

TELANGANA STATE POWER GENERATION CORPORATION LTD
1X800 MW KOTHAGUDEM TPS STAGE-VII UNIT#12, PALONCHA

TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

VOLUME II-B & III

SPECIFICATION No: PE-TS-410-145-I801



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

1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 **Volume-I (CONDITIONS OF CONTRACT)**

This consists of four parts as below :-

Volume-IA : This part contains instructions to bidders for making bids to BHEL.
Volume-IB : This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.
Volume-IC : This part contains special conditions of contract.
Volume-ID : This part contains commercial conditions for erection & commissioning site work, as applicable.

1.2 **Volume-II TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume-II which comprises of :-

Volume-IIA : General Technical Conditions
Volume-IIB : Technical Specification including Drawings, if any.

1.2.1 **Volume-IIB**

This volume is sub-divided into following sections :-

Section-A : This section outlines the scope of enquiry.
Section-B : This section provides "Project Information".
Section-C : This section indicates technical requirements specific to the contract, not covered in Section-D.
Section-D : This section comprises of technical specifications of equipments complete with data sheet A, B and C.

Data Sheet - A specifies data and other requirements pertaining to the Equipment.

Data Sheet - B Specifies data to be filled by the bidder (Data Sheet-B is contained in Volume-III).

Data Sheet - C Indicates data/documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

1.2.2 **Volume-III TECHNICAL SCHEDULES**

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.

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.

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	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
		VOLUME II-B	
		SECTION	
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FOR
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VOLUME II B

SECTION A

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1X800 MW KOTHAGUEDEM TPS TSGENCO

SECTION – A

SCOPE OF ENQUIRY

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SCOPE OF ENQUIRY

1. SCOPE

- 1.1 This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the **Control Valves with Pneumatic Actuator along with Accessories, Start-up/Commissioning and Mandatory Spares** as mentioned in different sections of this specification for **1X800 MW KOTHAGUDEM TPS TSGENCO**.
- 1.2 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.
- 1.3 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.
- 1.4 Following signed & stamped documents with company seal to be submitted by bidder.
- Complete offer including calculation sheets, catalogues etc.
 - Quality Plan
 - Datasheet A & B, duly filled
 - Schedule of prices & unit prices, inspection schedule
 - Schedule of submission of drawings/documents, equipment manufacture, inspection & dispatch.

2 GENERAL TECHNICAL INSTRUCTIONS

- 2.1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.
- 2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment's shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.
- 2.3 BHEL' s / Customer' s representatives shall be given access to the shop in which the equipment's are being manufactured or tested and all test records shall be made available to them.
- 2.4 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / Customer.



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FOR
CONTROL VALVES WITH
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1X800 MW KOTHAGUDEM TPS TSGENCO**

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VOLUME II B

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SECTION – B

PROJECT INFORMATION

VOLUME : IIA

SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

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2.00.00	APPROACH TO SITE
3.00.00	LAND
4.00.00	SOURCE OF COAL
5.00.00	SOURCE OF WATER
6.00.00	ASH DISPOSAL AREA
7.00.00	SALIENT DESIGN DATA

VOLUME : IIA

SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed 1x800 MW Kothagudem Thermal Power Station (KTPS), Stage-VII, Unit-12 would be set up by Telangana State Power Corporation Ltd. (TSGENCO) at Kothagudem, Telangana. The proposed Power Plant will be installed adjacent to the existing D colony of Kothagudem Thermal Power Station, at Kothagudem.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

2.00.00 APPROACH TO SITE

Site is located in the existing D Colony of Kothagudem Thermal Power Station, which is at a distance 30 km from temple town of Bhadrachalam and 300 km from Hyderabad by road. The Nearest railway station is Bhadrachalam Road (Known as Kothagudem) at a distance of 12 km. Kothagudem- Bhadrachalam National Highway branches off to the power station site near village Paloncha.

3.00.00 LAND

Land is primarily required for the main plant & auxiliaries (BTG) and balance of plant (BOP) like ash handling, coal storage, cooling tower, switchyard etc., which is available within the existing plant boundary.

The existing colony is to be dismantled, and the land of about 137 acres will be used for the main plant building, water facilities, switchyard, coal handling etc. The raw water reservoir will be located adjacent to the existing raw water reservoirs.

230 acres of land required for Ash Dyke will be procured. Land is available for staff colony, which is to be constructed by the EPC contractor.

4.00.00 SOURCE OF COAL

100% Imported and Blended coal (50% imported + 50% indigenous) will be used. Indigenous coal shall be sourced from Suliyari coal mines, Madhya Pradesh.

5.00.00 **SOURCE OF WATER**

Source of water (total quantity of water is 2192 m³/hr) is Godavari River near Burgampahad & water will be pumped through existing GRP pipe line (of length approx. 26 km).

6.00.00 **ASH DISPOSAL AREA**

Ash shall be dumped in the ash dump area which will be about 9 km from plant. The ash dyke area of 230 acres is adequate for 1x800 MW unit as per MOEF norms.

7.00.00 **SALIENT DESIGN DATA**

7.01.00 Meteorological data of site is given below:-

Elevation above MSL : 89 m

Monthly highest temperature : 44.9 °C

Monthly lowest temperature. : 12.9 °C

Rainfall

Average.: 1031 mm

Max. : 100 mm/ hr

Mean Wind speed : **44 m/sec**

Relative Humidity

Max : 82%

Min : 35%

Seismic Zone : Zone-III as per IS- 1893 (Part-IV)

[Climatological data of Khammam is attached for reference].



TECHNICAL SPECIFICATION FOR

CONTROL VALVES WITH ACCESSORIES (Pneumatically Operated)

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SECTION-C

SPECIFIC TECHNICAL REQUIREMENT

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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.

- 1) Bidder to note that data sheet-B, Format "Schedule of submission of Drawings / Documents, Equipment Manufacture, Inspection and Despatch" enclosed in Section-D, to be signed and stamped and submitted with the bid. Quality Plan enclosed in Volume-IIB should be furnished duly signed and stamped. NO DEVIATION IS ACCEPTABLE.
- 2) The control valves' actuator shall be designed for 150% thrust required for the valve (at shut-off pressure) at an airline supply pressure of 5.5 kg/sq.cm.
- 3) Control valves shall be sized to have an opening of 10% min. And 80% at max. Flow condition. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel.
- 4) All the valves shall be capable of handling at least 120% of the required maximum flow.
- 5) Cast iron valves are not acceptable.
- 6) Extension bonnets shall be provided where the maximum temperature of flowing fluid is greater than 280 deg. C.
- 7) Flanged valves (if applicable) shall be rated at no less than ANSI press class of 300 lbs.
- 8) Anti-cavitation trims shall be provided for valves with cavitation services and hardened trims for flashing services.
- 9) Control valve accessories shall be fitted on the valve body. Integral pneumatic tubing shall be ¼" OD SS tubing, and fittings shall also be of SS. Applicable accessories shall be terminated at the junction box (mounted on the body).
- 10) Type of flow action ("under the seat" or "over the seat") will be selected by the vendor, however wherever downstream side is subjected to vacuum, flow action shall be "flow to close" (over the seat). Separate indication for the same has not been provided.
- 11) Trim supplied shall be suitable for quick changing and trim velocity shall not exceed 30 m/sec.
- 12) Control valves shall undergo quality assurance program as per approved quality plan.
- 13) The multiple stages shall be such that the controlled pressure drop across each stage shall ensure that the valve does not cavitate in any of the stages.
- 14) The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.
- 15) Tolerance on end to end, center to center, center to face shall be in accordance with ANSI B16.10
- 16) Facility to adjust the maximum travel of the stem shall be incorporated.

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- 17) The end connections shall be socket welded for sizes 50nb or below and butt welded for sizes above 50nb. Flanged connection shall be provided for DM water services with suitable rubber lined interfaces.
- 18) Smart positioner shall be provided with advanced diagnostic software with features like stroke counter or travel counter, leakage in actuator, on line partial closure test, valve signature analysis, valve response test, valve fixation/ jamming detection etc. to be provided.
- 19) Universal HART calibrator (one per unit) shall be provided, common to all smart positioners.
- 20) Pc and software shall be provided, common to all control valve positioners.
- 21) Enclosure class [ingress protection (IP) class] for all the accessories shall be as shown in the accessories data sheet.
- 22) Noise level at 1m away and 1.5m above shall be within 85 dB for all the valves.
- 23) Travel time for all the control valve shall be within 10 sec.
- 24) For noise abatement ISA recommendation shall be followed.
- 25) Booster relay / volume booster shall be provided wherever required.
- 26) All the formats in Volume-III should be filled-up and furnished with the bid, complete in all respect. Catalogue, Leaflets related with the models of Control Valves as well as each Accessory must be furnished with the offer. In the absence of those, the bid would be considered incomplete and liable for rejection.
- 27) The Hook-up diagram for Control valve is attached in Section-C. The Bidder's scope starts from isolation valve at Inst. Air Supply header. The suitable Connector required for connection of pneumatic tubing to isolation valve at Inst. Air Header is also in bidder's scope. The connection details at inst air valve shall be furnished to the successful bidder after the award of contract.
- 28) 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 specification, furnished at section-C.**
- 29) Type of bonnet shall be according to the service condition. Extension bonnets shall be provided when the maximum temperature of the flowing fluid is greater than 280 Deg C.
- 30) Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10.
- 31) Anti-cavitation trims shall be provided for valves with cavitation services and hardened trims for flashing services.
- 32) Valve type like cavitation/flashing/ high DP has been indicated in the data sheet. Bidder to offer the valve accordingly. However if process is cavitating, although not indicated in the valve type, bidder to offer Anti-cavitation trim.
- 33) Noise abatement mentioned shall be obtained by valve body and trim design & not by any external means.



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- 34) Trim material and body material has been specified in the Datasheets-A. Bidder to offer body material & trim material combinations equivalent or better than the material specified in Datasheets-A. Wherever there is deviation from the datasheets, bidder to furnish the documentary proof for confirming superior trim material/ body material selection along with their offer. BHEL/Customer reserves the right to accept/reject any variation to the specification.
- 35) Trim supplied shall be suitable for quick changing and trim exit velocity shall be limited to avoid cavitation.
- 36) The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.
- 37) The end connections shall be socket welded for sizes 50nb or below and butt welded for sizes above 50nb. Flanged connection shall be provided for DM water services with suitable rubber lined interfaces.
- 38) Stem material for all Control Valves shall be SS 316 STELLITED.
- 39) Facility to adjust the maximum travel of stem & starting point of travel shall be incorporated.
- 40) Bidder to furnish the list of all control valves for which Cv test is to be carried. Cv test shall be carried out for each type of control valve (of same size, Cv, trim characteristics). Cv test shall be witnessed and reports shall be verified by BHEL/Customer. Type test certificate shall not be acceptable.
- 41) 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.
- 42) 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.
- 43) Selection of valves and actuators are bidder's responsibility. Any change in selection of type of valve / 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.
- 44) Limit switch, position feedback shall be terminated up to JB by 0.5 mm²/PVC/Cu/1.1kv/FRLS shielded control cables. Solenoid valve shall be terminated by 2.5 mm² size cable.
- 45) SS nameplate for control valve shall include tag no. / KKS no. / SI. no./ body material /size/press rating/trim material/trim type/action on air failure/diaphragm air pressure at full open and close condition.
- 46) Open to close and close to open time of pneumatic actuator (modulating type) shall be less than 10 sec. Bidder to include volume booster if required to achieve fast response time<10 sec for on/off type control valve also, the actuator shall have a response time less than 10 sec.



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- 47) Specification of electrical actuator shall not be considered.
- 48) Hand wheel shall have open/close direction.
- 49) Air filter regulator shall be designed for an inlet pressure of 5-8 kg/cm².
- 50) Limit switch shall be designed for 1, 00,000 operations.
- 51) Expander/reducer shall be in BHEL's scope of supply. Expander/reducer between valve body and cartridge (if supplied) shall be in bidder scope.
- 52) JB shall be 36 ways as per enclosed hook-up diagram.
- 53) Pneumatic connection: for each control valve 12 meters length (for each leg of 1/4" size light drawn tempered) SS tubing conforming to ASTM B75 shall be used. Thickness shall not be less than 0.065 inch. Fittings to be used with SS tubes shall be of SS, screwed type including SS connection to suit 15 NB size screwed root valves (as per IS-554). SS tubes shall be provided for connection between air filter regulators & root valves.
- 54) Inspection shall be carried out in line with approved drawing/ data sheet/ QP & specific technical requirements
- 55) Third party inspection: customer shall witness the inspection for control valves and Cv test at the manufacturer's works/ FCRI, PALAKKAD. Bidder to inform 15 days before the date of inspection.
- 56) 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.
- 57) **SPARES:** The following spares are required to be offered
 - (A) **Mandatory spares to be considered as separate package. Mandatory spares to be packed in different colour & shipped separately. Marking on mandatory spares must be in different colour from main supply so that these are easily identifiable at site.**
 - (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. 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.
 - (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

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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.

58) 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.

59) **SMART POSITIONER**

- i)** The smart positioner shall accept 4-20 mA signal from the control system as input and provide a compatible signal for driving the pneumatic actuator.
- ii)** In addition to the electrical-to-pneumatic signal conversion and positioning functions, it shall also perform detailed diagnostics & make available the actuator/control valve faults via HART interface. The HART signal for the detailed faults shall be superimposed on the 4-20 mA control signal itself. The faults to be covered shall include valve jamming, air supply failure, leakage etc.
- iii)** It shall have facility of characterisation of the valve (i.e. equal percentage, quick opening, linear, etc.) in the positioners itself.
- iv)** Bidder to include in their offer, if any software is required to be installed on the HMS PC (HMS in BHEL'S scope) to communicate with the smart positioners and to access the diagnostic features of the smart positioners. Bidder to furnish price for such software in their offer.
- v)** The positioner shall have the facility of detection of control signal failure and making the valve either stayput /open /close as per process requirement upon this condition.
- vi)** The smart positioner shall have the fail-freeze feature.
- vii)** Universal Hart Calibrator to be provided, One per Unit.

60) Bidder to provide Cast Steel (CS) yokes. Cast Iron (CI) yokes are Not Acceptable.

61) **Documentation:**

(A) Along with the bids: following documents for respective projects separately

- a) Signed and stamped compliance certificates in attached format (VOL.-III).**
- b) Schedule of prices in attached format (VOL.-III).**
- c) Schedule of submission of Drg. / Doc, Equip. Manufacture, Inspection and Dispatch.**

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d) Inspection schedule

(B) After the award of contract:

The documentation as listed below will separate for respective projects

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

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

(C) Final documentation:

Copies of documents / drawings to be furnished by the successful bidder shall be as follows:

- Assembly (dimensional) drawings, calculations, edge preparation details/datasheets/QP for approval – 10 sets.
- Category-I & IV approved final drawings /datasheets – 10 sets with CD – ROMS.
- Valve sizing calculations, noise level calculations and outlet velocity calculations – 10 sets with 2 CD – ROMS
- Test certificates – 10 sets.
- “As built” drawings – 10 sets.
- Operation & maintenance manuals – 10 sets.

VOLUME : VI
SECTION-VII
SUB SECTION - B
CONTROL VALVES

1.00.00 GENERAL

1.01.00 Control valves for regulating service shall normally be globe body, preferably cage guided, metal-to-metal seated, pneumatically operated and shall be provided with characterized plugs

1.02.00 Where high stroking speed , high actuation forces and accurate positioning is critical for the operation of the plant, as in case of HP or LP bypass valves, Separator Drain Valves , hydraulic actuators with electro-hydraulic interface shall be offered.

2.00.00 GENERAL TECHNICAL REQUIREMENTS

2.01.00 Bidder shall exercise caution in selecting severe service control valves like BFP recirculation, HP & LP bypass, superheater & reheater attemperator, PRDS for Boiler & Turbine, Feed control station ,Soot blower steam pressure, Fuel oil heating and pressurizing ,minimum economizer flow control ,DM make up (emergency / normal), control valves whose down stream are connected to vacuum such as HP/LP heater emergency level control, condenser make up water, separator level control , CEP minimum flow control etc. For such critical applications, Bidder shall offer valves which are proven for similar application. Above valves shall have leakage class equal or better than class-VI with metal-to-metal seating.

2.02.00 Valve with ANSI leakage class-V shall be provided for all applications except for the control valves indicated above.

2.03.00 Bidder shall provide redundant control valves for some services such as Main condensate flow control, Superheat attemperation control and Reheat attemperation control as a minimum for high availability. For other application, if the availability criteria for the plant cannot be met even with the best established product, redundant control valves shall be provided.

2.04.00 Control valves shall be located near floor or platform for ease of access and with adequate clearances for maintenance and lay-down and shall be placed as station with upstream motorized isolating valve, down-stream motorized isolating valve, inching duty motorized bypass valve and manual drain valves. Each redundant control valve shall have its upstream motorized and down-stream motorised isolating valves. Where quick shut off requirement is foreseen such as in case of SH & RH attemperation valves, upstream isolation valve shall be pneumatic type.

2.05.00 Wherever, steam conditioning calls for , Pressure reducing & desuperheating, combined PRDS type valves shall be offered.

2.06.00 Control Valve shall be furnished with IBR certification wherever required .

2.07.00 Valve Body / End Connections

2.07.01 Valve end to end dimension and connection shall be according to ANSI standard, straight through pattern. However, Bidder may offer angle body valve for high pressure drop applications. For high pressure drop applications, construction of the valve shall be such that the gland is not exposed to inlet pressure.

2.07.02 Control valves of 40 mm. size and above with line pressure up to 50 Kg / Sq. cm may have flanged or welded end connections.

- 2.07.03 Control valves, used in high pressure services shall have butt welded end connections for size 65mm and above and socket weld end connection for size 50 mm or below.
- 2.07.04 Control valve body shall be selected as per the ISA GUIDeline. Generally control valve body shall be cast and machined for pressure rating up to 1500 lbs. Above 1500 lbs, valve body shall be of forged steel. For Demineralized Water application, valve body shall be Stainless Steel.
- 2.07.05 Bonnet joints for all control valves shall be of flanged and bolted type.
- 2.07.06 Flanged valve shall be rated at no less than class 300 lbs
- 2.07.07 The direction of flow shall be clearly engraved on the body . Valve tag no, , description or purpose, stroke time shall be painted on all control valve body with black letters on white background in Bold letters.
- 2.07.08 Valve Body Material shall match the process condition requirement as per ANSI. . General guideline shall be as follows

SR. No.	SERVICE	MATERIAL
1.	Non corrosive, non-flashing and non cavitating service for fluid temperature up to 275°C	Cast carbon steel ASTM A216 Gr. WCB , Trim material - 316 SS stellited faced GUIDe posts and bushings.
2.	Non corrosive, non-flashing and non cavitating service for fluid temperature above 275°C	Cast alloy steel ASTM A217 Gr. WC9 Trim material - 316 SS stellited faced GUIDe posts and bushings.
3.	Severe flashing / cavitating services	Alloy steel ASTM A217 Gr. WC9 , Trim material - 440C
4.	Low flashing / cavitating services	Alloy steel ASTM A217 Gr. WC6 , Trim material - 17-4 PH SS
5.	DM water application (condenser hotwell normal, emergency make up etc.)	316 stainless steel

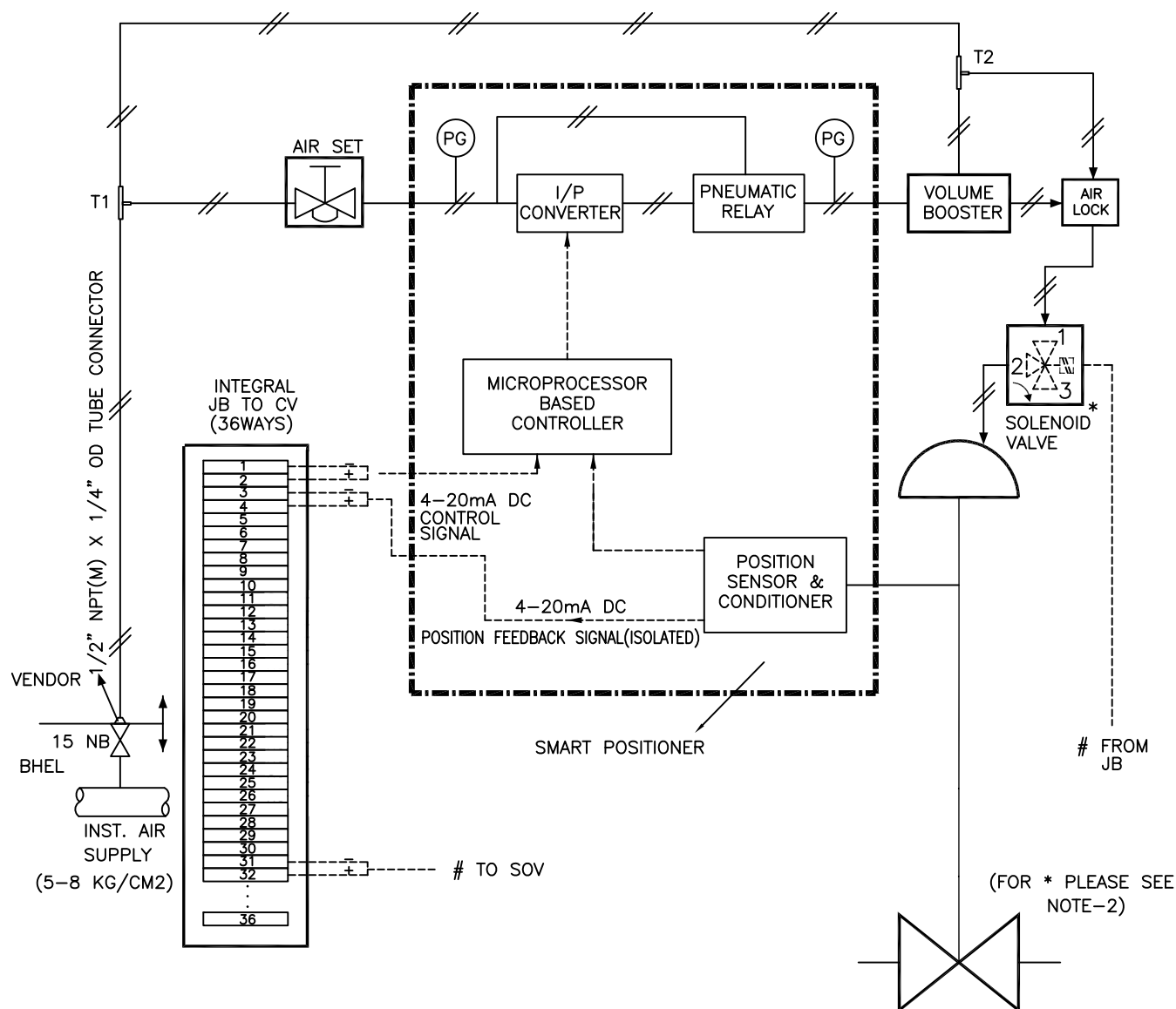
- 2.07.09 Bidder may supply valves with body and trim materials with superior quality than specified material and in such cases Bidder shall furnish the comparison of offered material properties ,such as cavitation resistance , , hardness , tensile strength , strain energy , corrosion and erosion resistance etc. , with specified material for Owner's approval.
- 2.08.00 Valve Size
- The control valve sizing (Cv / Kv) shall be based on following guidelines :
- a) The valves shall pass normal flow (MCR condition) with 60 to 70 percent opening for linear characterised valves and between 70 to 80 percent opening for equal percentage characterised valves.

- b) The valves shall have adequate rangeability to pass the minimum and maximum flows at 10% and 85% of the valve opening respectively. Valve stem travel range from minimum to maximum flow condition shall not be less than 50% of the total valve stem travel.
 - c) Valve Cv shall be selected in such a way that the valve shall be capable of handling at least 120% of required maximum flow.
 - d) The valve selection shall be based on the highest size dictated by the above considerations unless noise, flashing or other factors dictate the final selection.
 - e) Trim exit outlet velocity as defined in ISA handbook does not exceed 8 m / sec for liquid services , 150 m/sec for steam services and 50% of sonic velocity for flashing services The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.
- 2.09.00 Valve Top work
- 2.09.01 Top work shall be sized so that the valve shall operate properly when upstream pressure is 10 percent above maximum inlet pressure and downstream pressure is atmospheric.
- 2.09.02 Extended bonnet/ bonnet when maximum temperature fluid is greater than 280° C shall be provided and high temperature packing shall also be used for high temperature application.
- 2.09.03 The gland material shall be chosen to suit the operating temperature. PTFE may be chosen for lower temperature application (232°C maximum) and for high temperature application graphited asbestos glands are to be provided. For vacuum services,. All valves connected to vacuum on downstream side shall be provided with packing suitable for vacuum applications eg. double vee type chevron packing.
- 2.10.00 Valve Trim
- 2.10.01 Valve trim for applications up to leakage class-V shall be stainless steel 316 SS for pressure drop up to 7 Kg/ Sq. cm. For pressure drops above 7 Kg/Sq. cm hard trim (stelliting or equivalent) shall be used. Other alloys or treatment such as nitride shall be used if severe erosion is expected.
- 2.10.02 Balanced trim valves shall be offered for high shut-off pressure or high pressure drop condition to reduce the size of the actuators.
- 2.10.03 For flashing services and two stage mixtures, the trim material shall be 17-4 PH SS or equivalent.
- 2.10.04 If cavitating condition is foreseen, Bidder shall offer multistage or labyrinth trims valves. Trim of severe service valves shall be of multistage and multipath design with number of discrete pressure drop stages to eliminate the chances of erosion, cavitation, noise and vibration throughout the control range of the valve.
- 2.10.05 Quick replacement type trim shall be considered for easy maintenance.
- 2.10.06 Plug shall be one-piece construction cast , forged or machined from solid bar stock .Plug shall be screwed or pinned to valve stems or shall be integral with the valve stems.

- 2.11.00 Noise Level
- The equivalent sound level measured at 1.5M above nearest floor level in elevation and 1 M horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA. The noise abatement shall be achieved by valve body & trim design and not by use of silencers. Valve Actuators
- 2.12.00 Actuator
- 2.12.01 Spring-diaphragm type actuators shall generally be used. Piston type actuators shall be offered in case of high shut-off pressure & quick response requirement. Hydraulic actuation system shall be provided for Critical valves as described elsewhere in the specification.
- 2.12.02 The actuator shall be designed for 150% thrust required for the valve (at shut-off pressure) at an air line supply pressure of 5.5 Kg/Sq. cm.
- 2.12.03 Diaphragms shall be designed for 200% maximum operating pressure.
- 2.12.04 Nylon reinforced neoprene is preferred as diaphragm material.
- 2.12.05 Valve actuators shall be capable of operating at 80° C ambient, continuously.
- 2.12.06 Entire actuator assembly shall be painted with corrosion inhibiting paint.
- 2.12.07 Air connection size shall be 1/4" NPT (F) unless otherwise dictated by process response time. Integral tubing shall be stainless steel.
- 2.12.08 Bidder shall indicate the stroking time of the valve assemblies with positioned and ensure that the stroke time shall meet the process and equipment dynamics and shall be better than 10 seconds.
- 2.12.09 All actuators shall be of fail safe design signifying that the spring direction will tend to move the valve (open or close) in a direction safe for the process. "Failure to Open" or "Failure to Close" shall be marked on the actuator.
- 2.12.10 Hydraulic actuation system
- The system shall consist of , but not limited to , Hydraulic cylinder , proportional valve with blocking unit , SMART positioner with position transmitter , SOVs , safety bypass unit , safety control unit , Hydraulic supply unit and local controller cubicle with controller unit
- 2.13.00 Valve Positioners
- 2.13.01 All regulating service valves shall be offered with HART protocol based Smart Electro Pneumatic Positioners to ensure accuracy and repeatability of response.
- 2.13.02 Positioners shall have integral non contact type position transmitter, input and output gauges, local keypad & display and 4-20 mA DC output to DDCMIS in CCR.
- 2.13.03 Positioners shall be capable of functioning under hot, humid and vibrating conditions.
- 2.13.04 Positioner casings shall be dust tight, corrosion resistant and weatherproof to IP 65 .and explosion proof in hazardous areas.

- 2.13.05 In general, positioner shall operate at signal range 4 – 20 mA DC for the full travel of the valve. Split range operation in few cases may be required.
- 2.13.06 Remote calibration from control room shall be possible through HART management station.
- 2.14.00 Performance
- 2.14.01 Performance of the complete assembly of the control valves shall be better than +/- 1% of FS for linearity , +/- 0.5 % of FS for hysteresis , 1% for accuracy.
- 2.15.00 Valve Accessories
- 2.15.01 Accessories shall include side mounted hand wheels, open & close , intermediate (as applicable) limit switches for both regulating and On off valves ,, junction boxes with 20 % spare terminals , Air filter regulators , airlock relays , volume chambers etc. Solenoid valve (SOV) wherever required shall be furnished. Each limit switch shall have not less than 2 NO & 2 NC contacts with contact rating 5A , 240 V AC / 0.5 A , 220 V DC . SOV shall have SS bar stock body , SS316 Trim , SS coil enclosure , Class H insulation Air filter regulator shall have sintered bronze filter element with maximum 5 microns filter size & 2 inch dial size pressure gauges. .Protection class of all Limit switches , junction boxes , SOV etc. shall have protection class IP 65 and explosion proof for hazardous areas.
- 2.15.02 Air distribution line to all final control elements like control valves, pneumatic dampers (both regulating / on-off type) , SOV operated valves shall be through SS manifolds and SS isolating valves only. These valves shall be properly tagged also with KKS tag no. and description of final control element / instrument for which they are intended.
- 2.16.00 Test and Examination
- All valves shall be tested in accordance with the Quality Assurance programme agreed between the Owner and Bidder , which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specification . The test shall include but not be limited to Non destructive test , Hydrostatic shell test prior to seat leakage test , Seat leakage test , Valve closure test , Functional test of fully assembled valves including actuators and accessories. CV test etc. For all control valves Cv test shall be witnessed by Owner.

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



NOTES :-

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



STANDARD

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM
PE-TS-410-145-I104

DRG.
No.

PES-145-06B

REV.
No.

01

DATE

24.03.15

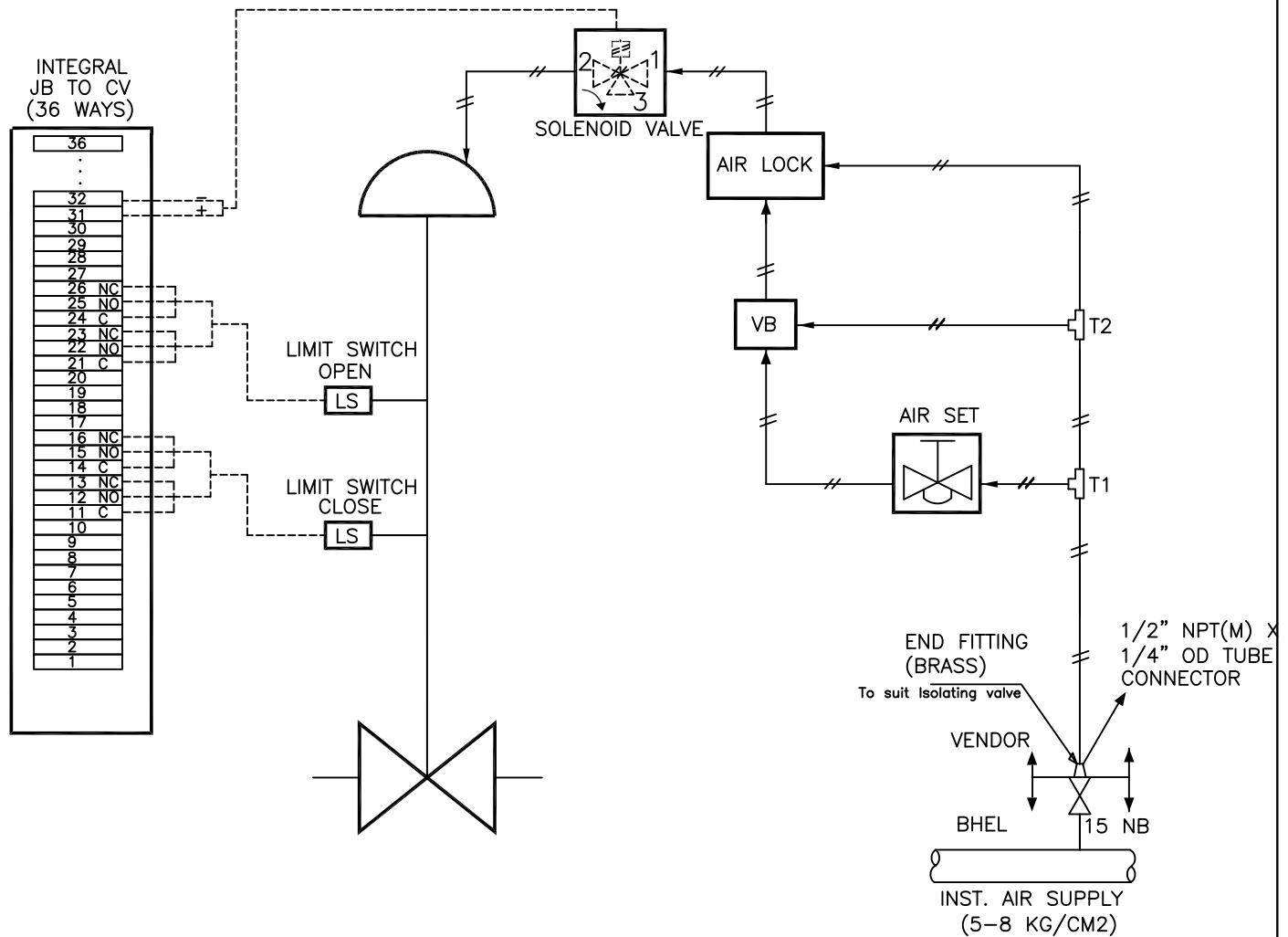
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STANDARD CONTROL VALVE HOOK-UP DIAGRAM (FOR ON / OFF TYPE)



NOTES :-

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



STANDARD

TITLE:-

**CONTROL VALVE HOOK-UP DIAGRAM
PE-TS-410-145-I104**

**DRG.
No.**

PES-145-06B

**REV.
No.**

01

DATE

24.03.15

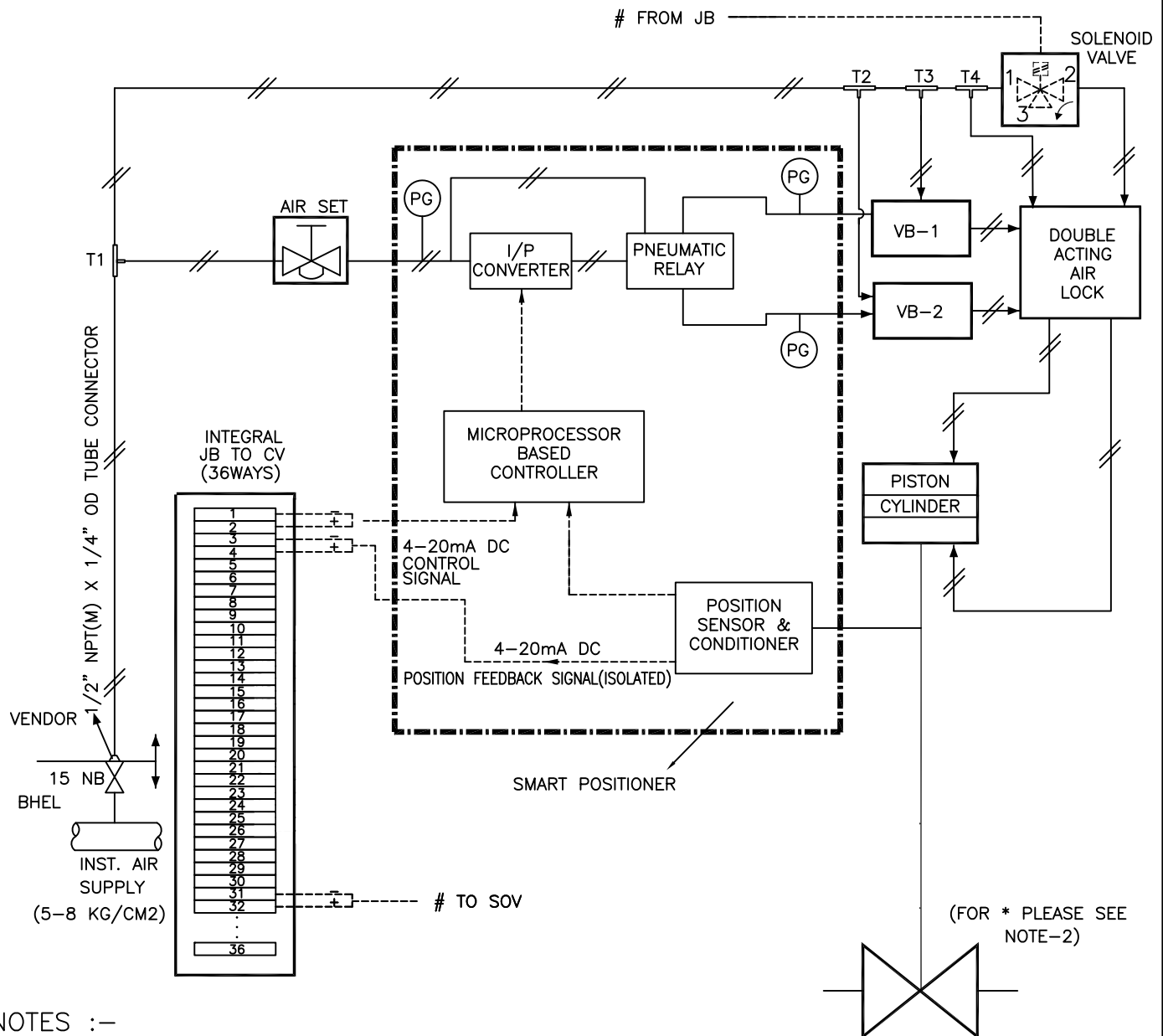
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STANDARD CONTROL VALVE HOOK-UP DIAGRAM (DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



NOTES :-

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



STANDARD

DRG.
No.

PES-145-06B

TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM
PE-TS-410-145-I104

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	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
		VOLUME II-B	
		SECTION D	
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SECTION – D

- **EQUIPMENT SPECIFICATION**
- **DATA SHEETS – A & B**
- **DATA SHEETS FOR ACCESSORIES**
- **DATA SHEETS – C**
- **QUALITY PLAN**
- **BILL OF QUANTITY**
- **SPARES**
- **SCHEDULE OF SUBMISSION OF
DRAWINGS / DOCUMENTS,
EQUIPMENT MANUFACTURE
INSPECTION AND DESPATCH**



TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

1X800 MW KOTHAGUDEM TPS TSGENCO

SPEC NO.: **PE-TS-410-145-I 801**

VOLUME II B

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SECTION-D

EQUIPMENT SPECIFICATION



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ACTUATOR)

1X800 MW KOTHAGUDEM TPS TSGENCO

SPECIFICATION NO.: PE-TS-410-145-I801

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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.



**SPECIFICATION FOR CONTROL VALVE
(WITH PNEUMATIC / ACTUATOR)**

1X800 MW KOTHAGUDEM TPS TSGENCO

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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 Equipercantage 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 SS tube and flare less brass fittings (Refer typical hook up diagram in sheet 12 of 12).

3.3.1 Hand wheel

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



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ACTUATOR)

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3.3.4 Air Filter Regulator

Instrument quality air at suitable pressure of 5.5 Kg/Cm2(g) to 7 Kg/Cm2(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/cm2g. 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/cm2, 0.2-0.6 Kg/cm2 or 0.6-1.0 Kg/cm2 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.

3.3.11 Junction Box



**SPECIFICATION FOR CONTROL VALVE
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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	:	$\pm 0.5\%$ of span
ii)	Linearity	:	$\pm 1\%$ of span
iii)	Sensitivity	:	$\pm 0.5\%$ of span.
iv)	Repeatability	:	$\pm 1\%$ of span
v)	Accuracy (Overall)	:	$\pm 1\%$ 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.



**SPECIFICATION FOR CONTROL VALVE
(WITH PNEUMATIC / ACTUATOR)**

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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.



**SPECIFICATION FOR CONTROL VALVE
(WITH PNEUMATIC / ACTUATOR)**

1X800 MW KOTHAGUDEM TPS TSGENCO

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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 mm² 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-IIB, 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/cm² & 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.

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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.

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.



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- 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.

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.

7.3 Guidelines for Packing of Smart Positioners:

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



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MARKING ON PACKING BOXES



A



B



C



D



E

- A** UPRIGHT
B FRAGILE
C PROTECTION FROM FALLING OR CONDENSING MOISTURE
D SLING POSITION
E PROTECTION FROM DIRECT RADIATION

7.4 The Following Details are to be marked on the Packing Cases:

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

8.0 APPLICABLE DATA SHEET FORMS

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

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

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-1801	
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SECTION – D

SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART) (PES – 145 – 06A)



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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 :

Diagnostic / Test Features (to be available in Smart Positioner and shall be accessible through any HMS software)	Minimum Diagnostic Features Like • Measurement of Valve positioning timing, • Detection of actuator leakage, • Display of fault alarm. • Logging of alarms and history. • Valve friction/jamming detection. • Detection of valve wear & tear, • Valve stroke length and timing.
	Advanced Diagnostic Features Like (OPTIONAL, if specified in customer's specification) • On line partial closure test. • Valve signature analysis (online graphical/tabular representation of input signal Vs valve travel). • Step response test.

4.0 Software :

Software (to be supplied alongwith smart positioner)	• Windows based software to meet the requirement for configuration, diagnostics, calibration and testing of Valve and actuator. • Easily up-gradable with same hardware and compatible with any Hart Management Systems (HMS). • Shall be capable to cater to all the tags in the specification at the same time.
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5.0 Hardware :

Hardware (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 :

Valve Action	Direct & Reverse. (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 :

Flow Characterization	Possible to fit valve characteristic curve linear & Equal percentage
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8.0 Performance:

Characteristic Deviation	$\leq 0.75\%$ of span
Ambient temp effect	$\leq 0.01\%$ / Deg C or better.
Dead Band	Adjustable 0.1 to 10%.
Scan Time	10ms
Resolution	$\leq 0.05\%$
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



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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.



TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

1X800 MW KOTHAGUDEM TPS TSGENCO

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DATA SHEETS - A&B

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		VOLUME		
		SECTION		
		REV. NO. 03	DATE : 12.05.2015	
		SHEET 3	OF	54
<u>INDEX</u>				
<u>Sl. No</u>	<u>Tag No</u>	<u>Description</u>	<u>Quantity</u>	<u>Sht No.</u>
1.	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER	1	4
2.	CRHV-6	D/A PEGGING FROM CRH LINE	1	6
3.	CDV-22/25	MAIN CONDENSATE CONTROL	2	8
4.	CDV-40	GSC MIN. FLOW RECIRCULATION	1	10
5.	CDV-46	EXCESS RETURN TO CST	1	12
6.	CDV-67	CONDENSATE SPRAY TO FLASH TANK-B	1	14
7.	CDV-72	CONDENSATE FOR VALVE GLAND SEALING	1	16
8.	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	2	18
9.	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A	2	20
10.	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	2	22
11.	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A	2	24
12.	DRV-58	LPH-3 ALT. DRAIN TO F/T-B	1	26
13.	DRV-73	DEAERATOR OVERFLOW TO F/T-B	1	28
14.	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	2	30
15.	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A	2	32
16.	DRV-40	LPH-4 NORMAL DRAIN TO LPH-3	1	34
17.	DRV-43	LPH-4 ALT. DRAIN TO F/T-B	1	36
18.	DMV-2	DM NORMAL MU TO HOTWELL	1	38
19.	DMV-5	DM EMERGENCY MU TO HOTWELL	1	40
20.	FDV-8	LOW LOAD FEED CONTROL	1	42
21.	DRV-52	DRIP PUMP DISCHARGE CONTROL	1	44
22.	DRV-78	LPH-2A&2B NORMAL DRAIN TO DC-1	1	46
23.	DRV-81	LPH-2A&2B ALT. DRAIN TO F/T-B	1	48
24.	-----	HOOK UP DIAGRAM		50
25.	-----	ACCESSORIES DATA SHEET		53

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							VOLUME			
							SECTION			
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							SHEET 5 OF 54			
Tag No.: ASV-8 / LBG51AA101 Qty.: 1 no. 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)				$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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.	7.5% BMCR	15	16	1.65	310				
	2.	15% BMCR (COLD)	42	16	1.7	310				
	3.	15% BMCR (HOT)	60	16	3.7	310				
	4.	NEXT UNIT START UP W/O RC PUMP	110	16	2	310				
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 20 * BODY DESIGN : PRESS (KG/CM2g) TEMP (DEG C) 20 310 * IBR FORM III-C ☒ REQUIRED ☐ NOT REQUIRED									
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg										
NOTES:										

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BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 7 OF 54			
Tag No.: CRHV-6 / LBQ10AA101 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% ± 0.5% + 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.	15% BMCR	42	14.4	3.65	341				
	2.	30% BMCR	120	20	3.65	347				
	3.	60% BYPASS	214.467	37.14	4.55	360				
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 73.5 * BODY DESIGN : PRESS (KG/CM2g) TEMP (DEG C) 73.5 365 * IBR FORM III-C ☒ REQUIRED ☐ NOT REQUIRED									
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg										
NOTES:										

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BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 9 OF 54			
Tag No.: CDV-22 / LCA50AA101 & CDV-25 / LCA51AA101 Qty.: 2 nos. (One against each Tag No.) 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)			$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$			..... ..... ..... .....			
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.	DESIGN POINT (PUMP)	1835	28	26	42.7				
	2.	60% LOAD	937.109	35	22	39.3				
	3.	100% MCR	1526.438	33	24	42.5				
	4.	VWO	1648.061	31	26	42.7				
	5.	MIN. (10% LOAD)	152.6	38	8	40				
	6.	HP-LP Bypass	1506.347	22	16	52.3				
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47 | 55 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED									
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....				
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A					
							VOLUME					
							SECTION					
							REV. NO. 03		DATE : 12.05.2015			
							SHEET 11		OF 54			
Tag No.: CDV-40 / LCA31AA101 Qty.: ...1 no.										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% ± 0.5% + 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.	32.4	42.5	0.3	49						
	2.	MAX	324	40.5	0.7	50						
	VALVE TYPE						☒ CAVITATION ☐ FLASHING ☒ HIGH DP					
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47/VACUUM | 55 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....					
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg											

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 13 OF 54			
Tag No.: CDV-46 / LCA41AA101 Qty.: 1 no. Date Sheet No. PES-145-06-DS1-0										
DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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.	40	36.5	4.0	50				
	2.	MAX	415	32.5	5.0	42.7				
	VALVE TYPE						☒ CAVITATION ☐ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47 | 55 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....				
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A												
							VOLUME												
							SECTION												
							REV. NO. 03		DATE : 12.05.2015										
							SHEET 15		OF 54										
Tag No.: CDV-67 / LCA34AA101 Qty.: 1 no.										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)				± 5% ± 5% + 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.	MAX.	10	35.0	0.5	50													
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☐ HIGH DP												
	* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47/VACUUM | 55 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....												
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....												
NOTES: ANTI CAVITATION TRIM SHALL BE PROVIDED																			

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 17 OF 54			
Tag No.: CDV-72 / LCA33AA101 Qty.: 1 no. 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)				$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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.	MAX.	4	31	3.0	50				
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP			
* MAX SHUT OFF PRESS (KG/CM2g) 47 * BODY DESIGN : PRESS (KG/CM2g) TEMP (DEG C) 47 55 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED										
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg										
NOTES:										

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DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)

SPECIFICATION NO.: PS-TS-410-145-I104A

VOLUME

SECTION

REV. NO. 03

DATE : 12.05.2015

SHEET 20 OF 54

Tag No.: DRV-17 / LCH35AA101 & DRV-23 / LCH45AA101
P&ID No.: PE-DG-410-100-N104

Qty.: 2 nos. (One against each Tag No.)
Date Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 21		OF 54	
Tag No.: DRV-17 / LCH35AA101 & DRV-23 / LCH45AA101 Qty.: 2 nos. (One against each Tag No.) 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% ± 0.5% + 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	50.369	23.61	0.3	Saturated				
	2.	60% MCR	89.477	35.48	0.3	Saturated				
	3.	100% MCR	195.092	58.79	0.3	Saturated				
	4.	VWO	215.625	62.9	0.3	Saturated				
	5.	BMCRCR	222.813	62.24	0.5	Saturated				
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 70 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 70/VACUUM | 280 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....			
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 23 OF 54			
Tag No. : DRV-27 / LCH10AA101 & DRV-34 / LCH20AA101 Qty.: 2 nos. (One against each Tag No.) 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% ± 0.5% + 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	64.695	9.71	6.64	159.3				
	2.	60% MCR	115.026	14.33	8.70	173.7				
	3.	100% MCR	244.006	23.4	12.7	196.3				
	4.	VWO	268.961	25.01	13.39	199.5				
	5.	BMCR	278.244	24.58	13.01	198.3				
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 28 * BODY DESIGN : PRESS (KG/CM2g) TEMP (DEG C) 28 210 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED									
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg									
NOTES:										

BHEL
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DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)

SPECIFICATION NO.: PS-TS-410-145-I104A

VOLUME

SECTION

REV. NO. 03

DATE : 12.05.2015

SHEET 24 OF 54

Tag No. : DRV-30 / LCH15AA101 & DRV-37 / LCH25AA101
P&ID No.: PE-DG-410-100-N104

Qty.: 2 nos. (One against each Tag No.)
Date Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A												
							VOLUME												
							SECTION												
							REV. NO. 03		DATE : 12.05.2015										
							SHEET 27		OF 54										
Tag No.: DRV-58 / LCJ31AA101 Qty.: ...1 no.										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% + 0.5% + 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	67.793	1.24	0.3	Saturated													
	2.	60% MCR	107.53	1.73	0.3	Saturated													
	3.	100% MCR	199.782	2.68	0.3	Saturated													
	4.	VWO	217.144	2.85	0.3	Saturated													
	5.	LPH-1/2 & DC-1/2 OUT	280	2.4	0.5	Saturated													
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP												
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 140 * IBR FORM III-C [] REQUIRED [] NOT REQUIRED						..... .....|..... .....												
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....												
NOTES:																			

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A													
							VOLUME													
							SECTION													
							REV. NO. 03		DATE : 12.05.2015											
							SHEET 29		OF 54											
Tag No.: DRV-73 / LAA01AA101 Qty.: 1 no.										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)					± 5% # ± 5% + 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.	MAX 10% BMCR	260	12.01	0.3	189.2														
	VALVE TYPE							☐ CAVITATION ☒ FLASHING ☐ HIGH DP												
	* MAX SHUT OFF PRESS (KG/CM2g) 15 * BODY DESIGN : PRESS (KG/CM2g) TEMP (DEG C) 15/ VACUUM 200 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED																			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg																				
NOTES:																				

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DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)

SPECIFICATION NO.: PS-TS-410-145-I104A

VOLUME

SECTION

REV. NO. 03

DATE : 12.05.2015

SHEET 30 OF 54

Tag No.: DRV-2 / LCH50AA101 & DRV-8 / LCH60AA101
P&ID No.: PE-DG-410-100-N104

Qty.: 2 nos. (One against each Tag No.)
Date Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

[illegible]

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 31 OF 54			
Tag No.: DRV-2 / LCH50AA101 & DRV-8 / LCH60AA101 Qty.: 2 nos. (One against each Tag No.) 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)				$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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	12.874	32.12	23.61	225.3				
	2.	60% MCR	23.873	47.79	35.48	247.5				
	3.	100% MCR	56.874	78.5	58.79	278.3				
	4.	VWO	63.675	84.38	62.90	283.2				
	5.	BMCR	65.902	83.63	62.24	282.5				
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 88 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 88 | 290 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... ..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....				
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PS-TS-410-145-I104A				
						VOLUME				
						SECTION				
						REV. NO. 03			DATE : 12.05.2015	
						SHEET 33		OF 54		
Tag No. : DRV-5 / LCH55AA101 & DRV-11 / LCH65AA101 Qty.: 2 nos. (One against each Tag No.) 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% + 0.5% + 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	12.874	32.12	0.3	Saturated				
	2.	60% MCR	23.873	47.79	0.3	Saturated				
	3.	100% MCR	56.874	78.5	0.3	Saturated				
	4.	VWO	63.675	84.38	0.3	Saturated				
	5.	BMCR	65.902	83.63	0.5	Saturated				
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 88 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 88/VACUUM | 300 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 35 OF 54			
Tag No.: DRV-40 / LCJ40AA101 Qty.: 1 no. Date Sheet No. PES-145-06-DS1-0 DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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	22.337	2.31	1.24	106.5				
	2.	60% MCR	36.038	3.26	1.73	116.9				
	3.	100% MCR	68.626	5.08	2.68	131.4				
	4.	VWO	74.835	5.40	2.85	133.5				
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 140 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....				
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 39 OF 54			
Tag No.: DMV-2 / LCR81AA101 Qty.: 1 no. 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% ± 0.5% + 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)	13	4	0.5	33				
	2.	NORMAL (1% MU)	26	3.5	0.5	33				
	3.	HW MU PUMP DESIGN FLOW	75	2.5	0.6	33				
	4.	2% MU	52	3	0.5	33				
	VALVE TYPE						☒ CAVITATION ☐ FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 10 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10/VACUUM | 55 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....				
NOTES: ANTI CAVITATION TRIM SHALL BE PROVIDED										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 43 OF 54			
Tag No.: FDV-8/ LAB50AA101 Qty.: 1 no. 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				± 1%		..... ..... ..... .....			
	HYSTERESIS				± 0.5%					
	SENSITIVITY				± 0.5%					
	ACCURACY (OVERALL)				± 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.	5% MCR (MIN.SPEED)	130	167	21	111				
	2.	15% MCR	390	165	32	111				
	3.	30% MCR	780	155	115	111 TO 138				
	4.	40% MCR	880	185	148	157				
	5.	40% Boiler Min R/c	1034	143	20	111				
	VALVE TYPE						☒ CAVITATION ☐ FLASHING ☒ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 450 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 450 | 200 * IBR FORM III-C ☒ REQUIRED ☐ NOT REQUIRED						..... ..... .....			
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....			
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PS-TS-410-145-I104A				
						VOLUME				
						SECTION				
						REV. NO. 03		DATE : 12.05.2015		
						SHEET 45 OF 54				
Tag No.: DRV-52 / LCA83AA101 Qty.: 1 no. 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% + 0.5% + 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	67.793	27	12	105.1				
	2.	60% MCR	107.53	26	15	115.2				
	3.	100% MCR	199.782	25	20.5	129.3				
	4.	VWO	217.144	24.5	21.5	131.3				
	5.	PUMP DESIGN	250	24	21.5	132				
	6.	LPH-1&2, DC- 1&2 BYPASS	286.5	22.5	20.5	125.5				
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 30 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 47/VACUUM | 140 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES:										

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PS-TS-410-145-I104A			
							VOLUME			
							SECTION			
							REV. NO. 03		DATE : 12.05.2015	
							SHEET 49 OF 54			
Tag No.: DRV-81 / LCJ24AA101 Qty.: 1 no. Date Sheet No. PES-145-06-DS1-0 DATA SHEET – A & B										
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)				$\pm 1\%$ $\pm 0.5\%$ $\pm 0.5\%$ $\pm 1\%$		..... ..... ..... .....			
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	16.933	0.2454	0.2	64.1				
	2.	60% MCR	27.856	0.3453	0.2	71.9				
	3.	100% MCR	53.498	0.5346	0.2	82.5				
	4.	VWO	58.309	0.5671	0.2	84.0				
	5	Max	62	0.8	0.25	96.1				
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP			
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 100 * IBR FORM III-C ☐ REQUIRED ☒ NOT REQUIRED						..... .....|..... .....			
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							.....			
NOTES:										

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 24/04/2015
		SHEET	

SECTION – D

DATA SHEETS – ACCESSORIES FOR CONTROL VALVES

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPECIFICATION NO.: PE-TS-410-145-I104A	
		VOLUME	
		SECTION	
		REV. NO. 02	DATE: 18.04.2015
		SHEET 53	OF 54

Tag No.: **Applicable to all Tag Nos.** Qty.: **As required**

Data Sheet No. PES-145-06-DS1-0

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

POSITIONER	MFR. & MODEL No. BYPASS: GAUGES : ENCLOSURE CLASS INPUT SIGNAL OUTPUT SIGNAL	VENDOR DATA ☐ YES : ☒ THREE : IP-65 4-20 mA TO SUIT ACTUATOR
AIR FILTER REGULATOR	MFR. & MODEL No. BOWL MATERIAL AIR SUPPLY PRESS (Kg/Cm2) OUTPUT PRESS (Kg/Cm2) OUTPUT GAUGE TYPE ACCURACY FILTER ELEMENT / ACCESSORIES MAT. FILTER SIZE ENCLOSURE TYPE MATERIAL	VENDOR DATA METALLIC 5.0 to 8.0 TO SUIT ACTUATOR ☒ REQUIRED ☐ NOT REQUIRED CONSTANT BLEED TYPE ±0.1% PHOSPHOR BRONZE / SS 5 MICRONS WEATHERPROOF & WATERPROOF SS
AIR LOCK	MFR. & MODEL No. SET PRESS (Kg/Cm2) SUPPLY PRESS (Kg/Cm2) RESET TYPE VENT PLUG	VENDOR DATA VENDOR DATA 3.0 to 5.0 AUTO ☒ REQUIRED
LIMIT SWITCH	MFR. & MODEL No. OPEN : INT : CLOSE CONTACT TYPE RATING (AC/DC) ENCLOSURE CLASS	VENDOR DATA 1 NO. : --- : 1 No. SPDT 2 NO + 2 NC 5A 240V AC and 0.2A 220V DC ☒ IP65
POSITION TRANSMITTER	MFR. & MODEL No. TYPE SUPPLY OUTPUT RATING ACCURACY ENCLOSURE CLASS	IN BUILT SMART POSITIONER ☒ ELECTRONIC (2-WIRE) CONTACTLESS (LVDT TYPE) ☐ OTHER 24V DC ☒ 4-20 ma ☐ 0-100 Ohms +/- 1% FS ☒ IP65
SOLENOID VALVE	MFR. & MODEL No. RATING OPERATION | QTY COIL INSULATION CLASS ENCLOSURE CLASS MANUAL OPERATION	VENDOR DATA ☒ 24V DC ☐ 220V DC ☐ 240V AC ☐ STAYPUT ☒ INTERLOCK | ☒ 1 ☐ 2 CLASS-H ☒ IP65 ☐ NEMA 4 YES / INBUILT

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPECIFICATION NO.: PE-TS-410-145-I104A	
		VOLUME	
		SECTION	
		REV. NO. 02	DATE: 21.04.2015
		SHEET 54	OF 54

Tag No.: **Applicable to all Tag Nos.** Qty.: **As required**

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

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

SOLENOID VALVE	BODY MATERIAL TRIM MATERIAL ENCLOUSER MATERIAL	SS BAR STOCK SS 316 STAINLESS STEEL
HANDWHEEL	ORIENTATION	☐ TOP MOUNTED ☒ SIDE MOUNTED
VOLUME BOOSTER		BIDDER TO SPECIFY
JUNCTION BOX	MFR. & MODEL No. NO. OF WAYS SIZE CABLE GLANDS : (SIZE / QUANTITY) ENCLOSURE CLASS	VENDOR DATA THIRTY SIX AS REQUIRED AS REQUIRED AS REQUIRED IP-65
SS TUBING & FITTING PER CV.	SS TUBING & FITTINGS	12 METER FROM INST. AIR HEADER ISOLATING VALVE TO THE CONTROL VALVE
DIAPHRAGM	MATERIAL	NYLON REINFORCED NEOPRENE



**TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH ACCESSORIES
(pneumatically operated)**

1X800 MW KOTHAGUDEM TPS TSGENCO

SPEC NO.: **PE-TS-410-145-I 801**

VOLUME II B

SECTION D

REV. NO. 00

DATE : 24/04/2015

SHEET

SECTION-D

DATA SHEETS -C

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO		SPECIFICATION NO PE-TS-410-145-1801	
			VOLUME II-B	
			SECTION D	
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			SHEET	
			NAME	
			SIGNATURE	
			DATE	
Tag No..... Quantity.....			Data Sheet No. PES-145-06-DS2-0	
DATA SHEET C				
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)				
GENERAL	PROJECT			
	SERVICE			
	LOCATION			
	DUTY			
	PIPE SIZE (inlet / outlet)			
	PIPE MATERIAL (inlet / outlet)			
BODY	MODEL NUMBER			
	TYPE OF BODY : GUIDING : NO. OF PORTS			
	BODY SIZE : PORT SIZE : DESIGN CV			
	END CONNECTION & RATING (ANSI)			
	BODY MATERIAL			
	PACKING MATERIAL SINGLE / DOUBLE			
	BONNET TYPE / MATERIAL			
	TRIM FORM			
	TRIM MATERIAL : SEAT | PLUG			
	TRIM MATERIAL : CAGE | GUIDE			
	FLOW			
	OUTLET VELOCITY			
	REQUIRED LEAKAGE CLASS			
	NOISE LEVEL (dBA) (Spec. 3.1.14)			
	VACUUM SERVICE			
	ANTI CAVITATION TRIM			
PNEUMATIC ACTUATOR	MODEL NO. & SIZE			
	CLOSE AT : OPEN AT (Kg / Cm ² g)			
	TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN			
	VLV POSN. ON SIGNAL ELEC FAILURE			
	VALVE POSN. ON SUPPLY AIR FAILURE			
ACCESSORIES	POSITIONER			
	AIR FILTER REGULATOR			
	AIR LOCK RELAY			
	POSITION LIMIT SWITCH			
	POSITION TRANSMITTER			
	SOLENOID VALVE			
	E / P CONVERTER			
	JUNCTION BOX			
	HAND WHEEL (SIDE MOUNTED)			
	LOCAL POSITION INDICATOR			
	ELECTRO PNEUMATIC POSITIONER			
PRESSURE GAUGES				

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO PE-TS-410-145-1801	
		VOLUME II-B	
		SECTION D	
		REV. NO. 00	DATE: 24/04/2015
		SHEET	

Tag No..... Quantity.....				Data Sheet No. PES-145-06-DS2-0					
DATA SHEET C									
DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)									
PERFORMANCE OF VALVE	LINEARITY								
	HYSTERSIS								
	SENSITIVITY								
	ACCURACY								
SERVICE CONDITION*	SL.+ NO.	LOAD	FLOW (T/HR)	INLET PR. (KG/CM² (A))	OUTLET PR. (KG/CM² (A))	TEMP DEG. C	CALCULATED CV	% VALVE LIFT	VALVE O/L VELOCITY
VALVE TYPE									
* MAX SHUT OFF PRESS ((KG/CM ² g)									
* BODY DESIGN : PRESS ((KG/CM ² g) | TEMP (DEG. C)									
* IBR FORM III-C									
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.									

BHEL PEM	SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ACTUATOR) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO.: PE-TS-410-145-I801	
		VOLUME	II B
		SECTION	D
		REV. NO.	00
		DATE: 24/04/2015	
		SHEET	

Tag No.: **Applicable to all Tag Nos.** Qty.: **As required**

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – C for ACCESSORIESDATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED-UP BY BIDDER)

POSITIONER	MFR. & MODEL No. BYPASS: GAUGES : ENCLOSURE CLASS INPUT SIGNAL OUTPUT SIGNAL	
AIR FILTER REGULATOR	MFR. & MODEL No. BOWL MATERIAL AIR SUPPLY PRESS (Kg/Cm2) OUTPUT PRESS (Kg/Cm2) OUTPUT GAUGE TYPE ACCURACY FILTER ELEMENT / ACCESSORIES MAT. FILTER SIZE ENCLOSURE TYPE MATERIAL	
AIR LOCK	MFR. & MODEL No. SET PRESS (Kg/Cm2) SUPPLY PRESS (Kg/Cm2) RESET TYPE VENT PLUG	
LIMIT SWITCH	MFR. & MODEL No. OPEN : INT : CLOSE CONTACT TYPE RATING (AC/DC) ENCLOSURE CLASS	
POSITION TRANSMITTER	MFR. & MODEL No. TYPE SUPPLY OUTPUT RATING ACCURACY ENCLOSURE CLASS	
SOLENOID VALVE	MFR. & MODEL No. RATING OPERATION | QTY COIL INSULATION CLASS ENCLOSURE CLASS MANUAL OPERATION	

BHEL PEM	SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ACTUATOR) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO.: PE-TS-410-145-I801	
		VOLUME	IIB
		SECTION	D
		REV. NO. 00	DATE: 24/04/2015
		SHEET	

Tag No.: **Applicable to all Tag Nos.** Qty.: **As required**

Data Sheet No. PES-145-06-DS1-0

DATA SHEET – C for ACCESSORIESDATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED-UP BY BIDDER)

SOLENOID VALVE	BODY MATERIAL TRIM MATERIAL ENCLOUSER MATERIAL	
HANDWHEEL	ORIENTATION	
VOLUME BOOSTER	BIDDER TO SPECIFY	
JUNCTION BOX	MFR. & MODEL No. NO. OF WAYS SIZE CABLE GLANDS : (SIZE / QUANTITY) ENCLOSURE CLASS	
SS TUBING & FITTING PER CV.	SS TUBING & FITTINGS	
DIAPHRAGM	MATERIAL	



TECHNICAL SPECIFICATION FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

1X800 MW KOTHAGUDEM TPS TSGENCO

SPEC NO.: PE-TS-410-145-I 801

VOLUME II B

SECTION D

REV. NO. 00 DATE : 24/04/2015

SHEET

SECTION-D

QUALITY PLAN

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION D				
								REV. NO. 01		DATE: 07.05.2015		
								SHEET 1 OF 7				
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	
1.0	MATERIAL											
1.1	Body & Bonnet casting / forgings, plug, valve stem, seat ring/cage.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3	---	2,1	Any Forging>=40mm thick or >= 50mm dia shall be UT checked irrespective of rating.
		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	RT for Body & UT for Bonnet(NDT)	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	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
LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test \$ P - Agency Performing the Test. 1 - BHEL 4 – Customer / Customer TPIA MA - Major characteristics UT – Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor												

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006						
								VOLUME		IIB				
								SECTION		D				
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								SHEET		2		OF		7
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks		
									P	W	V			
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1	For Body & Bonnet after machining		
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1			
		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	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1			
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1			
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1			
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Appd Drg	Record	3	---	2,1			

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

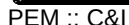
RT- Radiographic Test
 UT – Ultrasonic Test

PT – Dye penetrant Test
 MT- Magnetic Test

\$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

4 – Customer /
 Customer TPIA



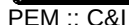
QUALITY PLAN NO.: PE-QP-999-145-I 006			
VOLUME	IIB		
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SHEET	3	OF	7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
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	
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	
2.0	IN PROCESS INSPECTION											
2.1	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	-----	Proper Physical Contact	---	2	---	---	

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

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 PEM :: C&I	STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)							QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME		IIB		
								SECTION		D		
								REV. NO.		01		DATE: 07.05.2015
SHEET		4		OF		7						
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	
3.0	TESTS ON COMPLETED VALVE											
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19	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, 4	Refer Note-4
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		7. Accuracy (Overall)	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1, 4	Refer Note-4
		8. Control Valve characteristics / CV Test	MA	♦ Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	1, 4	1	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.
LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test \$ P - Agency Performing the Test. 1 - BHEL 4 – Customer / Customer TPIA MA - Major characteristics UT – Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor												



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VOLUME	IIB		
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Report	2	1	1, 4	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	1	1, 4	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	1	1, 4	
		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	1	1	
5.0	AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	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	

1 - BHEL
2 - Vendor
3 - Sub-vendor
4 - Customer / Customer TPIA

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION D				
								REV. NO. 01 DATE: 07.05.2015				
								SHEET 6 OF 7				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
5.5	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	
5.6	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	
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	---	Refer Note-2

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

RT- Radiographic Test
UT – Ultrasonic Test

PT – Dye penetrant Test
MT- Magnetic Test

\$ P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

4 – Customer / Customer TPIA

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION D				
								REV. NO. 01 DATE: 07.05.2015				
								SHEET 7 OF 7				
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	
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

NOTES:

1. In case ~~valid CV test certificate for a similar control valve (Same type, Same size, Same CV) is not submitted to BHEL by the vendor~~, CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, 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.

LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test \$ P - Agency Performing the Test. 1 - BHEL 4 – Customer / Customer TPIA MA - Major characteristics UT – Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor											
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	TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH ACCESSORIES <i>(Pneumatically Operated)</i> 1X800 MW KOTHAGUDEM TPS TSGENCO	SPEC NO.: PE-TS-410-145-I 801	
		VOLUME II B	
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SECTION-D

BILL OF QUANTITY



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)
1X800 MW KOTHAGUDEM TPS TSGENCO

SPECIFICATION NO. **PE-TS-410-145-I801**

VOLUME **II-B**

SECTION **D**

REV. NO. 00

DATE 24/04/2015

SHEET

BILL OF QUANTITY

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

S. No.	TAG NO.	SERVICE/ ITEM DESCRIPTION	QTY/UNIT	Total Quantity
1	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER	1	1
2	CRHV-6	D/A PEGGING FROM CRH LINE	1	1
3	CDV-22/25	MAIN CONDENSATE CONTROL	2	2
4	CDV-40	GSC MIN. FLOW RECIRCULATION	1	1
5	CDV-46	EXCESS RETURN TO CST	1	1
6	CDV-67	CONDENSATE SPRAY TO FLASH TANK-B	1	1
7	CDV-72	CONDENSATE FOR VALVE GLAND SEALING	1	1
8	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	2	2
9	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A	2	2
10	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	2	2
11	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A	2	2
12	DRV-58	LPH-3 ALT. DRAIN TO F/T-B	1	1
13	DRV-73	DEAERATOR OVERFLOW TO F/T-B	1	1
14	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	2	2
15	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A	2	2
16	DRV-40	LPH-4 NORMAL DRAIN TO LPH-2	1	1
17	DRV-43	LPH-4 ALT. DRAIN TO F/T-B	1	1
18	DMV-2	DM NORMAL MU TO HOTWELL	1	1
19	DMV-5	DM EMERGENCY MU TO HOTWELL	1	1
20	FDV-8	LOW LOAD FEED CONTROL	1	1
21	DRV-52	DRIP PUMP DISCHARGE CONTROL	1	1
22	DRV-78	LPH-2A&2B NORMAL DRAIN TO DC-1	1	1
23	DRV-81	LPH-2A&2B ALT. DRAIN TO F/T-B	1	1

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
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BILL OF QUANTITY

[B]	360 METER OF ¼" SS TUBING FOR CONNECTION BETWEEN IA HEADER ON ONE END AND ACCESSORIES ON THE OTHER END OF CV	360 meter	360 meter
[C] (i)	1 LOT OF SS FITTINGS FOR CONNECTION TO AIR FILTER REGULATOR (AS PER HOOK-UP DIAGRAM)	1 Lot	1 Lot
(ii)	1 LOT OF SS FITTINGS FOR CONNECTION TO AIR LOCK RELAY (AS PER HOOK-UP DIAGRAM)	1 Lot	1 Lot
(iii)	1 LOT OF SS FITTINGS FOR CONNECTION TO IA HEADER ISOLATION VALVE (AS PER HOOK-UP DIAGRAM)	1 Lot	1 Lot
(iv)	1 LOT OF SS EQUAL TEE (AS PER HOOK-UP DIAGRAM)	1 Lot	1 Lot
[D]	START-UP/COMMISSIONING SPARES (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)	1 Set	1 Set
(i)	1 SET OF BODY AND BONNET GASKETS FOR EACH CV	1 Set	1 Set
(ii)	1 SET OF GLAND PACKINGS FOR EACH CV	1 Set	1 Set
[E]	Cv TEST CHARGES FOR EACH TYPE OF CONTROL VALVE (SEPARATE SHEET ATTACHED IN VOL-III)	1 Lot	1 Lot
[F]	ADVANCE DIAGNOSTIC FEATURES SOFTWARE (FOR ALL TAGS) SOFTWARE FOR CONFIGURATION, DIAGNOSTIC, CALIBRATION & TESTING	1 No.	1 No.
[G]	UNIVERSAL HAND HELD HART CALIBRATOR	1 No.	1 No.
[H]	PC (INDUSTRIAL GRADE)	1 No.	1 No.
[I]	MANDATORY SPARES AS PER LIST ENCLOSED IN SECTION D (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)	1 Lot	1 Lot
[J]	DOCUMENTATION CHARGES FOR FINAL DOCUMENTS & SOFT COPIES	1 Set	1 Set

	TECHNICAL SPECIFICATION FOR CONTROL VALVES WITH ACCESSORIES <i>(Pneumatically Operated)</i> 1X800 MW KOTHAGUDEM TPS TSGENCO	SPEC NO.: PE-TS-410-145-I 801	
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SECTION-D

SPARES

	Technical specification for Control Valves with Pneumatic Actuator and accessories 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
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LIST OF COMMISSIONING SPARES

S.No.	ITEM DESCRIPTION	QUANTITY
1.	Gaskets	One (1) set with each control valve Tag
2.	Gland Packings	One (1) set with each control valve Tag

LIST OF MANDATORY SPARES

Sl. No.	ITEM DESCRIPTION	QUANTITY
1	Plot Relay	1 set for each valve
2	Actuator Diaphragm	1 no.for each valve
3	Feedback Linkage	1 no.for each valve
4	Smart Positioners	10% of total quantity of each model / type
5	I/P Converters (if any)	10% of total quantity or minimum 15 nos.
6	Complete Consumables for Valve Viz. O-ring, Gland Packing, Packing Ring, Bonnet Seal etc	2 Sets each size, rating, type
7	Valve Disc	2 Sets each size, rating, type
8	Valve Spindle	2 Sets each size, rating, type
9	Valve Seat	2 Sets each size, rating, type
10	Bush	2 Sets each size, rating, type
11	Guide	2 Sets each size, rating, type

	Technical specification for Control Valves with Pneumatic Actuator and accessories 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
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12	Guide Bush	2 Sets each size, rating, type
13	Coupling Nut	2 Sets each size, rating, type
14	Actuator Piston with Rod & Seal	2 Sets each size, rating, type
15	Control valve stem packing and spare operator moulded rubber diaphragms	1 set for each size, rating, type
16	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.) for each of the control valves as offered.	1 set for each size, rating, type
17	Solenoid valves, position transmitters, limit switches, I/P convertors, positioners etc of each type	10% of total Quantity spare with minimum 1 no. for each size, rating, type

NOTES:

The quantity to be reckoned for % indicated shall be rounded off to the next higher whole number. For example if the % of total quantity arrived is 0.2, the quantity to be supplied shall be 1 and if the % of total quantity is 5.1, the quantity to be supplied shall be 6.

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I801	
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SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE INSPECTION AND DESPATCH

1. <u>ZERO DATE</u>	<u>DATE of LOI / FOI / TOI</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)	6 Weeks from the Zero date.
4. Inspection of Equipment as per Approved (Category-I) drawings / documents.	24 Weeks from the Zero date.
5. Release of MDCC by BHEL	26 Weeks from the Zero date.
6. Dispatch (Packaging & Dispatch)	26 Weeks from the Zero date.
7. Final documents submission as per Contract	28 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)

TELANGANA STATE POWER GENERATION CORPORATION LTD
1X800 MW KOTHAGUDEM TPS STAGE-VII UNIT#12, PALONCHA

TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

VOLUME III

SPECIFICATION No: **PE-TS-410-145-I 801**



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

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. : PE-TS-410-145-I801	
		VOLUME III	
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2	SCHEDULE OF PRICES	2
3	CV TEST CHARGES	1
3	SCHEDULE OF UNIT PRICES	1
4	INSPECTION SCHEDULE	1
5	DEVIATION SCHEDULE	1

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. : PE-TS-410-145-I801	
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SCHEDULE OF DRAWINGS, DATASHEETS, DOCUMENTS, CATALOGUES SUBMITTED WITH THE BID

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	Technical specification for Control Valves with Accessories (Pneumatically Operated) <u>1x800 MW KOTHGUDEM TPS TSGENCO</u>	SPECIFICATION NO. : PE-TS-410-145-I801	
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SCHEDULE OF PRICES

S.NO.	ITEM DESCRIPTION		QTY (No.)	TOTAL PRICE (INR)
[A] CONTROL VALVES COMPLETE WITH SMART POSITIONER AND ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB				
S. No.	TAG NO.	SERVICE	QTY	
1	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER	1	
2	CRHV-6	D/A PEGGING FROM CRH LINE	1	
3	CDV-22/25	MAIN CONDENSATE CONTROL	2	
4	CDV-40	GSC MIN. FLOW RECIRCULATION	1	
5	CDV-46	EXCESS RETURN TO CST	1	
6	CDV-67	CONDENSATE SPRAY TO FLASH TANK-B	1	
7	CDV-72	CONDENSATE FOR VALVE GLAND SEALING	1	
8	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	2	
9	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A	2	
10	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	2	
11	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A	2	
12	DRV-58	LPH-3 ALT. DRAIN TO F/T-B	1	
13	DRV-73	DEAERATOR OVERFLOW TO F/T-B	1	
14	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	2	
15	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A	2	
16	DRV-40	LPH-4 NORMAL DRAIN TO LPH-2	1	
17	DRV-43	LPH-4 ALT. DRAIN TO F/T-B	1	
18	DMV-2	DM NORMAL MU TO HOTWELL	1	
19	DMV-5	DM EMERGENCY MU TO HOTWELL	1	
20	FDV-8	LOW LOAD FEED CONTROL	1	
21	DRV-52	DRIP PUMP DISCHARGE CONTROL	1	
22	DRV-78	LPH-2A&2B NORMAL DRAIN TO DC-1	1	
23	DRV-81	LPH-2A&2B ALT. DRAIN TO F/T-B	1	

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	Technical specification for Control Valves with Accessories (Pneumatically Operated) <u>1x800 MW KOTHGUDEM TPS TSGENCO</u>	SPECIFICATION NO. : PE-TS-410-145-I801	
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[B]	360 METER OF ¼" SS TUBING FOR CONNECTION BETWEEN IA HEADER ON ONE END AND ACCESSORIES ON THE OTHER END OF CV	360 meter	
[C] (i)	1 LOT OF SS FITTINGS FOR CONNECTION TO AIR FILTER REGULATOR (AS PER HOOK-UP DIAGRAM)	1 Lot	
(ii)	1 LOT OF SS FITTINGS FOR CONNECTION TO AIR LOCK RELAY (AS PER HOOK-UP DIAGRAM)	1 Lot	
(iii)	1 LOT OF SS FITTINGS FOR CONNECTION TO IA HEADER ISOLATION VALVE (AS PER HOOK-UP DIAGRAM)	1 Lot	
(iv)	1 LOT OF SS EQUAL TEE (AS PER HOOK-UP DIAGRAM)	1 Lot	
[D]	START-UP/COMMISSIONING SPARES (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)	1 Set	
(i)	1 SET OF BODY AND BONNET GASKETS FOR EACH CV	1 Set	
(ii)	1 SET OF GLAND PACKINGS FOR EACH CV	1 Set	
[E]	Cv TEST CHARGES FOR EACH TYPE OF CONTROL VALVE (SEPARATE SHEET ATTACHED IN VOL-III)	1 Lot	
[F]	ADVANCE DIAGNOSTIC FEATURES SOFTWARE (FOR ALL TAGS) SOFTWARE FOR CONFIGURATION, DIAGNOSTIC, CALIBRATION & TESTING	1 No.	
[G]	UNIVERSAL HAND HELD HART CALIBRATOR	1 No.	
[H]	PC (INDUSTRIAL GRADE)	1 No.	
[I]	MANDATORY SPARES AS PER LIST ENCLOSED IN SECTION D (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)	1 Lot	
[J]	DOCUMENTATION CHARGES FOR FINAL DOCUMENTS & SOFT COPIES	1 Set	

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. PE-TS-410-145-I 801	
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CV TEST CHARGES

S.NO.	ITEM DESCRIPTION		CV TEST CHARGES
S. No.	TAG NO.	SERVICE	
1	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER	
2	CRHV-6	D/A PEGGING FROM CRH LINE	
3	CDV-22/25	MAIN CONDENSATE CONTROL	
4	CDV-40	GSC MIN. FLOW RECIRCULATION	
5	CDV-46	EXCESS RETURN TO CST	
6	CDV-67	CONDENSATE SPRAY TO FLASH TANK-B	
7	CDV-72	CONDENSATE FOR VALVE GLAND SEALING	
8	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	
9	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A	
10	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	
11	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A	
12	DRV-58	LPH-3 ALT. DRAIN TO F/T-B	
13	DRV-73	DEAERATOR OVERFLOW TO F/T-B	
14	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	
15	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A	
16	DRV-40	LPH-4 NORMAL DRAIN TO LPH-2	
17	DRV-43	LPH-4 ALT. DRAIN TO F/T-B	
18	DMV-2	DM NORMAL MU TO HOTWELL	
19	DMV-5	DM EMERGENCY MU TO HOTWELL	
20	FDV-8	LOW LOAD FEED CONTROL	
21	DRV-52	DRIP PUMP DISCHARGE CONTROL	
22	DRV-78	LPH-2A&2B NORMAL DRAIN TO DC-1	
23	DRV-81	LPH-2A&2B ALT. DRAIN TO F/T-B	

NOTES:

A) CHARGES TO BE INDICATED AGAINST EACH TAG NO.

B) CV TEST TO BE CONDUCTED FOR ONE PER TYPE PER SIZE, CV VALUE. TAG NOS. TO BE GROUPED ACCORDINGLY AND INDICATED

C) Cv TEST NEEDS TO BE CONDUCTED FOR ALL TYPES OF CONTROL VALVES. Cv TYPE TEST CERTIFICATE IS NOT ACCEPTABLE.

	Technical specification for Control Valves with Accessories (Pneumatically Operated) <u>1x800 MW KOTHGUDEM TPS TSGENCO</u>	SPECIFICATION NO. : PE-TS-410-145-I801	
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SCHEDULE OF UNIT PRICES

CONTROL VALVE ACCESSORIES		
S. No.	ITEMS	UNIT PRICE
1. \$	SMART POSITIONER EACH MODEL AND TYPE	
2.	AIR FILTER REGULATOR	
3.	AIR LOCK RELAY	
4. \$	POSITION LIMIT SWITCH OF EACH MODEL AND TYPE	
5.	ELECTRONIC POSITION TRANSMITTER OF EACH MODEL AND TYPE	
6.	SOLENOID VALVE	
7.	VOLUME BOOSTER (PNEUMATIC RELAY)	
8. \$	PRESSURE GAUGES OF EACH TYPE	
9.	JUNCTION BOX (36 WAYS)	
10.	HANDWHEEL	
11. \$	ACTUATOR OF EACH TYPE	
12.	SS FITTING FOR CONNECTION TO AIR FILTER REGULATOR	
13.	SS FITTING FOR CONNECTION TO AIR LOCK RELAY	
14.	SS FITTINGS FOR CONNECTING TO AIR HEADER	
15.	SS EQUAL TEE	
16.	¼" SS TUBING PER METRE	
17. \$	VALVE STEM WITH PLUG & SEAT RING EACH SIZE & TYPE	
18. \$	GASKET OF EACH SIZE AND TYPE	
19. \$	BODY SEAL GASKETS OF EACH SIZE AND TYPE	
20. \$	CAGE OF EACH SIZE AND TYPE	
21. \$	GLAND PACKING EACH SIZE AND TYPE	
22. \$	VALVE TRIM OF EACH SIZE AND TYPE	
23. \$	DIAPHRAM OF EACH SIZE AND TYPE	
24. \$	SEAL BOX "O" RING OF EACH TYPE AND SIZE	
25. \$	COLOR "O" RING OF EACH TYPE AND SIZE	
26.	POSITION TRANSMITTER	
27.	HAND HELD UNIVERSAL HART CALIBRATOR	
28.	DIAGNOSTIC SOFTWARE	

NOTE

\$: Separate list to be attached for each size and type of these control valve accessories.

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

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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

	Technical specification for Control Valves with Accessories (Pneumatically Operated) 1X800 MW KOTHAGUDEM TPS TSGENCO	SPECIFICATION NO. : PE-TS-410-145-I801	
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DEVIATION SCHEDULE

PARTICULARS OF THE BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL