

TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

1 x 525 MW TUTICORIN TPP

VOLUME - IIB

SECTIONS-A, C & D

SPECIFICATION No: PE-TS-427-145-I801



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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

CONTENTS

VOL-II B

SECTION	DESCRIPTION
A	Scope of Enquiry
C	Specific Technical Requirements
	Customer's Specification
	Datasheets-A&B (Data sheet no. PES-145-06-DS1-1)
	Datasheets-C (Data sheet no. PES-145-06-DS2-1)
	Quality Plan
	Bill of Quantity - Main Supply
	Bill of Quantity - Spares
D	Equipment Specification (PES – 145 – 06) 29
	Specification for Smart Positioner (PES – 145 – 06A) 35
	Hook-Up Diagram (PES-145-06B) 39
	Guideline for Packing (PES-145-06C) 45
	Specification for Electric Actuator (PES-145-06D) 47



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SECTION – A

SCOPE OF ENQUIRY



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SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SCOPE OF ENQUIRY

1. SCOPE

- 1.1 This specification covers the Design, Manufacture, Inspection and testing at manufacturer's works, proper packing for transportation and delivery to site of the **Control Valves with Pneumatic Actuator along with Accessories, Start-up/Commissioning Spares** as mentioned in different sections of this specification for **1 X 525 TUTICORIN TPP** project.
- 1.2 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.
- 1.3 Following signed & stamped documents with company seal to be submitted by bidder.
- a) Complete offer including calculation sheets, catalogues etc.
 - b) Quality Plan
 - c) Datasheet A & B, duly filled
 - d) Schedule of prices & unit prices, inspection schedule
 - e) Schedule of submission of drawings/documents, equipment manufacture, inspection & dispatch.

2 GENERAL TECHNICAL INSTRUCTIONS

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



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Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SECTION – C

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SPECIFIC TECHNICAL REQUIREMENTS

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

1. **All the formats in Volume-III, SCHEDULE OF SUBMISSION OF DRG./DOC. and QUALITY PLAN (BHEL Format) should filled-up and furnished with the bid, complete in all respect. In the absence of those, the bid would be considered incomplete and liable for rejection.** Catalogue, Leaflets related with the models of Control Valves as well as each Accessory must be furnished with the offer.
2. The Hook-up diagram for Control valve, attached in Section-D. The scope demarcation as indicated should be adhered. The connection details at Instrument Air valve shall be furnished to successful bidder after the award of contract.
3. Valve Body Sizes shall be quoted to take care of the specification requirements like parameters, and limitations of Fluid outlet velocities, Noise Level etc. **However Port (Trim) Sizes shall be selected to suit CV requirement for achieving percentage valve lift as per Technical Specification.**
4. Bidder to note that, **wherever downstream side of the valve is subjected to the Vacuum service, bidder to offer double Gland packing, and in that case, flow direction of working fluid shall be to close the valve.** Separate indication for the same has not been made in the data sheets-A.
5. For valves subjected to cavitation service, anti-cavitation trim shall be provided.
6. In case during erection/commissioning of the control valve, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the bidder free of cost.
7. Facility to adjust the maximum travel of the stem & starting point of travel shall be incorporated.



Technical specification for
Control Valves with Accessories
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SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

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

9. Hand wheel shall have open/ close direction.

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

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

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

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

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

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

16. Solenoid valve class of protection shall be IP-65

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

18. The smart positioner provided with Control Valves shall be compatible with Universal Hart Calibrator.

In order to interface with METSO system, the smart positioner of Control Valves has to be HART Compatible. Bidder to provide diagnostic software (for all tags) to be installed on HMS PC for communicating with the smart positioner and accessing the diagnostic features of the smart positioner. Bidder to offer latest version of calibration and diagnostic software which should be compatible with latest operating system at the time of commissioning of valve/positioner without any additional cost to BHEL. The offered software shall be compatible with the HART MANAGEMENT SYSTEM hardware of reputed makes like MTL, P&F etc. Additionally Vendor to provide DTM (device type manager) / DTD (device type description) files for engineering.

Refer clause no 3.0 volume IIB

SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

19. Positioner shall have both fail freeze and fail safe feature.

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

(A) Recommended Spares:

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

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

(B) Start-up & Commissioning Spares:

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

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

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

20. Documentation:

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

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

(B) After the award of contract:

The documentation as listed below for the project

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

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



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SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION A

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

(B) Final documentation:

The documentation as listed below will separate for respective projects

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

**21 LOW LOAD FEED CONTROL VALVE FDV-14 IS MULTI STAGE,
MULTI PATH TYPE VALVE. REFER TECHNICAL SPECIFICATION
CLAUSE 7.05.02**



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CUSTOMER SPECIFICATION



Suitable redundant & diode auctioneered 24V DC bulk power supply packs/modules and redundant feeders shall be provided to feed all modules/devices of DDCMIS.

6.01.08 Space heaters for control panels not necessary.

6.02.00 CLOSED TYPE TRANSMITTER RACKS

These racks shall be used for dust prone areas like Boiler, Mill, Coal and Ash handling, ESP and Deaerator etc.

6.02.01 Required number of transmitter racks shall be furnished to house transmitters, switches and converters by grouping them suitably, area-wise / function-wise.

6.02.02 The transmitter enclosures shall be constructed of suitable thick steel plate. The enclosures shall preferably be of modular construction and with two end plate assembly bolted to the frame.

6.02.03 The modules shall approximately be 1200 millimeters wide, 1000 millimeters deep and 2350 millimeters high to allow easy access to the internals. Racks shall be reinforced as required to ensure true surfaces and to provide adequate support for instruments and equipment mounted therein. Double interlocking doors shall be provided and shall be arranged for maximum possible access to the interior. Center posts or any member which would reduce access shall not be provided.

6.02.04 Doors shall have concealed quick removal type pinned hinges and locking handles. Doors locks shall accept the same key all over the plant. Gaskets shall be used between all mating sections to achieve dust proof enclosure rating for the modules and a IP-65 waterproof and dust tight rating on the terminal boxes.

6.02.05 All racks shall have a common closed drain trough to connect transmitter drain points to a common header after suitable pressure breaking.

6.03.00 OPEN TYPE TRANSMITTER RACKS

6.03.01 Open type transmitter racks may be provided for mounting transmitters, switches, gauges, converters and other accessories in rooms, buildings and closed areas like the power house building.

6.03.02 The open type racks may be shop or site fabricated. Transmitters, switches, converters and transducers of enclosure class IP-65 or better can be directly mounted on open racks

6.03.03 Racks shall be constructed on structural members of adequate strength and rigidity to ensure proper support to the mounted instruments and equipment. Racks shall be of welded construction throughout. Each rack shall be provided with a canopy to protect the instrument from dripping water or falling objects.

6.03.04 For operational convenience, the open type racks shall be used for mounting pressure and temperature gauges and switches and the local operating stations for electrical drives in the vicinity. Gauges mounted in racks shall be bottom connected and secured by double lock nuts.

7.00.00 CONTROL VALVES, ACTUATORS & ACCESSORIES

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-IV-SEC-13 - 47	DCPL-12Z05
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General Technical Guidelines for the Control Valves shall be as follows:

- a) Bidder shall exercise extreme caution in selecting severe service control valves like BFP recirculation valves, HP & LP bypass valves, superheater & Reheater attemperator valves, PRDS valves for Boiler & Turbine, Soot blower steam pressure control valve etc. For such critical applications, Bidder shall offer valves which are proven for similar application for not less than 2 years of continuous service in power plant environment. All the above valves shall have leakage class equal or better than class-V with metal-to-metal seating.
- b) Wherever, steam conditioning calls for Pressure reducing & desuperheating as well, combined PRDS type valves shall be offered.
- c) Bidder shall provide redundant control valves for 100% Feed water control, Superheat attemperation control and Reheat attemperation control as a minimum. For other application, if the availability criteria for the plant can not be met even with the best established product, redundant control valves shall be provided.
- d) All control valves shall be located near floor or platform for ease of access with adequate clearances for maintenance and lay-down and shall be placed as station with up- and down-stream motorized isolating valves, manual drain valves and inching bypass valve. Each redundant control valve shall have its up- and down-stream motorized isolating valves.

7.01.00 GENERAL

Control valves for regulating service shall normally be globe body, preferably cage guided; metal-to-metal seated, pneumatically operated and shall be provided with characterized plugs having ANSI leakage class-IV or better. Where the operating time is critical for the operation of the plant, as in case of HP or LP bypass valves, hydraulic actuators with electro-hydraulic interface shall be offered. For large flow conditions with low pressure drops, as in case of cooling water applications, butterfly valves shall be used.

The leakage class of control valves shall be dictated by the process and shall be approved by client / consultant.

7.02.00 VALVE BODY / END CONNECTIONS

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

- 7.02.01 Control valves of 40 mm. size and above with line pressure up to 50 Kg / Sq. cm may have flanged end connections.
- 7.02.02 Control valves, used in high pressure services, shall have butt welded end connections for size 65mm and above and socket weld end connection for size 50 mm or below.
- 7.02.03 Control valve body shall be cast and machined for pressure rating up to 1500 lbs rating. Above 1500 lbs, valve body shall be of forged steel. For Demineralized Water application valve body shall be Stainless Steel.

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-IV-SEC-13 - 48	DCPL-12Z05
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7.02.04 The direction of flow shall be clearly marked/engraved on the body.

7.03.00 VALVE SIZE

The control valve sizing (C_v / K_v) shall be based on following guidelines:

- a) The valves shall pass normal rate of flow (MCR condition) with 65 to 75 percent opening for linear characterised valves and between 75 to 85 percent opening for equal percentage characterised valves.
- b) The valves shall have adequate rangeability to pass the minimum and maximum flows between 10% to 90% opening of the valves, unless cage trim valves having wide rangeability are chosen.
- c) The valve shall have design C_v so as to pass the maximum specified rate of flow at 90 to 95 percent opening of the valve.
- d) The valve selection shall be based on the highest size dictated by the above considerations unless noise, flashing or other factors dictate the final selection.
- e) The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.

7.04.00 VALVE TOPWORK

7.04.01 Top work shall be sized so that the valve shall operate properly when upstream pressure is 10 percent above maximum inlet pressure and downstream pressure is atmospheric.

7.04.02 Extended bonnet/Finned bonnet and high temperature packing shall be used for high temperature application.

7.04.03 The gland material shall be chosen to suit the operating temperature. PTFE may be chosen for low temperature application and for high temperature application graphited asbestos glands are to be provided. For vacuum services, the glands shall be dry seal type.

7.05.00 VALVE TRIM

7.05.01 Valve trim for most applications up to leakage class-V shall be stainless steel 316 SS for pressure drop up to 7 Kg/ Sq. cm. For pressure drops above 7 Kg/Sq. cm hard trim (stelliting or equivalent) shall be used. Other alloys shall be substituted if required for corrosion and other fluid conditions.

7.05.02 Balanced trim valves shall be offered for high shut-off pressure or high pressure drop condition to reduce the size of the actuators. For flashing services and two stage mixtures, the trim material shall be 17-4 PH or equivalent. If cavitating condition is foreseen, Bidder shall offer multistage or labyrinth trim valves. Trim of severe service valves shall be of multistage and multipath design with sufficient no. of discrete pressure drop stages to eliminate the chances of erosion, cavitation, noise and vibration throughout the control range of the valve.

7.05.03 Quick replacement type trim shall be considered for easy maintenance.

7.06.00 NOISE LEVEL

The equivalent sound level measured at 1.5M above nearest floor level in elevation and 1 M horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA. If the calculated

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-IV-SEC-13 - 49	DCPL-12Z05
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noise is more than the above limit, even with low noise trim design, diffusers shall be included. Diffusers shall be made of stainless steel and shall be integrally connected to the control valve with necessary spool piece. The spool piece shall be in conformity with the main line piping specification.

7.07.00 VALVE ACTUATORS

7.07.01 Spring-diaphragm type valve actuators shall be used. Piston type actuators shall be offered in case of exceedingly high shut-off pressure & quick response requirement. Bidder shall consider piston type actuators for the following services as a minimum requirement.

- a) Auxiliary Pressure reducing & De-super heating stations.
- b) Feed control valves (both 100% & 30%).
- c) Superheat and Reheat Spray Control Valves.
- d) Condensate extraction pump minimum recirculation valve.

7.07.02 The actuator shall be designed for 150% thrust required for the valve (at shut-off pressure) at an air line supply pressure of 5.5 Kg/Sq. cm or as per manufacturers recommendation.

7.07.03 All the actuators shall be supplied mounted on the valve with all the accessories (limit switches, Torque switch, position feedback etc.,) integrally mounted. The diaphragms shall be designed for 200% maximum operating pressure.

7.07.04 Nylon reinforced neoprene shall be used as diaphragm material.

7.07.05 Valve actuators shall be capable of operating at 70 °C ambient, continuously.

7.07.06 Entire actuator assembly shall be painted with corrosion inhibiting paint.

7.07.07 All actuators shall be of fail safe design signifying that the spring direction will tend to move the valve (open or close) in a direction safe for the process. "Failure to Open" or "Failure to Close" shall be marked on the actuator.

Air restrictors or regulators if required shall be provided for varying the time of travel from 0 – 100 %.

7.07.08 **Space heaters for actuators are not necessary.**

7.07.09 Non-Contact type sensor shall be preferred for position feed back of actuators, limit switches, proximity non-contact type.

7.08.00 VALVE POSITIONERS

7.08.01 All regulating service valves shall be offered with intelligent integrated easily configurable **Smart Electro pneumatic actuators / digital positioners with auto calibration facility and compatible with HART communication.**

7.08.02 Positioners shall be three gauge type with equalizing lever for bypass.

7.08.03 Positioner casings shall be dust tight, corrosion resistant and weatherproof.

7.08.04 In general, positioner shall operate at signal range 4 – 20 mA DC for the full travel of the valve. Split range operation in few cases may be required.

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-IV-SEC-13 - 50	DCPL-12Z05
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Remote calibration from control room shall be possible through HART protocol.

7.09.00 VALVE ACCESSORIES

The accessories of the valves shall include hand wheels, limit switches, junction boxes, airlock relays, LVDT type position transmitter with 4 – 20mA DC output etc. Resistive type position transmitter is not acceptable.

~~8.00.00 FIELD INSTRUMENTS / ANALYSERS, ELECTRICAL SYSTEM METERS AND ACCESSORIES~~

~~The specification of all the items under this clause may be referred in volume – V.~~

~~9.00.00 CONTROL & INSTRUMENTATION CABLE~~

~~9.00.01 Cables shall be suitable for the area through which they are routed. All cable shall be flame retardant low smoke (FRLS / Teflon) type. Suitable distance shall be maintained in routing and laying instrumentation cables so that the interferences from electrical HT & LT cables are minimized. Cables carrying redundant instrument signals shall be alternately routed. In hazardous areas cables of suitable R/L ratio shall be provided for intrinsic safety.~~

~~9.00.02 Durable marking shall be provided on the surface of the cable at intervals not exceeding 5 mtrs. Marking shall include Manufacturer's name, Year of manufacture, Voltage grade, Type of cables (Conductor size & no. of pairs / triads / type of thermocouple), Insulation material, FRLS. Sequential length marking shall also be provided at every metre interval on outer sheath of cable.~~

~~9.00.03 Standard Drum to be of minimum 500 M length. Drum shall be anti rodent, anti termite and smooth finish.~~

~~9.00.04 From JB to field devices Teflon insulated (for conductor and overall shielded) heat proof cables shall be specified for all areas.~~

~~The following type of C&I cables has been referred in volume – V:
Thermocouple Compensating cable, RTD triad cable, Instrumentation pair signal cable.~~

~~10.00.00. PROGRAMMABLE LOGIC CONTROL SYSTEM~~

~~10.01.00. SYSTEM FUNCTION DESCRIPTION~~

~~10.01.01 Programmable Logic Control (PLC) systems have been envisaged for local control of various plant auxiliaries and offsite systems which are controlled from Local Control Panels/HMI's located at respective Local Control Rooms of Balance of Plants and offsite area. PLC systems shall be functionally independent control systems and connected to the plant wide network for centralized reporting and monitoring in Central Control Room.~~

~~10.01.02 The offsite plant/BOP/Plant auxiliaries are to be controlled from dedicated PLC and its HMI requirements are listed in Section-I9 / Cl.1.00.04.~~



7.01.25 SMART VALVE POSITIONER :

01. Type : Smart
02. Input level : 4-20 mA DC (HART)
03. Output range : to match valve stroke
04. Body Material : Cast Aluminum
05. Enclosure Protection : IP 66
06. Max. air supply pressure : 7 Kg/ sq.cm.
07. Response Time : 5 Seconds for 0 to 90% output pressure
08. Accuracy : $\pm 1.0\%$ of Full Scale.
09. Turning Range : 50° to 90°
10. Output Characteristics : Linear / Equal % / Quick Opening and provision for user customization of output.

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-VI-SCH-D - 45	DCPL-12Z05
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- 11. Lighting Protection : a) Peak Value of Voltage surge: 12kV
b) Peak Value of Current Surge: 1000A
- 12. Pressure gauges : To be provided on positioner
- 13. CE Conformity : a) Electromagnetic compatibility
b) EN 61326: 1997 (CE Marking)
- 14. Air connection : 1/4NPT internal thread.
- 15. Electrical Connection : 1/2NPT.

7.01.26 SOLENOID VALVE

- 01. Operating Principle : Electromagnetic (noiseless)
- 02. Coil voltage rating : 240 V AC / 220VDC (as required. Any other voltage, if necessary, to be arranged by bidder.)
- 03. Ways : 3 ways (normally open + normally closed) [general], other depending on requirement
- 04. Port size : 1/2" NPT / As per site requirement
- 05. Body : SS Bar Stock
- 06. Trim : AISI SS-316
- 07. Manual Operator : In built
- 08. Duty : Suitable for continuous energization
- 09. Sealing : Airtight and leak proof
- 10. Ambient Temperature : 0 - 50 ° C
- 11. Fluid Temperature : 0-150 ° C or as per application
- 12. Coil Enclosure : Stainless Steel
- 13. Insulation : Class-H
- 14. Coil Casing : IP-65 (Explosion proof for NEC Class-1, Division-1 area)
- 15. Mounting : On pipe or on panel
- 16. Cable Connection : 3/4" ET Compression gland
- 17. Accessories : Mounting brackets, nuts and bolts
- 18. Special feature : i) Temperature operated fuse at Explosion proof enclosure.

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-VI-SCH-D - 46	DCPL-12Z05
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- ii) Solenoid valve directly integral to actuator body shall have NAMOOR interface.

19. Pressure Rating : As per application

SEPC - 1 x 525 MW Tuticorin Thermal Power Project Stage-IV at Thoothukudi, Tamil Nadu	VOL-VI-SCH-D - 47	DCPL-12Z05
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7.01.23 AIR FILTER REGULATOR

- | | | |
|-----------------------|---|--|
| 01. Filter Element | : | Sintered Bronze |
| 02. Filter Size | : | 5 microns |
| 03. Input Air | : | 10.0 Kg/Sq. cm (maximum) |
| 05. Effect of Supply | : | Maximum 0.02 Kg/Sq. cm for a change pressure variation in supply pressure of 4 Kg/Sq. cm |
| 06. Bowl Material | : | Metallic cover around high temperature area/clear transparent polycarbonate with metallic cover for ordinary applications. |
| 07. Accessories | : | 2" dial size output pressure gauge |
| 08. Desirable Feature | : | No perceptible drop of pressure on opening the drain port. |



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SECTION-C

DATASHEET A&B



**DATA SHEET FOR CONTROL VALVES
(WITH PNEUMATIC ACTUATOR)**

SPECIFICATION NO.: PE-TS-422-145-I104

VOLUME IIB

SECTION D

REV. NO. 00

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General technical requirements for control valve with Accessories (with pneumatic actuator) are:

1. Valves selection will be based on enclosed control valve design parameters.
2. Trim material has been specified for the mentioned service conditions. However, any substitute material if recommended by the manufacturer will be provided if found technically acceptable after evaluation.
3. The valve shall pass normal rate of flow (MCR condition) with 65 to 75 percent Opening for linear characterized valves and between 75 to 85 percent opening for Equal percentage characterized valve.
4. Unless cage trim valves having wide rangeability are chosen, the valves shall have adequate rangeability to pass the minimum and maximum flows between 10% and 90% opening of the valves.
5. The valve shall have design CV so as to pass the maximum specified rate of flow at 90 to 95 percent opening of the valve.
6. Characteristics of control valves has been selected based on application / services. However in case supplier is not able to offer the required characteristics, due to Design considerations modified trim (mod.eq percentage or mod linear) will be selected after technical evaluation.
7. Ant cavitation trims shall be provided for valves with cavitation services and Hardened trims for flashing services
8. Valve body and trim design shall achieve the noise abatement. However low noise Pack (cartridge/diffuser) may be used in the downstream side of the valve due to Design constraints.
9. Control valve accessories shall be fitted on the valve body. Junction box shall be mounted on the valve body.
10. Type of flow action ("under the seat" or "over the seat") will be selected by the Vendor, however wherever downstream side is subjected to vacuum, flow action shall be "flow to close" (over the seat).
11. Wherever CV test certificates for the model, type (of valve) selected is available, the same shall be acceptable. However CV test shall be conducted on valves for which CV test certificates are not available.
12. The calculated CV, %valve lift and valve outlet velocity for different parameter Conditions shall be incorporated in vendors final documentations, after detail Engineering.
13. Control valve drawings / documents / datasheet giving details of model no, valve Size, and calculations for valve sizing, noise & velocity and technical details of Various accessories (of the successful bidder) shall be furnished for information And records after completion of engineering and supplies.
14. Extension bonnets shall be provided when the maximum temperature of the flowing Fluid is greater than 280 deg C.

LOW LOAD FEED CONTROL VALVE FDV-14 IS MULTI STAGE, MULTI
PATH TYPE VALVE. REFER TECHNICAL SPECIFICATION CLAUSE 7.05.02

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 1 OF 44	
Tag No. ....ASV-8... Qty.: ...1				
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	TUTICORIN TPP (1X525 MW)	.....	
	SERVICE	D/A PEGGING FROM AUX. STEAM HEADER	.....	
	LOCATION	☒ INDOOR ☐ OUTDOOR	.....	
	DUTY	☐ ON/OFF ☒ MODULATING	.....	
	PIPE SIZE (inlet / outlet)	273 x 9.53 | 508 x 12.7	.....	
	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	☒ BWE ☐ SWE ☐ FLANGED	.....	
	END CONNECTION & RATING (ANSI)	☒ A216 WCB ☐ A217 WC6 ☐ SS ☐ A217 CS	.....	
	BODY MATERIAL	☐ A351 CF8M	.....	
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE	.....	
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED	.....	
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE	.....	
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)	.....	
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	.....	
		SS 316 STELLITED | SS 316 STELLITED		
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT	.....	
	OUTLET VELOCITY	☐ < 7 M/SEC(WATER) | ☒ MAC NO < 1/3 (STM)	.....	
	REQUIRED LEAKAGE CLASS	☐ II ☐ III ☒ IV ☐ V ☐ 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/CM ² g)	1.0 | 0.2	.....	
	*TRAVEL TIME FOR	< 10SEC	.....	
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY	.....	
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE	.....	
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ STAYPUT	.....	
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED	.....	
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED	.....	
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED	.....	
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED	.....	
	POSITION TRANSMITTER	PART OF POSITIONER	.....	
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED	.....	
	E/P CONVERTER	PART OF POSITIONER	.....	
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED	.....	
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED	.....	
	LOCAL POSITION INDICATOR	☒ REQUIRED	.....	
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED	.....	

DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00		DATE : 17-AUG-2016
						SHEET 4 OF 44			
Tag No. : CRHV-6... Qty.: 1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	15% BMCR	38	12	3.65	240			
	2.	60% BYPASS MDBFP	134	27.5	3.8	330			
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP		
* MAX SHUT OFF PRESS (KG/CM ² g) 54 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 54 | 360 * 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. <u>2</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 5 OF 44	
Tag No. : CDV-22 & CDV-25 Qty.: 2 (One for each Tag No)				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	MAIN CONDENSATE CONTROL		.....
	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	406.4 x 12.7 | 406.4 x 12.7		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☒ A216 WCB ☐ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☐ LINEAR ☒ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED SS 316 STELLITED | SS 316 STELLITED		.....|.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	OUTLET VELOCITY	☒ < 7 M/SEC(WATER) | ☐ MAC NO < 1/3 (STM)		.....
	REQUIRED LEAKAGE CLASS	☐ II ☐ III ☒ IV ☐ V ☐ 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/CM ² g)	0.2 | 1.0		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ STAYPUT		.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PE-TS-422-145-I104			
						VOLUME IIB			
						SECTION D			
						REV. NO. 00		DATE : 17-AUG-2016	
					SHEET 6 OF 44				
Tag No. : CDV-22 & CDV-25 Qty.: 2 (One for each Tag No)									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$			..... ..... ..... .....	
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	% VLV LIFT	VLV O/L VELOCITY
	1.	MIN. (10% LOAD)	128.5	32	8	41.5			
	2.	60% LOAD	804.3	30	10.5	46.7			
	3.	100% MCR	1285.6	28.5	16	46.6			
	4.	VWO	1345.6	28	16.5	46.5			
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 39 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 39 | 60 * 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. <u>4</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00		DATE : 17-AUG-2016
						SHEET 8 OF 44			
Tag No. :...CDV-43... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)							DATA SHEET – B (TO BE FILLED UP BY BIDDER)		
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	MIN.	30	31.5	4.0	41.3			
	2.	MAX	300	26	5.0	47.8			
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 39 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 39 | 60 * 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. <u>2</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 9 OF 44	
Tag No. ....CDV-39... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	GSC/ CEP MIN. FLOW RECIRCULATION		.....
GENERAL*	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 168.3 x 7.11		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	1.0 | 0.2		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ STAYPUT		.....
				
				
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00	DATE : 17-AUG-2016	
							SHEET 10 OF 44		
Tag No. :...CDV-39... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$			..... ..... ..... .....	
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	% VLV LIFT	VLV O/L VELOCITY
	1.	MIN.	22	30.5	0.2	41.3			
	2.	MAX	220	25	0.6	47.8			
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 39 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 39/VACUUM | 60 * 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. <u>2</u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 11 OF 44	
Tag No. ....CDV-72... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☒ A216 WCB ☐ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☐ LINEAR ☒ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....|.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	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		.....
	MODEL NO. & SIZE	BIDDER TO SPECIFY		.....|.....
	CLOSE AT : OPEN AT (KG/CM ² g)	1.0 | 0.2		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....	
*VALVE POSN. ON SUPPLY AIR FAILURE	☒ STAYPUT		.....	
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00	DATE : 17-AUG-2016	
						SHEET 12 OF 44			
Tag No. :...CDV-72... Qty.: ...1 per Unit... DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	MAX.	10	31.5	3.5	47.8			
	VALVE TYPE						☐ CAVITATION ☐ FLASHING ☒ HIGH DP		
* MAX SHUT OFF PRESS (KG/CM ² g) 39 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 39 | 60 * 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. <u> 1 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 13 OF 44	
Tag No. ....DRV-2... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-6A NORMAL DRAIN TO HPH-5A		.....
	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 168.3 x 7.11		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....|.....
FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....	
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/CM ² g)	0.2 | 1.0		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
*VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE		.....	
*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO CLOSE		.....	
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PE-TS-422-145-I104			
						VOLUME IIB			
						SECTION D			
						REV. NO. 00		DATE : 17-AUG-2016	
					SHEET 14 OF 44				
Tag No. :...DRV-2... Qty.: ...1 per Unit... DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$			..... ..... ..... .....	
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	22.36	17	7.5	171.1			
	2.	60% MCR	41	26.5	11	189.4			
	3.	100% MCR	81.6	42.5	17.5	210.2			
	4.	VWO	87.4	44	18.5	212.4			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 54 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 54 | 220 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 15 OF 44	
Tag No. ....DRV-8... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-6B NORMAL DRAIN TO HPH-5B		.....
GENERAL*	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 168.3 x 7.11		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	0.2 | 1.0		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN			.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO CLOSE		.....
				
				
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 17 OF 44	
Tag No. ....DRV-5... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-6A ALT. DRAIN TO FLASH TANK -A		.....
GENERAL*	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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	1.0 | 0.2		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO OPEN		.....
				
				
				
				
ACCESSORIES	POSITIONER(SMART)	☒ 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		.....
ACCESSORIES	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PE-TS-422-145-I104			
						VOLUME IIB			
						SECTION D			
						REV. NO. 00		DATE : 17-AUG-2016	
					SHEET 18 OF 44				
Tag No. :...DRV-5... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$			..... ..... ..... .....	
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	22.36	18	0.3	202.6			
	2.	60% MCR	41	27.5	0.3	225.8			
	3.	100% MCR	81.6	43.5	0.3	252.7			
	4.	VWO	87.3	45	0.3	255			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 54 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 54/VACUUM | 280 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 19 OF 44	
Tag No. ....DRV-11... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-6B ALT. DRAIN TO FLASH TANK -B		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....|.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	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/CM ² g)	1.0 | 0.2		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO OPEN		.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00		DATE : 17-AUG-2016
						SHEET 20 OF 44			
Tag No. :...DRV-11... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	22.36	18	0.3	202.6			
	2.	60% MCR	41	27.5	0.3	225.8			
	3.	100% MCR	81.6	43.5	0.3	252.7			
	4.	VWO	87.3	45	0.3	255			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 54 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 54/VACUUM | 280 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 21 OF 44	
Tag No. ....DRV-15... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-5A NORMAL DRAIN TO DEAERATOR		.....
GENERAL*	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 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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	0.2 | 1.0		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO CLOSE		.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PE-TS-422-145-I104			
						VOLUME IIB			
						SECTION D			
						REV. NO. 00		DATE : 17-AUG-2016	
					SHEET 22 OF 44				
Tag No. :...DRV-15... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$			..... ..... ..... .....	
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	35.44	5.5	4.0	143.9			
	2.	60% MCR	68.4	9.5	4.7	152.3			
	3.	100% MCR	129.8	16	7.2	171.2			
	4.	VWO	138.2	16.5	7.5	173.0			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 22 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 22 | 180 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 23 OF 44	
Tag No. ....DRV-22... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-5B NORMAL DRAIN TO DEAERATOR		.....
GENERAL*	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 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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	0.2 | 1.0		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO CLOSE		.....
				
				
				
				
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 25 OF 44	
Tag No. ....DRV-18... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-5A ALT. DRAIN TO FLASH TANK-A		.....
	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	219.1 x 8.18 | 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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....|.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	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/CM ² g)	1.0 | 0.2		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO OPEN		.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00	DATE : 17-AUG-2016	
							SHEET 26 OF 44		
Tag No. :...DRV-18... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	35.44	8.5	0.3	166.2			
	2.	60% MCR	68.4	12.5	0.3	183.1			
	3.	100% MCR	129.8	19	0.3	205.15			
	4.	VWO	138.2	19.5	0.3	207.03			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 22 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 22/VACUUM | 225 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 27 OF 44	
Tag No. ....DRV-25... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	HPH-5B ALT. DRAIN TO FLASH TANK-B		.....
	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	219.1 x 8.18 | 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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS		.....|.....
		17-4 PH SS | 17-4 PH SS		.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	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/CM ² g)		1.0 | 0.2		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO OPEN		.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00	DATE : 17-AUG-2016	
							SHEET 28 OF 44		
Tag No. :...DRV-25... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	35.44	8.5	0.3	166.2			
	2.	60% MCR	66.7	12.5	0.3	183.1			
	3.	100% MCR	129.75	19	0.3	205.15			
	4.	VWO	136.8	19.5	0.3	207.03			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 22 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 22/VACUUM | 225 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00		DATE : 17-AUG-2016
						SHEET 30 OF 44			
Tag No. :...DRV-28... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	16.62	1.3	0.8	90.1			
	2.	60% MCR	25.5	1.8	1.1	99.6			
	3.	100% MCR	48.3	2.8	1.6	112.6			
	4.	VWO	47.9	2.9	1.7	113.9			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 3.5 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 3.5/ 120 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 31 OF 44	
Tag No. ....DRV-31... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	LPH-3 ALT. DRAIN TO FLASH TANK -B		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS		.....|.....
		17-4 PH SS | 17-4 PH SS		.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	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	BIDDER TO SPECIFY		.....|.....
	MODEL NO. & SIZE	1.0 | 0.2		.....|.....
	CLOSE AT : OPEN AT (KG/CM ² g)	< 10 SEC		.....
	*TRAVEL TIME FOR	BIDDER TO SPECIFY		.....
	OPEN TO CLOSE, CLOSE TO OPEN	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE			.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00	DATE : 17-AUG-2016	
						SHEET 32 OF 44			
Tag No. :...DRV-31... Qty.: ...1 ... DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	16.6	1.9	0.3	106.3			
	2.	60% MCR	25.5	2.3	0.3	115.8			
	3.	100% MCR	45.6	3.4	0.3	130.54			
	4.	VWO	48.3	3.5	0.3	131.8			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 3.5 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 3.5/ 140 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 33 OF 44	
Tag No. ....DRV-34... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	LPH-2 NORMAL DRAIN TO LPH-1		.....
	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	273 x 9.27 | 323.9 x 9.53		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | 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	☒ BWE ☐ SWE ☐ FLANGED		.....|.....|.....|.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC6 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....|.....
	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....|.....
	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/CM ² g)	0.2 | 1.0		.....|.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE		.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO CLOSE		.....
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00		DATE : 17-AUG-2016
						SHEET 34 OF 44			
Tag No. :...DRV-34... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	46.1	0.7	0.2	56.8			
	2.	60% MCR	70.6	0.9	0.3	64.8			
	3.	100% MCR	128.14	1.5	0.4	74			
	4.	VWO	136.0	1.6	0.4	74.9			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 3.5 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 3.5/VACUUM | 75 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 35 OF 44	
Tag No. ....DRV-37... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	LPH-2 ALT. DRAIN TO FLASH TANK -A		.....
	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	273 x 9.27 | 323.9 x 9.53		.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | 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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☒ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☐ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....	
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/CM ² g)	1.0 | 0.2		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....	
*VALVE POSN. ON SUPPLY AIR FAILURE	☒ TO OPEN		.....	
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)						SPECIFICATION NO.: PE-TS-422-145-I104		
							VOLUME IIB		
							SECTION D		
							REV. NO. 00		DATE : 17-AUG-2016
						SHEET 36 OF 44			
Tag No. :...DRV-37... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 2\%$ $\pm 1\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
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	% VLV LIFT	VLV O/L VELOCITY
	1.	40% MCR	46.1	1.3	0.3	88.44			
	2.	60% MCR	7.002	1.5	0.3	97.24			
	3.	100% MCR	128.14	2.1	0.3	110.6			
	4.	VWO	136.0	2.2	0.3	111.7			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 3.5 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 3.5/VACUUM | 115 * 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. <u> 4 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 37 OF 44	
Tag No. ....DRV-48... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	DEAERATOR OVERFLOW TO FLASH TANK-B		.....
GENERAL*	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☒ ON/OFF ☐ MODULATING		.....
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 273 x 9.27		.....
	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	☒ BWE ☐ SWE ☐ FLANGED		.....
	END CONNECTION & RATING (ANSI)	☐ A216 WCB ☒ A217 WC9 ☐ SS ☐ A217 CS		.....
	BODY MATERIAL	☐ A351 CF8M		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE		.....
	BONNET TYPE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	TRIM FORM	☐ LINEAR ☐ EQ. PERCENTAGE		.....
	TRIM MATERIAL: SEAT | PLUG	☒ QUICK OPEN (ON/OFF)		.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS 17-4 PH SS | 17-4 PH SS		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	1.0 | 0.2		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ STAYPUT		.....
				
				
				
				
ACCESSORIES	POSITIONER(SMART)	☐ REQUIRED ☒ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	☐ REQUIRED ☒ NOT REQUIRED		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	☐ REQUIRED ☒ NOT REQUIRED		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)					SPECIFICATION NO.: PE-TS-422-145-I104			
						VOLUME IIB			
						SECTION D			
						REV. NO. 00		DATE : 17-AUG-2016	
					SHEET 38 OF 44				
Tag No. :...DRV-48... Qty.: ...1 ...									
DATA SHEET – A & B									
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)								DATA SHEET – B (TO BE FILLED UP BY BIDDER)	
PERFORMANCE OF VALVE	LINEARITY HYSTERESIS SENSITIVITY ACCURACY (OVERALL)				$\pm 5\%$ $\pm 5\%$ $\pm 0.5\%$ $\pm 2\%$		..... ..... ..... .....		
SERVICE CONDITION*	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM ² (A)	OUTLET PR. KG/CM ² (A)	TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	MAX. 10% BMCR	170	10	0.3	163.6			
	2.	MAX. 10% BMCR	170	7	0.3	138.2			
	VALVE TYPE						☐ CAVITATION ☒ FLASHING ☐ HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM ² g) 11 * BODY DESIGN : PRESS (KG/CM ² g) | TEMP (DEG C) 11/VACUUM | 175 * 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. <u> 1 </u> AND SHALL BE CHECKED FOR ALL OTHER CONDITIONS.									

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)		SPECIFICATION NO.: PE-TS-422-145-I104	
			VOLUME IIB	
			SECTION D	
			REV. NO. 00	DATE : 17-AUG-2016
			SHEET 39 OF 44	
Tag No. ....FDV-14... Qty.: ...1 ...				
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	TUTICORIN TPP (1X525 MW)		.....
	SERVICE	LOW LOAD FEED CONTROL		.....
GENERAL*	LOCATION	☒ INDOOR ☐ OUTDOOR		.....
	DUTY	☐ ON/OFF ☒ MODULATING		.....
	PIPE SIZE (inlet / outlet)	273 x 36 | 273 x 36		.....
	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	☒ A216 WCC ☐ A217 WC9 ☐ SS ☐ A217 CS		.....
	END CONNECTION & RATING (ANSI)	☐ A351 CF8M		.....
	BODY MATERIAL	☐ PTFE ☒ GRAFOIL ☐ DOUBLE ☒ SINGLE		.....
	PACKING: MATERIAL SINGLE / DOUBLE	☐ STD ☐ EXTENDED ☐ FINNED		.....
	BONNET TYPE	MULTI STAGE. MULTI PATH TYPE VALVE. REFER TECHNICAL SPECIFICATION CLAUSE 7.05.02		.....
	TRIM FORM	☐ 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		.....
BODY*	FLOW	☐ BELOW SEAT ☐ ABOVE SEAT		.....
	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/CM ² g)	1.0 | 0.2		.....
	*TRAVEL TIME FOR	< 10 SEC		.....
	OPEN TO CLOSE, CLOSE TO OPEN	BIDDER TO SPECIFY		.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	☒ TO OPEN ☐ STAYPUT ☐ TO CLOSE		.....
PNEUMATIC ACTUATOR	*VALVE POSN. ON SUPPLY AIR FAILURE	☒ STAYPUT		.....
				
				
				
				
ACCESSORIES	POSITIONER(SMART)	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR FILTER REGULATOR	☒ REQUIRED ☐ NOT REQUIRED		.....
	AIR LOCK RELAY	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION LIMIT SWITCH	☒ REQUIRED ☐ NOT REQUIRED		.....
	POSITION TRANSMITTER	PART OF POSITIONER		.....
	SOLENOID VALVE	☒ REQUIRED ☐ NOT REQUIRED		.....
	E/P CONVERTER	PART OF POSITIONER		.....
	JUNCTION BOX	☒ REQUIRED ☐ NOT REQUIRED		.....
	HAND WHEEL (SIDE MOUNTED)	☒ REQUIRED		.....
	LOCAL POSITION INDICATOR	☒ REQUIRED		.....
	ELECTRO PNEUMATIC POSITIONER	☐ REQUIRED ☒ NOT REQUIRED		.....
				

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPECIFICATION NO.: PE-TS-422-145-I104
		VOLUME IIB
		SECTION D
		REV. NO. 00 DATE : 17-AUG-2016
		SHEET 41 OF 44
Tag No. ....DMV-37 Qty.: ...1		
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 SERVICE LOCATION DUTY PIPE SIZE (inlet / outlet) PIPE MATERIAL (inlet / outlet)	TUTCORIN TPP (1X525 MW) NORMAL MAKE UP TO HOTWELL ☒ INDOOR ☐ OUTDOOR ☐ ON/OFF ☒ MODULATING 114.3 X 3.05 | 114.3 X 3.05 312 TP 304 | SA 312 TP 304
BODY*	MODEL NO. TYPE OF BODY: GUIDING: NO. OF PORTS BODY SIZE: PORT SIZE: DESIGN CV END CONNECTION & RATING (ANSI) BODY MATERIAL PACKING: MATERIAL SINGLE / DOUBLE BONNET TYPE TRIM FORM TRIM MATERIAL: SEAT | PLUG : CAGE | GUIDE BUSH FLOW OUTLET VELOCITY REQUIRED LEAKAGE CLASS NOISE LEVEL (dBA) (spec. 3.1.14) VACUUM SERVICE ANTI CAVITATION TRIM	BIDDER TO SPECIFY ☒ GLOBE ☐ ANGLE | ☐ TOP ☒ CAGE | ONE ☒ BWE ☐ SWE ☐ FLANGED ☐ A216 WCB ☐ A217 WC6 ☐ SS ☐ A217 CS ☒ A351 CF8M ☐ PTFE ☒ GRAFOIL ☒ DOUBLE ☐ SINGLE ☐ STD ☒ EXTENDED ☐ FINNED ☐ LINEAR ☒ EQ. PERCENTAGE ☐ QUICK OPEN (ON/OFF) SS 316 STELLITED | SS 316 STELLITED SS 316 STELLITED | SS 316 STELLITED ☐ BELOW SEAT ☐ ABOVE SEAT ☒ < 7 M/SEC (WATER) ☐ MAC NO.< 1/3(STM) ☐ II ☐ III ☒ IV ☐ V ☐ VI LESS THAN 85 dBA ☒ YES ☐ NO ☐ YES ☒ NO
PNEUMATIC ACTUATOR	MODEL NO. & SIZE CLOSE AT : OPEN AT (KG/CM ² g) *TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN *VALVE POSN. ON SIGNAL AIR FAILURE *VALVE POSN. ON SUPPLY AIR FAILURE	BIDDER TO SPECIFY 0.2 | 1.0 < 10 SEC BIDDER TO SPECIFY ☐ TO OPEN ☐ STAYPUT ☒ TO CLOSE ☒ STAYPUT
ACCESSORIES	POSITIONER(SMART) AIR FILTER REGULATOR AIR LOCK RELAY POSITION LIMIT SWITCH POSITION TRANSMITTER SOLENOID VALVE E/P CONVERTER JUNCTION BOX HAND WHEEL (SIDE MOUNTED) LOCAL POSITION INDICATOR ELECTRO PNEUMATIC POSITIONER	☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☐ NOT REQUIRED PART OF POSITIONER ☒ REQUIRED ☐ NOT REQUIRED PART OF POSITIONER ☒ REQUIRED ☐ NOT REQUIRED ☒ REQUIRED ☒ REQUIRED ☐ REQUIRED ☒ NOT REQUIRED

	Technical specification for Control Valves with Accessories (Pneumatically Operated)		SPECIFICATION NO. PE-TS-422-145-I 801	
			SECTION I	
			REV. NO. 00	DATE: 16.01.17
			SHEET	

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

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

DATA SHEET – A & B for ACCESSORIES

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)				DATA SHEET – B (TO BE FILLED-UP BY BIDDER)	
POSITIONER	MFR. & MODEL NUMBER				
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ☐ NO ☐ THREE ☐ TWO ☐ IP 66	
	INPUT SIGNAL (Kg / Cm ²)			☐ 0.2 – 1.0 ☐ 4-20 mA HART COMPATIBLE	
	OUTPUT SIGNAL (Kg / Cm ²)			TO SUIT ACTUATOR	
AIR FILTER REGULATOR TWO (2) Nos. PER CV (Auto drain feature is required)	MFR. & MODEL NUMBER				
	AIR SUPPLY PRESS (Kg / Cm ² g)			☒ 5.0-8.0 ☐	
	OUTPUT PRESS (Kg / Cm ² g)			TO SUIT ACTUATOR	
	FILTER SIZE			5 MICRON	
AIR LOCK	OUTPUT GAUGE			☒ REQUIRED ☐ NOT REQUIRED	
	MFR. & MODEL NUMBER				
	SET PRESS (Kg / Cm ²)				
	SUPPLY PRESS (Kg / Cm ²)			☒ 5.0-8.0 ☐	
	RESET TYPE			AUTO	
LIMIT SWITCH	VENT PLUG			REQUIRED	
	MFR. & MODEL NUMBER				
	OPEN posn	INT posn	CLOSE posn	1 NO. ☐ --- ☐ 1 NO.	
	CONTACT TYPE			SPDT 2 NO + 2 NC	
	RATING (AC / DC)			5A 250V AC AND 0.2A 220V DC	
POSITION TRANSMITTER	ENCLOSURE CLASS			☒ IP 65 ☐	
	MFR. & MODEL NUMBER				
	TYPE			PART OF POSITIONER	
	SUPPLY				
	OUTPUT RATING				
	ACCURACY				
ENCLOSURE CLASS					
SOLENOID VALVE	RATING			☒ 24V DC ☐ 220V DC ☐ 240V AC ☐	
	TYPE			3-WAY (UNIVERSAL OPERATION TYPE)	
	OPERATION	QUANTITY		☐ Stay put ☐ Interlock ☐ 1 ☐ 2	
	COIL INSULATION CLASS			CLASS - H	
	ENCLOSURE CLASS			☒ IP 65 ☐ NEMA 4 ☐	
	ORIENTATION			☐ TOP MOUNTED ☒ SIDE MOUNTED	
JUNCTION BOX (FRP type body material)	NO. OF WAYS			☐ 24-WAYS ☐ AS REQUIRED ☒ 36-Ways	
	SIZE			AS REQUIRED	
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).	
	ENCLOSURE CLASS			☒ IP 65 ☐	
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY		PART OF POSITIONER	
	SPLIT RANGE				
	ENCLOSURE CLASS				
	LINEARITY				
	HYSTERISIS				
Tubing & Fittings / per CV	This is in addition to cu. Tubing and fittings which are integral part of CV			15 Meters of 1/4" SS TUBING, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.	
PAINTING	COLOUR SHADE :			RED/GREEN/OTHER	
	THICKNESS				
	TYPE			EPOXY	
			COMPANY SEAL		
			NAME		
			SIGNATURE		
			DATE		



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SECTION-C
DATASHEET C



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

DOCUMENT NO.

VOLUME IIB

SECTION **C**

ISSUE NO. 2

REV. NO. 00

DATE: 16.01.17

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

Data Sheet No. PES-145-06-DS2-1

DATA SHEET C

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

GENERAL *	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
BODY	MODEL NUMBER	
	TYPE OF BODY : GUIDING : NO. OF PORTS	
	BODY SIZE : PORT SIZE : DESIGN CV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE	
	TRIM FORM	
	TRIM MATERIAL : SEAT | PLUG	
	TRIM MATERIAL : CAGE | GUIDE	
	FLOW	
	OUTLET VELOCITY	
	REQUIRED LEAKAGE CLASS	
	NOISE LEVEL (dBA)	
	VACUUM SERVICE	
	ANTI CAVITATION TRIM	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm ² g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
ACCESSORIES	POSITIONER(SMART)	
	AIR FILTER REGULATOR	
	AIR LOCK RELAY	
	POSITION LIMIT SWITCH	
	POSITION TRANSMITTER	
	SOLENOID VALVE	
	E / P CONVERTER	
	JUNCTION BOX	
	HAND WHEEL (SIDE MOUNTED)	
	LOCAL POSITION INDICATOR	



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

DOCUMENT NO.

VOLUME IIB

SECTION **C**

ISSUE NO. 2

REV. NO. 00

DATE: 16.01.17

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

Data Sheet No. PES-145-06-DS2-1

DATA SHEET C

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

PERFORMANCE OF VALVE	HYSTERSIS								
	LINEARITY								
	SENSITIVITY								
	ACCURACY (Overall)								
SERVICE CONDITION*	SL.+ NO.	LOAD	FLOW (T/HR)	INLET PR. (KG/CM² (A))	OUTLET PR. (KG/CM² (A))	TEMP DEG. C	CALCULATED CV	% VALVE LIFT	VALVE O/L VELOCITY
		VALVE TYPE							
		* MAX SHUT OFF PRESS ((KG/CM ² g)							
		* BODY DESIGN : PRESS ((KG/CM ² g) | TEMP (DEG. C)							
		* IBR FORM III-C							
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.									
SEA WORTHY PACKING		APPLICABLE / NOT APPLICABLE							



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

SPECIFICATION NO.: **PE-TS-422-145-I801**

DOCUMENT NO.:

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

ISSUE NO. 2

REV. NO. 00

DATE: 16.01.17

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

Data Sheet No. PES-145-06-DS2-1

DATA SHEET C FOR ACCESSORIES

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

POSITIONER	MFR. & MODEL NUMBER		
	BYPASS	GAUGES	ENCL. CLASS
	INPUT SIGNAL (Kg / Cm ²)		
	OUTPUT SIGNAL (Kg / Cm ²)		
AIR FILTER REGULATOR	MFR. & MODEL NUMBER		
	AIR SUPPLY PRESS (Kg / Cm ² g)		
	OUTPUT PRESS (Kg / Cm ² g)		
	OUTPUT GAUGE		
	FILTER SIZE		
AUTO DRAIN FEATURE			
AIR LOCK	MFR. & MODEL NUMBER		
	SET PRESS (Kg / Cm ²)		
	SUPPLY PRESS (Kg / Cm ²)		
	RESET TYPE		
	VENT PLUG		
LIMIT SWITCH	MFR. & MODEL NUMBER		
	OPEN posn	INT posn	CLOSE posn
	CONTACT TYPE		
	RATING (AC / DC)		
	ENCLOSURE CLASS		
POSITION TRANSMITTER	MFR. & MODEL NUMBER		
	TYPE		
	SUPPLY		
	OUTPUT RATING		
	ACCURACY		
	ENCLOSURE CLASS		
SOLENOID VALVE	MFR. & MODEL NUMBER		
	RATING		
	OPERATION	QUANTITY	
	COIL INSULATION CLASS		
	ENCLOSURE CLASS		
HANDWHEEL	ORIENTATION		
JUNCTION BOX	NO. OF WAYS		
	SIZE		
	CABLE GLANDS (Size / Quantity)		
	ENCLOSURE CLASS		
	BODY MATERIAL		
I/P CONVERTER	INPUT SIGNAL	POWER SUPPLY	
	SPLIT RANGE		
	ENCLOSURE CLASS		
	LINEARITY		
	HYSTERESIS		
Cu./SS Tubing & Fittings / per CV	15 Meters of ¼ " PVC coated SS Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.		
PAINTING	COLOUR/SHADE		
	THICKNESS (DFT)		
	TYPE		
			COMPANY SEAL
			NAME
			SIGNATURE
			DATE



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

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

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

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

SECTION-C
QUALITY PLAN

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)							QUALITY PLAN NO.: PE-QP-999-145-I 006 VOLUME IIB SECTION C ISSUE NO. 2 REV. NO. 00 DATE: 16.01.17				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$				Remarks
										P	W	V	
1.0	INCOMING 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 /	Approved drg. / data sheet /	Test Certificate	3	---	2,1		TC for body/bonnet from foundry only
		2. Heat Treatment	MA	Review of H. T. Chart	Each H. T.	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3/2	2	1		1. I.BR Certification (if applicable) to be verified by BHEL. 2. Applicable for body /bonnet only
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1		Applicable for body and bonnet for rating ANSI 900 and above.
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2		
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1		After Machining on machined surface only
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	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		

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
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 STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)		QUALITY PLAN NO.: PE-QP-999-145-I 006										
		VOLUME		IIB								
		SECTION		C								
		ISSUE NO. 2		REV. NO. 00		DATE: 16.01.17						
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	P	W	V	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2	---	2	
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
				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	Mfr. standard	Record	3	---	2	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Relevant Standards	Relevant Standards	Test Certificate	3	---	2	
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1	

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PEM :: C&I 		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006 VOLUME IIB SECTION C ISSUE NO. 2 REV. NO. 00 DATE: 16.01.17				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks				
									P	W	V					
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2					
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2					
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					
3.0	TESTS ON COMPLETED VALVE															
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4				
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19/ ASME B16.34	No Leakage	Test Certificate	2	1	1	Refer Note-4				
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1	1	Refer Note-4				
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
		2. Opening/Closing time	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
		3. Linearity/cam characteristic	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics \$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test. 1 - BHEL 2 - Vendor 3 - Sub-vendor																

PEM :: C&I 		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006				
												IIB				
												C				
												DATE: 16.01.17				
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					
		4. Repeatability	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
		5. Hysteresis	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
		6. Sensitivity	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
		7. Accuracy (Overall)	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4				
		8. Control Valve characteristics / CV Test	MA	♦ Measurement (Press. vs. discharge and opening 0-100% in steps of 10%)	One per type	Mfr. Procedure	Approved drg. / data sheet	Test Certificate	2	--	1	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.				
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Mfr. Procedure	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	Approved drg./ data sheet	Records	2	1	1	Refer Note-4				
		11. Pre defined valve position in case of air failure	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	1	1					
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional, paint thickness	100%	Mfr. Procedure	Approved drg./ data sheet	Test Certificate	2	1	1					
		13. Surface Quality	MA	Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1					
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics \$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test. 1 - BHEL 2 - Vendor 3 - Sub-vendor																

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics
 \$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.
 PT - Dye penetrant Test
 MT- Magnetic Test
 RT- Radiographic Test
 UT – Ultrasonic Test

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

PEM :: C&I 		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)										QUALITY PLAN NO.: PE-QP-999-145-I 006 VOLUME IIB SECTION C ISSUE NO. 2 REV. NO. 00 DATE: 16.01.17				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks				
									P	W	V					
5.0 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	---	---	Certificate of Conformance (C.O.C)				
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)				
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)				
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)				
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	---	(C.O.C)				
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	---	---	(C.O.C)				
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)				
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)				
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)				
5.6	Smart Positioner	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)				
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics																
\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.																
1 - BHEL 2 - Vendor 3 - Sub-vendor																

 STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)		QUALITY PLAN NO.: PE-QP-999-145-I 006										
		VOLUME		IIB								
		SECTION		C								
		ISSUE NO. 2		REV. NO. 00		DATE: 16.01.17						
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
	(As Applicable)	2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	P	W	V	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Mfr. Standard	Mfr. Standard	Test Certificate	2	---	---	(C.O.C)
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	Mfr. Standard	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

NOTES:

1. In case valid CV test certificate for a similar control valve (same size, same CV, same trim characteristics) 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 called for in the Data sheets.
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), C.O.C's(Certificates of Conformance) shall be submitted to BHEL for verification and acceptance.

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SECTION – C

BILL OF QUANTITY-MAIN SUPPLY



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

BILL OF QUANTITY-MAIN SUPPLY

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

S. No.	KKS TAG	SERVICE	Qty. / Unit
1	AS-8	D/A Pegging from Aux. Steam Header	1
2	CRH-6	D/A Pegging from CRH Line	1
3	CD-22	Main Condensate Control	1
4	CD-25	Main Condensate Control	1
5	CD-39	CEP Minimum Recirculation	1
6	CD-43	EXCESS dump Control	1
7	CD-72	Condensate for Valve Gland Sealing	1
8	DR-2	HPH-6A NORMAL DRAIN TO HPH-5A	1
9	DR-8	HPH-6B NORMAL DRAIN TO HPH-5B	1
10	DR-5	HPH-6A ALT DRAIN TO HP FLASH TANK-A	1
11	DR-11	HPH-6B ALT DRAIN TO HP FLASH TANK-B	1
12	DR-15	HPH-5A DRAIN TO Deaerator	1
13	DR-22	HPH-5B DRAIN TO Deaerator	1
14	DR-18	HPH-5A ALT Drain to HP Drain F/T-A	1
15	DR-25	HPH-5B ALT Drain to HP Drain F/T-A	1
16	DR-28	LPH-3 Drain to LPH-2	1
17	DR-31	LPH-3 Alt Drain to F/T-B	1
18	DR-34	LPH-2 Drain to LPH-1	1
19	DR-28	LPH-2 Drain F/T-A	1
20	DR-48	Deaerator Overflow to F/T-B	1



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

21	DM-37	Normal make up to Hotwell	1
22	DM-40	Emergency make up to Hotwell	1
23	FDV-14	LOW LOAD FEED CONTROL VALVE	1
[B]	345 METRES 1/4 " SS Tubing		345 meter
[C]	SS FITTINGS- FOR 1 UNITS (to be supplied loose)		
1	SS FITTINGS for connection to Air Filter Regulator		23
2	SS FITTINGS for connection to Air Lock Relay		23
3	SS FITTINGS for connection to IA Header Isolation Valve		23
4	SS EQUAL TEE		23
5	Connector		23
[D]	CV TEST CHARGES		1 LOT
[E]	VALVE DIAGNOSTIC AND CONFIGURATION SOFTWARE (FOR ALL TAGS)		1 LOT



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

SECTION – C

BILL OF QUANTITY-SPARES



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.

VOLUME II B

SECTION C

ISSUE NO. 2

REV. NO. 00

DATE 16.01.17

BILL OF QUANTITY- SPARES

LIST OF COMMISSIONING SPARES

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-1801**

DOCUMENT NO.

VOLUME **II-B**

SECTION **D**

ISSUE NO. 2

REV. NO. 00

DATE: 16.01.17

SECTION – D

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

DOCUMENT NO.

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

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

SECTION-D

EQUIPMENT SPECIFICATION (PES-145-06)



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PE-TS-422-145-I801

DOCUMENT NO.: PES – 145 - 06

VOLUME II B

SECTION D

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

1.0 SCOPE

- 1.1 This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Control valve (with Pneumatic/Electric Actuator as identified in the datasheet-A) for use in Utility/Captive Power Station/Combined Cycle Station.
- 1.2 Expander/Reducer between valve body & pipe shall be in BHEL's scope of supply. However, any other expander/reducer required shall be in bidder's scope of supply.

2.0 CODES AND STANDARDS

- 2.1 As a minimum requirement, the latest revision/version of the following (or equivalent) standards shall be complied as a minimum requirement :-

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

3.0 TECHNICAL REQUIREMENTS

The Control valve, Actuator and the accessories shall be suitable for continuous operation under an ambient temperature of 0-60°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB Section-B or Section-C.

3.1 Control Valve

The control valve shall be suitably designed for the process operating conditions and system characteristics as specified in the Data Sheet-A.

- 3.1.1 The control valve shall be of globe/angle body design, as per datasheet, with single port. Valve trim shall be cage guided balanced type for valve sizes $\geq 3"$ and above. The valve trim shall be suitable for quick replacement without any cutting or welding. Anti-cavitation trims shall be provided for valves with cavitation service and hardened trims for flashing services.
- 3.1.2 The trim material and body material has been specified in the Datasheet-A. Bidder to offer body material and trim material combination as per the datasheet. Wherever there is a deviation from the datasheets, bidder to furnish the documentary proof for confirming superior trim material/body material selection along with their offer. BHEL/Customer reserves the right to accept/reject any variation in the specification.
- 3.1.3 Asbestos shall not be used for the packing or any other component.
- 3.1.4 The valve bonnet and packing shall be suitable for the service conditions as in Data Sheet-A. Gland sealed type bonnets are not acceptable. Double packing is mandatory for applications involving vacuum service. For valves where downstream is subjected to vacuum, flow action shall be "flow to close" (over the seat). Bonnets having Teflon packing shall have valve stem finished to 2-4 microns. Packing material requiring lubrication will not be acceptable.



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PE-TS-422-145-I801

DOCUMENT NO.: PES – 145 - 06

VOLUME II B

SECTION D

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

Type of bonnet shall be according to the service condition. Extension bonnets shall be provided when the maximum temperature of the flowing fluid is greater than 280 or unless otherwise specified. Cast Steel (CS) yokes shall be offered for CEP Minimum Recirculation valve/GSC minimum recirculation control valve. Cast Iron (CI) yokes are not acceptable for this service.

- 3.1.5 The valve end connection as specified in Data Sheet-A shall conform to ANSI B16.25 for Butt Weld connection, ANSI B16.11 for Socket Weld connection and ANSI B16.5 for flanged ends. Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10. The end connections shall be Socket Welded for sizes up to 50 NB and Butt Welded for sizes above 50 NB.
- 3.1.6 The valve seat leakage shall be as per FCI-70.2. The leakage class shall be as per Data Sheet-A.
- 3.1.7 The valve body shall have the direction of flow embossed on all valves.
- 3.1.8 The sizing shall conform to the requirements of ISA S75.01, and the valve capacity shall be selected so as to meet the following:
- | | | | | |
|--|---|---|---|--------------------|
| Valve with Linear Characteristic | - | Normal Flow (Design Point) | : | 70-75% valve lift. |
| | - | Max. Flow | : | 90% valve lift. |
| | - | Min. Flow | : | >10% valve lift. |
| Valve with Equipercentage Characteristic | - | Normal Flow (Design Point) | : | 75-85% valve lift. |
| | - | Max. Flow | : | 90% valve lift. |
| | - | Min. Flow | : | >10% valve lift. |
| ON/OFF Quick open Characteristic | - | 1.1 times the CV calculated on the basis of maximum flow condition. | | |
- The valve offered shall be capable of handling 120 % of the required maximum flow.
- 3.1.9 Calculation for valve sizing, velocity and noise shall be subject to purchaser's approval during contract stage. However responsibility of proper selection and design for the duties specified lies with the vendor. Any modifications required to be done on the valves or actuators & accessories to achieve satisfactory performance of the control system shall be done without any commercial & delivery implication.
- 3.1.10 The valve outlet velocities shall be limited to the following values, unless otherwise specified in the Data sheet-A.
- | | | | |
|------|------------------|----|--|
| i) | Liquid service | <= | 8 m/sec |
| ii) | Steam service | <= | 150 m/sec |
| iii) | Flashing service | <= | 50% of sonic velocity for flashing services. |
- 3.1.11 For flashing duty, 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 The equivalent weighted sound level measured at 1.5 metre above floor level in elevation and 1 metre horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA (without pipe insulation). The offer shall include noise prediction calculations for each valve.



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PE-TS-422-145-I801		
DOCUMENT NO.: PES – 145 - 06		
VOLUME	II B	
SECTION	D	
ISSUE NO.	2	
REV. NO.	00	DATE : 16.01.17

- 3.1.14 In case of predicted noise level above 85 dBA, same shall be brought down to acceptable noise level i.e. below 85 dBA through Source treatment (proper valve trim & valve body selection). Path treatment (LNP/ Diffuser/ Cartridge/ Silencer etc.), if any shall be subject to Customer's/Owner's approval.
- 3.1.15 In case of wrong selection/mal operation of valve and for associated actuator during guarantee period, the vendor shall replace the valve suitably with a modified/new valve of design as approved by purchaser and all the expenses for replacement, rectification/modification including transportation both ways will be at vendor's expenses.
- 3.2 **ACTUATORS-** The control valves shall be operated either pneumatically (with pneumatic actuator) or electrically (with electric actuator).
For pneumatic actuator, clause nos. 3.2.1 through 3.2.6 to be followed.
- For electric actuator, please refer the technical specification for electric actuator (Refer Document No. PES-145-06D).
- 3.2.1 **Pneumatic Actuator**
- The actuator shall be designed for a thrust of 120% of valve's shut-off pressure at an airline supply pressure of 5 Kg/Sq. cm.
- The pneumatic actuators shall be employed for modulating or open/close duty, as specified in Data Sheet-A. The bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drops, shut off pressure and valve travel.
- The pneumatic spring opposed diaphragm actuator or piston actuator as the case may be for modulating duty shall be capable of positioning the associated valve at desired opening for all the operating conditions specified.
- 3.2.2 The pneumatic actuator for open/close duty shall be suitable for fast opening/closing of the associated valve.
- 3.2.3 The actuator design shall allow valve assembly to be mounted at 45° inclination on either side in the vertical plane.
- 3.2.4 The actuators shall be suitably sized to ensure that the associated valve travel time from full open to full closed position and vice versa is less than 10 seconds or as specified in the datasheet under the most stringent service conditions.
- 3.2.5 The actuator's hand wheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve.
- 3.2.6 Each actuator shall be provided with a mechanical pointer attached to stem, moving over a graduated scale with markings, for OPEN, 25%, 50%, 75%, CLOSE positions.
- 3.3 **Accessories for Control valve with Pneumatic Actuator**
- The bidder shall offer all the accessories as specified in the Data Sheet - A for the Pneumatic Actuators under modulating or OPEN/CLOSE duty. The accessories specified shall be supplied duly mounted on the valve actuator and piped with PVC covered copper/ SS tube and flare-less brass/ SS fittings etc. as per the hook up diagram (Refer drawing no. PES-145



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

SPECIFICATION NO.: PE-TS-422-145-I801		
DOCUMENT NO.: PES – 145 - 06		
VOLUME	II B	
SECTION	D	
ISSUE NO.	2	
REV. NO.	00	DATE : 16.01.17

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

3.5 Sub-vendor list –

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

4.0 TESTING AND INSPECTION

4.1 The testing and inspection of the equipment/items shall be in line with the approved QAP

4.2 The cost of all tests as per the approved QAP will be deemed to have been included in the bid.

4.3 In case, the bidder is supplying the valve from outside India, the third party inspection shall be arranged and considered by the bidder in their offer.

5.0 SPARES AND CONSUMABLES

5.1 Start-up/Commissioning Spares

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

5.2 Mandatory Spares

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

6.0 DRAWINGS AND DOCUMENTS

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

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

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

6.1.3 Quality Plan duly signed & stamped.

6.1.4 All relevant Catalogs with detailed technical information.



SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ELECTRIC ACTUATOR)

SPECIFICATION NO.: PE-TS-422-145-I801

DOCUMENT NO.: PES – 145 - 06

VOLUME II B

SECTION D

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

6.2 The successful bidder shall furnish the following documents to BHEL during the contract stage viz. after the award of contract:

5 sets of the following documents for approval + 2 sets of CDs:

6.2.1 CONTROL VALVE DOCUMENTS (Drg. No. PE-VO-XXX-145-I004) including the following:-

- (a) Assembly (dimensional) drawings.
- (b) Valve Edge preparation details.
- (c) Data sheet-C completely filled-up.
- (d) Hook-up diagram of Control Valve with Actuator & Accessories.
- (e) Valve & Actuator assembly dimensional drawings with weights.
- (f) All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.
- (g) All relevant catalogues for models of the valves as well as accessories finalized.

6.2.2 QUALITY PLAN (Drg. No. PE-QP-XXX-145-I006) duly signed and stamped.

6.3 Final documentation:

Documents / drawings to be furnished by the successful bidder shall be as follows:
15 sets with 6 CD-ROMS of:-

6.3.1 Category I & IV approved CONTROL VALVE DOCUMENTS

6.3.2 Test certificates

6.3.3 Operation & maintenance manuals for Control Valve, Actuator and all accessories

7.0 MARKING AND PACKING

7.1 Marking

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

7.2 Packing

All equipment / materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea water spray (where applicable) as well as rough handling and delays in transit and storage in open. Guidelines for packing are enclosed (Refer specification no. PES-145-06C).

8.0 APPLICABLE DATA SHEET FORMS

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

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

DOCUMENT NO.

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

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

SECTION-D

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

	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)	SPECIFICATION NO.: PE-TS- 422-145-I801
		DOCUMENT NO.: PES-145-06A
		VOLUME. II B
		SECTION D
		ISSUE NO. 2 . REV.00

1.0 Electrical

Input Signal	4-20mA
Power Supply	Loop Powered from the output card of Control System (12-30 V DC)
Hart Protocol	Compatibility For Remote Calibration & Diagnostic (Super-Imposed HART Signal On Input Signal (4-20mA))
Valve Position Feedback (4-20mA)	Position Sensing 4-20mA O/P Signal For Control System To Be Provided. If non contact type of Position feedback signal is required, Position transmitter to be separately provided.

2.0 Environment

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

3.0 Software For Configuration & Diagnostic

Software	Windows Based Software, Software Shall Meet The Requirement For Configuration, Diagnostics, Calibration And Testing Of the Actuator. Valve positioning timing, actuator leakage, and Valve Wear & tear, fault alarm to be offered as a minimum. Easily up gradable with same hardware and compatible with any HART management systems / AMS.
Diagnostic/Test Features	Advanced Diagnostic Features Like Stroke On Line Partial Closure Test, Valve Signature Analysis (Online graphical representation) , Step Response Test, Valve Friction/Jamming Detection Etc To Be Provided.

	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)	SPECIFICATION NO.: PE-TS- 422-145-I801
		DOCUMENT NO.: PES-145-06A
		SECTION D
		ISSUE NO. 2 . REV.00

Factory Valve Signature Tests Reports (Pr Vs Valve Travel And Travel Vs I/P Signal) Are To Be Provided.

Hardware PC For Configuration/Software (OPTIONAL)

Test Certificates Test Certificates As Per Manufacture Standard/Relevant Standard Are To Be Submitted.

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

4.0 Modes

Valve Action	Direct & Reverse, Valve Action. (Same positioner for Single Acting or Double Acting And no separate relays required for changing from Single acting to double).
Flow Characterization	Possible to fit valve characteristic curve linear & Equal percentage
Fail Safe/Fail Freeze (Optional)	Fail Safe/Fail Freeze feature is to be provided.

5.0 Performance

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

SPECIFICATION NO.: PE-TS-422-145-1801
DOCUMENT NO.: PES-145-06A
SECTION D
ISSUE NO. 2, REV.00



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

DOCUMENT NO.

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

ISSUE NO. 2

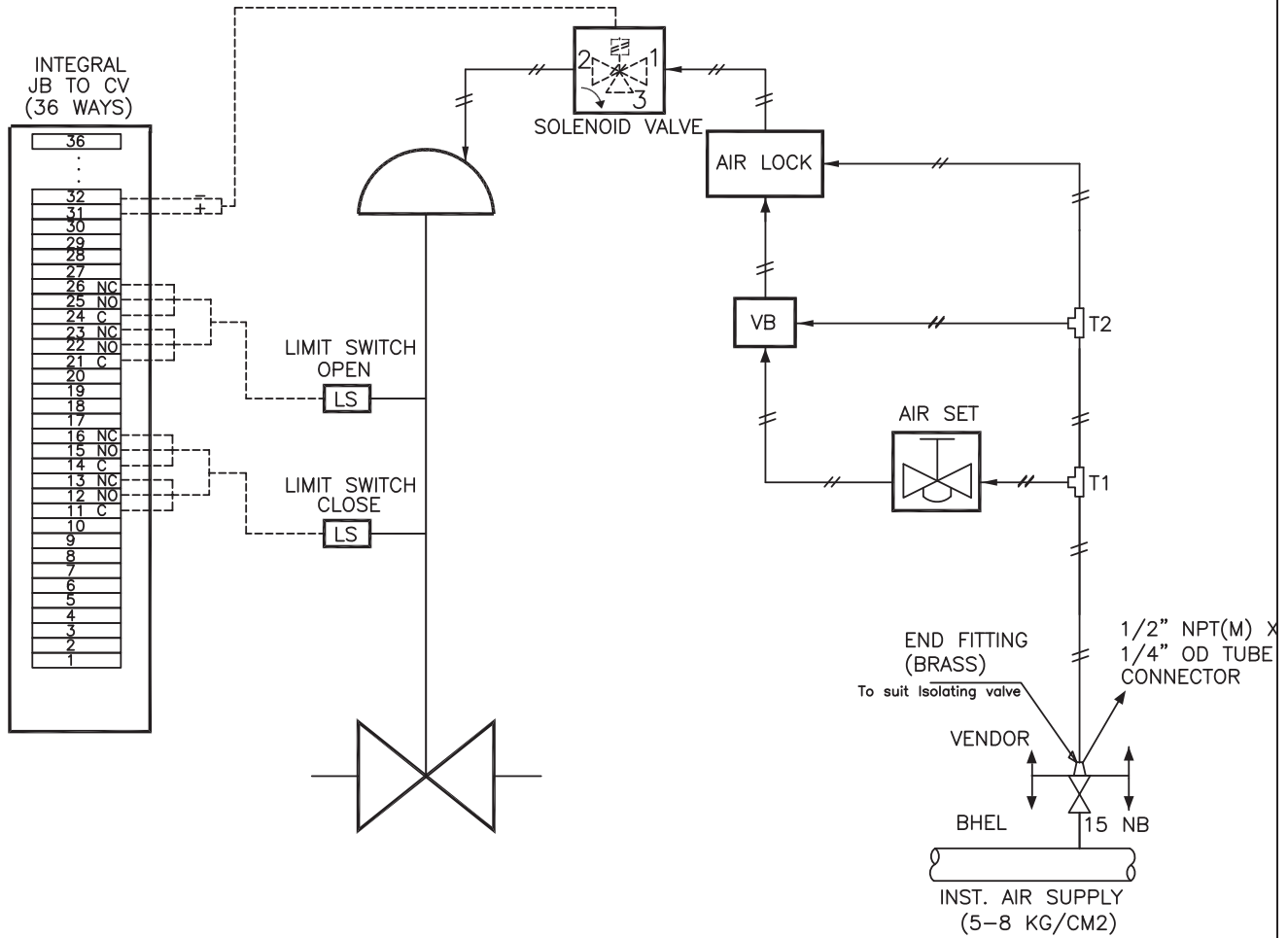
REV. NO. 00

DATE : 16.01.17

SECTION-D

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

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



NOTES :-

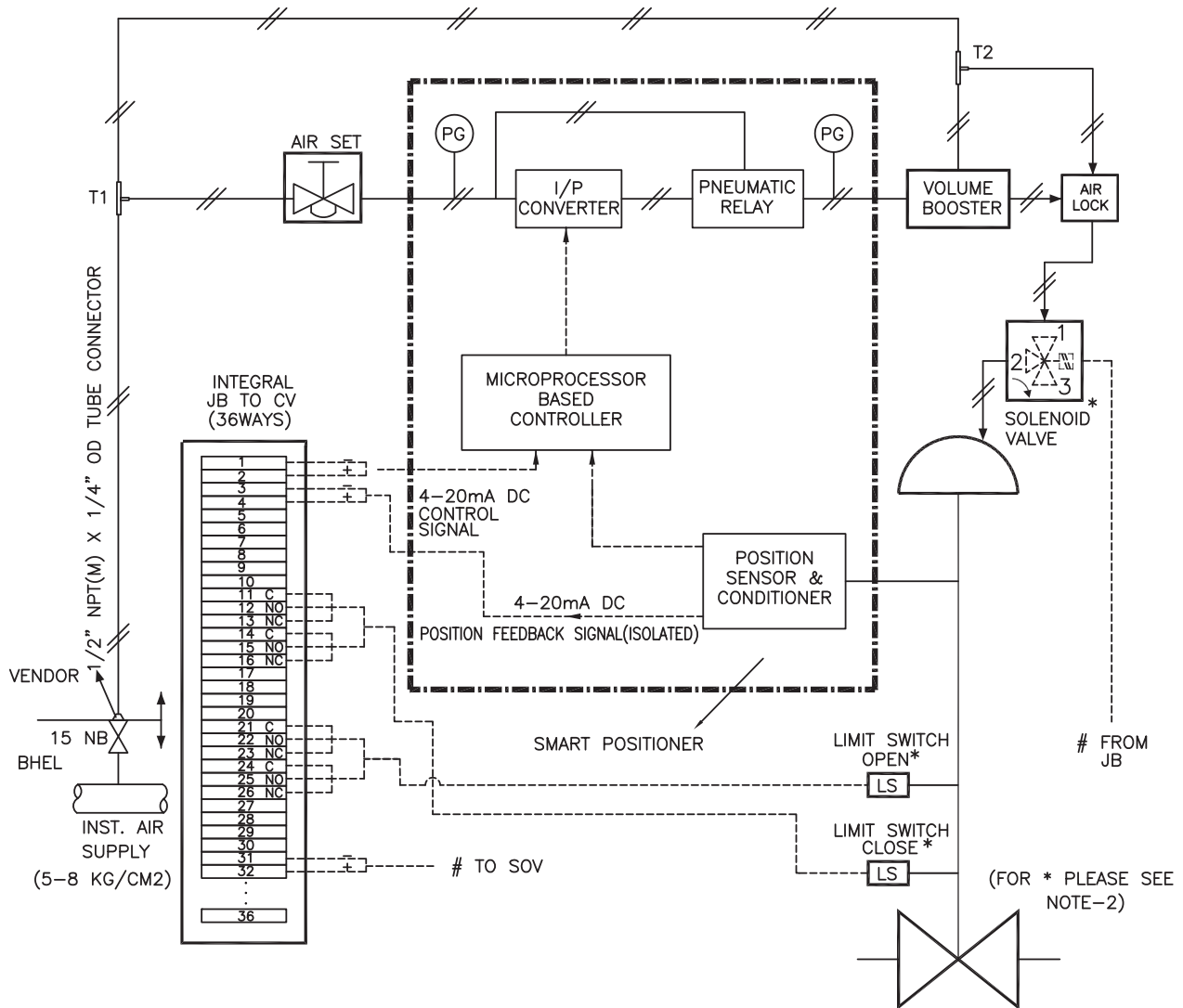
1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRIC SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVES PORTS CONDITION:
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
3. MOUNTING ACCESSORIES AS REQUIRED.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET.
5. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
6. 15 METERS 1/4" SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.



TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

CONTROL VALVE HOOK-UP DIAGRAM (WITH SMART POSITIONER)



NOTES :-

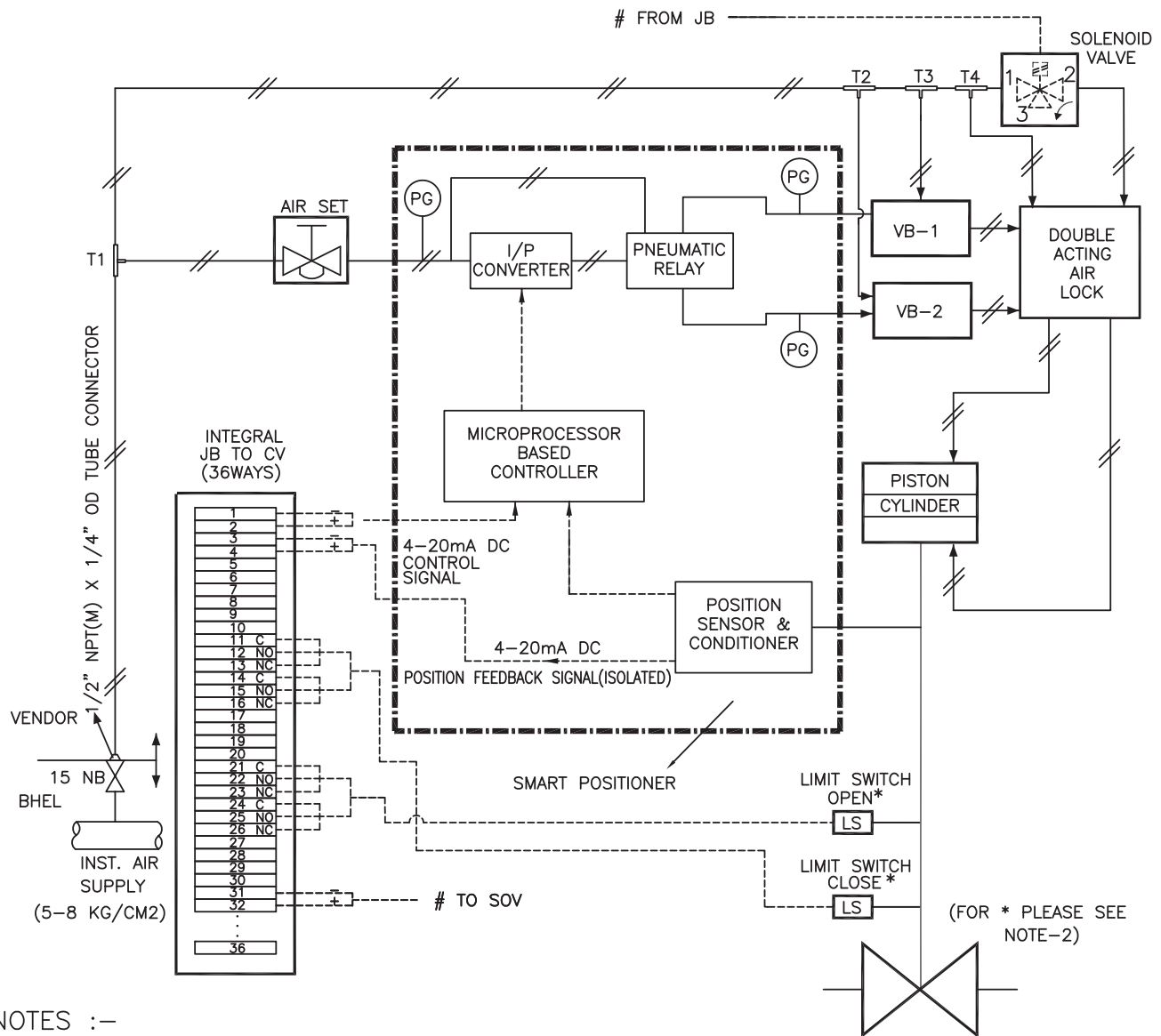
1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 15 METERS 1/4" / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 SHALL BE PROVIDED.



TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM

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



NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
PORT 1 AND 2 SHALL BE CONNECTED UNDER DE-ENERGISED CONDITION.
PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 15 METERS 1/4" / SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS / SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 & TEE-T3 SHALL BE PROVIDED.



TITLE:-

CONTROL VALVE HOOK-UP DIAGRAM



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-1801**

DOCUMENT NO.

VOLUME **II-B**

SECTION **D**

ISSUE NO. 2

REV. NO. 00

DATE: 16.01.17

SECTION – D

GUIDELINES FOR PACKING (PES-145-06C)



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPEC NO.: PE-TS-422-145-I801

DOCUMENT NO.: PES-145-06C

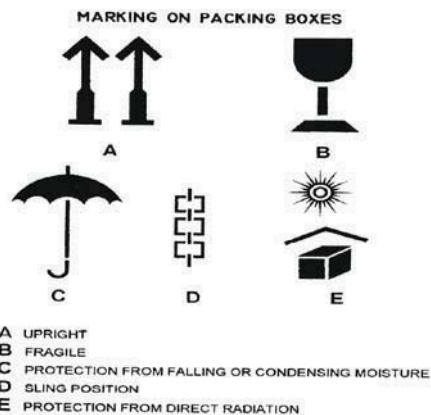
VOLUME II B

SECTION D

ISSUE NO. 2, REV. 00

Guidelines for Packing

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



The Following Details are to be marked on the Packing Cases

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



Technical specification for
Control Valves with Accessories
(Pneumatically Operated)

SPECIFICATION NO. **PE-TS-422-145-I801**

DOCUMENT NO.

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

ISSUE NO. 2

REV. NO. 00

DATE : 16.01.17

SECTION-D

SUB-VENDOR LIST

SI No	Package Code	Package Name	Supplier Name	Supplier Communication Address	Supplier Works Address
285	145-25000-A	JUNCTION BOX	Shrenik & Company,	Mr. Mitesh Shah/Mr. Pulin Shah 39 A/3 ,Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad Phone- 9825024921 Pincode : 382213 Email : sales@pustron.com, pulin@sumip.com	Works-1->Mr.Pulin Shah/ Mr. Kaloesh Parmar 39 A/3 ,Panchratna Industrial Est,Sarkhej-Bavla Road, Changodhar -Ahmedabad-GUJARAT INDIA Phone- 98250 80339 1 FAX : 079-26932424 Pincode : 382213 Email : sales@sumip.com
286	145-25000-A	JUNCTION BOX	K.S.INSTRUMENTS PVT.LTD.	S Raghavan No. 72, 3rd Main, 1st Stage Industrial Suburb, Yeshwanthpur Bangalore Phone- 9880385770 Pincode : 560022 Email : sales1@ksinstruments.net	
287	145-25000-A	JUNCTION BOX	SUCHITRA INDUSTRIES	NO-2,OPP-27 AECS LAYOUT 2ND STG REJAMAHALVILAS EXTN 2ND STG BANGALORE Phone- Pincode : Email : suchitra.industriesblr@gmail.com	Works-1->B. Srinivas Suchitra Industries, Opp No 53, Muneshwara Black Devinagar, Lottagal hal -BANGALORE-KARNATAKA INDIA Phone- 080-23511247 FAX : Pincode : 560094 Email : suchitra_industries@yahoo.com
288	145-25000-A	JUNCTION BOX	AJMERIA INDUSTRIAL & ENGINEERING WORKS	JIGNESH MAHENDRA AJMERIA DENA BANK BLDG.,SHREE NAGESH INDL ESTATE,STATION ROAD, MUMBAI Phone- 022 67973578 Pincode : 400 088 Email : ajmera@ajmera.net, jmajmera@yahoo.com	Works-1->JIGNESH MAHENDRA AJMERIA DENA BANK BLDG., SHREE NAGESHINDL ESTATE,STATION ROAD, -MUMBAI-MAHARASHTRA INDIA Phone- 022 67973578 FAX : Pincode : 400 088 Email : ajmera@ajmera.net

PACKAGE NAME
AIR TRAP

SUPPLIER NAME
1. PENNANT ENGINEERING PVT LTD
2. FORBES MARSHALL STEAM SYSTEM PVT LTD