OPGCL-BANAHARPALLI STPP
(2 x 660 MW)

TECHNICAL SPECIFICATION
FOR

CONTROL VALVES WITH ACCESSORIES

(Pneumatically Operated)

SPECIFICATION No: PE-TS-391-145-I 104

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.

PREPARED BY	APPROVED BY :
VM RAO, DGM (Q)	RAJIVA K SOOD, AGM & MR
	SDM_files labelled.doc

CONTENTS

VOL-II B

SECTION – A

SCOPE OF ENQUIRY

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 2**X660 MW BANAHARPALLI STPP**

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 as per Quality Plan (Section-D). 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.

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

2 GENERAL TECHNICAL INSTRUCTIONS

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

2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment'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 authorized representatives shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to them.

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

SECTION – B

PROJECT INFORMATION

PEM / PG-II-1, BHEL, PPEI, NOIDA

SPECIAL CONDITIONS OF CONTRACT (SCC) Rev-0

2X660MW OPGCL/IB TPS, BANHARPALLI, UNIT # 3 & 4 (Job No. 391)

ODISHA POWER GENERATION CORPORATION LTD. (OPGCL)

These conditions shall be read and construed along with General Condition of Contract (GCC), to be enclosed along with the tender enquiry. In case of any conflict or inconsistency, the conditions given in SCC shall prevail over the GCC.

Sl No.	Title	Description
1.	**Project Name**	**2X660MW OPGCL/IB TPS, BANHARPALLI, UNIT # 3 & 4**
2.	Nature of project & Type of Bidding	Non-Mega & ICB (International Competitive Bidding)
3.	Customer Order Ref No	Limited notice to proceed (LNTP) dtd. 27.07.2013 & Notice to proceed (NTP) dtd. 26.03.2014
4.	Zero Date	LNTP zero date: 27.07.2013 & NTP zero date: 26.03.2014
5.	Consignee Address	CONSTRUCTION MANAGER, BHARAT HEAVY ELECTRICALS LIMITED, IB THERMAL POWER PROJECT,UNIT 3 & 4 , VILLAGE-BANAHARPALLI, DIST.-JHARSUGUDA STATE- ODISHA, INDIA. PIN CODE-768234.
6.	Customer Consultants	DCPL, Kolkata
7.	Customer (OPGCL) CST Regn No./Tin No./VAT No.	a. CST Regn no. 21771700082 (Central) b. Tin No. 21771700082 c. VAT No. 21771700082
8.	Nearest Railway station	Belpahar Railway Station
9.	Mode of Dispatch	Air, Road, Rail & Sea Transportation
10.	Road Permit Required	Online Road Permit is applicable for this project. Prescribed format (to be provided at execution stage) duly filled up by vendor to be submitted to BHEL-PEM for issuance of road permit.
11.	BHEL Site Office Address:	CONSTRUCTION MANAGER, BHARAT HEAVY ELECTRICALS LIMITED, IB THERMAL POWER PROJECT,UNIT 3 & 4 , VILLAGE-BANAHARPALLI, DIST.-JHARSUGUDA STATE- ODISHA, INDIA. PIN CODE-768234.
12.	BHEL CST Details	CST : ND 5341151 DATED 01/07/2006 UPTT : ND 0345307 DATED 01/07/2006 UPTIN: 09765702874
13.	Transit Insurance	By BHEL; Vendors to intimate the underwriters quoting the insurance Policy No. as per Sl no. 14
14.	Policy No. Underwriters	Shall be informed later
15.	Ultimate Consignee	Odisha Power Generation Corporation Limited, Zone-A, 7th Floor, Fortune Towers, Chandrasekharpur, Bhubaneswar-751023, Odisha, India
16.	Dispatch intimation	Yes, Not less than (30) days prior to shipment date of consignment and dispatch details to be sent to: a) BHEL Site office (As mentioned in Sl no.11) b) BHEL, PEM, PPEI-Noida c) Underwriter Within 7 days after dispatch vendors must furnish docs required as below (Soft Copy/Fax) i. Vendor's invoice, ii. LR / RR, iii. Packing List/ Challan indicating the items dispatched (with their weights) iv. Insurance intimation and letter informing the underwriters about the v. BHEL /OPGCL-MDCC as applicable vi. Photograph of packings/ boxes showing dispatch marking as per Sl No. 19

17.	Document required for Vendor's payment.	For vendor payment following documents shall be provided to BHEL:- **For Claiming Dispatch Payments** a) Invoice – original+5 copies b) Receipted LR (signed & stamped)/ confirmation from site regarding receipt of packages/ Boxes – original/ copy- 6 Copies c) Delivery order- 6 copies d) Packing List - clearly showing number of packages, gross weight and net weight. - original+5 copies e) MDCC from BHEL/ Customer – as applicable – 6 copies f) Guarantee Certificate – Original + 1 copy g) Insurance Intimation - 2 copies h) CQIR / Inspection Reports – Original/ copy-2 copies i) PVC Calculation and copy of all applicable indices, if PVC applicable. – 2 copies j) Duty drawback documents (original excise invoice, original disclaimer certificate, original certificate from excise authority for payment of excise duty), if applicable. – original + 1copy **For Claiming Freight Payment** a) Invoice – Original + 1 copy b) Receipted LR (signed & stamped)/ confirmation from site regarding receipt of packages/ Boxes original/ copy- 2 copies c) Transporter's document indicating the freight amount. Original money receipt to be submitted- 2 copies **For Claiming MRC Payment** a) Invoice – Original + 1 copy b) Copy of MRC- 2 copies **For Claiming Payment for Taxes & Duties** a) Invoice as per rule 4A of Service Tax Act – Original + 1 copy b) Copy of Service Tax registration certificate c) Copy of challan for Service Tax payment d) Original excise invoice for ED/CST payment Note: Description of items in packing list shall be as per PO items or suitable correlation between PO & packing list must be furnished. **Soft copy of above shall be submitted by vendor as advance copy.**
18.	Paying Authority	Concerned BHEL units placing the order.
19.	Dispatch Markings	Each box/ Drum shall be marked with Capital Letters indicating any one of the following. Supplies under each of these headings shall be packed separately. Main Supply / Mandatory Spares / Commissioning spares or Tools & Tackles Each package/Drum delivered under the Contract shall be marked by vendor as per details listed below and such markings must be distinct and in English language (all previous irrelevant markings being carefully obliterated) for purposes of identification. Each and every box (package) shall be marked with following:- 1) Name & address of the consignee 2) Project Name 3) BHEL Unit name placing the order 4) Package Name, Vendor Name & PO No and date. 5) Packing No.: (e.g. 1/10, 2/10, 3/10 when there are 10 packages for one consignment) 6) Packing Mark: (Symbols indicating "TOP" and other special markings like "TOP", "BOTTOM", "DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE", etc. 7) Following docs must be put inside the box: I. 1 copy of respective standard manufacturer's erection instruction/O &M manual shall be kept for immediate reference by BHEL site. II. 1 copy of Packing List/ Challan indicating the items dispatched (with their weights) Above instructions are to be read in conjunction with clauses (No. 19) stipulated in the GCC rev 06. Note : Each of the spares items shall be tagged with part no. and PO item ref no/BBU ref no.
20.	Demurrage charges	Demurrage charges shall be paid by supplier/vendor to the transporter. No claim shall be acceptable in this regard.

21.	Unloading at site	a) By BHEL site office for supply packages. b) By vendors for Turnkey i.e. Supply and E&C packages
22.	Storage at site	a) By BHEL site office for supply packages. b) By vendors for Turnkey i.e. Supply and E&C packages c) Successful tenderer shall be required to submit detailed instructions for storage of supplies within three months of date of issue of LOA/ Order/ Contract.
23.	Movement of material within Site	a) By BHEL site office for supply packages. b) By vendors for Turnkey i.e. Supply and E&C packages
24.	PVC (Price Variation clause)	The prices shall be firm and shall not be subject to price variation on account of material & labor till the completion schedule unless stated otherwise in the PO.
25.	Custom Duties, Concessional custom duty against Essentiality certificate (EC)	Vendors to note that being an ICB Non-Mega project, EC issued by OPGCL shall be passed on to vendors through BHEL for the items identified by BHEL at enquiry stage (Limited to CIF content indicated in P.O. or actual CIF used by vendor as per original bill of entry of the items imported whichever is lower) for availing Concessional Custom Duty (CD) as applicable for imported contents under Project Import regulations. Vendors shall indicate the list of imported items, quantity, CIF value (in Rupee) and foreign currency, Amt. of CD, rate of CD along with the origin or country supplying raw material etc. in price bid which will be referred to OPGCL for issuing EC. Request for additional Item/ additional CIF other than the original bid submitted with enquiry shall not be entertained by BHEL during contract execution stage. List of packages for which CIF is available as per Sl No. 31. Vendors shall be solely responsible for arranging the foreign exchange release for any material, component & bought out items that may be required to be imported and no foreign exchange will be paid or arranged by BHEL. Any increase or decrease in exchange rate shall be borne by vendor. Vendor shall include the Concessional CD/CVD/SAD as a part of quoted ex-works price. Vendor shall deliver to BHEL all necessary documents required for each item of Equipment required to allow BHEL to obtain any Tax benefits/closure of bonds that the BHEL is eligible for under applicable laws existing as the effective date or that come into force thereafter. Vendor shall cooperate in good faith to minimize its liability for seller taxes under applicable laws to the extent legally permissible and pass on the benefit of any savings on account of such reduction to BHEL. Vendor shall inform BHEL and provide the necessary documentation to obtain required certificates from BHEL to avail exemption. Obtaining custom duty benefit in line with the Essentiality Certificate issued shall be vendor's scope.
26.	Excise Duty & Central Sales Tax (ED & CST)	Vendors shall quote ED & CST separately in price bid and it will be considered for evaluation purpose to arrive at the L1 bidder. ED & CST will be reimbursed to vendor by BHEL.
27.	Any Business Tax, Goods Tax, Octroi and Other Taxes and charges	Vendors shall include any Business Tax, Goods Tax, Octroi and other Taxes and charges as a part of quoted ex-works price. Entry Tax is not applicable on vendors.
28.	VAT	Vendors shall indicate VAT as applicable separately in price bid and it will be considered for evaluation purpose to arrive at the L1 bidder. For payment of VAT Annexure-I (Page1 of 1) may be referred.
29.	Taxes & Duties (For Order Directly to Foreign Bidders)	In case of order on foreign vendors, the dispatches shall be FOB (Port of Dispatch) basis and the Taxes Duties in the country of dispatch shall be borne by Foreign Bidder & to be accounted in the ex-works price quoted to BHEL-PEM. The taxes duties applicable in India shall be borne by BHEL-PEM as port clearance/handling charges in India for the direct order placed by PEM to the foreign bidder.
30.	Freight	Vendors shall quote freight separately in price bid. Freight will be considered for evaluation purpose to arrive at the L1 bidder and will be reimbursed by BHEL.
31.	Packages for which CIF is available	Refer package specific NIT.
32.	Inspection Agency	BHEL/ BHEL approved 3rd party inspection agencies and/or OPGCL

33.	Inspection procedure for Domestic supplies	Vendor shall raise inspection call on BHEL CQS web site to applicable Inspection Agency (As mentioned in PO/LOI or to be informed later) with a copy of inspection call to BHEL-PEM for arranging Customer participation in inspection/ Joint inspection on the proposed date, as applicable, with an advance notice of 21 business days. The MDCC shall be issued by BHEL/OPGC or jointly as applicable on the basis of clear inspection report.(CQIR)
34.	Foreign supplies	In case of Imported Supplies, test certificates & inspection reports duly accepted by the agreed Inspection agency shall be submitted in soft copy to BHE-PEM. Same shall be reviewed by PEM/Engineering in line with the Technical Specifications & Approved Data sheets and then sent to OPGCL for their clearance. The dispatch clearance (MDCC) by OPGC/BHEL as applicable shall be given to the foreign supplier or representative in India after acceptance of above test certificates.

	Prepared by	Checked by	Reviewed by	Vetted by	Approved by
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Department	PG-II-1	PG-II-1	PG-II-1	Fin	PG-II-1
Signature			on leave		
Date	16/6/14	16.06.14			18/6/14

Checked with respect to taxes & duties only
17/6/14

Annexure-I

SPECIAL CONDITIONS OF CONTRACT (REV 00)

2x660 MW OPGCL IB BANHARPALLI TPS, # 3 & 4

In order to avail the benefit of input tax credit available to BHEL, in case of VAT to be levied on intra-state transaction between BHEL & vendor and to fulfill the compliances as per requirements of applicable State's VAT law, the following modality shall be applicable :-

BHEL has identified a nodal agency in each State to take care of VAT compliances in the State in which the project is located. For the subject project nodal agency shall be:

BHEL SITE OFFICE,
NALCO CPP, BANARAL P.O. 1,
ANGUL DT
ORISSA - 759128

TIN NO. 21031301916

Nodal agency is defined as Buyer and BHEL/ PEM shall be paying agency in such cases, where VAT is applicable.

Vendors' original tax invoice for intra State transactions is one of the important documents for availing Input Tax credit. In this regard, the following may be noted by all vendors for strict compliance:

- As a general rule, a tax invoice must be original, must contain vendor's TIN No with full address, invoice no & date, product description with unit rate, quantity, value, VAT rate, VAT amount, gross value of bill, **Buyer i.e. BHEL's address with TIN No**, (as given above) special marking like "Original" and/or "valid for input credit"/ Buyer can take credit against this" etc as per applicable State VAT law.

- Please note that BHEL's address and TIN to be mentioned in vendors tax invoice shall be **principal place of business & applicable TIN No. of nodal agency of BHEL, as given above. In no case the vendors, invoices shall be addressed to BHEL PEM nor shall they contain our TIN.** However for payment purposes, the invoice may mention BHEL PEM as paying authority.

- As original tax invoice of vendors are to be furnished to nodal unit for assessment/VAT audit purposes, extra copy of Original invoice is required to be submitted by vendors for retaining with PEM bank payment voucher.

- Original tax invoice along with extra copy of Original Tax invoice in line with respective state VAT law shall be essential document to be submitted by vendor for claiming payment.

- Vendor shall also furnish a certificate/statement/document as prescribed under applicable State VAT law. Please note that some of the States requires additional certificate/documents e.g. Haryana requires certificate in form C-4 in addition to original tax invoice.

- Please note that reimbursement/payment of VAT shall be subject to furnishing of Vat complaint tax invoice and other certificate/document as per applicable State VAT law.

- Tax invoice must show VAT rate & VAT amount separately and in no case, all inclusive prices are to be shown in the tax invoice since input credit is not admissible in case VAT is not indicated separately.

- In case vendor is unable to furnish VAT compliant tax invoice & other certificate/document, VAT shall not be reimbursed by BHEL.

SECTION-C

SPECIFIC TECHNICAL REQUIREMENT

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) For Actuator selection, bidder to take care of Customer spec. Attached in subsequent part of this section (Page 22, Section-C)

2) 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.

3) 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.

4) 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.

5) 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 customer specification furnished at section-C.**

5a) **In case of any contradiction in requirements** of Control Valves between Spec. no. PES-145-06 enclosed in Section-D AND Customer requirement of Control Valves at section-C ,**the requirement of section -C shall prevail.**

6) 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.

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

8) Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10.

9) Anticavitation trims shall be provided for valves with cavitation service and hardened trims for flashing service.

10) 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 Anticavitation trim.

11) Noise abatement mentioned shall be obtained by valve body and trim design & not by any external means.

12) Control valve accessories shall be fitted on the valve body. Integral pneumatic tubing shall be Stainless Steel, and fittings shall be of stainless steel. Applicable accessories shall be terminated at the junction box (mounted on the body).

13) Type of flow action ("under the seat" or "over the seat") will be selected by the bidder. However wherever downstream side is subjected to vacuum, flow action shall be "flow to close" (over the seat). Specific mention for the same has not been made in the datasheets.

14) 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.

15) Trim supplied shall be suitable for quick changing and trim exit velocity shall be limited to avoid cavitation.

16) The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.

17) The End Connections Shall Be Socket Welded For Sizes Below 50NB And Butt Welded For Sizes 50NB And Above.

18) The Counter Flange (required for Flanged Valves) shall be in bidder scope of supply.

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

20) **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(as per Quality Plan attached in Section-D). Cv test reports shall be approved by BHEL/Customer.Type test certificate shall also be acceptable.Bidder to note that only those type test reports for same type of control valves shall be offered for approval which are not older than 5 years from the date of Part 1 opening (receipt of technical unpriced offer).**

21) 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.

22) 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.

23) 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.

24) SS nameplate for control valve shall include tag no./kks no./sl. No./body material /size/press rating/trim material/trim type/action on air failure/diaphragm air pressure at full open and close condition.

25) 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.

26) Not Applicable

27) Hand wheel shall have open/close direction.

28) Air filter regulator shall be designed for an inlet pressure of 5-8 kg/cm2.

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

30) Expander/reducer shall be in BHEL's scope of supply.

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

32) Pneumatic connection: for each control valve 25 meters length SS tubing shall be used. Fittings to be used with SS tubes shall be 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.

33) Inspection shall be carried out in line with approved drawing/ data sheet/ QP & specific technical requirements

34) 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.

35) 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.

36) **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

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.

37) 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.

38) **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, any software required to be installed on the HMS PC (in bidder'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.

39) **Documentation:**

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

a) Duly filled in Datsheet-C for each valve.(VOL.-III).

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

c) Schedule of submission of Drg. / Doc, Equip. Manufacture, Inspection and Dispatch.

d) Inspection schedule

(B) After the award of contract:

The documentation as listed below will separate for respective projects

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

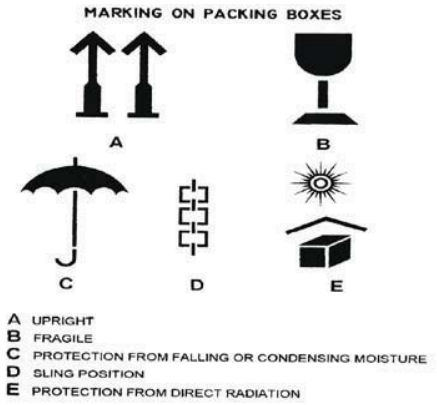
(C) Final documentation:

DRAWING AND DOCUMENTS FOR SUBMISSION

S.N.	Drawings and documents	Soft and Hard Prints
1.0	DRAWING FOR APPROVAL	
1.1	For approval	Soft+2 Hard Print
1.2	For customer approval	Soft+2 Hard Print
1.3	For final distribution	Soft+2 CD +5 Hard Print
2.0	DRAWING FOR REFERENCE	
2.1	For reference	Soft+2 Hard Print
2.2	For final distribution	Soft+2 CD+5 Hard Print
3.0	CERTIFICATE, REPORTS ETC.	Soft+2 Hard Print
4.0	AS BUILT DRAWINGS (IF REQUIRED)	Soft+2 CD+8 Hard Print
5.0	O&M MANUAL	
5.1	Draft for approval	Soft +3 CD+ 5 Hard Print
5.2	For final distribution	Soft +3 CD + 8 Hard Print
6.0	QUALITY PLAN / Field quality plan / PG test	Soft + 2 Hard Print

Guidelines for Packing

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



<u>The Following Details are to be marked on the Packing Cases</u>

- ✓ 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)

Control Valve Sizing and Construction

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

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

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

iv) Applications like the CEP minimum recirculation valve shall have anti-cavitation trim with tight shut-off. The deaerator level control valve shall have characterized trim cages to have a cavitation protection at minimum flow as well as good rangeability.

v) All control valves shall have minimum leakage rate as per leakage Class-IV. However the leakage class may vary in critical applications subject to approval.

vi) The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.

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Valve Construction

i) All valves shall be of globe body design & straightaway pattern with single or double port unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure drops permit.

ii) Valves with high lift cage guided plugs & quick change trims shall be supplied.

iii) Cast iron valves are not acceptable.

iv) Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Consultant. Bonnet joints of the internal threaded or union type shall not be acceptable.

v) Plug shall be one-piece construction either cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.

vi) All valves connected to vacuum on downstream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing).

vii) Valve characteristic shall match with the process characteristics.

viii) Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.

ix) Flanged valves shall be rated at no less than ANSI pressure class of 300 lbs.

Valve Materials

The control valve body & trim material shall be as stipulated in Annexure-IV of this section.

However, Seller may offer valves with body and trim materials better than specified materials and in such cases Seller shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-à-vis the specified material for Consultant's consideration and approval.

End Preparation

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

Valve Actuators

The HP and LP Bypass, turbine inlet control valves shall be with electro-hydraulic actuators and all other control valves shall be furnished with pneumatic actuators. The Seller shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg. C continuously.

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

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

Control Valve Accessory Devices

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

7.00.00 INSPECTION AND TESTING

7.01.00 Testing of Piping at Works

7.01.01 Material Test and Analysis

All ~~materials~~ **Major pressure retaining materials, high stressed zone materials and IBR items** shall be furnished in strict accordance with the

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ANNEXURE-V

DATA SPECIFICATIONS SHEET FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER

Electrical	Input Signal	4-20 mA.
	Power Supply	Loop Powered from the output card of Control System.
	Hart Protocol	Compatibility For Remote Calibration & Diagnostics (Super-Imposed Hart Signal On Input Signal(4-20 mA).
	Valve Position Sensing	Position Sensing (Non Contact-Sensing Type), 4-20 Ma O/P Signal For Control System To Be Provided.
Environment	Operating Temp	(-)30 To 80 Deg. C
	Humidity	0-95 %
	Protection Class	IP-65 Minimum.
Software For Configuration And Diagnostic	Software	Windows Based Software. Configuration Shall Meet the Requirement, Diagnostics, Calibration Testing Of The Actuator.
	Diagnostic/Test Features	Advanced Diagnostic Features Like Features Stroke Counter Or Travel Counter, Leakage In Actuators, On Line Partial Closure Test, Valve Signature Analysis, Step Response Test, Valve Friction /Jamming Detection Etc To Be Provided.
	Factory Valve Signature Tests Reports (Pr Vs Valve Travel And Travel Vs I/P Signal) are to be provided.	
Hardware	PC	For Configuration/Software, Ref PC Specified elsewhere
Tests Certificates		Test certificates as per Manufacture Standard/Relevant Standard are To Be Submitted.
Configuration / Remote Calibration, Auto & Manual Calibration Shall Be Possible.		
Operating Modes	Operating Range	Full Range & Split Range Signal Range.
	Valve Action	Direct & Reverse. Valve Action.
	Flow Characterisation	Possible To Fit Valve Characteristic Curve Linear & Equal Percentage.

Fail Safe/Fail Freeze	Fail Safe/Fail Freeze Feature is to be Provided.	
Pneumatic	Air Capacity	Sufficient To Handle The Valves Selected/Boosters To Be Supplied If Required.
	Air Supply Pressure	To Suit The Air Supply Pressure/ Quality Available.
	Process Connection	1/4 Inch NPT.
Performance	Characteristic Deviation	<=0.5 % Of Span.
	Ambient Temp Effect	<=0.01 %/Deg C Or Better.
EMC & CE Compliance	Required To International Standard Like EN/IEC.	En50081-2& En50082 Or Equivalent.
Accessories	In Built Operator	Display With Push Buttons For Configuration Panel And Display On The Positioner Itself (Password Protected/Hardware Lock).
	Hand Held Hart Calibrator	Universal Hart To Be Calibrator Provided, One Per Unit.
	Press Gauge Block	For Supply & Output Pr., Filter Regulator Other Accessories Shall Be Provided As On Required Basis For Making System Complete.
	Electrical Cable Entry	1/2-Npt, Side Or Bottom Entry To Avoid Water Ingress.
	Valves Mounting Assembly	For Sliding Stem/Rotary/Single Acting/Double Acting On Required Basis.

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07.	Removable bulk storage	:	DVD 6 GB (R/RW)
08.	Operating system	:	Latest windows
09.	UPS	:	with 30 min battery backup
10.	Software	:	Additional comprehensive disk maintenance utility for disk clean sweep /crash guard/antivirus etc.

b) **Monitor**

01.	Type	:	LCD colour monitor (TFT based)
02.	Screen diagonal	:	22" (approx.) flat
03.	Display	:	XGA or better
04.	Resolution	:	1024 X 768 or better
05.	Degree of protection	:	IP-30
06.	External Controls	:	Brightness, contrast, Horizontal / Vertical amplification & shift
07.	Version	:	To suit industrial application.

c) **Key Board & Mouse**

01.	Type	:	Flat spill proof membrane or Positive depression type ASCII.
02.	Life Expectancy	:	50 million cycles per key
03.	Version	:	To suit industrial application
04.	Mouse	:	Optical mouse

5.17.05 **Specification of PC**

a) **CPU**

01.	Processor	:	32 bit
02.	Main Memory	:	1 GB expandable to 4 GB
03.	Hard drive	:	40 GB
04.	Floppy drive	:	3½", 1.44MB
05.	Removable bulk storage	:	DVD (R/RW)
06.	Graphic memory	:	16 MB

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07.	Audio controller	:	16-bit or better
08.	Operating system	:	WIN XP
09.	Communication ports	:	2 serial, one parallel, 8 USB, Dual 100Mbps Ethernet
10	expansion slos	:	3

b) **Monitor**

01.	Type	:	LCD colour monitor (TFT based)
02.	Screen diagonal	:	22" (approx.) flat
03.	Display	:	XGA or better
04.	Resolution	:	1024 X 768 or better
05.	Degree of protection	:	IP-30
06.	External Controls	:	Brightness, contrast, Horizontal / Vertical amplification & shift
07.	Power supply	:	240 V, 50 Hz, 1 phase
08.	Version	:	To suit industrial application.

c) **Key Board & Mouse**

01.	Type	:	Flat spill proof membrane or Positive depression type ASCII.
02.	Life Expectancy	:	50 million cycles per key
03.	Version	:	To suit industrial application
04.	Mouse	:	Optical mouse

5.17.06 **Large Video Screen (LVS)**

a) **Display Screen and Projection Device**

01.	Type of Screen	:	~~**LCD with black screen**~~ **LED based**
02.	Screen size	:	67 inch (diagonal)
03.	Contrast ratio	:	1200:1 (typical)
04	Angle of Vision	:	180 Degree Horizontal
05.	Resolution	:	XGA (1024 X 768) or better
06.	Junction Interface	:	Seamless screen to screen alignment to configure in to a video wall.

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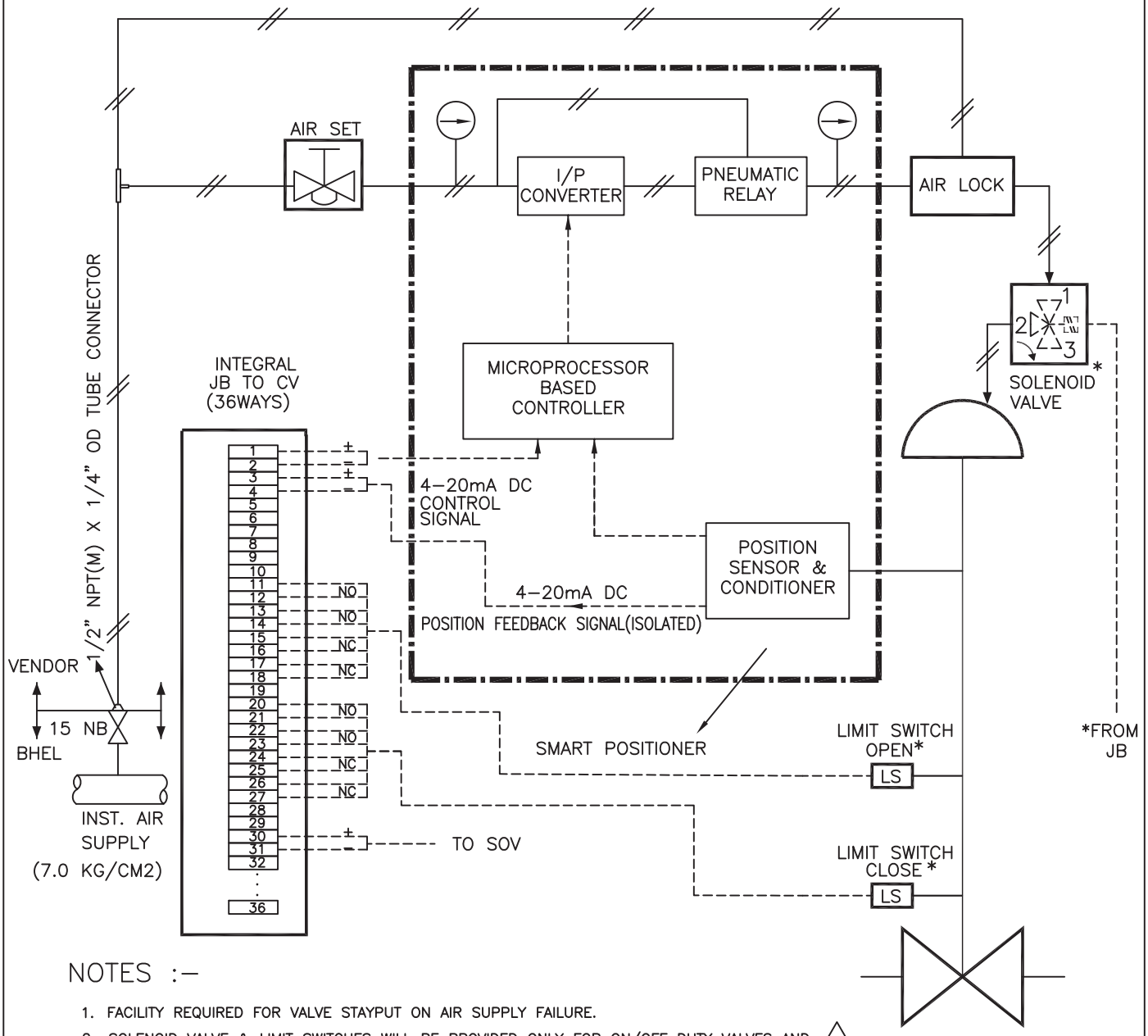
BANAHARPALLI SUPER THERMAL POWER PROJECT - 2 X 660 MW

HOOK–UP DIAGRAM WITH SMART POSITIONER



NOTES :–

1. FACILITY REQUIRED FOR VALVE STAYPUT ON AIR SUPPLY FAILURE.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR ON/OFF DUTY VALVES AND CONTROL VALVES WHERE OPEN/CLOSE INTERLOCK IS REQUIRED AND INDICATED IN RESPECTIVE DATA SHEETS. 2
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. GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 4–20mA (ISOLATED SIGNAL)
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
8. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVES
   THE FOLLOWING ACCESSORIES SHALL NOT BE APPLICABLE:–
   a) SMART POSITIONER b) POSITION TRANSMITTER c) I/P CONVERTER
9. 25 METERS SS TUBING & 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 SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER SHALL BE PROVIDED IF REQUIRED

* SOLENOID VALVE & LIMIT SWITCH– APPLICABLE AS PER DATASHEET 2

SECTION – D

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

SECTION-D

EQUIPMENT SPECIFICATION

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.

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

3.1.7 The sizing shall conform to the requirements of ANSI/ISA(S75- 01), and the valve capacity shall be selected so as to meet the following:

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

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

3.1.9 Suitable justification and evidence shall be furnished regarding proper selection of the valve.

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

i)	Liquid service	<=	7 Metres/Sec.
ii)	Steam service	<=	1/3 Sonic velocity in the flow medium.

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

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

3.1.13 In case of predicted noise level above 85 dBA, suitable low noise trim or inbuilt diffusers shall be provided to bring down the noise level below 85dBA.

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

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

3.2 Pneumatic Actuator

The pneumatic actuators shall be employed for modulating or open/close duty, as specified in Data Sheet-A. The bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drops and shut off pressure.

3.2.1 The pneumatic spring opposed diaphragm actuator for modulating duty shall be capable of positioning the associated valve at desired opening for all the operating conditions specified.

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

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

3.2.4 The actuators shall be suitably sized to ensure that the associated valve travel time from full open to full closed position and vice versa is less than 20 seconds under the most stringent service conditions.

3.2.5 The actuator shall be painted with epoxy based paint.

3.3 Accessories for Control valve with Pneumatic Actuator

The bidder shall offer all the accessories as specified in the Data Sheet - A for the Pneumatic Actuators under modulating or OPEN/CLOSE duty. The accessories specified shall be supplied duly mounted on the valve actuator and piped with PVC covered copper tube and 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.

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 Hysterisis 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

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	:	± 1% of span
ii)	Linearity	:	± 2% of span
iii)	Sensitivity	:	± 0.5% of span.
iv)	Repeatability	:	± 1% of span
v)	Accuracy (Overall)	:	± 2% of span

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

3.5 Electric Actuator

The electric actuator shall be employed for modulating duty.

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

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

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

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

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

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

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

3.5.8 The motor shall operate satisfactorily under the following conditions:

i) ±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.

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 pet 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.

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.

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 ± 1% accuracy. The enclosure shall conform to IP-55. Necessary cable glands shall be supplied.

3.6.5 Wiring

i) The actuator and the accessories will be neatly wired up to the terminal boxes.
ii) The internal wiring shall be minimum of 1 mm^2 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.

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/cm^2 & 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.
i) Dimension checks.

4.3.5 Type tests or Test Reports

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

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

4.5 The St andard QP is inc luded in this s pecification to e nable bidder to u nderstand th e e xtent of inspection and tes ting req uirements to exe cute this job. The successful b idder has t o f ollow the agreed Q P, taking c are of customer r equirements men tioned i n Sec -C and s ubmit Q P fo r fin al approval by BHEL / Customer.

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

As part of the main equipment s upply, the bi dder s hall s upply all commissioning spares and consumables required during Start-up,

5.2 Mandatory Spares

The bidder s hall offer al ong with main offer , the Mand atory Spa res a s s pecified 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 lis t of Rec ommended Spares alon g with th e n ormal s ervice e xpectancy period and fre quency of rep lacement; quantities recommended for 3 years operation along with unit rate ag ainst each item to e nable BHEL / BHEL's Customer to place a s eparate order la ter, 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 Qua lity 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 s hall fu rnish the following documents in re quired number of copies to BHEL during the contract stage:

6.2.1 For approval

i) Dimens ional drawings.

ii) Installation drawings with overall dimensions of the completed equipment and clearances for operation and maintenance.

iii) Data sheet-C, completely filled-up along with all the enclosures including the sizing calculations & noise calculations.

iv) Quality Plan.

v) Test Certificates.

6.2.2 Final / As-built Drawings

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

6.3 Operation & Maintenance Manuals

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

7.0 MARKING AND PACKING

7.1 Marking

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

7.2 Packing

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

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8.0 APPLICABLE DATA SHEET FORMS

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

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

SECTION – D

SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)

(PES – 145 – 06A)

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.

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

8.0 Performance:

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

9.0 Test Certificates:

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

10.0 EMC & CE compliance

International Standard Like EN/IEC. To EN 50081-2 & EN 50082 or equivalent

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.

SECTION-D

DATA SHEETS - A&B

Notes:

1. All general technical requirements including material & construction, leakage class, body sizing and Cv sizing etc. shall be as per the datasheet. 2
2. Type of bonnet shall be according to the service condition. Extension bonnets shall be provided when the maximum temperature of the flowing fluid is greater than 280 ^{o}C.
3. If the downstream is subjected to vacuum, flow direction of the fluid shall be to close. Separate indication for the same has not been made in the data sheet.
4. Valve and actuator shall be designed for full differential pressure (Max. shut-off pressure).
5. Mandatory spares for control valves, shall be as per contract.
6. Testing & other requirements shall be as per customer's specifications and BHEL QP PE-QP-391-145-I006.
7. Quantity indicated is for one unit.
8. Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10.
9. For valves subjected to cavitation service, anti cavitation trim shall be provided and for flashing service, hardened trims shall be provided.
10. Trim shall be Quick Replacement type.
11. The Trim Characteristics mentioned in the datasheets are subject to change depending on model, % lift achieved as per vendor recommendation. 2

INDEX

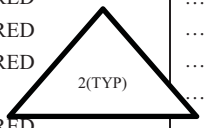
FORM NO. PEM-6666-0

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET	

Tag No. : ASV-8/ LBG51AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N103

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	D/A PEGGING FROM AUX. STEAM HEADER	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	323.9 x 9.53 | 559 x 10	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 672 GR B70	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	……|……
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC(WATER) | [] MAC NO. < 1/3 (STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……



FORM NO. PEM-6666-0

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET	

Tag No. : ASV-8/ LBG51AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	7.5% BMCR	16	16	1.65	250			
	2.	25% BMCR (COLD)	53.28	16	1.7	250			
	3.	15% BMCR (HOT)	45.61	16	3.7	250			
	4.	35% BMCR (COLD)	74.60	16	1.7	250			
	5.	START-UP	106.2	16	1.7	250			
	VALVE TYPE						[] CAVITATION [] FLASHING [■] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 20 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 20 | 280 * IBR FORM III-C [■] REQUIRED [] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITION INDICATED AT SL. NO. 3 AND SHALL BE CHECKED FOR ALL SPECIFIED CONDITIONS AS PER SPECIFICATION PAGE 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 5	OF 48

Tag No. : CRHV-6/ LBQ10AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N103

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	D/A PEGGING FROM CRH LINE	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	355.6 x 15.09 | 965 x 37	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 335 P22	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	……|……
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 6	OF 48

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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	15% BMCR	41.9	14.4	3.65	340.7			
	2.	60% BYPASS MDBFP	163.56	33.57	3.65	344.0			
	3.	HP/LP BYPASS HOUSE LOAD	172.357	33.57	3.65	336.7			
	4.	START-UP	93	14.4	1.65	340.7			
	VALVE TYPE						[] CAVITATION [] FLASHING [■] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 73.1 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.1 | 360 * IBR FORM III-C [■] REQUIRED [] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___2____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.
2. Maximum valve opening under any condition not to exceed 75%

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 7	OF 48

Tag No. : CDV-10, CDV-12 Qty.: 3 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0
CDV-14/ LCA11/12/13AA101 PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	CEP A/B/C MINIMUM RECIRCULATION	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	219.1 x 8.18 | 219.1 x 8.18	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	...|...
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[] GLOBE [■] ANGLE | [] TOP [■] CAGE | ONE	...|...|...|...
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	...|...|...
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	...|...
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	...|...
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	...|...
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[■] YES [] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	...|...
	*TRAVEL TIME FOR	< 10 sec	.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 8	OF 48

Tag No. : CDV-10, CDV-12 Qty.: 3 per Unit (One against each Tag No.) Date Sheet No. PES-145-06-DS1-0
CDV-14/ LCA11/12/13AA101 PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

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

	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
SERVICE CONDITION*	1.	MIN.	30	43.0	0.6	46.3			
	2.	NORMAL	265	43.0	0.6	46.3			
	3.	MAX.	300	43.0	1.5	46.3			
	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:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___2____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 9	OF 48

Tag No. :CDV-22 & CDV-25/ LCA51/52AA101Qty.: 2 per Unit(1 against each Tag) Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	MAIN CONDENSATE CONTROL	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	457 x 12.7 | 457 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	.....|.....
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 10	OF 48

Tag No. :CDV-22 & CDV-25/ LCA51/52AA101Qty.: 2 per Unit(1 against each Tag) Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

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

	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
SERVICE CONDITION*	1.	DESIGN POINT	1740	28	25	46.2			
	2.	60% LOAD	861.2	34.1	13.4	41.5			
	3.	100% MCR	1454.1	31.0	21.3	45.9			
	4.	VWO	1556.5	30.35	22.9	46.5			
	5.	MIN. (10% LOAD)	141.61	35.1	6.5	46.3			
	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:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 11	OF 48

Tag No. : CDV-39/ LCA31AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	GSC MIN. FLOW RECIRCULATION	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	219.1 x 8.18 | 219.1 x 8.18	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 12	OF 48

Tag No. : CDV-39/ LCA31AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	MIN.	32.4	36.9	0.3	46.3			
	2.	MAX	324	30.5	0.7	46.3			
	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:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___2____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 13	OF 48

Tag No. :CDV-43/ LCA41AA101 Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	EXCESS RETURN TO CST	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	273 x 9.27 | 273 x 9.27	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[] GLOBE [■] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

3

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 14	OF 48

Tag No. :CDV-43/ LCA41AA101 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	MIN.	37.5	37.2	4.0	46.3			
	2.	MAX	375	30.8	5.0	46.3			
	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:

1. * TO BE FILLED BY MSE
2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___2____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 15 OF 48	

Tag No. :CDV-67/LCA34AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N111

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	CONDENSATE SPRAY TO SD FLASH TANK	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[■] ON/OFF [] MODULATING	……
	PIPE SIZE (inlet / outlet)	33.4 x 4.55 | 33.4 x 4.55	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[] BWE [■] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[] LINEAR [] EQ. PERCENTAGE	……
		[■] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[] REQUIRED [■] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[■] REQUIRED [] NOT REQUIRED	……
	POSITION TRANSMITTER	NOT APPLICABLE	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	NOT APPLICABLE	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 16	OF 48

Tag No. : CDV-67/LCA34AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 5% # ± 5% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	MAX.	10	32.7	0.5	46.3			
	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:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.
2. # WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 17 OF 48	

Tag No. :CDV-72/ LCA33AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	CONDENSATE FOR VALVE GLAND SEALING	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	60.3 x 5.54 | 60.3 x 5.54	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	*[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M ** REFER NOTE 2*	3 ……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 18	OF 48

Tag No. :CDV-72/ LCA33AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	MAX.	4	28-35	3.0	46.3			
	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:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.
2. * VALVE MATERIAL SHALL BE A217WC6 AND ANTI-CAVITATION TYPE TRIM IN CASE THE VALVE IS SUBJECTED TO CAVITATION FOR THE GIVEN CONDITION.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 19	OF 48

Tag No. : DRV-2 & DRV-8/ LCH30/40AA101Qty.: 2 per Unit (1 against each Tag No.) Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 12.7 | 323.9 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 20	OF 48

Tag No. : DRV-2 & DRV-8/ LCH30/40AA101Qty.: 2 per Unit (1 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	45.21	22.37	10.32	182.6	2		
	2.	60% MCR	65.5	32.8	14.84	201.2			
	3.	100% MCR	148.4	54.27	24.23	226.1			
	4.	VWO	165	58	25.87	229.7			
	5.	BMCR	168.5	58.03	25.8	229.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 73.1 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.1 | 240 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 21	OF 48

Tag No. :DRV-5 & DRV-11/ LCH35/45AA101Qty.: 2 per Unit (1 against each Tag No.) Date Sheet No.PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	HPH-7A/7B ALT. DRAIN TO HP DRAIN F/T	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 12.7 | 323.9 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	.....|.....
	: CAGE | GUIDE BUSH	440 C | 440 C	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[■] YES [] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 22	OF 48

Tag No. :DRV-5 & DRV-11/ LCH35/45AA101Qty.: 2 per Unit (1 against each Tag No.) Date Sheet No.PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

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

	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
SERVICE CONDITION*	1.	40% MCR	45.21	22.37	0.3	182.6	2		
	2.	60% MCR	65.5	32.8	0.3	201.2			
	3.	100% MCR	148.4	54.27	0.3	267.83			
	4.	VWO	165	58	0.3	272.08			
	5.	BMCR	168.5	58.03	0.5	272.12			
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 73.1 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.1/VACUUM | 275 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 23	OF 48

Tag No.:DRV-15 & DRV-22/ LCH10/20AA101Qty.: 2 per Unit (1 against each Tag No.)Date Sheet No.PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 323.9 x 9.53	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 24	OF 48

Tag No.:DRV-15 & DRV-22/ LCH10/20AA101Qty.: 2 per Unit (1 against each Tag No.)Date Sheet No.PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

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

	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
SERVICE CONDITION*	1.	40% MCR	37.24	8.4	6.6	153.4			
	2.	60% MCR	86.5	13.1	8.6	168.7			
	3.	100% MCR	188.5	22.4	12.5	186.4			
	4.	VWO	208.4	23.3	13.1	188.9			
	5.	BMCR	213.5	23	12.8	188.4			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 30 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 30 | 210 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 25 OF 48	

Tag No.:DRV-18 & DRV-25/ LCH15/25AA101Qty.: 2 per Unit (1 against each Tag No.)Date Sheet No.PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	HPH-6A/6B ALT. DRAIN TO HPD F/T	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 323.9 x 9.53	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	.....|.....
	: CAGE | GUIDE BUSH	440 C | 440 C	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[■] YES [] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....|.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 26	OF 48

Tag No.:DRV-18 & DRV-25/ LCH15/25AA101Qty.: 2 per Unit (1 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	37.24	10.1	0.3	179.6			
	2.	60% MCR	86.5	14.8	0.3	196.76			
	3.	100% MCR	188.5	23.8	0.3	220.21			
	4.	VWO	208.4	25	0.3	222.84			
	5.	BMCR	213.5	25.2	0.5	222.12			
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 30 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 30/VACUUM | 230 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 27	OF 48

Tag No. :DRV-28/ LCJ30AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LPH-3 NORMAL DRAIN TO LPH-2	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 323.9 x 9.53	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 28	OF 48

Tag No. :DRV-28/ LCJ30AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	55.375	0.58	0.1	79.1			
	2.	60% MCR	75.951	0.93	0.27	86.6			
	3.	100% MCR	143.411	1.61	0.6	98.5			
	4.	VWO	155.986	1.7	0.63	100.1			
	5.	HPH OUT	159.195	1.8	0.67	101.4			

VALVE TYPE	[] CAVITATION [■] FLASHING [] HIGH DP
* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 110 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 29	OF 48

Tag No. :DRV-31/ LCJ31AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LPH-3 ALT. DRAIN TO LP DRAIN F/T	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 323.9 x 9.53	……|……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	……|……
	: CAGE | GUIDE BUSH	440 C | 440 C	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:
		VOLUME
		SECTION
		REV. NO. / DATE :
		SHEET 30 OF 48

Tag No. :DRV-31/ LCJ31AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	55.375	2 0.92	0.3	96.78			
	2.	60% MCR	75.951	1.89	0.3	105.88			
	3.	100% MCR	143.411	1.95	0.3	118.82			
	4.	VWO	155.986	2.04	0.3	113.1			

VALVE TYPE	[■] CAVITATION [■] FLASHING [] HIGH DP
* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 130 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 31	OF 48

Tag No. :DRV-34/ LCJ20AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LPH-2 NORMAL DRAIN TO LPH-1	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	323.9 x 9.53 | 355.6 x 9.53	……|……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:
		VOLUME
		SECTION
		REV. NO. / DATE :
		SHEET 32 OF 48

Tag No. :DRV-34/ LCJ20AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	77.193	0.44	0.33	58.4			
	2.	60% MCR	106.09	0.61	0.4	64.3			
	3.	100% MCR	200.63	0.94	0.51	73.9			
	4.	VWO	218.2	0.97	0.52	75.3			
	5.	ALL HPH OUT	223.3	1.06	0.56	76.0			

VALVE TYPE	[] CAVITATION [■] FLASHING [] HIGH DP
* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 85 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 33	OF 48

Tag No. :DRV-37/ LCJ21AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LPH-2 ALT. DRAIN TO LP DRAIN F/T	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	323.9 x 9.53 | 355.6 x 9.53	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	……|……
	: CAGE | GUIDE BUSH	440 C | 440 C	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 34	OF 48

Tag No. :DRV-37/ LCJ21AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	77.193	0.44	0.3	77.72			
	2.	60% MCR	106.09	0.61	0.3	85.88			
	3.	100% MCR	200.63	0.94	0.3	97.37			
	4.	VWO	218.2	0.97	0.3	98.24			
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 105 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 35 OF 48	

Tag No. :DRV-48/LAA01AA201… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	DEAERATOR OVERFLOW TO LP DRAIN F/T	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[■] ON/OFF [] MODULATING	……
	PIPE SIZE (inlet / outlet)	219.1 x 6.35 | 323.9 x 9.53	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[] LINEAR [] EQ. PERCENTAGE	……
		[■] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	……|……
	: CAGE | GUIDE BUSH	440 C | 440 C	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[] REQUIRED [■] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[■] REQUIRED [] NOT REQUIRED	……
	POSITION TRANSMITTER	NOT APPLICABLE	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	NOT APPLICABLE	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 36	OF 48

Tag No. :DRV-48/LAA01AA201… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 5% # ± 5% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	MAX.-1 10% BMCR	210	14.62	0.3	189.28			
	2.	MAX.-2 10% BMCR	210	5.63	0.5	138.2			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 20 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 20/VACUUM | 200 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___1____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.
2. # WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 37	OF 48

Tag No.:DRV-53 & DRV-59/LCH50/60AA101Qty.: 2 per Unit (1 against each Tag No.)Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3 x 14.27 | 219.1 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 38	OF 48

Tag No.:DRV-53 & DRV-59/LCH50/60AA101Qty.: 2 per Unit (1 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	16.3	32.4	22.9	221.3	2		
	2.	60% MCR	22.8	45.9	33.0	242.4			
	3.	100% MCR	54.3	75.5	54.7	272.7			
	4.	VWO	61.0	81.4	58.2	277.5			
	5.	BMCR	62.0	81.3	58.3	277.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 88 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 88 | 285 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 39	OF 48

Tag No.:DRV-56& DRV-62/LCH55/65AA101Qty.:2 per Unit (One against each Tag No.)Date Sheet NoPES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	.....
	SERVICE	HPH-8A/8B ALT. DRAIN TO HP DRAIN F/T	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3 x 14.27 | 219.1 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY*	MODEL NO.	Bidder to Specify	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	.....|.....
	: CAGE | GUIDE BUSH	440 C | 440 C	.....|.....
	FLOW	Bidder to Specify	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[■] YES [] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	.....|.....
	*TRAVEL TIME FOR	< 10 sec	.....|.....
	OPEN TO CLOSE, CLOSE TO OPEN	|	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	.....
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	.....
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	.....
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	.....
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	.....
	POSITION TRANSMITTER	PART OF POSITIONER	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 40	OF 48

Tag No.:DRV-56& DRV-62/LCH55/65AA101Qty.:2 per Unit (One against each Tag No.)Date Sheet NoPES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

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

	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
SERVICE CONDITION*	1.	40% MCR	16.3	32.4	0.3	236.82			
	2.	60% MCR	22.8	46.2	0.3	259.39			
	3.	100% MCR	54.3	75.8	0.3	291.39			
	4.	VWO	61.0	81.7	0.3	294.14			
	5.	BMCR	62.0	81.6	0.5	293.62			
	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:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 41 OF 48	

Tag No. :DRV-65/ LCJ40AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LPH-4 NORMAL DRAIN TO LPH-3	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 219.1 x 8.18	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR C	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 42	OF 48

Tag No. :DRV-65/ LCJ40AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	34.734	2.37	0.61	97.9	2		
	2.	60% MCR	46.8	3.4	0.94	107.2			
	3.	100% MCR	88.9	5.4	1.62	121.1			
	4.	VWO	96.7	5.6	1.71	123.0			
	5.	HPH OUT	98.66	5.87	1.81	124.6	2		
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) * IBR FORM III-C						7 7/VACUUM | 135 [] REQUIRED [■] NOT REQUIRED		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 43	OF 48

Tag No. :DRV-68/ LCJ41AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N104

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LPH-4 ALT. DRAIN TO LP DRAIN F/T	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 219.1 x 8.18	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR C	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440 C | 440 C	……|……
	: CAGE | GUIDE BUSH	440 C | 440 C	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 44	OF 48

Tag No. :DRV-68/ LCJ41AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	40% MCR	34.734	3.3	0.3	97.9	2		
	2.	60% MCR	46.8	4.3	0.3	140.05			
	3.	100% MCR	88.9	5.7	0.3	155.95			
	4.	VWO	96.7	6.0	0.3	157.75			
	VALVE TYPE						[■] CAVITATION [■] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 7 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/VACUUM | 165 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___4____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 45	OF 48

Tag No. :DM-45/ LCR81AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N106

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	DM NORMAL MU TO HOTWELL	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	168.3 x 3.4 | 168.3 x 3.4	……
	PIPE MATERIAL (inlet / outlet)	SA 312 TP 304 (ERW) | SA 312 TP 304 (ERW)	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [] A217 WC6 [] SS [] A217 CS	……
		[■] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	……|……
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 46	OF 48

Tag No. :DM-45/ LCR81AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	MIN. (0.5% MU)	10.55	6.5 #	0.5	40			
	2.	NORMAL (1% MU)	21	5.5 #	0.55	40			
	3.	MAX. (3% MU)	63.3	4.5 #	0.6	40			
	4.	NORMAL (1% MU)	21	5.5 #	1.6	40			
	5.	EMERGENCY (5% MU)	106	3.2 #	0.5	33			
	6.	EMERGENCY (5% MU)	106	3.2 #	1.5	33			
	VALVE TYPE						[■] CAVITATION [] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 10 * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10/VACUUM | 50 * IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

1. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___2____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.
2. # INLET PRESSURE TO BE CONFIRMED AFTER FINALISATION OF PUMP PARAMETERS.

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 47	OF 48

Tag No. :FDV-14/ LAB50AA101… Qty.: …1 per Unit … Date Sheet No. PES-145-06-DS1-0
PID NO: PE-DG-391-100-N105

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	OPGC-BANHARPALLI STPP (2 X 660MW)	……
	SERVICE	LOW LOAD FEED CONTROL	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	355.6 x 64 | 355.6 x 64	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	……|……
BODY*	MODEL NO.	Bidder to Specify	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	Bidder to Specify	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	……|……
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	……
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
	FLOW	Bidder to Specify	……
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[■] YES [] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	Bidder to Specify	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	……|……
	*TRAVEL TIME FOR	< 10 sec	……
	OPEN TO CLOSE, CLOSE TO OPEN	|	……
	*VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	*VALVE POSN. ON SUPPLY AIR FAILURE	[■] STAYPUT	……
ACCESSORIES	POSITIONER(SMART)HART COMPATIBLE	[■] REQUIRED [] NOT REQUIRED	……
	AIR FILTER REGULATOR	[■] REQUIRED [] NOT REQUIRED	……
	AIR LOCK RELAY	[■] REQUIRED [] NOT REQUIRED	……
	POSITION LIMIT SWITCH	[] REQUIRED [■] NOT REQUIRED	……
	POSITION TRANSMITTER	PART OF POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	PRESSURE GUAGES	[■] REQUIRED [] NOT REQUIRED	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE :
		SHEET 48	OF 48

Tag No. :FDV-14/ LAB50AA101… 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 HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 1% ± 1% ± 0.5% ± 2%	…… …… …… ……

	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
SERVICE CONDITION*	1.	5% MCR (MIN.SPEED)	106	82	18	111			
	2.	15% MCR	318	122	75.2	111			
	3.	25% MCR	530	126	115.4	111 TO 138			
	4.	35% Boiler Min R/c-I	739	124	119.5	156.5			
	5.	35% Boiler Min R/c-II	739	124	20	111			
	VALVE TYPE						[■] CAVITATION [] FLASHING [■] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2g) 470 # * BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 470 # | 200 * IBR FORM III-C [■] REQUIRED [] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. * PARAMETERS LIKELY TO CHANGE ON RECEIPT OF PUMP INPUTS FROM BHEL-HYD.
2. + DESIGN CV SHALL BE BASED ON SERVICE CONDITIONS INDICATED AT SL. NO. ___2____ AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS AS PER SPECIFICATION PAGE NO. 30 CLAUSE NUMBER 3.1.7.
3. # DESIGN PRESSURE SUBJECT TO CUSTOMER APPROVAL.

SECTION – D

DATA SHEETS – ACCESSORIES FOR CONTROL VALVES

FORM NO. PEM-6666-0

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	Specification No.:
		Volume
		Section
		Rev. No. 00 Date :30.07.2014
		Sheet

Tag No: **Quantity: As required** Data Sheet No. PES-145-06-DS1-0

Applicable for tag nos. wherever statement "REQUIRED" indicated in the individual CV data sheets

DATA SHEET – A & B for ACCESSORIES
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)

SMART POSITIONER (HART PROTOCOL BASED)	MFR. & MODEL NUMBER			Bidder to Specify		
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ■ NO	☐ THREE ■ TWO	■ IP – 65
	INPUT SIGNAL			4- 20 mA DC		
	OUTPUT SIGNAL (Kg / Cm^2)			TO SUIT ACTUATOR		
AIR FILTER REGULATOR	MFR. & MODEL NUMBER			Bidder to Specify		
	AIR SUPPLY PRESS (MAX.) (Kg / Cm^2 g)			■ 5.0 - 8.0		
	OUTPUT PRESS (Kg / Cm^2 g)			TO SUIT ACTUATOR		
	OUTPUT GAUGE			■ REQUIRED (2 Inch) ☐ NOT REQUIRED		
AIR LOCK	MFR. & MODEL NUMBER			Bidder to Specify		
	SET PRESS (Kg / Cm^2)					
	SUPPLY PRESS (MAX.) (Kg / Cm^2)			■ 5.0 - 8.0		
	RESET TYPE			AUTO		
	VENT PLUG			REQUIRED		
LIMIT SWITCH	MFR. & MODEL NUMBER			Bidder to Specify		
	OPEN posn	INT posn	CLOSE posn	**1 NO.**	**---**	**1 NO.**
	CONTACT TYPE			SPDT		
	RATING (AC / DC)			5A 240V AC AND 0.5A 220V DC		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
POSITION TRANSMITTER	MFR. & MODEL NUMBER			Bidder to Specify (Part of SMART Positioner)		
	TYPE			■ Electronic (2-Wire) Contactless ☐ OTHER		
	SUPPLY			■ 24V DC ☐ 220V DC ☐ 110V AC ☐ 240V AC		
	OUTPUT RATING			■ 4-20mA ☐ 0-100 ohms		
	ACCURACY +			_ 2% FS		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
SOLENOID VALVE	MFR. & MODEL NUMBER			ROTEX / ASCO		
	RATING			■ 24V DC ☐ 220V DC ☐ 240V AC ☐		
	OPERATION Q	UANTITY		☐ Stayput ■ Interlock	■ 1 ☐ 2	
	COIL INSULATION CLASS			CLASS - H		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
	BODY & TRIM			SS BAR STOCK & AISI SS-316 respectively		
JUNCTION BOX	NO. OF WAYS			☐ 24-WAYS ☐ AS REQUIRED ■ 36-Ways		
	SIZE AS			REQUIRED		
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
I/P CONVERTER (Part of SMART Positioner)	INPUT SIGNAL	POWER SUPPLY		4-20mA DC	24V DC	
	SPLIT RANGE			☐ YES ☐ NO		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
	Accuracy	Repeatability		± 0.5 % FS	± 0.5 % FS	
SS. Tubing & Fittings / per CV	**This is in addition to SS Tubing and fittings which are integral part of CV**			25 Meters of SS Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.		

SECTION-D

DATA SHEETS -C

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) 2X660MW BANAHARPALI	SPECIFICATION NO **PE-TS-391-145-I104**
		VOLUME **II-B**
		SECTION **D**
		REV. NO. 00 / DATE: 30.07.2014
		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^2g)	
	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	

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

SECTION-D

QUALITY PLAN

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 03 DATE: 09.04.14
SHEET 1 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
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	
		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; 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

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 03 DATE: 09.04.14
SHEET 2 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
		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

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 03 DATE: 09.04.14
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 $ P	Agency $ W	Agency $ V	Remarks
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 Recor ds		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		---	---	
3.0	**TESTS ON COMPLETED VALVE**											

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

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 03 DATE: 09.04.14
SHEET 4 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2 1	,4 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	,4 1		Refer Note-4 3
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2 1	,4 1		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	Refer Note-4
2.		Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		7. Accuracy (Overall) 1	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		8. Control Valve Flow 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 / ISA S75.02 1	As per specs/ Approved drg. / data sheet	Test Certificate	2	1,4 3	1	♦Size = Body & port size Or Body size & CV for non std port. Refer Note 1.

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
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PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 03 DATE: 09.04.14
SHEET 5 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
		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	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	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	
		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	

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
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1 - BHEL; 2 - Vendor; 3 - Sub-vendor; 4 - Customer

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 03 DATE: 09.04.14
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 $ P	Agency $ W	Agency $ V	Remarks
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. Hysterisis	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. Hysterisis	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
7.0	**PACKING**	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
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1 - BHEL; 2 - Vendor; 3 - Sub-vendor; 4 - Customer

PEM :: C&I	STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)	QUALITY PLAN NO.: **PE-QP-391-145-I 006**
		VOLUME IIB
		SECTION D
		REV. NO. 03 DATE: 09.04.14
		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	

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; 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

SECTION-D

BILL OF QUANTITY

BILL OF QUANTITY

S.NO.	ITEM DESCRIPTION		Qty/Unit	Total Qty.
[A]	**CONTROL VALVES COMPLETE WITH PNEUMATIC ACTUATOR AND ALL ACCESSORIES MOUNTED , PIPED AND TERMINATED ON JB**			
S. No.	**TAG NO.**	**SERVICE**		
1.	ASV-8	D/A Pegging from Aux. Steam Header	1	2
2.	CRHV-6	D/A Pegging from CRH Line	1	2
3.	CDV-22 & CDV-25	Main Condensate Control	2	4
4.	CDV-10,CDV-12 & CDV-14	CEP A/B/C Minimum Recirculation	3	6
5.	CDV-39	GSC min. flow recirculation	1	2
6.	CDV-43	Excess Dump Control	1	2
7.	CDV-67	Condensate for SD F/T	1	2
8.	CDV-72	Condensate for Valve Gland Sealing	1	2
9.	DRV-2 & DRV-8	HPH-7A/7B Drain to HPH-6A/6B	2	4
10.	DRV-5 & DRV-11	HPH-7A/7B Drain to HP Drain F/T	2	4
11.	DRV-15 & DRV-22	HPH-6A/6B Drain to Deaerator	2	4
12.	DRV-18 & DRV-25	HPH-6A/6B Drain to HP Drain F/T	2	4
13.	DRV-28	LPH-3 Drain to LPH-2	1	2
14.	DRV-31	LPH-3 Drain to LP Drain F/T	1	2
15.	DRV-34	LPH-2 Drain to LPH-1	1	2
16.	DRV-37	LPH-2 Drain to LP Drain F/T	1	2
17.	DRV-48	Deaerator Overflow	1	2
18.	DRV-53 & DRV-56	HPH-8A/8B Drain to HPH-7A/7B	2	4
19.	DRV-59 & DRV-62	HPH-8A/8B Drain to HP Drain F/T	2	4
20.	DRV-65	LPH-4 Drain to LPH-3	1	2
21.	DRV-68	LPH-4 Drain to LP Drain F/T	1	2
22.	DMV-45	DM Normal Makeup to Hotwell	1	2
23.	FDV-14	Low Load Feed Control	1	2

BILL OF QUANTITY

[B]	**SS TUBING (To be supplied Loose)**		**625** METERS	1250 METERS
[C]	**FITTINGS: (To be supplied Loose)**	**(i)** SS FITTING for Connection to Air Filter Regulator	1 Lot	2 Lot
		(ii) SS FITTING for Connection to Air Lock Relay	1 Lot	2 Lot
		(iii) SS FITTING for Connection to IA Header isolation valve	1 Lot	2 Lot
		(iv) SS EQUAL TEE	1 Lot	2 Lot
[D]	**SOFTWARE & ACCESSORIES**			
1	VALVE CONFIGURATION,DIAGNOSTIC, CALIBRATION AND TESTING SOFTWARE		1 Set	2 Sets.
2	PC ALONGWITH SYSTEM/APPLICATION SOFTWARE		1 Set	2 Sets
3	UNIVERSAL HAND HELD CALIBRATOR		1 Set	2 Sets

SECTION-D

SPARES

[A] LIST OF COMMISSIONING SPARES (FOR ALL VALVES)

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

[B] LIST OF MANDATORY SPARES FOR VALVES OTHER THAN FDV-14

S.No.	ITEM DESCRIPTION	QUANTITY
1	Pneumatic Actuator for Diaphragm Actuated Valve	2(two) nos. of each type of Actuator
2	Actuator Seal Kit for Pneumatic Cylinder Actuated Valve	2(two) nos. of each type of Actuator
3	Gland Packing	1(one) set for each type of Control Valve
4	Plug, Stem, Cage, Stem etc.	1(one) set for each type of Control Valve
5	Retainer Ring, Seal ring etc.	1(one) set for each type of Control Valve
6	Gaskets	2(two) sets for each type of Control Valve
7	Position Transmitter Complete Set	10% of total quantity used in the system or min. 2 nos. whichever is more for each type & model.
8	Control valve E/P Positioner Complete Set	10% of total quantity used in the system or min. 2 nos. whichever is more for each type & model.
9	Complete Set of Solenoid Valve for Pneumatic type On/Off Valve	2Nos. for each type and ratings
10	Solenoid Coil for Pneumatic Type On/Off valve	5Nos. for each type and ratings
11	Position Limit Switch for Pneumatic Type On/Off Valve	5Nos. for each type and ratings
12	Air Lock Relay	5Nos. for each type
13	Signal Air Booster Unit	2Nos. for each type

[C] LIST OF MANDATORY SPARES FOR FDV-14

S.No.	ITEM DESCRIPTION	QUANTITY
1	Pneumatic Actuator for Diaphragm Actuated Valve	2(two) nos. of each type of Actuator
2	Actuator Seal Kit for Pneumatic Cylinder Actuated Valve	2(two) nos. of each type of Actuator
3	Gland Packing	1(one) set for each type of Control Valve
4	Plug, Stem, Cage, Stem etc.	1(one) set for each type of Control Valve
5	Retainer Ring, Seal ring etc.	1(one) set for each type of Control Valve
6	Gaskets	2(two) sets for each type of Control Valve
7	Position Transmitter Complete Set	10% of total quantity used in the system or min. 2 nos. whichever is more for each type & model.
8	Control valve E/P Positioner Complete Set	10% of total quantity used in the system or min. 2 nos. whichever is more for each type & model.
9	Complete Set of Solenoid Valve for Pneumatic type On/Off Valve	2Nos. for each type and ratings
10	Solenoid Coil for Pneumatic Type On/Off valve	5Nos. for each type and ratings
11	Position Limit Switch for Pneumatic Type On/Off Valve	5Nos. for each type and ratings
12	Air Lock Relay	5Nos. for each type
13	Signal Air Booster Unit	2Nos. for each type
14	Bonnet	50% of total quantity used

NOTES :
Wherever % is indicated, the quantity shall be calculated for % of supply for total quantity of 2 units of 2x660MW, unless otherwise specified. 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.

SECTION-D

PAINTING

16.00.00 **PAINTING**

16.01.00 **General**

All exposed metallic and wooden surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the acceptance of the Buyer.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Buyer. The quality and supplier of the paints shall require acceptance of the Buyer.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the spray painting equipment.

If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Buyer. Spray guns shall not be used outdoors in windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.

The Seller shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35 Deg.C shall be selected by the Seller, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35 Deg.C.

The colour scheme shall be submitted during execution of contract for acceptance by the Buyer / Consultant.

16.02.00 **Preparation**

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.

The priming coat shall be applied without delay.

16.03.00 **Damaged Paintwork**

Any damaged paintwork shall be made good as follows:

a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.

b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50mm around the perimeter of the original damage.

c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

16.04.00 **Painting Systems**

The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.

a) **Surfaces Subject To Weathering**

All surfaces shall have a minimum of four coats of paint made up as follows :

Primer coat	:	30 micron DFT
Tie coat	:	30 micron DFT
Finishing coat (2 Nos.)	:	20 micron DFT per coat

The total minimum DFT shall be 100 micron.

b) **Surfaces Inside Buildings**

All surfaces shall have a minimum of three coats of paint made up as follows:

Primer coat	:	30 micron DFT
Tie coat	:	30 micron DFT
Finishing coat (2 Nos.)	:	20 micron DFT per coat

The total minimum DFT shall be 100 micron.

The type and colour of primer & finish coat shall be selected by the Seller after approval by the Buyer.

For detail painting on building & structural steel elements refer Section-IIG/1 & IIG/2 of this specification.

c) **Un-insulated components >120 ° C but less than 600 ° C (other than those coming in the gas path) like Safety & Valves, Silencers, etc) and for Drain Cooler, LP Heaters-2 & 3 and HP Heaters**

1) Surface Preparation: St3 by Power tool cleaning.

2) Two coats of Heat resistant Aluminum Paint to IS 13183 Gr2 (Up to 400° C)/Gr.1 (Up to 600° C) - DFT 20 µ/coat Total DFT 40 micron

d) **Insulated parts exposed to temperature <400 °C (except those in gas path) and for Deaerator and BFPDT Oil Cooler:**

1) Surface Preparation: St3 by Power tool cleaning.

2) 2 coat of red-oxide zinc phosphate primer to IS 12744

Total DFT 60 micron

e) **Heat exchanger Coils coming in the gas path. (Eco.SH &RH coils, Loose tubes, etc.) :**

Power tool cleaning followed by one coat of dip-coat paint - Red-oxide Zinc phosphate primer to BHEL Spec. DFT 30 micron/coat. Total DFT = 30 mic.

f) **Components coming in the gas path (other than Coils), including water walls, SH panels, SH Headers, Hot air ducts, etc.**

Power tool cleaning followed by 2 coats of Red-oxide Zinc phosphate primer to IS 12744 - DFT 30 micron/coat. Total DFT = 60 mic.

17.00.00 **COLOUR CO-ORDINATION & FINISH**

17.01.00 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.

17.02.00 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and deliverables provided shall be colour coded for ease of identification.

17.03.00 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.

17.04.00 Final colours and finishes shall be to the acceptance of the Buyer.

OPGCL-BANAHARPALLI
(2 x 660 MW)

TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

VOLUME-III

SPECIFICATION No: PE-TS-391-145-I 104

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

CONTENTS

VOL-III

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

1.	**ZERO DATE**	**DATE of LOI / FOI / TOI**
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)

SCHEDULE OF PRICES

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

S. No.	TAG NO.	SERVICE	QTY/UNIT	PRICE/UNIT	PRICE FOR 2 UNITS
1.	ASV-8	D/A Pegging from Aux. Steam Header	1		
2.	CRHV-6	D/A Pegging from CRH Line	1		
3.	CDV-22 & CDV-25	Main Condensate Control	2		
4.	CDV-10,CDV-12 & CDV-14	CEP A/B/C Minimum Recirculation	3		
5.	CDV-39	GSC min. flow recirculation	1		
6.	CDV-43	Excess Dump Control	1		
7.	CDV-67	Condensate for SD F/T	1		
8.	CDV-72	Condensate for Valve Gland Sealing	1		
9.	DRV-2 & DRV-8	HPH-7A/7B Drain to HPH-6A/6B	2		
10.	DRV-5 & DRV-11	HPH-7A/7B Drain to HP Drain F/T	2		
11.	DRV-15 & DRV-22	HPH-6A/6B Drain to Deaerator	2		
12.	DRV-18 & DRV-25	HPH-6A/6B Drain to HP Drain F/T	2		
13.	DRV-28	LPH-3 Drain to LPH-2	1		
14.	DRV-31	LPH-3 Drain to LP Drain F/T	1		
15.	DRV-34	LPH-2 Drain to LPH-1	1		
16.	DRV-37	LPH-2 Drain to LP Drain F/T	1		
17.	DRV-48	Deaerator Overflow	1		
18.	DRV-53 & DRV-56	HPH-8A/8B Drain to HPH-7A/7B	2		
19.	DRV-59 & DRV-62	HPH-8A/8B Drain to HP Drain F/T	2		
20.	DRV-65	LPH-4 Drain to LPH-3	1		
21.	DRV-68	LPH-4 Drain to LP Drain F/T	1		
22.	DMV-45	DM Normal Makeup to Hotwell	1		
23.	FDV-14	Low Load Feed Control	1		

SCHEDULE OF PRICES

		PRICE FOR ONE UNIT	TOTAL PRICE FOR 2 UNITS
[B]	625 METERS OF SS TUBING (Per Unit) FOR CONNECTION BETWEEN IA HEADER ON ONE END AND ACCESSORIES ON THE OTHER END OF CV		
[C] (i)	1 LOT OF SS FITTINGS FOR CONNECTION TO AIR FILTER REGULATOR(AS PER HOOK-UP DIAGRAM)		
(ii)	1 LOT OF SS FITTINGS FOR CONNECTION TO AIR LOCK RELAY(AS PER HOOK-UP DIAGRAM)		
(iii)	1 LOT OF SS FITTINGS FOR CONNECTION TO IA HEADER ISOLATION VALVE(AS PER HOOK-UP DIAGRAM)		
(iv)	1 LOT OF SS EQUAL TEE(AS PER HOOK-UP DIAGRAM)		
[D]	START-UP/COMMISSIONING SPARES (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)		
(i)	1 SET OF BODY AND BONNET GASKETS FOR EACH CV		
(ii)	1 SET OF GLAND PACKINGS FOR EACH CV		
[E]	SOFTWARE FOR CONFIGURATION , DIAGNOSTIC, CALIBRATION & TESTING		
[F]	PC ALONGWITH SYSTEM/APPLICATION SOFTWARE		
[G]	MANDATORY SPARES AS PER LIST ENCLOSED IN SECTION D (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)		
[H]	Cv TEST CHARGES FOR EACH TYPE OF CONTROL VALVE		
[I]	UNIVERSAL HAND HELD CALIBRATOR		

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

CV TEST CHARGES

S.NO.	ITEM DESCRIPTION	
[A]	CONTROL VALVES WITH ALL THE ACCESSORIES	

S. No.	TAG NO.	SERVICE	CV TEST CHARGES
1.	ASV-8	D/A Pegging from Aux. Steam Header	
2.	CRHV-6	D/A Pegging from CRH Line	
3.	CDV-10,CDV-12 & CDV-14	CEP A/B/C Minimum Recirculation	
5.	CDV-22 & CDV-25	Main Condensate Control	
6.	CDV-39	GSC min. flow recirculation	
7.	CDV-43	Excess Dump Control	
8.	CDV-67	Condensate for SD F/T	
9.	CDV-72	Condensate for Valve Gland Sealing	
10.	DRV-2 & DRV-8	HPH-7A/7B Drain to HPH-6A/6B	
11.	DRV-5 & DRV-11	HPH-7A/7B Drain to HP Drain F/T	
12.	DRV-15 & DRV-22	HPH-6A/6B Drain to Deaerator	
12	DRV-18 & DRV-25	HPH-6A/6B Drain to HP Drain F/T	
13	DRV-28	LPH-3 Drain to LPH-2	
14	DRV-31	LPH-3 Drain to LP Drain F/T	
15	DRV-34	LPH-2 Drain to LPH-1	
16	DRV-37	LPH-2 Drain to LP Drain F/T	
17	DRV-48	Deaerator Overflow	
18	DRV-53 & DRV-56	HPH-8A/8B Drain to HPH-7A/7B	
19	DRV-59 & DRV-62	HPH-8A/8B Drain to HP Drain F/T	
20	DRV-65	LPH-4 Drain to LPH-3	
21	DRV-68	LPH-4 Drain to LP Drain F/T	
22	DMV-45	DM Normal Makeup to Hotwell	
23	FDV-14	Low Load Feed Control	

SCHEDULE OF UNIT PRICES

CONTROL VALVE ACCESSORIES

S. No.	ITEMS	UNIT PRICE
1. $	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.	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

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

DEVIATION SCHEDULE

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