b>	
	<p>The primer shall be applied to properly prepared surfaces only. The specifications of the coating material manufacturers shall be observed.  The minimum temperature shall be +5°C and the relative humidity shall not exceed 80%. The temperature of the work piece shall be at least 3 °C above dew point.</p>	
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13.3.1.2	<p><b>Application Procedure</b></p> <p>The primer shall be applied by means of brush or by spray. The top coats shall be applied by means of brush, roller or by spray.</p> <p>At points where coating application is interrupted, the individual layers shall be adequately stepped to ensure proper layer sequence when coating operations are resumed</p>	
13.3.1.3	<p><b>Touching Up</b></p> <p>Before each layer is applied, previous coating shall be touched up where necessary by way of rust removal and cleaning, according coating MANUFACTURER'S specifications. The final top coat shall be reapplied completely, if required.</p>	
13.3.1.4	<p><b>Uncoated Surfaces</b></p> <p>Moving parts of machines (e.g., stems, shafts, sliding and locating bearings), nameplates, instruments and sealing surface shall not be coated. Welds shall be left free of coating up to a distance of 30 mm on each side of the weld edge until erection and weld examinations, if any, have been completed.</p>	
13.3.1.5	<p><b>Bond Strength</b></p> <p>The pull-off stress determined using the pull-off test method for adhesion shall be not less than 1.5 N/mm<sup>2</sup>, according to ISO 4624.</p>	
13.3.1.6	<p><b>Surface Conditions of Coating Surfaces</b></p> <p>The coating surface shall have a uniform film thickness, shade and gloss and shall be free from inclusions, sags and wrinkles.</p>	
13.3.1.7	<b>Coating Systems</b>	
13.3.1.7.1	<p><b>General Requirements for Coating Systems</b></p> <p>Coating materials according to SSPC, BS 5493 or DIN 55 928 shall be used. Intermediate coats are to be pigmented with micaceous iron oxide. The materials shall be matched with each other so that they are compatible. Coatings deviating from this specification shall be subject to approval. Standards of surface preparation and painting shall give a time to first maintenance of 10 years.</p> <p>The colour and gloss of top coats shall be in accordance with sub-clause suggested colour codes for painting (Sub-clause 13.10).</p>	
13.3.1.7.2	<b>Standard Coating System (External Coatings)</b>	
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a) **Steel Structures**

- i. All steel structures shall receive two primer coats and two finish coats of painting. First coat of primer shall be given in shop after fabrication before dispatch to erection site after surface preparation as described below. The second coat of primer shall be applied after erection and final alignment of the erected structures. Two finish coats shall also be applied after erection.
- ii. Steel surface which is to painted shall be cleaned of dust and grease and the heavier layers of rust shall be removed by chipping prior to actual surface preparation. The surface shall be abrasive blasted to Sa-2½ finish as per SIS05-5900. Primer paint shall be zinc silicate of approved brand. Dry film thickness of each primer coat shall be 40 microns.
- iii. Finish paint shall be 2 coats of High built epoxy finish of approved brand. Dry film thickness of each finish coat shall be 90 microns. The undercoat and finish coat shall be of different tint to distinguish the same from finish paint. The total dry film thickness shall be 300 microns. All paints shall be of approved brand and shade as per the OWNER'S requirement.
- iv. Joints to be site welded shall have no paint applied within 100 mm of welding zone. Similarly where Friction grip fasteners are to be used no painting shall be provided. On completion of the joint the surfaces shall receive the paint as specified.
- v. Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly. Surfaces inaccessible after erection including top surfaces of floor beams supporting gratings or chequered plate shall receive one additional coat of finish paint over and above number of coats specified before erection. Portion of steel member embedded / to be encased in concrete shall not be painted.

b) **Galvanised iron and steel requiring paint finish at site**  
At site

Surface Treatment  
Mechanical cleaning from contaminants by means of washing or steam jetting and sweep blasting with fine sand or etching (T-Wash).

Touch-up mechanical damages:  
De rusting St 3 and application of high build epoxy primer DFT 80 µm.

Finish coating:  
Analogous to standard painting scheme

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13.3.1.7.2.1	<p><b>Painting of indoor components such as valves, pumps, motors, electrical parts, tanks etc.</b></p> <p>a) At works</p> <p><u>Surface preparation:</u> Blasting according to SIS 055900: grade SA 2 ½. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer dry film thickness 15 – 25 µm, may be used.</p> <p><u>Prime coat:</u> Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 µm.</p> <p>b) At site</p> <p>Thorough cleaning to remove oil, grease, dirt and any other contaminants. De-rusting of all mechanical damages according to SIS 055900 Grade ST3. Touch up with dry film thickness 50 µm.</p> <p><u>Finish coat:</u> Application of two finishing coats of Chlorinated rubber paint in approved shades at 30-40 microns DFT each coat in approved shades.</p>	
13.3.1.7.2.2	<p><u>Remarks:</u> Equipment coated with a standard application system can be accepted if the quality of this application system is corresponding with the quality of the above mentioned system.</p>	
13.3.1.7.2.3	<p><b>Painting of Outdoors equipment (external surfaces) such as piping, valves, pumps, motors, electrical parts, tanks etc.</b></p> <p>Weather exposure, weather resistance, temperature up to 120°C as per 13.7.1 and 13.7.3.</p> <p><u>Surface Preparation:</u> Blasting according to SIS 055900: grade Sa 2 ½. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer dry film thickness 15-25 µm, may be used.</p> <p><u>Prime Coat:</u> Two (2) layers of zinc phosphate epoxy, total dry film thickness 75 µm.</p> <p><u>Intermediate Coat:</u> One (1) layer 2 pack high build epoxy polyamide Mio, dry film thickness 100 µm.</p>	
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<p><u>Finish Coat:</u> Application of two finishing coats of Chlorinated rubber paint in approved shades at 50 microns DFT each coat in approved shades.</p> <p>13.3.1.7.2.4      <b>Special Coating System (External Coatings)</b></p> <p><b>Parts exposed to temperatures above 120<sup>0</sup>C, up to 200<sup>0</sup>C, not insulated</b></p> <p>a)    At works</p> <p><u>Surface Preparation:</u> Blasting according standard SIS 55900 Grade Sa 2<sup>1</sup>/<sub>2</sub> and ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm, may be used</p> <p><u>Prime coat</u> Inorganic ethyl zinc silicate, dry film thickness 75 µm.</p> <p>b)    At site</p> <p><u>Pre-treatment:</u></p> <p>De-rusting of all mechanical damages, according to ISO 8501-1: 1989, grade St 3 Touch-up with 1 pack inorganic ethyl zinc silicate, dry film thickness 50 µm. Removal of all decontaminants from prime coat.</p> <p><u>Intermediate Coat:</u> 1 pack silicon acrylic, dry film thickness 35 µm.</p> <p><u>Final coat</u> 1 pack silicon acrylic, dry film thickness as 35 µm.</p> <p>Total system dry film thickness 145 µm. Final coat according to colour code.</p> <p><b>Parts exposed to temperatures above 200<sup>0</sup>C, up to 400<sup>0</sup>C, not insulated</b></p> <p>At works</p> <p><u>Surface Preparation:</u></p> <p>Blasting according to ISO 8501-1: 1988 grade Sa 2<sup>1</sup>/<sub>2</sub>. Depending on</p>		
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<p>production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film 15-25 µm, shall be used.</p> <p><u>Prime coat:</u></p> <p>Inorganic ethyl zinc silicate, dry film of thickness 75 µm.</p> <p>At site</p> <p><u>Pre-treatment:</u> De-rusting of all mechanical damages, according standard Sa 2 1/2 to ISO 8501-1: 1988. Touch-up with coating system according to MANUFACTURER'S recommendations.</p> <p><b>Insulated Parts, continuously exposed to condensing water or parts exposed to temperatures</b></p> <p>a) For parts that are provided with insulation on site. Insulated parts, exposed to condensing water</p> <p>At works</p> <p><u>Surface Preparations:</u></p> <p>Blasting according standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm shall be used.</p> <p><u>Prime coat:</u></p> <p>Inorganic ethyl zinc silicate, dry film thickness 75µm.</p> <p>b) Insulated parts exposed to temperatures Parts, exposed to temperatures up to &lt;400<sup>0</sup>C at works</p> <p><u>Surface Preparation:</u></p> <p>Blasting according to standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm shall be used.</p> <p>Parts, exposed to temperatures above 400<sup>0</sup>C at works (Steam pipes, pressure tubes and parts for the HRSG, such as heating surfaces, heaters and super heaters reheaters, etc.)</p> <p><u>Surface preparation:</u></p>		
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<p>Blasting according standard Sa 2 1/2 to ISO 8501-1: 1988.</p> <p><u>Temporary primer:</u></p> <p>Varnish.</p> <p>c) Intermittent exposure due to condensing water / chemicals (Indoors) At works</p> <p><u>Surface Preparation:</u> Blasting according to standard Sa 2 1/2 to ISO 8501-1: 1988. Depending on production flow, a weldable, inorganic ethyl zinc silicate shop primer, dry film thickness 15-25 µm may be used.</p> <p><u>Prime Coat:</u> Two layers of zinc phosphate epoxy primer total dry film thickness greater than or equal to 75 µm.</p> <p>At site <u>Pre-treatment:</u></p> <p>De-rusting of all mechanical damages, according standard Sa 3 to ISO 8501-1: 1988, touch-up with 2 pack high build epoxy with volume solid content of more than 85%, 75 µm.</p> <p><u>Intermediate Coat:</u> 2 pack high build epoxy, dry film thickness 80 µm.</p> <p><u>Finish coat:</u></p> <p>2 pack epoxy according to colour appearance, dry film thickness of 50 µm.</p> <p>Total system dry film thickness 205 µm.</p> <p>When exposed to weathering, weather resistance finish coat shall be applied.</p> <p>d) Water exposure</p> <p>Surfaces permanently or predominantly in contact with water.</p> <p>At site / works</p> <p><u>Pre-treatment:</u></p>		
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<p>Removal of all welding pearls. Blasting according standard Sa 3 to ISO 8501-1: 1988.</p> <p><u>Coat:</u></p> <p>4 coats 2 pack coal-tar-epoxy, dry film thickness 125 µm each. Total system dry film thickness 500 µm. Touch-up after erection as required.</p> <p><b>13.3.1.7.2.5 Buried / underground piping system (except for sea water piping)</b> Where pipelines are buried, underground protection shall be provided for the piping system as indicated in any one of the methods given below: Coal tar primer, coal tar enamel, inner wrap of fibre glass, final outer wrap of enamel impregnated fibre glass. Total thickness of coating shall not be less than 4.0 mm. With anti-corrosive tape of minimum 4 mm thick conforming to IS-10221 and AWWA C 203-93.</p> <p>Pipe surfaces shall be cleaned by shot or sand blasting before application.</p> <p>Tests to be carried out after application Bond / Adhesion test Holiday test</p> <p><b>13.3.1.7.3 INTERNAL COATINGS</b></p> <p><b>13.3.1.7.3.1 Tanks (Internal Surfaces) as specified in relevant sections of specification</b> Industrial, deionised, demineralised and potable water up to 60°C pH range: 4.5 – 9.5. Blasting according to ISO 8501-1: 1988, grade Sa 2<sup>1/2</sup>.</p> <p><u>Prime coat:</u> Two layers of zinc phosphate epoxy primer total DFT greater than or equal to 75 µm.</p> <p><u>Pre-treatment:</u> De-rusting of all mechanical damages, according to standard Sa 3 to ISO 8501-1:1998, touch up with 2 pack high build epoxy with volume solid content of more than 85%, 75 µm.</p> <p><u>Intermediate coat:</u> 2 pack high build epoxy, dry film thickness 80 µm.</p>		
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<p><u>Finish coats:</u> 2 pack solvent free epoxy paint dry film thickness 150 µm per coat. In case of service or potable water tanks, the coating material selected shall not taint the water. QA / QC procedure, including pinhole inspection, for shall be submitted for approval by Owner / Owner's Representative.</p> <p>13.3.1.7.3.2      <b>Rubber Lining of Pipes, Valves and Tanks as specified in relevant sections.</b></p> <p>At works</p> <p><u>Pre-treatment:</u> Blasting according standard 2<sup>1</sup>/<sub>2</sub> to ISO 8501-1: 1988.</p> <p><u>Rubber lining:</u> Hard-rubber 5mm for DM water applications, thickness greater than or equal to 3 mm for others. In case of failure of rubber lining for both pipes and vessels, the rubber lining shall be replaced by COROCOAT</p> <p>13.4.0      <b>Painting for Electrical Items</b> 13.4.1      All the steel work shall be thoroughly cleaned of rust, scale, oil, grease, dirt and scarf by pickling, emulsion cleaning, etc. The sheet steel shall be phosphated / oven dried and then painted with two coats of zinc rich primer paint. After application of the primer, two coats of finishing synthetic enamel paint shall be applied. The colour of the finishing coats inside shall be glossy white and exterior of the treated sheet steel shall be shade 631 of IS-5 / RAL 7032 for all switchboard/MCC/ Distribution boards, control panels, etc.</p> <p>13.4.2      All electrical equipment shall be given tropical and fungicidal treatment and outdoor equipment shall be provided with rain hood to prevent entry of rain water into the equipment.</p> <p>13.5.0      <b>Painting for I &amp; C equipment: Epoxy coating required for all I&amp;C equipment.</b> 13.5.1      <b>Suggested Colour Codes for Painting</b></p> <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Item / Service</th> <th>Colour</th> <th>IS-5</th> <th>Colour (Band)</th> <th>IS - 5</th> </tr> </thead> <tbody> <tr> <td colspan="6" style="height: 40px;"></td> </tr> </tbody> </table>			Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS - 5						
Sl. No.	Item / Service	Colour	IS-5	Colour (Band)	IS - 5									
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13.5.1	Structures, platforms, galleries, ladders and handrails.	Dark Admiralty Grey	632	-	-
13.5.2	Boiler casing, ducting	Nut Brown	413	-	-
13.5.3	Crane				
(a)	Crane structure	Golden Yellow	356	Black	-
(b)	Trolley and hook	Crimson	540	-	-
13.5.4	Pump motors, compressors	Light Grey	631	-	-
13.5.5	Tanks (without insulation and cladding)				
(a)	Outdoor	Aluminium	-	-	-
(b)	Indoor	Light Grey	631	-	-
13.5.6	Vessels and all other proprietary equipment (without insulation and cladding)	Light Grey	631	-	-
13.5.7	Switchgear	Light Grey	631	-	-
13.5.8	Control and relay panels	Light Grey	631/ 7078 of IS1650	-	-
13.5.9	Turbines	Light Grey	631	-	-
13.5.10	Generators and exciter	Light Grey	631	-	-
13.5.11	Transformers	Aluminium	-	-	-
13.5.12	Machinery guards	Signal red	537	-	-
13.5.13	Piping (Without insulation and cladding)				
(a)	Water System				

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(i)	Boiler feed	Sea Green	217	-	-
(ii)	Condensate	Sea Green	217	Light Brown	410
(iii)	DM Water	Sea Green	217	Light Orange	557
(iv)	Soft Water	Sea Green	217	French Blue	166
(v)	Bearing cooling water	Sea Green	217	French Blue	166
(vi)	Potable and filtered water	Sea Green	217	French Blue	166
(vii)	Service and clarified water	Sea Green	217	French Blue	166
(viii)	Cooling water	Sea Green	217	French Blue	166
(ix)	Raw water	Sea Green	217	White	-
(b)	Air system				
(i)	Station air	Sky Blue	101	-	-
(ii)	Control air	Sky Blue	101	White	-
(c)	Oil system				
(i)	Light oil (HSD)	Light Brown	410	French blue	166
(ii)	Lubricating oil	Light Brown	410	Light grey	631
(iii)	Transformer oil	Light Brown	410	Light Orange	557
(d)	Gas system				
(i)	Fuel gas (Re-gassified LNG)	Canary Yellow			
(ii)	Carbon dioxide	Canary Yellow	309	Light grey	631
(iii)	Hydrogen	Canary Yellow	309	Signal red	537
(e)	Fire Services	Fire red	536	-	-
(f)	Effluent pipes	Black	-	-	-
(g)	Vacuum pipes	Sky Blue	101	Black	-
(h)	Drainage	Black	-	-	-
NOTES					
1.	This colour code basically refers to IS: 2379 for piping with necessary modifications.				
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<p>2. Where band colour is specified, same shall be provided at 10 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.</p> <p>Note: Bidder shall furnish his painting specification to suit corrosive atmosphere of coastal area along with the bid. The specification shall in general be in line with the above requirements.</p>		
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Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: **PE-TS-392-145-I 801**

VOLUME II B

SECTION D

REV. NO. 00

DATE : 15.07.2013

SHEET OF

## SECTION-D

**EQUIPMENT SPECIFICATION**  
**DATA SHEETS - A&B**  
**DATA SHEETS - C**  
**QUALITY PLAN**  
**BILL OF QUANTITY**  
**SPARES**





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

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: **PE-TS-392-145-I 801**

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SECTION D

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# SECTION – D

## EQUIPMENT SPECIFICATION



## SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PES – 145 - 06

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SECTION D

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### 1.0 SCOPE

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) for use in Utility/Captive Power Station/Combined Cycle Station.

### 2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 The Design and Materials used for the components shall also comply with the relevant National and International standards.

2.3 As a minimum requirement, the following standards shall be complied with :

Indian Boiler Regulation (IBR)	:	
Allowable Seat leakage	:	ANSI-B16.104 / FCI-70.2
Pressure & Temperature ratings	:	ANSI-B16.34
Enclosure class	:	IEC-144 / NEMA / IS-13947
Control Valves	:	ISA S-75
Electric Motor operated Actuators	:	IS-9334

### 3.0 TECHNICAL REQUIREMENTS

The Control valve, Actuator and the accessories shall be suitable for continuous operation under an ambient temperature of 0-55°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 operating conditions and system characteristics as specified in the Data Sheet-A.

3.1.1 The control valve shall be of globe body design with single port. The valve trim, shall be suitable for quick removal without any cutting or welding.

3.1.2 The material of body, internals and packing shall be as specified in the data sheets. Alternatives, considered more suitable for service specified may be given as alternative offer, along with adequate justification. However main offer shall totally meet specification requirements. Asbestos shall not be used for the packing or any other component.

3.1.3 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. Bonnets having teflon packing shall have valve stem finished to 2-4 microns. Packing material requiring lubrication will not be acceptable. Justification for proper selection of bonnet & packing shall be furnished in the bid.

3.1.4 The valve end connection as specified in Data Sheet-A shall conform to ANSI B16.25 for Butt Weld connection and ANSI B16.5 for flanged ends. End to end dimension shall be as per ANSI 16.10.

3.1.5 The valve seat leakage shall be as per ANSI B16.104 / FCI-70.2. The leakage class shall be as per Data Sheet-A.



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- 3.1.6 The valve body shall have the direction of flow embossed on all valves.
- 3.1.7 The sizing shall conform to the requirements of ANSI/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. |   |                    |
- 3.1.8 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 implication.
- 3.1.9 Suitable justification and evidence shall be furnished regarding proper selection of the valve.
- 3.1.10 The valve outlet velocities shall be limited to the following values, unless otherwise specified in the Data sheet-A.
- |     |                |    |  |
|-----|----------------|----|--|
| i)  | Liquid service | <= | 7 Metres/Sec.                          |
| ii) | Steam service  | <= | 1/3 Sonic velocity in the flow medium. |
- 3.1.11 For flashing duty, the trim design shall be such that the vapour bubbles are kept away from valve body.
- 3.1.12 For cavitation service, the trim design shall be of multistage pressure drop type, so as to avoid cavitation altogether, instead of keeping cavitation away from valve parts.
- 3.1.13 In case of predicted noise level above 85 dBA, suitable low noise trim or inbuilt diffusers shall be provided to bring down the noise level below 85dBA.
- 3.1.14 The equivalent weighted sound level measured at 1.5M. above floor level in elevation and one 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 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.



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### 3.2 Pneumatic Actuator

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 and shut off pressure.

3.2.1 The pneumatic spring opposed diaphragm actuator 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 20 seconds under the most stringent service conditions.

3.2.5 The actuator shall be painted with epoxy based paint.

### 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 tube and flareless brass fittings (Refer typical hook up diagram in sheet 12 of 12).

#### 3.3.1 Handwheel

Handwheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve. The handwheel shall have a circular stainless steel plate with Tag number and service.

#### 3.3.2 Local Position Indicator

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

#### 3.3.3 Position Transmitter

The position transmitter shall be supplied as indicated in Data Sheet-A. The electronic position transmitter shall be non-contact type with 4-20 mA DC 2-wire output suitable for 12-50V DC supply. The resistance type position transmitter shall have 0-100 ohm variation for valve position change of 0-100%. The position transmitters of both types shall have accuracy and enclosure class. Necessary cable glands shall be supplied.



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### 3.3.4 Air Filter Regulator

Instrument quality air at suitable pressure of 5.5 Kg/Cm<sup>2</sup>(g) to 7 Kg/Cm<sup>2</sup>(g) shall be supplied to each valve through air filter regulator. The filter regulator shall include an inbuilt blow-down valve, 5 micron size filter. The design pressure for regulator shall be 7 Kg/cm<sup>2</sup>g. The Air filter regulator shall be selected to meet the requirements of positioner/actuator, E/P convertor and air-lock. The flow capacity of the Air filter regulator shall be variable with a knob. Output gauge shall be provided wherever pneumatic positioner is not specified for the valve.

### 3.3.5 Air Lock Relay

Air lock relay shall retain the valve position stayput, in case of air supply failure and shall reset automatically on resumption of air supply. Air lock shall have a threaded plug for evacuating diaphragm air if required for local manual operation.

### 3.3.6 Solenoid Valves

Solenoid valves are meant for interlock & protection purposes overriding the controller signal, and/or to result stayput action on controller signal failure. The Solenoid valve shall be 3-way **Universal** type and the valve internals shall be of stainless steel. The coil shall have class-H insulation and rated for continuous AC/DC duty as specified in Data sheet-A. The enclosure shall be to IP-55. Cable gland shall be provided for cable entry. The solenoid shall in general conform to IS-8935. The solenoid operation shall be universal type. The solenoid shall be suitable for 24V DC supply, unless specified otherwise in Data Sheet-A.

### 3.3.7 Limit Switches

Limit switches are required as specified in the data sheet-A. Each limit switch shall have 2NO+2NC contacts with contact rating of 5A at 240V AC/0.2A at 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.

### 3.3.8 I/P Converter

I/P Converters shall preferably be of force balance type and shall produce pneumatic output signal corresponding to input current signal, also specified in Data Sheet. Convertor electronics shall be protected against reverse connection of signal polarities and a separate external connection shall be provided to facilitate grounding of instrument casing. Cable glands with neoprene gromets suitable for PVC cables shall be provided. I/P convertor shall have span adjustment facility. I/P convertor enclosure shall conform to IP-55 enclosure class.

### 3.3.9 Positioner

Positioner shall be suitable for accepting controller output signal 0.2-1.0 Kg/cm<sup>2</sup>, 0.2-0.6 Kg/cm<sup>2</sup> or 0.6-1.0 Kg/cm<sup>2</sup> as specified and give an output suitable for the actuator. Pneumatic positioner shall have 3 gauges. All gauges shall have metric scales. The positioner input signal range shall be adjustable. Wherever applicable, it shall be possible to bypass the positioner by means of a switch. **Linearity and Hysteresis shall be as indicated in Data sheet-A**

### 3.3.10 Electro pneumatic Positioner

In place of separate E/P Converter and pneumatic positioner a combined electro pneumatic positioner can also be supplied. The electro pneumatic positioner shall have 2 gauges.



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### 3.3.11 Junction Box

Wherever specified, an integral junction box with all electrical accessories conduited up to JB shall be supplied. The junction box shall have two (2) cable glands for outgoing cables. Junction box shall have enclosure class of IP-55.

### 3.4 Guarantee & Performance

3.4.1 The overall performance of the control valve with pneumatic actuator assembly shall be as follows:-

i)	Hysteresis	:	$\pm 1\%$ of span
ii)	Linearity	:	$\pm 2\%$ of span
iii)	Sensitivity	:	$\pm 0.5\%$ of span.
iv)	Repeatability	:	$\pm 1\%$ of span
v)	Accuracy (Overall)	:	$\pm 2\%$ of span

3.4.2 The guarantee for the control valve, pneumatic actuator & accessories shall be for 12 months continuous operation from the date of commissioning, unless specified otherwise in VOL-IIB Section-B or Section-C.

### 3.5 Electric Actuator

The electric actuator shall be employed for modulating duty.

3.5.1 The actuator assembly shall be complete with drive motors, gears, hand wheel, signaling & switching units, associated control, integral starter, (when specified) and other accessories as required.

3.5.2 The Electric Actuator shall be capable of positioning the associated valve at the desired opening for all the operating conditions.

3.5.3 The motor shall meet the requirements of Current, torque, Axial thrust, Accelerating & stall time as imposed by the driven equipment.

3.5.4 The motor shall be suitable for direct on line starting.

3.5.5 Motors shall be suitable for inching & plugging duty operations.

3.5.6 The motors shall be capable of starting and accelerating to rated speed at 85% of rated voltage.

3.5.7 The motors shall be rated for continuous operations for modulating duty.

3.5.8 The motor shall operate satisfactorily under the following conditions:

- i)  $\pm 10\%$  supply voltage variation at rated frequency.
- ii)  $-5\%$  to  $+ 3\%$  variation in frequency at rated supply voltage.

iii) Simultaneous variation in voltage and frequency, the sum of absolute percentage not exceeding 10%.  
3.5.9 The Actuator shall be suitable for mounting directly on the valve and shall be suitable for mounting in any position. Supports required for inclined mounting shall form part of supply of valve assembly.

3.5.10 The actuator shall be capable of producing the required torque and thrust at the output shaft for satisfactory operation of the associated valve.



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- 3.5.11 Each actuator shall have a hand wheel for emergency operation. The hand wheel shall be designed such that it is declutched automatically when the power supply to the motor is restarted.
- 3.5.12 The hand wheel shall be so arranged that when looking from hand wheel, the valve is closed by rotating the hand wheel in clockwise direction.
- 3.5.13 Motor shall be totally enclosed conforming to IP-65 or better as per data sheet. The enclosure shall be suitable to protect the motor from leakage steam, water or oil from valve joints and glands.
- 3.5.14 Where flameproof enclosures are specified, it shall meet the specification IS-2148.
- 3.5.15 Insulation shall be at least class-B or better and shall be tropicalised to withstand the atmospheric condition.
- 3.5.16 The actuator shall be provided with antifriction bearing in grease filled cartridge.
- 3.5.17 Each actuator shall be provided with a mechanical position indicator to indicate accurately the valve position.
- 3.5.18 The integral starter, if specified in data sheet-A, shall be provided in weatherproof enclosure with protection class not less than IP-65 or better as per data sheet.

The integral starter shall consist of:

- i) Mechanical & Electrically interlocked reversing contractors suitable for class AC4 duty or Thyristor as per data sheet.
- ii) Thermal overload relay.
- iii) Step down control transformer with fuses.
- iv) Interposing relay.
- v) Monitoring relay..
- vi) Open, Close & Stop push buttons.
- vii) Indicating lamps.
- viii) Local-Remote lockable selector switch with spare potential free contacts, wired for remote interface.
- ix) A potential free contact shall be provided for remote annunciation of power failure/overload condition. The contact shall be SPDT, rated for at 5A 240V AC or 0.2A at 220V DC.



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- 3.5.19 The actuator shall be suitably time rated for the duty cycle involved with the necessary number of starts per hour, but in no case, less than 1200 starts per hour.
- 3.5.20 The actuator shall be provided with a suitable control unit for receiving 4-20 mA signal from remote controller.
- 3.5.21 The servomotor gear should have self locking or suitable brake so as to maintain it's last position as and when the motor power is switched off.
- 3.5.22 Thermostat/Thermistor as specified in the data sheet shall be provided for sensing the winding temperature and giving trip command. The trip contact shall be change over type. The contact shall be wired up to the actuator terminal box.
- 3.6 Accessories for Control Valve with Electric Actuator
- 3.6.1 Torque Switches
- i) Each actuator shall be provided with at least one open and one close torque switches each with 2 NO+2 NC contacts. The contacts shall be rated for 5A at 240V AC or 0.2A at 220V DC.
  - ii) The torque switches shall have a minimum accuracy  $\pm 3\%$  of set value.
  - iii) The torque switches shall be provided with calibrated knobs for setting desired torque. Separate knobs shall be provided for close and open torque switches.
  - iv) The torque switches shall be provided with mechanical latching device to prevent operation when unsealing from the positions. The latching device shall unlatch as soon as the valve leaves the end position. If such provision is not possible, the torque switches shall be bypassed by end position limit switches, which open on valve leaving end position. These limit switches are additional to the number of limit switches specified elsewhere.
  - v) The torque switches or worm gear shall be self-locking type so that when torque switch operates it remains operated until the actuator is operated in the reverse.
  - vi) The torque switch enclosure shall conform to IP-55.
- 3.6.2 Limit Switches
- Each limit switch shall have 2NO+2NC contact with contacts rated for 5A 240V AC/0.2A 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.
- 3.6.3 Space Heater
- A space heater shall be provided in limit switch and starter compartments to prevent condensation. This shall be suitable for the power supply specified in the data sheet. Where integral starters are provided the space heaters shall be wired to control supply within the actuator.





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### 3.6.4 Remote Position Transmitter

The position transmitter shall be supplied as indicated in Data Sheet-A. The electronic position transmitter shall be non-contact type with 4-20mA DC 2-wire output suitable for 12-50V DC supply. The resistance type position transmitter shall have 0- 100 ohm variation for valve position change of 0-100%. The position transmitters of both types shall have  $\pm 1\%$  accuracy. The enclosure shall conform to IP-55. Necessary cable glands shall be supplied.

### 3.6.5 Wiring

- i) The actuator and the accessories will be neatly wired up to the terminal boxes.
- ii) The internal wiring shall be minimum of 1 mm<sup>2</sup> stranded PVC insulated copper conductor.
- iii) The wiring shall be identified by means of numbered ferrules on both ends of all wires.

### 3.7 Terminal and Terminal boxes

#### 3.7.1 Motor Terminal Box

- i) The terminals, terminal boards, terminal boxes, winding tails and associated equipment shall be suitable for connection to supply system having short circuit capacity specified in data sheet and clearance time determined by the associated fuses.
- ii) The terminals shall be stud type insulated from the frame. The insulation shall not be porcelain. The studs shall be of brass or stainless steel or phosphor bronze of adequate size.
- iii) The terminal box shall be totally enclosed conforming to degree of protection IP-65.

#### 3.7.2 Actuator Terminal Box

- i) All terminals of limit and torque switches, space heater, position transmitters, thermostat/thermister shall be brought to a common terminal box. The enclosure shall be to degree of protection IP-65.
- ii) Terminal board with plug in connector shall be provided. Alternatively stud type or insertion type may be considered. Pinch screw type however will not be accepted. All terminals shall be shrouded to prevent accidental contact. Where stud type terminals are offered, it shall be as per clause 3.7.1 (ii).
- iii) There shall be at least five terminals spare to terminate spare cores of cable.

#### 3.7.3 Cable Glands

The motor terminal box and actuator terminal box shall be provided with required number of double compression nickel plated brass cable glands to suit cable type and associated size.

#### 3.7.4 Earthing Terminal

Two earthing terminal shall be provided on either side of motor and actuator terminal box.

#### 3.7.5 Painting

The Actuator shall be painted with epoxy-based paint.



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### 4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.

4.2 The bidder shall furnish the Quality Plan in the format enclosed in volume-III. In case the Quality Plan(s) is/are included in volume-II B, the bidder shall furnish his Quality Plan strictly in line with the same. The Quality Plan shall be discussed and finalised with the technically accepted bidders before opening the price bid. The stages where purchaser would like to be associated for witnessing or verification of tests would be indicated by the purchaser in the Quality Plan before approval.

4.3 The following test shall be conducted as a minimum requirement.

#### 4.3.1 Control Valve

- i) Radiographic tests on castings.
- ii) Dye penetrant tests on machined surface.
- iii) Ultrasonic tests for the forgings & bars of all valves with 60 Kg/cm<sup>2</sup> & higher ratings.
- iv) Hydrostatic tests as per ANSI B 16.34 prior to seat leakage tests.
- v) Valve closure and seat leakage tests as per ANSI B 16.104 / FCI-70.2.

#### 4.3.2 Pneumatic Actuators

Functional test of actuator and each accessory.

#### 4.3.3 Electric Actuator

- i) Routine tests on motors as per IS: 325.
- ii) Functional test on actuator and each accessory.
- iii) Insulation resistance and high voltage test.
- iv) Stall current & Stall torque test.
- v) Output shaft speed and torque of actuator and corresponding current tests.

#### 4.3.4 Control valve with Actuator & Accessories fully assembled

- i) Functional tests of control valve operation along with actuator & accessories.
- ii) Dimension checks.

#### 4.3.5 Type tests or Test Reports

- i) Valve lift vs. Flow test (**Cv Test**)
- ii) Degree of protection tests for the enclosures
- ii) Temperature rise test (**applicable for Electrical Actuator only**).
- iii) Type test for motor as per IS: 325.

4.4 Inspection will be conducted by BHEL and/or their authorised representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder, for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests covered under 4.3.5 above, "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorised representatives or in independent Test House/Laboratory approved by BHEL.

4.5 **The Standard QP is included in this specification to enable bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the agreed QP, taking care of customer requirements mentioned in Sec-C and submit QP for final approval by BHEL / Customer.**



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## 5.0 SPARES AND CONSUMABLES

### 5.1 Commissioning Spares and consumables

As part of the main equipment supply, the bidder shall supply all commissioning spares and consumables required during Start-up,

### 5.2 Mandatory Spares

The bidder shall offer along with main offer, the Mandatory Spares as specified in Volume IIB Section-C of the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

### 5.3 Recommended Spares

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation along with unit rate against each item to enable BHEL / BHEL's Customer to place a separate order later, if required.

### 5.4 Special Tools & Tackles

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

## 6.0 DRAWINGS AND DOCUMENTS

### 6.1 The bidder shall furnish the following documents in required number of copies along with the bid:

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

6.1.2 Wiring diagrams for Electrical Actuators.

6.1.3 Hook up diagrams of Control Valve with Actuator & accessories.

6.1.4 Valve & actuator assembly dimensional drawings with weights.

6.1.5 Quality Plan

6.1.6 All relevant Catalogs with detailed technical information.

6.1.7 Bar-chart to indicate the time schedule for procurement, manufacture, testing and despatch.

### 6.2 The successful bidder shall furnish the following documents in required number of copies to BHEL during the contract stage:

#### 6.2.1 For approval

- i) Dimensional drawings.
- ii) Installation drawings with overall dimensions of the completed equipment and clearances for operation and maintenance.
- iii) Data sheet-C, completely filled-up along with all the enclosures including the sizing calculations & noise calculations.
- iv) Quality Plan.
- v) Test Certificates.



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### 6.2.2 Final / As-built Drawings

Final / As-built drawings / CDs in required number of copies shall be submitted.

### 6.3 Operation & Maintenance Manuals

O&M Manuals in required number of copies shall be submitted. O&M manuals shall also contain storage and commissioning instructions.

## 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.

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## 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 C for Control Valve with Pneumatic Actuator
- Data sheet A&B for Control Valve with Electric Actuator
- Data sheet C for Control Valve with Electric Actuator



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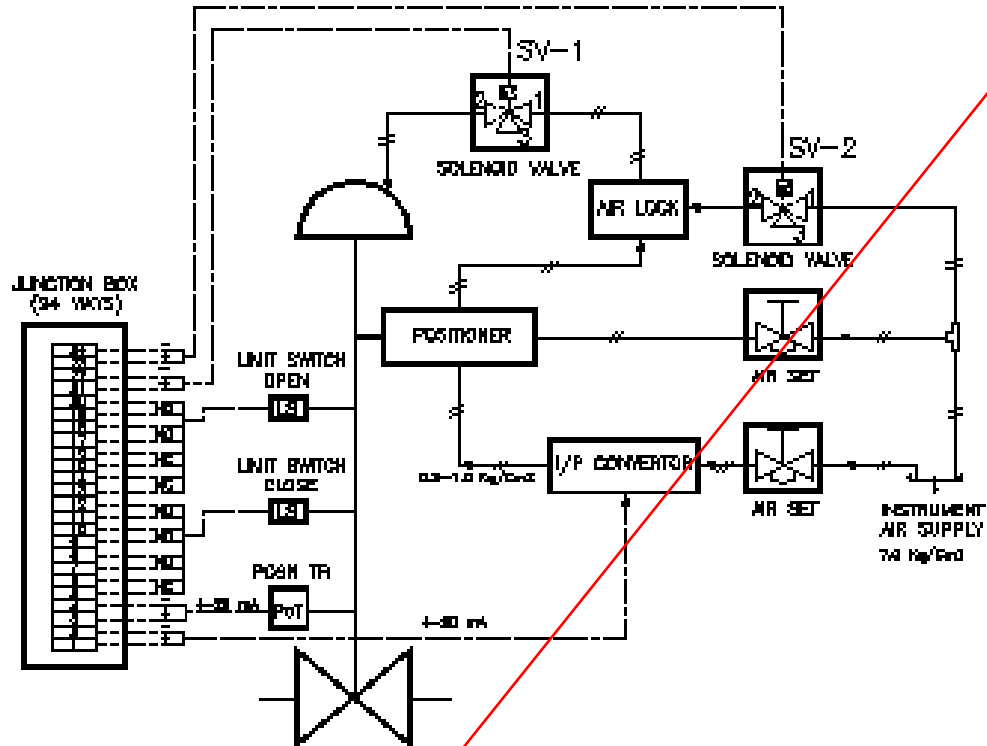
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**THIS HOOK UP IS NOT APPLICABLE**



## **NOTES:-**

1. SOLENOID VALVE SV-1 WILL BE PROVIDED, IF SPECIFIED IN DATA SHEET, FOR OVER-RIDING THE CONTROLLER SIGNAL.
2. SOLENOID VALVE SV-2 WILL BE PROVIDED, IF SPECIFIED IN DATA SHEET, FOR VALVE STOP/PUT POSITION REQUIREMENT ON CONTROLLER SIGNAL FAILURE.
3. SOLENOID VALVES PORT CONNECTION  
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGIZED CONDITION.  
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGIZED CONDITION.
4. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVE THE FOLLOWING ACCESSORIES SHALL NOT BE APPLICABLE:-
  1. POSITIONER
  2. POSITION TRANSMITTER
  3. I/P CONVERTER
  4. AIR LOCK



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

**2x660 MW Suratgarh STPS, Stage-V**

SPEC NO.: **PE-TS-392-145-I 801**

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# SECTION – D

## DATA SHEETS – A & B

<b>BHEL PEM</b>	DOCUMENT TITLE	DOCUMENT NUMBER
	<b>DATA SHEET FOR CONTROL VALVES</b>	REVISION 00 NUMBER
	<b>RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V</b>	SHEET 1 OF 52

**Notes:** This shall be read in conjunction with section C

1. All general technical requirements including material & construction, leakage class, body sizing and CV sizing etc. shall be as per customer specifications.
2. 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 200 °C.
3. If the downstream is subjected to vacuum, flow direction of the fluid shall be to close. Separate indication for the same has not been made in the data sheet.
4. Valve and actuator shall be designed for full differential pressure (Max. shut-off pressure).
5. Mandatory spares for control valves, shall be as per contractual agreement with customer.
6. Testing & other requirements shall be as per customer's specifications.
7. Quantity indicated is for one unit.
8. Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10.
9. In addition to tag nos. CDV-22 & CDV-39, anti cavitation trim to be provided for valves subjected to cavitation as per service conditions.

<b>BHEL PEM</b>	DOCUMENT TITLE	DOCUMENT NUMBER
	<b>DATA SHEET FOR CONTROL VALVES</b>	REVISION 00 NUMBER
	<b>RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V</b>	SHEET 2 OF 52

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<b>S.No.</b>	<b>SERVICE</b>	<b>Qty. / Unit</b>	<b>Qty. for Two Units</b>
1.	D/A Pegging from Aux. Steam Header (ASV-8)	01	02
2.	D/A Pegging from CRH Line (CRHV-6)	01	02
3.	Main Condensate Control (CDV-22)	01	02
4.	GSC & CEP min. flow recirculation (CDV-39)	01	02
5.	Excess Dump Control (CDV-43)	01	02
6.	Condensate for SD F/T (CDV-67)	01	02
7.	Condensate for Valve Gland Sealing (CDV-72)	01	02
8.	HPH-7 Normal Drain to HPH-6 (DRV-2)	01	02
9.	HPH-7 Alt Drain to HP drain F/T (DRV-5)	01	02
10.	HPH-6 Alt Drain to Deaerator (DRV-15)	01	02
11.	HPH-6 Alt Drain to HP drain F/T (DRV-18)	01	02
12.	LPH-3 Drain to LPH-2 (DRV-28)	01	02
13.	LPH-3 Drain to LP drain F/T (DRV-31)	01	02
14.	LPH-2 Drain to LPH-1 (DRV-34)	01	02
15.	LPH-2 Drain to LP Drain F/T (DRV-37)	01	02
16.	Deaerator Overflow (DRV-48)	01	02
17.	HPH-8 Drain to HPH-7 (DRV-53)	01	02
18.	HPH-8 Drain to F/T (DRV-59)	01	02
19.	LPH-4 Drain to LPH-3 (DRV-65)	01	02
20.	LPH-4 Alt Drain to LP drain F/T (DRV-68)	01	02
21.	Low Capacity DM MU to Hotwell (DMV-2)	01	02
22.	High Capacity DM MU to Hotwell (DMV-9)	01	02
23.	Low Load Feed Control (FDV-14)	01	02
24.	HPH-7 Alt Drain to Deaerator (DRV-8)	01	02
25.	HPH-8 Drain to Deaerator (DRV-56)	01	02







<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>				
			JOB NO. 392		
			REV. NO. 00	DATE :	
		SHEET 5 of 52			
Tag No. ....CRHV-6... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>					
<b>DATA SHEET – A &amp; B</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>	
GENERAL*	PROJECT	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....	
	SERVICE	D/A PEGGING FROM CRH LINE		.....	
GENERAL*	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)	355.6 x 15.09             965 x 34		.....	
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C             SA 106 GR C		..... .....	
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 type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <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 type="checkbox"/> DOUBLE <input checked="" type="checkbox"/> SINGLE		..... .....	
	BONNET TYPE	<input 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)		.....	
	SS 316 STELLITED   SS 316 STELLITED		..... .....		
	SS 316 STELLITED   SS 316 STELLITED		..... .....		
BODY*	FLOW (BELOW SEAT / ABOVE SEAT)	BIDDER TO SPECIFY		.....	
	OUTLET VELOCITY	<input type="checkbox"/> < 7 M/SEC (WATER)   <input checked="" type="checkbox"/> MAC NO. < 1/3(STM)		.....	
	REQUIRED LEAKAGE CLASS	<input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input checked="" 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)	0.2             1.0		..... .....
		*TRAVEL TIME FOR	< 10 SEC		.....
		OPEN TO CLOSE, CLOSE TO OPEN	Bidder to specify		.....
*VALVE POSN. ON SIGNAL AIR FAILURE		<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE		.....	
	*VALVE POSN. ON SUPPLY AIR FAILURE		<input checked="" type="checkbox"/> STAYPUT	.....	
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....	
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....	
	POSITION TRANSMITTER	PART OF POSITIONER		.....	
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....	
ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....		



<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 7 of 52		
Tag No. ....CDV-22... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<b>DATA SHEET – A &amp; B</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>
GENERAL*	PROJECT	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	MAIN CONDENSATE CONTROL		.....
GENERAL*	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)	457 x 12.7	457 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C	SA 106 GR C	.....
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 type="checkbox"/> DOUBLE <input checked="" type="checkbox"/> SINGLE		.....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input type="checkbox"/> LINEAR <input checked="" type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
BODY*	TRIM MATERIAL: SEAT   PLUG	SS 316 STELLITED   SS 316 STELLITED		.....
	: CAGE   GUIDE BUSH	SS 316 STELLITED   SS 316 STELLITED		.....
	FLOW( BELOW SEAT/ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" 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)	0.2   1.0		.....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
ACCESSORIES	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>								
							JOB NO. 392		
							REV. NO.	00	DATE :
						SHEET 8 of 52			
<p>Tag No. :...CDV-22... Qty.: ...1 per Unit ...</p> <p>Date Sheet No. PES-145-06-DS1-0</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(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	40% LOAD	582	32.9	9.6	39.6			
	2.	60% LOAD	861	30.6	12.7	41.5			
	3.	100% MCR	1455	30.7	20.2	46.3			
	4.	VWO	1556	30.1	20.7	46.5			
	5.	DESIGN POINT	1754	29	26.7	46.5			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS ( KG/CM2g) 45 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 45   55 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED						..... ..... ..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....			
NOTES: 1.            +            DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  4  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 9 of 52		
Tag No. ....CDV-39... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	GSC & CEP MIN. FLOW RECIRCULATION		.....
GENERAL*	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)	219.1 x 8.18             219.1 x 8.18		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C             SA 106 GR C		..... .....
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 type="checkbox"/> A216 WCB <input checked="" 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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
BODY*	TRIM MATERIAL: SEAT   PLUG	17-4 PH SS             17-4 PH SS		..... .....
	: CAGE   GUIDE BUSH	17-4 PH SS             17-4 PH SS		..... .....
BODY*	FLOW (ABOVE SEAT/BELOW SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0             0.2		..... .....
	*TRAVEL TIME FOR	<10SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....

<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES</b> <b>(WITH PNEUMATIC ACTUATOR)</b>								
						JOB NO. 392			
						REV. NO. 00		DATE :	
					SHEET 10 of 52				
Tag No. :...CDV-39... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>									
<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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)			$\pm 1\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 1\%$			..... ..... ..... .....		
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	MIN.	32.4	35.4	0.2	46.3			
	2.	MAX	324	30.3	0.5	46.4			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS ( KG/CM2g) 45 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 45/VACUUM   55 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES: 1.        +        DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  2  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									





<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>								
						JOB NO. 392			
						REV. NO. 00		DATE :	
					SHEET 12 of 52				
Tag No. :...CDV-43... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>									
<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(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	MIN.	36	35.7	2.0	46.3			
	2.	MAX	364	30.6	2.5	46.4			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS ( KG/CM2g) 45 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 45   55 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES: 1.        +        DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  2  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 13 of 52		
Tag No. ....CDV-67... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	CONDENSATE FOR SD FLASH TANK		.....
GENERAL*	LOCATION	<input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR		.....
	DUTY	<input checked="" type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING		.....
	PIPE SIZE (inlet / outlet)	33.4 x 4.55   33.4 x 4.55		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B   SA 106 GR B		.....
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 type="checkbox"/> BWE <input checked="" type="checkbox"/> SWE <input type="checkbox"/> FLANGED		.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input checked="" 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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input checked="" type="checkbox"/> QUICK OPEN (ON/OFF)		.....
BODY*	TRIM MATERIAL: SEAT   PLUG	17-4 PH SS   17-4 PH SS		.....
	: CAGE   GUIDE BUSH	17-4 PH SS   17-4 PH SS		.....
	FLOW(BELOW SEAT/ ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0   0.2		.....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
				.....
				.....
ACCESSORIES	POSITIONER(SMART)	<input type="checkbox"/> REQUIRED <input checked="" 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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	E/P CONVERTER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
	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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....

<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>									
							JOB NO. 392			
							REV. NO.      00		DATE :	
							SHEET		14 of 52	
<div style="display: flex; justify-content: space-between;"> <span>Tag No. :...CDV-67... Qty.: ...1 per Unit ...</span> <span>Date Sheet No. PES-145-06-DS1-0</span> </div>										
<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)				± 5% # ± 5% ± 0.5% ± 2%			..... ..... ..... .....		
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MAX.-1	10	35	0.2	46.3				
	2.	MAX.-2	10	27	0.5	46.4				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                          45 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C)         45/VACUUM   55 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES:										
1.	+	DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ____1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.								
2.	#	WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.								

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 15 of 52		
Tag No. ....CDV-72... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<b>DATA SHEET – A &amp; B</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>
GENERAL*	PROJECT	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	CONDENSATE FOR VALVE GLAND SEALING		.....
GENERAL*	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)	60.3 x 5.54   60.3 x 5.54		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B   SA 106 GR B		.....
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 *REFER NOTE 2		.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL <input type="checkbox"/> DOUBLE <input checked="" type="checkbox"/> SINGLE		.....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input type="checkbox"/> LINEAR <input checked="" type="checkbox"/> EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT   PLUG	<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
	17-4 PH SS   17-4 PH SS		.....	
	17-4 PH SS   17-4 PH SS		.....	
BODY*	FLOW (BELOW SEAT/ ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" 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)	1.0   .02		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE		<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE		<input checked="" type="checkbox"/> STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....	











BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)																			
						JOB NO. 392														
						REV. NO. 00		DATE :												
					SHEET		20 of 52													
Tag No. :...DRV-5... Qty.: ...1 per Unit ...										Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B																				
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)															DATA SHEET – B (TO BE FILLED UP BY BIDDER)					
PERFORMANCE OF VALVE		LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)					± 1% ± 1% ± 0.5% ± 1%					..... ..... ..... .....								
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY											
	1.	40% MCR	72.5	23.3	0.3	217.1														
	2.	60% MCR	131.0	33.7	0.3	238.0														
	3.	100% MCR	297.1	54.5	0.3	267.9														
	4.	VWO	329.6	58.1	0.3	272.1														
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP													
	* MAX SHUT OFF PRESS ( KG/CM2g) 73.1 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 73.1/VACUUM   275 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED										..... ..... ..... .....									
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg															.....					
NOTES: 1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>4</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.																				







<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>									
							JOB NO. 392			
							REV. NO.      00		DATE :	
							SHEET		24 of 52	
<div style="display: flex; justify-content: space-between;"> <span>Tag No. :...DRV-18... Qty.: ...1 per Unit ...</span> <span>Date Sheet No. PES-145-06-DS1-0</span> </div> <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)				± 1% ± 1% ± 0.5% ± 1%			..... ..... ..... .....		
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	98.8	10.3	0.3	179.5				
	2.	60% MCR	173.2	14.9	0.3	196.8				
	3.	100% MCR	377.5	23.9	0.3	221.3				
	4.	VWO	417.0	25.5	0.3	224.7				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                                  30 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C)                 30/VACUUM     230 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
<b>NOTES:</b> 1.            +            DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  4  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 25 of 52		
Tag No. ....DRV-28... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<b>DATA SHEET – A &amp; B</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>
GENERAL*	PROJECT	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	LPH-3 NORMAL DRAIN TO LPH-2		.....
	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)	273 x 6.35             323.9 x 9.53		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B             SA 106 GR B		..... .....
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 type="checkbox"/> A216 WCB <input checked="" 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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
PNEUMATIC ACTUATOR	TRIM MATERIAL: SEAT   PLUG	17-4 PH SS             17-4 PH SS		..... .....
	: CAGE   GUIDE BUSH	17-4 PH SS             17-4 PH SS		..... .....
	FLOW(BELOW SEAT/ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		.....
	MODEL NO. & SIZE	BIDDER TO SPECIFY		..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2             1.0		..... .....
ACCESSORI ES	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
ACCESSORI ES	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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....
				.....
				.....





<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 27 of 52		
Tag No. ....DRV-31... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	LPH-3 ALT. DRAIN TO LP DRAIN F/T		.....
GENERAL*	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)	273 x 6.35             323.9 x 9.53		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B             SA 106 GR B		..... .....
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 type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <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 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)		.....
	440 C             440 C		..... .....	
	440 C             440 C		..... .....	
BODY*	FLOW(BELOW SEAT/ ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0             0.2		..... .....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....







<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 31 of 52		
Tag No. ....DRV-37... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<b>DATA SHEET – A &amp; B</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>
GENERAL*	PROJECT	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	LPH-2 ALT. DRAIN TO LP DRAIN F/T		.....
GENERAL*	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)	323.9 x 6.35	355.6 x 9.53	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B	SA 106 GR B	.....
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 type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <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 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)		.....
	440 C	440 C	.....	
	440 C	440 C	.....	
BODY*	FLOW (BELOW SEAT/ ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0   .02		.....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....





BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)										
							JOB NO. 392				
							REV. NO.		00		DATE :
							SHEET		34 of 52		
<div>Tag No. :...DRV-48... Qty.: ...1 per Unit ...<div>Date Sheet No. PES-145-06-DS1-0</div></div>											
DATA SHEET – A & B											
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)			
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)				± 5% # ± 5% ± 0.5% ± 2%			..... ..... ..... .....			
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY		
	1.	MAX.-1 10% BMCR	210	14.1	0.3	188.9					
	2.	MAX.-2 10% BMCR	210	5.3	0.5	138.2					
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP				
	* MAX SHUT OFF PRESS ( KG/CM2g)                      20 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C)         20/VACUUM      200 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....				
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....				
NOTES: 1.        +        DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ____1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. 2.        #        WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.											







<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 37 of 52		
Tag No. ....DRV-59... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	HPH-8 ALT. DRAIN TO HP DRAIN F/T		.....
	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)	219.1 x 10.31             273 x 12.7		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C             SA 106 GR C		..... .....
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 type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
	TRIM MATERIAL: SEAT   PLUG	440 C             440 C		..... .....
	: CAGE   GUIDE BUSH	440 C             440 C		..... .....
	FLOW(BELOW SEAT/ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0       0.2		..... .....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE		<input checked="" type="checkbox"/> STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)																							
						JOB NO. 392																		
						REV. NO. 00		DATE :																
					SHEET		38 of 52																	
Tag No. :...DRV-59... Qty.: ...1 per Unit ...										Date Sheet No. PES-145-06-DS1-0														
DATA SHEET – A & B																								
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)															DATA SHEET – B (TO BE FILLED UP BY BIDDER)									
PERFORMANCE OF VALVE		LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)					± 1% ± 1% ± 0.5% ± 1%					..... ..... ..... .....												
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY															
	1.	40% MCR	24.5	32.2	0.3	235.0																		
	2.	60% MCR	45.7	46.7	0.3	257.6																		
	3.	100% MCR	108.6	76.2	0.3	290.0																		
	4.	VWO	121.9	81.7	0.5	295.0																		
	VALVE TYPE							<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP																
	* MAX SHUT OFF PRESS ( KG/CM2g) 88 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 88/VACUUM   300 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED							..... ..... ..... .....																
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg															.....									
NOTES: 1.        +        DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  4  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.																								

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 39 of 52		
Tag No. ....DRV-65... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<b>DATA SHEET – A &amp; B</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>
GENERAL*	PROJECT	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	LPH-4 NORMAL DRAIN TO LPH-3		.....
	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)	168.3 x 7.11	219.1 x 6.35	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B	SA 106 GR B	.....
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 type="checkbox"/> A216 WCB <input checked="" 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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
PNEUMATIC ACTUATOR	TRIM MATERIAL: SEAT   PLUG	17-4 PH SS	17-4 PH SS	.....
	: CAGE   GUIDE BUSH	17-4 PH SS	17-4 PH SS	.....
	FLOW (BELOW SEAT.ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		.....
	MODEL NO. & SIZE	BIDDER TO SPECIFY		.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2	1.0	.....
ACCESSORI ES	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
ACCESSORI ES	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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....
				.....
				.....



<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 41 of 52		
Tag No. ....DRV-68... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	LPH-4 ALT. DRAIN TO LP DRAIN F/T		.....
GENERAL*	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)	168.3 x 7.11             219.1 x 8.18		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B             SA 106 GR C		.....
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 type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
BODY*	TRIM MATERIAL: SEAT   PLUG	440 C             440 C		.....
	: CAGE   GUIDE BUSH	440 C             440 C		.....
	FLOW(BELOW SEAT/ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0             0.2		.....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input checked="" type="checkbox"/> STAYPUT		.....
				.....
				.....
ACCESSORIES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....
				.....

<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>									
							JOB NO. 392			
							REV. NO.      00		DATE :	
						SHEET		42 of 52		
Tag No. :...DRV-68... Qty.: ...1 per Unit ...										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)			± 1% ± 1% ± 0.5% ± 1%			..... ..... ..... .....			
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	40% MCR	28.9	3.0	0.3	126.6				
	2.	60% MCR	46.8	4.0	0.3	138.8				
	3.	100% MCR	89.0	5.8	0.3	154.9				
	4.	VWO	96.7	6.2	0.5	157.2				
	VALVE TYPE						☐ CAVITATION    [■] FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                          7 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C)         7/VACUUM     165 * IBR FORM III-C     ☐ REQUIRED    [■] NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES:										
1.            +            DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  4  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										





<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>									
							JOB NO. 392			
							REV. NO.      00		DATE :	
						SHEET		44 of 52		
<div style="display: flex; justify-content: space-between;"> <span>Tag No. :...DMV-2... Qty.: ...1 per Unit ...</span> <span>Date Sheet No. PES-145-06-DS1-0</span> </div> <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)				± 1% ± 1% ± 0.5% ± 1%		..... ..... ..... .....			
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MIN. (0.5% MU)	10.5	7.1	0.5	33				
	2.	NORMAL (1% MU)	21	6.6	0.55	33				
	3.	MAX. (1.5% MU)	31.5	4.1	0.6	33				
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
* MAX SHUT OFF PRESS ( KG/CM2g)                          10 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C)         10/VACUUM      50 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....				
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES: 1.            +            DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  2  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										



<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>									
							JOB NO. 392			
							REV. NO.	00	DATE :	
							SHEET	46 of 52		
<div style="display: flex; justify-content: space-between;"> <span>Tag No. :...DMV-9... Qty.: ...1 per Unit ...</span> <span>Date Sheet No. PES-145-06-DS1-0</span> </div> <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)				± 1% ± 1% ± 0.5% ± 1%			..... ..... ..... .....		
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY	
	1.	MIN. (1% MU)	21	6.6	0.5	33				
	2.	NORMAL (2% MU)	42	4.1	0.55	33				
	3.	MAX. (3% MU)	63	3.6	0.6	33				
	4.	MAX. (3% MU)	63	3.6	1.5	33				
	VALVE TYPE						<input checked="" type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP			
	* MAX SHUT OFF PRESS ( KG/CM2g)                      10 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C)         10/VACUUM     50 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES: 1.            +            DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  2  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.										





<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 49 of 52		
Tag No. ....DRV-8... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	HPH-7 ALT. DRAIN TO DEAERATOR		.....
	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)	323.9 x 14.27             355.6 x 15.09		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C             SA 106 GR C		..... .....
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 T SPECIFY		..... ..... .....
	END CONNECTION & RATING (ANSI)	<input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED		.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input checked="" type="checkbox"/> A217 WC9 <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 type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
	TRIM MATERIAL: SEAT   PLUG	17-4 PH SS             17-4 PH SS		..... .....
	: CAGE   GUIDE BUSH	17-4 PH SS             17-4 PH SS		..... .....
	FLOW9BELOW SEAT/ ABOVE SEAT)	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 type="checkbox"/> IV <input checked="" type="checkbox"/> V <input type="checkbox"/> VI		.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA		.....
	VACUUM SERVICE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2             1.0		..... .....
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input checked="" type="checkbox"/> TO CLOSE		.....
		<input checked="" type="checkbox"/> STAYPUT		.....
ACCESSORI ES	POSITIONER(SMART)	<input checked="" type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	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 checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input checked="" type="checkbox"/> REQUIRED <input 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		.....
	ELECTRO PNEUMATIC POSITIONER	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED		.....

<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>								
							JOB NO. 392		
							REV. NO.	00	DATE :
						SHEET 50 of 52			
<p>Tag No. :...DRV-8... Qty.: ...1 per Unit ...</p> <p>Date Sheet No. PES-145-06-DS1-0</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(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	72.5	21.3	6.0	217.1			
	2.	60% MCR	131.0	31.8	8.3	238.0			
	3.	100% MCR	297.1	52.7	12.2	267.9			
	4.	VWO	329.6	56.4	12.9	272.1			
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP		
	* MAX SHUT OFF PRESS ( KG/CM2g) 73.1 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 73.1   275 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....		
NOTES: 1.            +            DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>  4  </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.									



<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>			
			JOB NO. 392	
			REV. NO. 00	DATE :
		SHEET 51 of 52		
Tag No. ....DRV-56... Qty.: ...1 per Unit ... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>				
<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	RRVUNL - 2x660 MW SURATGARG STPP, STAGE-V		.....
	SERVICE	HPH-8 ALT. DRAIN TO DEAERATOR		.....
GENERAL*	LOCATION	<input type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR		.....
	DUTY	<input type="checkbox"/> ON/OFF <input type="checkbox"/> MODULATING		.....
	PIPE SIZE (inlet / outlet)	219.1 x 10.31             273 x 12.7		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C             SA 106 GR C		..... .....
BODY*	MODEL NO.	BIDDER TO SPECIFY		.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	<input type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE   <input type="checkbox"/> TOP <input type="checkbox"/> CAGE   ONE		..... ..... .....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO SPECIFY		..... ..... .....
	END CONNECTION & RATING (ANSI)	<input type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED		.....
	BODY MATERIAL	<input type="checkbox"/> A216 WCB <input type="checkbox"/> A217 WC9 <input type="checkbox"/> SS <input type="checkbox"/> A217 CS		.....
		<input type="checkbox"/> A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input type="checkbox"/> GRAFOIL <input type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE		..... .....
	BONNET TYPE	<input type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED		.....
	TRIM FORM	<input type="checkbox"/> LINEAR <input type="checkbox"/> EQ. PERCENTAGE		.....
		<input type="checkbox"/> QUICK OPEN (ON/OFF)		.....
BODY*	TRIM MATERIAL: SEAT   PLUG	17-4 PH SS             17-4 PH SS		..... .....
	: CAGE   GUIDE BUSH	17-4 PH SS             17-4 PH SS		..... .....
BODY*	FLOW(BELOW SEAT/ABOVE SEAT)	BIDDER TO SPECIFY		.....
	OUTLET VELOCITY	<input 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 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 type="checkbox"/> NO		.....
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input type="checkbox"/> NO		.....
				.....
				.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY		..... .....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2             1.0		..... .....
	*TRAVEL TIME FOR	<10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	<input type="checkbox"/> TO OPEN <input type="checkbox"/> STAYPUT <input type="checkbox"/> TO CLOSE		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SUPPLY AIR FAILURE	<input type="checkbox"/> STAYPUT		.....
				.....
				.....
				.....
				.....
ACCESSORIES	POSITIONER(SMART)	<input type="checkbox"/> REQUIRED (WITH HART PROTOCOL)		.....
	AIR FILTER REGULATOR	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	AIR LOCK RELAY	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION LIMIT SWITCH	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	<input type="checkbox"/> REQUIRED		.....
	LOCAL POSITION INDICATOR	<input type="checkbox"/> REQUIRED		.....
ACCESSORIES	ELECTRO PNEUMATIC POSITIONER		.....	
	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		.....	

<b>BHEL</b> <b>PEM</b>	<b>DATA SHEET FOR CONTROL VALVES</b> <b>(WITH PNEUMATIC ACTUATOR)</b>											
						JOB NO. 392						
						REV. NO. 00		DATE :				
						SHEET 52 of 52						
Tag No. :...DRV-56... Qty.: ...1 per Unit ...										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)				± 1% ± 1% ± 0.5% ± 1%				..... ..... ..... .....			
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY			
	1.	40% MCR	24.5	30.3	6.0	235.0						
	2.	60% MCR	45.7	44.9	8.3	257.6						
	3.	100% MCR	108.6	74.5	12.2	290.0						
	4.	VWO	121.9	80.1	12.9	295.0						
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input checked="" type="checkbox"/> FLASHING <input type="checkbox"/> HIGH DP					
	* MAX SHUT OFF PRESS ( KG/CM2g) 88 * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) 88   300 * IBR FORM III-C <input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED						..... ..... ..... .....					
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....					
NOTES: 1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. <u>4</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION CLAUSE NUMBER 3.1.7.												



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

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

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

## DATA SHEET – A &amp; 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 checked="" type="checkbox"/> YES <input type="checkbox"/> NO	<input checked="" type="checkbox"/> THREE <input type="checkbox"/> TWO <input type="checkbox"/> IP-55
	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> TWO (2) Nos. PER CV	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)			<input checked="" type="checkbox"/> 7.0 <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"/> 7.0 <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 - 64 <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 type="checkbox"/> Interlock <input type="checkbox"/> 1 <input type="checkbox"/> 2	
	COIL INSULATION CLASS			CLASS - F	
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	POWER SUPPLY		PART OF SMART POSITIONER	
	SPLIT RANGE				
	ENCLOSURE CLASS				
	LINEARITY				
	HYSTERISIS				
<b>Cu. Tubing &amp; Fittings / per CV</b>	This is in addition to cu. Tubing and fittings which are integral part of CV			25 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.	
					COMPANY SEAL
					NAME
					SIGNATURE
					DATE



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

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: **PE-TS-392-145-I 801**

VOLUME II B

SECTION D

REV. NO. 00

DATE : 15.07.2013


SHEET OF

# SECTION – D

## DATA SHEET – C



<b>BHEL PEM</b>	<b>DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)</b>						SPECIFICATION NO.:		
							VOLUME		
							SECTION		
							REV. NO.	DATE :	
							SHEET		OF
Tag No. :.... Qty.: .... <span style="float: right;">Date Sheet No. PES-145-06-DS1-0</span>									
<b>DATA SHEET – C</b>									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)						..... ..... ..... .....		
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	VALVE TYPE								
* MAX SHUT OFF PRESS ( KG/CM2g) * BODY DESIGN : PRESS (KG/CM2g)   TEMP (DEG C) * IBR FORM III-C						..... ..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....			

	<b>Technical specification for Control Valves with Accessories</b> (Pneumatically Operated)		SPECIFICATION NO.	
			VOLUME <b>II-B</b>	
			SECTION <b>D</b>	
			REV. NO.	DATE:
			SHEET	OF
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> <b>(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			
<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>	Part of positioner			
<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>	Part of positioner			
<b>Cu. Tubing &amp; Fittings / per CV</b>	25 Meters of 1/4" PVC coated Cu. Tubing, with 1 set of Fittings for connection to IA Header on one end and accessories on another end of CV			
			COMPANY SEAL	
			NAME	
			SIGNATURE	
			DATE	



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

**2x660 MW Suratgarh STPS, Stage-V**

SPEC NO.: **PE-TS-392-145-I 801**

VOLUME II B

SECTION D

REV. NO. 00


DATE : 15.07.2013


SHEET OF


# SECTION – D

## QUALITY PLAN




 <b>STANDARD QUALITY PLAN</b> <b>FOR</b> <b>CONTROL VALVE (PNEUMATIC)</b>		QUALITY PLAN NO.: <b>PE-QP-999-145-I 006</b>										
		VOLUME		IIB								
		SECTION		D								
		REV. NO.		05		DATE: <b>24.07.2010</b>						
		SHEET		1		OF		6				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
<b>1.0 MATERIAL</b>												
1.1	Body & Bonnet casting / forgings, plug, stem.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3	---	2,1	
		2. Heat Treatment	MA	Review of H. T. Chart	Each H. T.	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3/2	2	1	IBR Certification (if applicable) to be verified by BHEL
		3. Internal quality of castings	MA	<b>RT for Body &amp; UT for Bonnet(NDT)</b>	100%	ASME B 16.34	ASME B 16.34	Test Report / <b>FILM</b>	3/2	2	1	Only for rating ANSI 900 and above.  Applicable for Body and Bonnet only. For Lower rating only if called for in specification.
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	After Machining on machined surface only
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	<b>2</b>	1	For Body & Bonnet after machining
<b>LEGEND:</b> * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics												
<b>\$</b> P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.												
1 - BHEL 2 - Vendor 3 - Sub-vendor												


<div> PEM :: C&amp;I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006 VOLUME IIB SECTION D REV. NO. 05 SHEET 2 OF 6 DATE: 24.07.2010				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks				
									P	W	V					
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1					
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1					
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2		2,1					
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1					
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1					
		3. Performance	MA	1. Stiffness ratio 2. Scragging 3. Cyclic test (Endurance) 4. Dimension (Measurement)	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1					
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Rele. Standards	Rele. Standards	Test Certificate	3	---	2,1	In case TC is not available, Actual test shall be conducted				
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1					
<div>LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics RT- Radiographic Test UT – Ultrasonic Test PT – Dye penetrant Test MT- Magnetic Test</div> <div>\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test. 1 - BHEL 2 - Vendor 3 - Sub-vendor</div>																

 PEM :: C&I		<b>STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b>										QUALITY PLAN NO.: <b>PE-QP-999-145-I 006</b>			
												VOLUME		IIB	
												SECTION		D	
												REV. NO.		05	
												DATE:		24.07.2010	
		SHEET		3		OF		6							
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks			
									P	W	V				
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2,1				
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2,1				
<b>2.0 IN PROCESS INSPECTION</b>															
2.1	Body & Bonnet after machining, Plug with actuator stem	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.			
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1				
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1				
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	-----	Proper Physical Contact	Test Records	2						
<b>3.0 TESTS ON COMPLETED VALVE</b>															
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4			
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19	No Leakage	Test Certificate	2	1	1	Refer Note-4			
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1	1	Refer Note-4			
4.0	<b>OPERATION TEST ON COMPLETED VALVE (Final inspection)</b>	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4			
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4			


<b>LEGEND:</b>				* CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	RT- Radiographic Test UT - Ultrasonic Test	PT - Dye penetrant Test MT- Magnetic Test	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor
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<div></div> <div>PEM :: C&amp;I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: <b>PE-QP-999-145-I 006</b> VOLUME IIB SECTION D REV. NO. 05 SHEET 4 OF 6 DATE: <b>24.07.2010</b>				
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks				
									P	W	V					
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test <b>Report</b>	2	<b>1</b>	1	Refer Note-4				
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test <b>Report</b>	2	<b>1</b>	1	Refer Note-4				
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test <b>Report</b>	2	<b>1</b>	1	Refer Note-4				
		6. <b>Sensitivity</b>	<b>MA</b>	<b>Measurement</b>	100%	Approved drg. / data sheet	Approved drg. / data sheet	<b>Test Report</b>	<b>2</b>	<b>1</b>	<b>1</b>	Refer Note-4				
		7. <b>Accuracy (Overall)</b>	<b>MA</b>	<b>Measurement</b>	100%	Approved drg. / data sheet	Approved drg. / data sheet	<b>Test Report</b>	<b>2</b>	<b>1</b>	<b>1</b>	Refer Note-4				
		8. Control Valve characteristics / <b>CV Test</b>	MA	◆Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	--	1	◆Size = Body & port size Or Body size & CV for non std port. <b>Refer Note 1.</b>				
		9. Operation of limit switch & solenoids and other accessories	MA	<b>Function</b>	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test <b>Report</b>	2	<b>1</b>	1	On assembled valve Refer Note-4				
		10. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Records	2	<b>1</b>	1	Refer Note-4				
		11. Pre defined valve position in case of air failure	MA	Visual	100%	As per spec & Appd drg	As per spec & Appd drg	Test Certificate	2	<b>1</b>	1					
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	<b>1</b>	1					
<div>LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics</div> <div>\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.</div> <div>1 - BHEL 2 - Vendor 3 - Sub-vendor</div>																

 PEM :: C&I	<b>STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b>						QUALITY PLAN NO.: <b>PE-QP-999-145-I 006</b>					
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							SECTION		D			
							REV. NO.		05		DATE: <b>24.07.2010</b>	
							SHEET		5		OF 6	
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	

<b>5.0</b>	<b>AUXILIARY ITEMS</b>											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	Overall leakage including tubing
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	1	On completed valve
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	

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

<div></div> <div>PEM :: C&amp;I</div>		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: <b>PE-QP-999-145-I 006</b>							
												VOLUME		IIB					
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												SHEET		6		OF		6	
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>s</sup>			Remarks							
									P	W	V								
<b>5.6</b>	Smart Positioner (As Applicable)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1								
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1								
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1								
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1								
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Approved data sheet / Mfr. Standard	Approved data sheet / Mfr. Standard	Test Certificate	2	1	1								
<b>6.0</b>	<b>PAINTING</b>	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	1	<b>Refer Note-2</b>							
<b>7.0</b>	<b>PACKING</b>	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	<b>Refer Note-3</b>							

**NOTES:**

1. Cv test will be conducted if Test Certificate for a similar Model / Size / Cv is not available. Validity of the certificate considered as last 3 years. Cv test conducted at IIT/FCRI/any govt. approved laboratory shall not be witnessed by BHEL.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing, if applicable.
4. The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
6. Copies of all TC's/Test Certificates for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests(Leak/Operation) shall be submitted to BHEL for verification and acceptance.

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



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

**2x660 MW Suratgarh STPS, Stage-V**

SPEC NO.: **PE-TS-392-145-I 801**

VOLUME II B

SECTION D

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# SECTION – D

## BILL OF QUANTITY



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

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: PE-TS-392-145-I 801

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## BILL OF QUANTITY

S.NO	ITEM DESCRIPTION		Qty/Unit	Qty for two Units
[A]	CONTROL VALVES COMPLETE WITH PNEUMATIC ACTUATOR AND ALL ACCESSORIES MOUNTED , PIPED AND TERMINATED ON JB			
S. No.	TAG NO.	SERVICE		
1	ASV-8	D/A Pegging from Aux. Steam Header	1	2
2	CRHV-6	D/A Pegging from CRH Line	1	2
3	CDV-22	Main Condensate Control	1	2
4	CDV-39	GSC & CEP min. recirculation	1	2
5	CDV-43	Excess <b>Dump Control</b>	1	2
6	CDV-67	Condensate for SD F/T	1	2
7	CDV-72	Condensate for Valve Gland Sealing	1	2
8	DRV-2	HPH-7 Normal Drain to HPH-6	1	2
9	DRV-5	HPH-7 Alt drain to HP Drain F/T	1	2
10	DRV-15	HPH-6 Alt Drain to Deaerator	1	2
11	DRV-18	HPH-6 Alt Drain to HP drain F/T	1	2
12	DRV-28	LPH-3 Drain to LPH-2	1	2
13	DRV-31	LPH-3 Drain to LP drain F/T	1	2
14	DRV-34	LPH-2 Drain to LPH-1	1	2
15	DRV-37	LPH-2 Drain to LP Drain F/T	1	2
16	DRV-48	Deaerator Overflow	1	2
17	DRV-53	HPH-8 Drain to HPH-7	1	2
18	DRV-59	HPH-8 Drain to F/T	1	2
19	DRV-65	LPH-4 Drain to LPH-3	1	2
20	DRV-68	LPH-4 Alt Drain to LP drain F/T	1	2
21	DMV-2	Low Capacity DM MU to Hotwell	1	2
22	DMV-9	High Capacity DM MU to Hotwell	1	2
23	FDV-14	Low Load Feed Control	1	2
24	DRV-8	HPH-7 Alt Drain to Deaerator	1	2
25	DRV-56	HPH-8 Drain to Deaerator	1	2





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S.NO	ITEM DESCRIPTION		Qty/Unit	Qty for two Units
[B]	25 Meters of 10mm OD x 1.5mm thick PVC Coated Cu. Tubing (for each CV) (To be supplied Loose)		625 meter	1250 meter
[C]	<b>FITTINGS: for each CV (To be Supplied Loose)</b>	(i) BRASS FITTING-Double Compression Type for Connection to Air Filter Regulator	1 LOT	2 LOT
		(ii) BRASS FITTING- Double Compression Type for Connection to Solenoid Valve	1 LOT	2 LOT
		(iii) BRASS FITTING- Double Compression Type for Connection to IA Header isolation valve.	1 LOT	2 LOT
		(iv) Brass TEE	1 LOT	2 LOT
[D]	<b>START-UP/COMMISSIONING SPARES :</b> ( TOTAL PRICE FOR 1 SETS OF BODY AND BONNET GASKET & 1 SETS OF GLAND PACKINGS PER CV )		<b>1 LOT</b>	2 LOT
[E]	<b>MANDATORY SPARES</b>		<b>1 LOT</b>	1 LOT



Technical specification for  
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**2x660 MW Suratgarh STPS, Stage-V**

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## SECTION – D

## SPARES



Technical specification for  
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2x660 MW Suratgarh STPS, Stage-V

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**[A] LIST OF COMMISSIONING SPARES (1 LOT PER UNIT)**

Sr .No.	ITEM DESCRIPTION	QUANTITY REQUIRED
1	Gaskets	One (1) set with each control valve Tag
2	Gland Packing	One (1) set with each control valve Tag

**[B] LIST OF MANDATORY SPARES**

Sr. No.	ITEM DESCRIPTION	QUANTITIES FOR TWO UNITS(1 LOT)
1.	Plug and steam assembly	2 No. of each type
2.	Seat ring	2 No. of each type
3.	Packing and gaskets	2 No. of each type
4.	Pilot relay	2 No. of each type
5.	Actuator diaphragm	2 No. of each type
6.	O-rings	4 Nos. of each size for positioner
7.	Feedback linkage	2 No. of each type

**NOTE** : - The Actual Quantity shall be worked out during detailed Engineering.

**RAJASTHAN RAJYA VIDUT UTPADAN NIGAM LIMITED**  
**2x660 MW Suratgarh STPS, Stage-V**

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

**VOLUME III**

SPECIFICATION No: **PE-TS-392-145-I 801**



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



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

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: **PE-TS-392-145-I 801**

VOLUME III

SECTION

REV. NO. 00 DATE : 15.07.2013

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### VOL-III

S. No.	DESCRIPTION	No. of sheets
1	COMPLIANCE CERTIFICATE	1
2	SCHEDULE OF PRICES	1
3	SCHEDULE OF UNIT PRICES	1
4	CV TEST CHARGES	1
5	INSPECTION SCHEDULE	1
6	SCHEDULE OF SUBMISSION OF DRAWINGS/DOCUMENTS	1

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

**Project:** 2x660 MW Suratgarh STPS, Stage-V

**Specification no.:** PE-TS-392-145-1801

**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.

Signature with date	
Name	
Company seal	



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

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: PE-TS-392-145-I 801

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### SCHEDULE OF PRICES

S.NO	ITEM DESCRIPTION		Qty/Unit	Qty for two Units	PRICE FOR ONE UNIT(Ex Works)	PRICE FOR TWO UNITS(Ex Works)
S. No.[A]	TAG NO.	SERVICE				
1	ASV-8	D/A Pegging from Aux. Steam Header	1	2		
2	CRHV-6	D/A Pegging from CRH Line	1	2		
3	CDV-22	Main Condensate Control	1	2		
4	CDV-39	GSC & CEP min. recirculation	1	2		
5	CDV-43	Excess Dump Control	1	2		
6	CDV-67	Condensate for SD F/T	1	2		
7	CDV-72	Condensate for Valve Gland Sealing	1	2		
8	DRV-2	HPH-7 Normal Drain to HPH-6	1	2		
9	DRV-5	HPH-7 Alt Drain to HP Drain F/T	1	2		
10	DRV-15	HPH-6 Alt Drain to Deaerator	1	2		
11	DRV-18	HPH-6 Alt Drain to HP Drain F/T	1	2		
12	DRV-28	LPH-3 Drain to LPH-2	1	2		
13	DRV-31	LPH-3 Drain to LP Drain F/T	1	2		
14	DRV-34	LPH-2 Drain to LPH-1	1	2		
15	DRV-37	LPH-2 Drain to LP Drain F/T	1	2		
16	DRV-48	Deaerator Overflow	1	2		
17	DRV-53	HPH-8 Drain to HPH-7	1	2		
18	DRV-59	HPH-8 Drain to F/T	1	2		
19	DRV-65	LPH-4 Drain to LPH-3	1	2		
20	DRV-68	LPH-4 Alt Drain to LP Drain F/T	1	2		
21	DMV-2	Low Capacity DM MU to Hotwell	1	2		
22	DMV-9	High Capacity DM MU to Hotwell	1	2		
23	FDV-14	Low Load Feed Control	1	2		
24	DRV-8	HPH-7 Alt Drain to Deaerator	1	2		
25	DRV-56	HPH-8 Drain to Deaerator	1	2		

#### PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



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

**2x660 MW Suratgarh STPS, Stage-V**

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S.NO	ITEM DESCRIPTION	Qty/Unit	Qty for two Units	PRICE FOR ONE UNIT(Ex Works)	PRICE FOR TWO UNITS(Ex Works)
[B]	25 Meters of 10mm OD x 1.5mm thick PVC Coated Cu. Tubing (for each CV) (To be supplied Loose)	625 meter	1250 meter		
[C]	<b>FITTINGS: for each CV (To be Supplied Loose)</b> <ul style="list-style-type: none"> <li>(i) BRASS FITTING-Double Compression Type for Connection to Air Filter Regulator</li> <li>(ii) BRASS FITTING- Double Compression Type for Connection to Solenoid Valve</li> <li>(iii) BRASS FITTING- Double Compression Type for Connection to IA Header isolation valve.</li> <li>(iv) Brass TEE</li> </ul>	1 LOT	2 LOT		
[D]	<b>START-UP/COMMISSIONING SPARES :</b> ( TOTAL PRICE FOR 1 SETS OF BODY AND BONNET GASKET & 1 SETS OF GLAND PACKINGS PER CV )	1 LOT	2 LOT		
[E]	<b>MANDATORY SPARES</b>	----	1 LOT		
[F]	<b>TOTAL Cv TEST CHARGE</b>	1LOT	1 LOT		
[G]	<b>DOCUMENTATION CHARGES FOR THE FINAL DOCUMENTS &amp; SOFT COPIES</b>	1 LOT	2 LOT		
<b>TOTAL (A+B+C+D+E+F+G) for two units</b>					
<b>PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE</b>					
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	





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

2x660 MW Suratgarh STPS, Stage-V

SPEC NO.: **PE-TS-392-145-I 801**

VOLUME III

SECTION

REV. NO. 00 DATE : 15.07.2013

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## SCHEDULE OF UNIT PRICES

### CONTROL VALVE ACCESSORIES

S. No.	ITEMS	UNIT PRICE (Ex-Works)
1.	SMART POSITIONER (EACH TYPE)	
2.	VALVE TRIM OF EACH TYPE (Separate list to be attached if required)	
3.	DIAPHRAGMS,O-RINGS,SEALS ETC OF ALL TYPE,MAKE ETC	
4.	AIR FILTER REGULATORS	
5.	AIR LOCK RELAY	
6.	POSITION LIMIT SWITCH	
7.	VOLUME BOOSTER	
8.	SOLENOID VALVE	
9.	E/P CONVERTER	
10.	PRESSURE GAUGES OF EACH TYPE	
11.	JUNCTION BOX (36 WAYS)	
12.	HANDWHEEL	
13.	ACTUATOR OF EACH TYPE (Separate list to be attached if required)	
14.	BRASS FITTING FOR CONNECTION TO AIR FILTER REGULATOR	
15.	BRASS FITTING FOR CONNECTION TO SOLENOID VALVE	
16.	BRASS FITTINGS FOR CONNECTING TO AIR HEADER	
17.	EQUAL BRASS TEE	
18.	COPPER TUBING PER METRE	

### PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



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VOLUME II B

SECTION D

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## BILL OF QUANTITY

S.NO	ITEM DESCRIPTION		Qty/Unit	Qty for twoUnits	CV Test Charges( EX-Works) One Unit	CV Test Charges(E X-Works) TwoUnits
S. No.	TAG NO.	SERVICE				
1	ASV-8	D/A Pegging from Aux. Steam Header	1	2		
2	CRHV-6	D/A Pegging from CRH Line	1	2		
3	CDV-22	Main Condensate Control	1	2		
4	CDV-39	GSC & CEP min. recirculation	1	2		
5	CDV-43	Excess Dump Control	1	2		
6	CDV-67	Condensate for SD F/T	1	2		
7	CDV-72	Condensate for Valve Gland Sealing	1	2		
8	DRV-2	HPH-7 Normal Drain to HPH-6	1	2		
9	DRV-5	HPH-7 Alt drain to HP Drain F/T	1	2		
10	DRV-15	HPH-6 Alt Drain to Deaerator	1	2		
11	DRV-18	HPH-6 Alt Drain to HP Drain F/T	1	2		
12	DRV-28	LPH-3 Drain to LPH-2	1	2		
13	DRV-31	LPH-3 Drain to LP Drain F/T	1	2		
14	DRV-34	LPH-2 Drain to LPH-1	1	2		
15	DRV-37	LPH-2 Drain to LP Drain F/T	1	2		
16	DRV-48	Deaerator Overflow	1	2		
17	DRV-53	HPH-8 Drain to HPH-7	1	2		
18	DRV-59	HPH-8 Drain to F/T	1	2		
19	DRV-65	LPH-4 Drain to LPH-3	1	2		
20	DRV-68	LPH-4 Alt Drain to LP Drain F/T	1	2		
21	DMV-2	Low Capacity DM MU to Hotwell	1	2		
22	DMV-9	High Capacity DM MU to Hotwell	1	2		
23	FDV-14	Low Load Feed Control	1	2		
24	DRV-8	HPH-7 Alt Drain to Deaerator	1	2		
25	DRV-56	HPH-8 Drain to Deaerator	1	2		

- NOTE:**
- CV TEST TO BE CONDUCTED FOR ONE PER TYPE PER SIZE, CV VALUE. TAG NOS. TO BE GROUPED ACCORDINGLY AND INDICATED.
  - IF THE BIDDER HAS CV TEST CERTIFICATE FOR A SIMILAR MODEL/SIZE/CV AND THE CERTIFICATE IS NOT MORE THAN THREE YEARS OLD FROM THE DATE OF TEST CONDUCTED, THE CERTIFICATE SHALL BE ACCEPTABLE.
  - IN CASE THE SUBMITTED CV TEST CERTIFICATES ARE FOUND NON-ACCEPTABLE TO BHEL/CUSTOMER, BIDDER SHALL CONDUCT THE CV TYPE TEST WITHOUT ANY PRICE IMPLICATION TO BHEL.



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VOLUME III

SECTION

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## INSPECTION SCHEDULE

(PLACE & ADDRESS OF TESTING/ INSPECTION AND ITS SCHEDULE DATE & DURATION IN NUMBER OF DAYS ITEM/COMPONENTWISE TO BE LISTED)

### PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL



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SECTION D

REV. NO. 00

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SHEET OF

**SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE INSPECTION AND DESPATCH**

- | 1. <u><b>ZERO DATE</b></u>   | <u><b>DATE of LOI / FOI / TOI</b></u> |
|--|---------------------------------------|
| 2. Submission of Data Sheets / documents / catalogues / Valve sizing calculations / Noise calculations for approval.   | 2 Weeks from the Zero date.           |
| 3. Technical finalisation, freezing of inputs of manufacture by way of vetting of documents and technical discussions and resubmissions of documents (if required) | 8 Weeks from the Zero date.           |
| 4. Inspection of Equipment as per Approved (Category-I) drawings / documents.  | 18 Weeks from the Zero date.          |
| 5. Release of MDCC by BHEL   | 20 Weeks from the Zero date.          |
| 6. Dispatch (Packaging & Dispatch)   | 21 Weeks from the Zero date.          |
| 7. Final documents submission as per Contract  | 22 Weeks from the Zero date.          |

**NOTE:** Delays due to non-fulfillment of the requirements of approved Quality Plan and approved Data sheets; Drawings, Catalogues and Sizing Calculations observed during inspection shall be to the Vendor's account.

Delays due to INCOMPLETE (Partly) submission of Data sheets, Drawings, Catalogues and Sizing Calculations also be considered as **"DOCUMENTS NOT SUBMITTED"**

**(Signature and Stamp of the Bidder)**