

**TECHNICAL SPECIFICATION**  
**FOR**  
**CONTROL VALVE WITH ACCESSORIES**  
**(Pneumatically Operated)–FDV**  
**(FOR RATE CONTRACT)**

**VOLUME II–B**  
**SECTION C & D**

**SPECIFICATION No.**  
**PE–TS–20–145–H104–A**

	<b>TITLE</b> <b>TECHNICAL SPECIFICATION</b> <b>FOR</b> <b>CONTROL VALVES WITH ACCESSORIES (Pneumatically Operated)–FDV</b> <b>(FOR RATE CONTRACT)</b>	<b>DOC. NO. PE–TS–20–145–H104–A</b>			
	<b>BHARAT HEAVY ELECTRICALS LTD</b> <b>POWER SECTOR</b> <b>PROJECT ENGINEERING MANAGEMENT</b> <b>NOIDA</b>	<b>DEPT</b> <b>CODE</b>	<b>NAME</b> <b>SS</b> <b>CM/MK/SCS</b> <b>RT</b>	<b>SIGN</b> 	<b>DATE</b> <b>02.01.2026</b> <b>07.01.2026</b> <b>07.01.2026</b>



Technical specification for  
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SPEC NO.: PE-TS-20-145-H104-A

VOLUME II B

REV. NO. 00

DATE 07.01.2026

## CONTENT

SECTION	DESCRIPTION	PAGE NO.
	Project Information & Scope	3
C	Specific Technical Requirements	6
	Customer's Specification	11
	Typical Process Parameters for valve services	12
	Datasheets-A	13
	Datasheets-C	18
	Quality Plan	21
	Bill of Quantity-Control Valve	31
	Bill of Quantity-Control Valve Components/Accessories/ Mandatory Spares	32
	Bill of Quantity-Cv test for Control Valves	33
D	Equipment Specification	35
	Specification for Smart Positioner	42
	Hook-Up Diagram	44
	Guideline for Packing	47
	Suggestive Sub-Vendor List	50
	Documentation Requirement	52
	Compliance Certificate	54



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -FDV  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II B

REV. NO. 00

DATE 07.01.2026

### PROJECT INFORMATION

SL.NO	DESCRIPTION	DETAILS
1	CUSTOMER	PROJECT SPECIFIC REQUIREMENT SHALL BE FURNISHED LATER
2	LOCATION	
2.1	COORDINATES	
2.2	NEAREST RAILWAY STATION	
2.3	NEAREST SEA PORT	
2.4	NEAREST AIRPORT	
2.5	NEAREST NATIONAL HIGHWAY	
3	METEOROLOGICAL DATA	
3.1	MAXIMUM TEMPERATURE	
3.2	MINIMUM TEMPERATURE	
3.3	RELATIVE HUMIDITY (FOR DESIGN)	
3.4	AVERAGE ANNUAL RAINFALL	
3.5	SEISMIC ZONE (AS PER IS 1893)	
3.6	HEIGHT ABOVE MSL	



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -FDV  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II B

REV. NO. 00

DATE 07.01.2026

**SCOPE OF THIS PACKAGE COVERS THE FOLLOWING:**

SL.NO	PARAMETERS	REQUIREMENT
1	Supply Including Design, Engineering, Manufacturing of	
a)	Main Supply including commissioning Spares	YES
2	Painting	YES
3	Inspection & Testing	YES
4	Packing	YES
5	Transportation & Delivery to Site	YES
6	Erection & Commissioning	NO
7	Supervision of Erection & Commissioning	NO
8	Performance Guarantee (PG) Test	NO
9	Mandatory Spares	YES
10	O & M Service	NO
11	O & M Spares	NO



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -FDV  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II B

SECTION C

REV. NO. 00

DATE 07.01.2026

## SECTION – C

**SPECIFIC TECHNICAL REQUIREMENTS**

**CUSTOMER'S SPECIFICATION**

**DATA SHEETS – A FOR CONTROL VALVES**

**DATA SHEETS – A FOR ACCESSORIES**

**DATA SHEETS – C FOR CONTROL VALVES**

**DATA SHEETS – C FOR ACCESSORIES**

**QUALITY PLAN**

**BILL OF QUANTITY (BOQ)**



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -**FDV**  
**(RATE CONTRACT)**

SPEC NO.: <b>PE-TS-20-145-H104-A</b>		
VOLUME	II B	
SECTION	C	
REV. NO.	00	DATE 07.01.2026

**SPECIFIC TECHNICAL REQUIREMENTS**



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II-B

SECTION C

REV. NO. 00 | DATE: 07.01.2026

### **SPECIFIC TECHNICAL REQUIREMENTS**

- 1.0 This specification is intended for finalization of rate contract between BHEL-PEM and bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL-PEM and Bidder. Project specific technical detail, process parameters, tests requirement shall be made available to the bidder along with project specific enquiry and shall be shared after finalization of the rate contract.
- 2.0 The given requirement is bare minimum and equipment shall be designed/manufactured/ tested as per latest codes and standards. 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 assembly complete with Pneumatic Actuator and other accessories, as mentioned in different sections of this specification.
- 3.0 The bids shall be evaluated as per NIT. Ordering shall be done separately for each project based on finalization of the rate contract.
- 4.0 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Project specific quality plan, shall be furnished to the bidder along with the project specific enquiry after finalization of rate contract, which shall be complied by the bidder in totality without any additional cost and delivery implication to BHEL.

#### **5.0 TECHNICAL INSTRUCTIONS**

- I. It is not the intent here to specify all the details of design and manufacturing. 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 BHEL/Customer, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in their judgement is not in full accordance herewith.
- II. 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.
- III. BHEL's/Customer's representatives shall be given access to the shop in which equipment are being manufactured or tested and all test records shall be made available to them.
- IV. **The bidder to quote for items as per price format attached. The quantity as mentioned in the BOQ is only for evaluation purpose. However actual ordered quantity may vary from project to project.**
- V. List of tentative projects targeted for execution of this rate contract is mentioned elsewhere in the NIT. During rate contract in force; BHEL-PEM reserves the right to order control valves for projects other than the mentioned project list.
- VI. During rate contract in force; any other unit of BHEL may also make use of these rates.
- VII. Inspection shall be carried out in line with pre-approved project specific Quality Plan, drawings/data sheet/QP.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-**FDV**  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II-B

SECTION C

REV. NO. 00 | DATE: 07.01.2026

- VIII. Quality plan, attached herewith, is to be duly signed and stamped by the bidder and to be furnished along with the bid as a token of acceptance as a minimum requirement. Any deviation w.r.t specification and quality plan, shall not be acceptable and bid / offer shall be rejected.
- IX. Wherever in data sheet more than one options are marked, bidder to comply for all the options. However, bidder to note that any one option shall be selected by BHEL for a specific project and the same shall be supplied by bidder within the quoted price as per the SCHEDULE OF PRICES included in the NIT.
- X. Scope of supply shall include complete Control Valves with Pneumatic Actuator along with accessories, tubing as mentioned in different sections of this specification.
- XI. Cv test – Cv test shall be carried out for each type of control valve (of same size, same Cv, same trim characteristics) for every project. During the project specific enquiry, bidder to inform the tag nos. of control valves for which the Cv tests have to be conducted. Cv test reports/ certificates conducted for same type of control valve shall also be acceptable subject to Customer's acceptance for a project. Bidder to note that only those Cv. test reports for same type of control valves shall be offered for verification which are not older than 5 years from the date of submission of bidder's technical un-priced offer for rate contract. The validity of Cv test certificates shall be verified during review of the project specific documents. In case valid Cv test certificates are not available or the test certificates are not acceptable to Customer, bidder to conduct the Cv test for those valves at Fluid Control Research Institute (FCRI, Palakkad) FCRI/laboratory approved by Govt. Of India/ BHEL approved laboratory. Bidder to quote for the Cv tests as per the price format for Cv test enclosed under the SCHEDULE OF PRICES included in the NIT. Payment shall be made only if the Cv test is conducted by the bidder.
- XII. Bidder shall offer control valves with sufficient number of discrete pressure drop turns(stages) & paths as per process requirement. The multiple stages & paths shall be selected by the bidder so as to limit the pressure drop in each stage up to 50% or less.
- XIII. In addition to the above, control valve with FL factor  $\geq 0.995$  shall be considered for one project with single unit.
- XIV. Position limit switch, solenoid valve if required for a specific project; shall be considered by the bidder. Bidder to quote against these items as mentioned in the price format (Schedule Of Prices) in addition to the main control valve's price.
- XV. One(1) no. moisture separator unit, if required for a specific project; shall be considered per control valve as mentioned in hook-up diagram enclosed in this technical specification. Bidder to quote against these items as mentioned in the price format (Schedule Of Prices) in addition to the main control valve's price.
- XVI. Valve Trim, Valve body –
- (i) Trim material and body material has been specified in Datasheets-A. Bidder to offer trim material/body material combination, which is equivalent or better than the material specified in Datasheets-A. Wherever there is deviation from the datasheets, bidder to furnish a documentary proof for confirming superior trim material/body material selection along with their offer. If the offered material is not acceptable to the Customer, bidder to provide material as per the datasheet requirement without any commercial and delivery implication.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
(RATE CONTRACT)

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II-B

SECTION C

REV. NO. 00 DATE: 07.01.2026

(ii) Valve sizes, with tentative Cv range has been indicated in the datasheet and the price format. The bidder may offer a higher valve size so as to meet Cv v/s % Lift requirement. The same may be accepted, however no commercial and delivery implication will be applicable.  
(iii) For the top guided balanced type control valves (up to 3" size), material of the guide bush shall be harder and superior to the cage material offered by the bidder.

- XVII. Noise level – Bidder to note that noise abatement shall be achieved through valve body and trim design & not by any external means. If the noise abatement (< 85 dBA) is not achieved only by the valve's design, bidder may offer a cartridge/low dB plate/diffuser of a suitable size subject to acceptance by the Customer. The expander between the valve and this cartridge shall also be provided by the bidder and shall be included in the quoted price of valve.
- XVIII. Bidder to include volume booster, if required, in their offer to achieve stroking time (travel time) < 10 secs. Volume booster wherever applicable shall be as per hook-up diagram enclosed in this technical specification whenever required within the main control valve assembly. Bidder to ensure that inclusion of Volume Booster should not lead to hunting of valve's position during it's operation.
- XIX. Bidder to provide diagnostic software 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 hardware of reputed makes like MTL, P&F etc.
- XX. A suggestive sub-vendor list for accessories/other items of the control valve assembly has been enclosed in this specification. Bidder may propose sub-vendors other than those listed in the specification, with supporting documents/credentials for their proven track record. However, sub-vendors are subjected to BHEL's and Customer's approval without any commercial and delivery implication to BHEL.
- XXI. For the valves, manufactured and supplied from a foreign country, expenses for all inspection shall be included in bidder's quoted price.
- XXII. Pneumatic tubing of the control valves will be SS tubing with SS fitting as per hook-up diagrams enclosed in this specification. The SS fittings shall be double compression type of SWAGELOK or equivalent make (subject to approval by end Customer). Bidder to provide the required tubing & fitting for each control valve within their quoted price.
- XXIII. Bidder may offer either spring diaphragm or piston cylinder type actuator as per their actuator design meeting the shut off pressure requirement, stroke length & travel time requirement for the control valve.
- XXIV. Sea worthy packing – Sea worthy packing (if applicable) for a specific project shall be informed during the project specific order. The same shall be provided by the bidder without any commercial and delivery implication. Inspection of sea worthy packing shall be done as per project specific sea worthy packing specification by Customer/BHEL/BHEL appointed inspection agency.
- XXV. Refer Section-D viz. "Equipment Specification" for Codes and Standards, Technical requirements, Tests & Inspection, Drawings and Documents, Packing, Marking & applicable Datasheets reference.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II-B

SECTION C

REV. NO. 00 | DATE: 07.01.2026

- XXVI. The "Service" description indicated in the respective datasheet(s) is for reference only. The actual service description for respective datasheets and all inputs like pipe size, design/ process parameters & accessories requirements shall be informed during project specific order.
- XXVII. SCHEDULE OF PRICES has to be duly filled by the bidder in all respects. Kindly also refer valve's datasheet for further details. Bids incomplete in any form shall not be evaluated and shall be liable for rejection.
- XXVIII. Typical process parameters for the various control valves services covered in the datasheet A1FDV in Section-C of the specification. Actual process parameters shall be informed to bidder during project specific order. Bidder to perform the valve sizing/selection accordingly for all projects.
- XXIX. e-Learning Module shall be provided by bidder for 3 projects as per details provided in project specific order.
- XXX. The final documentation including the requisite number of operating manuals, maintenance and service manuals, component documentation, assembly documentation, drawings and listing, etc. shall be submitted in requisite quantities in English language and also in other language as per Customer's requirement. This shall be informed during project specific order and bidder to comply to this requirement without any commercial and delivery implication to BHEL.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-**FDV**  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II-B

SECTION C

REV. NO. 00 | DATE: 07.01.2026

**CUSTOMER'S SPECIFICATION**

Same shall be informed by BHEL during project specific order

**RATE CONTRACT FOR CONTROL VALVES (FDV)**

**TYPICAL PROCESS PARAMETERS**

DATASHEET REFERENCE		A1FDV			
SERVICE DESCRIPTION		LOW LOAD FEED CONTROL			
SL NO.	LOAD	FLOW(T/Hr)	INLET PRESSURE(Kg/cm2(a))	OUTLET PRESSURE(Kg/cm2(a))	TEMP(Deg C)
1	5% BMCR (MIN SPEED) Case-I	135	60.82	12.72	111
2	5% BMCR (MIN SPEED) Case-II	135	36	12.72	111
3	10% BMCR (MIN SPEED)	270	57.87	23.10	111
4	20% BMCR	541	80.48	61.61	111
5	25% BMCR	676	109.8	89.56	138
6	30% BMCR	812	116.83	111.83	153
7	40% BMCR (BCP NOT IN OPRN)	1082	112.3	16.62	111



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -**FDV**  
(**RATE CONTRACT**)

SPEC NO.: **PE-TS-20-145-H104-A**

VOLUME II B

SECTION C

REV. NO. 00

DATE 07.01.2026

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



**Technical specification for  
Control Valves with Accessories  
(Pneumatically Operated)-FDV  
(RATE CONTRACT)**

SPECIFICATION NO. PE-TS-20-145-H104-A	
DOCUMENT NO.	
VOLUME II B	
SECTION C	
REV. NO. 00	DATE: 07.01.2026

Data Sheet No. A1FDV

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

<b>GENERAL</b>	PROJECT	Shall be furnished during project order stage	
	SERVICE	LOW LOAD FEED CONTROL	
	LOCATION	<input checked="" type="checkbox"/> INDOOR <input checked="" type="checkbox"/> OUTDOOR	
	DUTY	<input type="checkbox"/> ON/OFF <input checked="" type="checkbox"/> MODULATING	
	PIPE SIZE (inlet / outlet)	Shall be furnished during project order stage	
	PIPE MATERIAL (inlet / outlet)	Shall be furnished during project order stage	
<b>BODY</b>	MODEL NUMBER	Bidder to specify during project order stage	
	TYPE OF BODY:GUIDING:NO.OF PORTS	<input checked="" type="checkbox"/> GLOBE <input type="checkbox"/> ANGLE : <input type="checkbox"/> TOP <input checked="" type="checkbox"/> CAGE : ONE	
	BODY SIZE : RANGE OF DESIGN Cv	12 " : 200 – 600 (Tentative)	14 " : 400 – 600 (Tentative)
	END CONNECTION : RATING (ANSI)	<input checked="" type="checkbox"/> BWE <input type="checkbox"/> SWE <input type="checkbox"/> FLANGED : <input checked="" type="checkbox"/> #3000 SPL <input checked="" type="checkbox"/> Other rating	
	BODY MATERIAL	<input checked="" type="checkbox"/> A217 WC9	
	PACKING MATERIAL : SINGLE / DOUBLE	<input type="checkbox"/> PTFE <input checked="" type="checkbox"/> GRAFOIL : <input checked="" type="checkbox"/> DOUBLE <input type="checkbox"/> SINGLE	
	BONNET TYPE	<input checked="" type="checkbox"/> STD <input type="checkbox"/> EXTENDED <input type="checkbox"/> FINNED	
	*TRIM FORM	<input type="checkbox"/> LINEAR <input checked="" type="checkbox"/> EQ. PERCENTAGE <input type="checkbox"/> QUICK OPEN	
	# TRIM MATERIAL : SEAT RING	<input checked="" type="checkbox"/> SS 316 STELLITED <input checked="" type="checkbox"/> 17-4 PH SS	
	# TRIM MATERIAL : PLUG	<input checked="" type="checkbox"/> SS 316 STELLITED <input checked="" type="checkbox"/> 17-4 PH SS	
	# TRIM MATERIAL : CAGE+	<input checked="" type="checkbox"/> SS 316 STELLITED <input checked="" type="checkbox"/> 17-4 PH SS	
	FLOW : TO CLOSE / TO OPEN	Bidder to specify during project order stage	
	OUTLET VELOCITY	<input checked="" type="checkbox"/> < 7 M/SEC (WATER)	
	## REQUIRED LEAKAGE CLASS	<input checked="" type="checkbox"/> IV <input checked="" type="checkbox"/> V	
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	
	VACUUM SERVICE	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
	ANTI CAVITATION TRIM	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
<b>PNEUMATIC ACTUATOR</b>	MODEL NO. & SIZE	Bidder to specify during project order stage	
	CLOSE AT : OPEN AT (Kg / Cm <sup>2</sup> g)	To suit actuator	
	** TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	< 10 secs.	
	VALVE POSN. ON SIGNAL FAILURE	<input checked="" type="checkbox"/> TO OPEN <input type="checkbox"/> TO CLOSE <input type="checkbox"/> STAYPUT	
VALVE POSN. ON SUPPLY AIR FAILURE	STAYPUT		
<b>ACCESSORIES</b>	SMART POSITIONER	REQUIRED	
	AIR FILTER REGULATOR	REQUIRED	
	AIR LOCK RELAY	REQUIRED	
	\$ POSITION LIMIT SWITCH	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED	
	\$ SOLENOID VALVE	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED	
	JUNCTION BOX	REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	REQUIRED	
	LOCAL POSITION INDICATOR	REQUIRED	



**Technical specification for  
Control Valves with Accessories  
(Pneumatically Operated)-FDV  
(RATE CONTRACT)**

SPECIFICATION NO. <b>PE-TS-20-145-H104-A</b>	
DOCUMENT NO.	
VOLUME II B	
SECTION C	
REV. NO. 00	DATE: 07.01.2026

Data Sheet No. A1FDV

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

PERFORMANCE OF VALVE	HYSTERSIS		± 1%						
	LINEARITY		± 1%						
	SENSITIVITY		± 0.5%						
	ACCURACY (Overall)		± 2%						
SERVICE CONDITION	SL. NO.	LOAD	FLOW (T/HR)	INLET PR. (KG/CM <sup>2</sup> (A))	OUTLET PR. (KG/CM <sup>2</sup> (A))	TEMP DEG. C	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
(Shall be furnished during project order stage)									
	VALVE TYPE						<input type="checkbox"/> CAVITATION <input type="checkbox"/> FLASHING <input checked="" type="checkbox"/> HIGH DP		
	MAX SHUT OFF PRESS (KG/CM <sup>2</sup> g)						525		
	BODY DESIGN : PRESS (KG/CM <sup>2</sup> g)   TEMP (DEG. C)						525	200	
	IBR FORM III-C <input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED								

**NOTES:**

- 1.# BHEL will select either of trim material combination as per the options in the data sheet –A which shall be supplied by the bidder at the same price. However, alternative field proven trim material combination, superior to the specified trim material can be offered by the bidder subject to approval by the end Customer without any commercial and delivery implication to BHEL.
2. ##BHEL will select either of the Leakage class (IV or V) as per the project specific requirement. Bidder to provide the required leakage class accordingly without any commercial and delivery implication to BHEL.
3. Bidder to note that noise abatement shall be achieved through valve body and trim design & not by any external means. If the noise abatement (< 85 dBA) is not achieved only by the valve's design, bidder may offer a cartridge/low dB plate/diffuser of a suitable size subject to acceptance by the Customer. The expander between the valve and this cartridge shall also be provided by the bidder and shall be included in the quoted price of main control valve assembly.
- 4.\*\*Bidder to include volume booster, if required in their offer, to achieve the stroking time (travel time) < 10 secs. Volume booster shall be provided by the bidder as per the hook-up diagram enclosed in this technical specification whenever required within the quoted price of the main control valve assembly.
5. \$Position limit switch, solenoid valve if required for a specific project; shall be considered by the bidder. Bidder to quote against these items as mentioned in the price format (Schedule Of Prices) in addition to the quoted price of main control valve assembly.
6. One(1) no. moisture separator unit shall be considered per control valve as per hook-up diagram enclosed in this technical specification, as per requirement in project specific order. Bidder to quote against these items as mentioned in the price format (Schedule Of Prices) in addition to the quoted price of main control valve assembly.
7. If the bidder wishes to offer a higher valve size (> 14") so as to meet the Cv. vs. % Lift requirement, the same shall be accepted without any commercial and delivery implication to BHEL, within the quoted price of main control valve assembly.
8. Performance of the valve (Hysteresis, Linearity, Sensitivity & Accuracy) mentioned above in the datasheet is the minimum requirement. Actual requirement may vary as per the project specific order which has to be confirmed by the bidder, without any commercial and delivery implication, within quoted price of the main control valve assembly.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)  
**(RATE CONTRACT)-FDV**

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II B

SECTION C

REV. NO. 00

DATE 07.01.2026

**SECTION-C**

**DATASHEET-A FOR ACCESSORIES**



**Technical specification for  
Control Valves with Accessories  
(Pneumatically Operated)-FDV  
(RATE CONTRACT)**

SPECIFICATION NO.:PE-TS-20-145-H104-A

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

REV. NO. 00

DATE: 07.01.2026

Data Sheet No. B1

APPLICABLE FOR MAIN VALVES WHEREVER OPTION "REQUIRED"  
INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEETS

**DATA SHEET – A FOR ACCESSORIES FOR CONTROL VALVE - MODULATING DUTY (TO BE FILLED BY PURCHASER)**

<b>SMART POSITIONER</b>	MFR. & MODEL NUMBER			Bidder to specify during project order stage		
	BYPASS	GAUGES	ENCL. CLASS	■ YES ■ NO	■ TWO* ■ THREE*	■ IP-65
	INPUT SIGNAL			4-20 mA DC, HART		
	OUTPUT SIGNAL (Kg / Cm <sup>2</sup> )			TO SUIT ACTUATOR		
	TYPE OF POSITION TRANSMITTER (INTEGRAL PART OF POSITIONER)			Electronic,2-Wire with 4-20 mA DC Output operated at 24 V DC(preferably non-contact type)		
<b>AIR FILTER REGULATOR</b>	MFR. & MODEL NUMBER			Bidder to specify during project order stage		
	AIR SUPPLY PRESS (Kg / Cm <sup>2</sup> g)			5.0 – 8.0		
	OUTPUT PRESS (Kg / Cm <sup>2</sup> g)			TO SUIT ACTUATOR		
	FILTER SIZE/ FILTER MATERIAL			5 MICRON/SINTERED BRONZE		
	OUTPUT GAUGE			■ REQUIRED □ NOT REQUIRED		
<b>AIR LOCK RELAY</b>	MFR. & MODEL NUMBER			Bidder to specify during project order stage		
	SET PRESS (Kg / Cm <sup>2</sup> )			3.5(tentative)		
	SUPPLY PRESS (Kg / Cm <sup>2</sup> )			5.0 – 8.0		
	RESET TYPE			AUTO		
	VENT PLUG			REQUIRED		
<b>LIMIT SWITCH</b>	MFR. & MODEL NUMBER			Bidder to specify during project order stage		
	OPEN posn	INT posn	CLOSE posn	1 NO.	---	1 NO.
	CONTACT TYPE			SPDT 2 NO + 2 NC		
	RATING (AC / DC)			5A,240 V AC AND 0.2A,220 V DC		
	ENCLOSURE CLASS			IP 65		
<b>SOLENOID VALVE</b>	MFR. & MODEL NUMBER			Bidder to specify during project order stage		
	RATING			24V DC		
	TYPE			■ 3-WAY(UNIVERSAL OPERATION TYPE) ■ 4/2-WAY(UNIVERSAL OPERATION TYPE)		
	QUANTITY			AS PER VALVE DATASHEET & HOOK-UP DIAGRAM		
	COIL INSULATION CLASS			CLASS – H (with temp rise limited to Class-B)		
	ENCLOSURE/BODY MATERIAL			■ SS ■ BRASS		
	ENCLOSURE CLASS			IP 65		
<b>HANDWHEEL</b>	ORIENTATION			SIDE MOUNTED		
<b>JUNCTION BOX</b>	NO. OF WAYS			36-Ways		
	TYPE OF TERMINAL BLOCKS			CAGE CLAMP		
	ELECTRICAL CONNECTION			■ THROUGH CABLE GLAND ■ PLUG-IN SOCKET		
	CABLE GLANDS (Qty/Type/Material)			As required /Double Compression Type/SS or Nickel Plated Brass		
	ENCLOSURE CLASS			IP 65		
<b>SS Tubing &amp; Fittings / per CV</b>	BODY MATERIAL			■ FRP ■ SHEET STEEL		
	This is in addition to pneumatic Tubing and fittings which are integral part of CV			12 Meters of ¼"SS Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.(Refer NOTE 3)		
	COLOUR/SHADE			Shall be informed during project specific enquiry		
<b>PAINTING</b>	THICKNESS (DFT) – in microns			Shall be informed during project specific enquiry		
	TYPE			EPOXY		
						COMPANY SEAL
						NAME
						SIGNATURE
						DATE

**NOTES:**

- \*All the single acting smart positioners shall be provided with two (02) no. of gauges. Double acting positioners shall be provided with three(03) gauges.
- Wherever in data sheet more than one options are marked, bidder to comply for all the options. BHEL will select any one option for a specific project and the same shall be supplied by bidder without any commercial implication with respect to rate contract.
- Where volume booster is envisaged, bidder may offer 1/2" or suitable sized tubing (for both inlet as well as output side) along with its required fittings.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -**FDV**  
**(RATE CONTRACT)**

SPEC NO.	: PE-TS-20-145-H104-A		
VOLUME	II B		
SECTION	C		
REV. NO.	00	DATE	07.1.2026
SHEET	53	OF	94

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



**Technical specification for  
Control Valves with Accessories  
(Pneumatically Operated) -FDV  
(RATE CONTRACT)**

SPECIFICATION NO. **PE-TS-20-145-H104-A**VOLUME **IIB**SECTION **C**REV. NO. **00**DATE: **07.01.2026**Datasheet No. **CX**

**DATA SHEET C**

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

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



**Technical specification for  
Control Valves with Accessories  
(Pneumatically Operated) -FDV  
(RATE CONTRACT)**

SPECIFICATION NO. <b>PE-TS-20-145-H104-A</b>	
VOLUME IIB	
SECTION <b>C</b>	
REV. NO. 00	DATE: 07.01.2026

Datasheet No. CX

**DATA SHEET C**

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

<b>PERFORMANCE OF VALVE</b>	HYSTERSIS								
	LINEARITY								
	SENSITIVITY								
	ACCURACY (Overall)								
<b>SERVICE CONDITION*</b>	<b>SL.+ NO.</b>	<b>LOAD</b>	<b>FLOW (T/HR)</b>	<b>INLET PR. (KG/CM<sup>2</sup> (A))</b>	<b>OUTLET PR. (KG/CM<sup>2</sup> (A))</b>	<b>TEMP DEG. C</b>	<b>CALCULATED CV</b>	<b>% VALVE LIFT</b>	<b>VALVE O/L VELOCITY</b>
	VALVE TYPE								
	* MAX SHUT OFF PRESS ((KG/CM <sup>2</sup> g)								
	* BODY DESIGN : PRESS ((KG/CM <sup>2</sup> g)   TEMP (DEG. C)								
	* IBR FORM III-C								



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -**FDV**  
**(RATE CONTRACT)**

SPECIFICATION NO. <b>PE-TS-20-145-H104-A</b>	
DOCUMENT NO. PE-QP-999-145-I006	
VOLUME <b>II-B</b>	
SECTION <b>C</b>	
REV. NO. 00	DATE : 07.01.2026

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

	<b>MANUFACTURER/BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>			<b>STANDARD QUALITY PLAN</b>				SPEC. NO : --		DATE: --				
				CUSTOMER :--				QP NO.: PE-QP-999-145-H 006 REV 00		DATE: 04.01.2024				
				PROJECT: --				PO NO.: --		DATE: --				
				ITEM: CONTROL VALVE		SYSTEM: S&CE				SHEET 1 OF 8				
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
	2	3	4	5	6		7	8	9	*	**			
					M	B/C				D	M	B	C	

1.0	RAW MATERIAL												
1.1	Body & Bonnet castings/forgings ,plug, valve stem, seat ring/cage	Physical, Chemical properties	MA	Physical, Chemical tests	100%	10%	Approved drg/ datasheet	Approved drg/data sheet	Test Certificate	√	P/W	V	
		Heat Treatment	MA	Review of H.T. Certificate	100%	10%	Approved drg/ datasheet	Approved drg/data sheet	Test Certificate	√	P/W	V	1. Applicable for body /bonnet only 2. IBR certificate(if applicable) to be verified.
		Internal quality of castings/forgings	MA	RT for Body & UT for Bonnet	100%	10%	ASME B 16.34	ASME B 16.34	Test Report/ Film	√	P/W	V	Applicable for body and bonnet for rating ANSI 900 and above.
		Surface Quality	MA	1.Visual	100%	10%	ANSI/ MSS-SP-55	ANSI/ MSS-SP-55	Inspection Report	√	P/W	V	Applicable for body/bonnet only.
		Pressure Test for shell	MA	Hyd. Test	100%	10%	ISA-S-75.19	ISA-S-75.19	Inspection Report	√	P/W	V	For Body and Bonnet after machining.

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL							
ENGINEERING		QUALITY		Sign & Date		Seal		Doc No:		Name		Sign & Date		Seal	
Prepared by:	CHETAN MALIK	CHETAN MALIK	Checked by:	SUMAN NAKWAL	Suman Nakwal			Reviewed by:							
Reviewed by:	SURESH CHAND SHARMA	Suresh Chand Sharma	Reviewed by:	HARISH KUMAR	Harish Kumar			Approved by:							
Approved by:	GIRISH BHAGCHANDANI	Girish Bhagchandani													

	<b>MANUFACTURER/BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>		<b>STANDARD QUALITY PLAN</b>				SPEC. NO : --		DATE: --	
			CUSTOMER :--				QP NO.: PE-QP-999-145-H 006 REV 00		DATE: 04.01.2024	
			PROJECT: --				PO NO.: --		DATE: --	
			ITEM: CONTROL VALVE		SYSTEM: S&CE				SHEET 2 OF 8	

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

1.2	Diaphragm	Surface Quality	MA	Visual	100%	10%	Mfr. standard	COC./Test Certificate	COC/Test Certificate	√	P/V	V	
		Hardness	MA	Measurement	100%	10%	Mfr. standard	COC/Test Certificate	COC/ Test Certificate	√	P/V	V	
		Endurance/ Life cycle	MA	Cyclic Test 10,000 cycles	One/ type	One/ type	Mfr. standard	No damage	COC/Test Certificate	√	P/V	V	
1.3	Spring	Composition	MA	Chemical-Analysis	One Sample/ Heat	One Sample/ Heat	Mfr. Standard	COC/Test Certificate	COC/Test Certificate	√	P/V	V	
		Mech. Properties	MA	Mech. Test	One Sample/ Heat	One Sample/ Heat	Mfr. Standard	COC/Test Certificate	COC/Test Certificate	√	P/V	V	
		Performance	MA	1.Stiffness Ratio	100%	10%	Mfr. standard	COC/Test Certificate	COC/Test Certificate	√	P/V	V	
				2.Scragging	100%	10%	Mfr. standard	COC/Test Certificate	COC/Test Certificate	√	P/V	V	
		3.Cyclic Test (Endurance)	One/ type	One/ type	Mfr. standard	COC/Test Certificate	COC/Test Certificate	√	P/V	V			

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
Name	Sign & Date	Name	Sign & Date	Seal		Name	Sign & Date	Seal	
Prepared by: CHETAN MALIK		Checked by: SUMAN NAKWAL				Reviewed by:			
Reviewed by: SURESH CHAND SHARMA		Reviewed by: HARISH KUMAR				Approved by:			
Approved by: GIRISH BHAGCHANDANI									

	MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO : --		DATE: --	
				CUSTOMER :--				QP NO.: PE-QP-999-145-H 006 REV 00		DATE: 04.01.2024	
				PROJECT: --				PO NO.: --		DATE: --	
				ITEM: CONTROL VALVE		SYSTEM: S&CE				SHEET 3 OF 8	

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

				4. Dimension (Measurement)	One sample/ Lot	One sample /Lot	Mfr. Standard	COC/Test Certificate	COC/Test Certificate	√	P/ V	V	
--	--	--	--	----------------------------	-----------------	-----------------	---------------	----------------------	----------------------	---	------	---	--

<b>2.0</b>	<b>IN PROCESS INSPECTION</b>												
2.1	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring vi cage	Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces )	10%	ASME B 16.34	ASME B 16.34	Inspection Report	√	P/ W	V	Butt weld ends shall be included.
		Dimensional checks	MA	Measurement	100%	10%	Appd Drg.	Appd Drg.	Inspection Report	√	P/ W	V	
		Hard Facing (wherever applicable)	MA	Hardness Measurement	One sample/ Lot	One sample /Lot	Appd Datasheet	Appd Datasheet	Inspection Report	√	P/ W	V	

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL							
ENGINEERING		QUALITY		Sign & Date		Seal		Doc No:		Name		Sign & Date		Seal	
Prepared by:	CHETAN MALIK	CHETAN MALIK	Checked by:	SUMAN NAKWAL	Suman Nakwal			Reviewed by:							
Reviewed by:	SURESH CHAND SHARMA	Suresh Chand Sharma	Reviewed by:	HARISH KUMAR	Harish Kumar			Approved by:							
Approved by:	GIRISH BHAGCHANDANI	Girish Bhagchandani													

	MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO : --			DATE: --			
				CUSTOMER :--				QP NO.: PE-QP-999-145-H 006 REV 00			DATE: 04.01.2024			
				PROJECT: --				PO NO.: --			DATE: --			
				ITEM: CONTROL VALVE		SYSTEM: S&CE					SHEET 4 OF 8			
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
	2	3	4	5	6		7	8	9	*	**			
					M	B/C				D	M	B	C	

FINAL TESTING/INSPECTION													
3.0 TESTS ON COMPLETED VALVE													
3.1	Actuator Chamber	Leakage	MA	Pneumatic Test	100%	10%	Mfr. standard	No Leakage	Test Certificate	√	P/W	W	
3.2	Body	Leakage (Body Mount Leakage)	MA	Hydro Test	100%	10%	ISA-S-75.19/	No Leakage	Test Certificate	√	P/W	W	
3.3	Seat Leakage	Seat Leakage	MA	Pneumatic / WaterTest	100%	10%	FCI-70.2	Approved Datasheet	Test Certificate	√	P/W	W	
4.0	OPERATION TEST ON COMPLETED VALVE ASSEMBLY	Valve Travel	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report	√	P/W	W	
		Opening / Closing Time	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report	√	P/W	W	
		Linearity / Cam characteristic	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report	√	P/W	W	
		Repeatability	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report	√	P/W	W	
		Hysterisis	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report	√	P/W	W	
		Sensitivity	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report	√	P/W	W	

BHEL				BIDDER/ SUPPLIER			FOR CUSTOMER REVIEW & APPROVAL					
ENGINEERING		QUALITY		Sign & Date		Seal		Doc No:				
Name	Sign & Date	Name	Sign & Date	Name	Sign & Date	Name	Sign & Date	Name	Sign & Date	Seal		
Prepared by: CHETAN MALIK		Checked by: SUMAN NAKWAL		Reviewed by: SURESH CHAND SHARMA		Reviewed by: HARISH KUMAR		Approved by: GIRISH BHAGCHANDANI				

	<b>MANUFACTURER/BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>		<b>STANDARD QUALITY PLAN</b>				SPEC. NO : --		DATE: --	
	<b>CUSTOMER :--</b>				QP NO.: PE-QP-999-145-H 006 REV 00		DATE: 04.01.2024			
	<b>PROJECT: --</b>				PO NO.: --		DATE: --			
	ITEM: CONTROL VALVE		SYSTEM: S&CE				SHEET 5 OF 8			

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

		Accuracy(Overall)	MA	Measurement	100%	10%	Approved datasheet	Approved Datasheet	Inspection Report				
		Control Valve characteristics / CV Test	MA	Measurement (Press. vs. discharge and discharge vs opening 0-100% in steps of 10%)	One per type	One per type	Mfr. Procedure	Approved Datasheet	Test Certificate	√	P/W	V	
		Operation of limit switch & solenoids and other accessories	MA	Function	100%	10%	Mfr. Procedure	Approved Datasheet	Inspection Report	√	P/W	W	On assembled Valve.
		Overall dimensions	MI	Visual and dimensional	100%	10%	Approved drg	Approved drg	Inspection Report	√	P/W	W	
		Pre-defined valve position in case of air / signal failure	MI	Visual and dimensional	100%	10%	Approved data sheet	Approved data sheet	Inspection Report	√	P/W	W	
		Stamping (for direction of flow), Tag No.	MA	Visual	100%	10%	Approved drg /datasheet	Approved drg /datasheet	Test Certificate	√	P/W	W	

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING		QUALITY		Sign & Date		Doc No:			
Name	Sign & Date	Name	Sign & Date	Seal		Name	Sign & Date	Seal	
Prepared by: CHETAN MALIK		Checked by: SUMAN NAKWAL				Reviewed by:			
Reviewed by: SURESH CHAND SHARMA		Reviewed by: HARISH KUMAR				Approved by:			
Approved by: GIRISH BHAGCHANDANI									

	MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS			STANDARD QUALITY PLAN				SPEC. NO : --		DATE: --	
				CUSTOMER :--				QP NO.: PE-QP-999-145-H 006 REV 00		DATE: 04.01.2024	
				PROJECT: --				PO NO.: --		DATE: --	
	ITEM: CONTROL VALVE		SYSTEM: S&CE		SHEET 6 OF 8						

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

5.0	AUXILIARY ITEMS( Performance test of auxiliary items shall be performed on the completely assembled valve) – Refer NOTE-3												
5.1	Air Filter Regulator	Performance Test	MA	Measurement	Each type	Each type	Mfr. Standard	No leakage	--	√	P/V	V	
		Overall leakage	MA	Visual(soap solution)	100 %	10%	Mfr. Standard	No leakage	--	√	P/V	V	
5.2	Air lock relay	Performance Test	MA	Leakage test	100%	10%	Mfr. Standard	No leakage	--	√	P/V	V	
5.3	Smart Positioner	Physical Verification Make/Model	MA	Visual	100%	10%	Approved drg/ datasheet	Approved drg/ datasheet	--	√	P/V	V	
		Degree of Protection	MA	IP/NEMA test	Each type	Each type	Relevant Standard	Relevant Standard	--	√	P/V	V	
		Calibration	MA	Measurement	Each type	Each type	Mfr. Standard	Mfr. Standard	--	√	P/V	V	
5.7	Electrical items (i) Limit Switches	Routine Test	MA	HV, IR, Continuity function	100%	10%	Approved Data sheet	Approved Data sheet	--	√	P/V	V	
		Degree of protection	MA	IP/NEMA Tests	One sample/ type	One sample/ Lot	Approved Data sheet	Approved Data sheet	--	√	P/V	V	

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL							
ENGINEERING		QUALITY		Sign & Date		Seal		Doc No:		Name		Sign & Date		Seal	
Prepared by:	CHETAN MALIK	CHETAN MALIK	Checked by:	SUMAN NAKWAL	Suman Nakwal			Reviewed by:							
Reviewed by:	SURESH CHAND SHARMA	Suresh Chand Sharma	Reviewed by:	HARISH KUMAR	Harish Kumar			Approved by:							
Approved by:	GIRISH BHAGCHANDANI	Girish Bhagchandani		Harish Kumar	Harish Kumar										

	<b>MANUFACTURER/BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>			<b>STANDARD QUALITY PLAN</b>				<b>SPEC. NO : --</b>		<b>DATE: --</b>			
								<b>CUSTOMER :--</b>				<b>QP NO.: PE-QP-999-145-H 006 REV 00</b>	
				<b>PROJECT: --</b>				<b>PO NO.: --</b>				<b>DATE: --</b>	
				<b>ITEM: CONTROL VALVE</b>		<b>SYSTEM: S&amp;CE</b>						<b>SHEET 7 OF 8</b>	

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

	(ii) Solenoids	Routine Test	MA	HV, IR, Continuity function	100%	10%	Approved Data sheet	Approved Data sheet	--	√	P/V	V	
		Degree of protection	MA	IP/NEMA Tests	One sample/ type	One sample /Lot	Approved Data sheet	Approved Data sheet	--	√	P/V	V	
	(iii) Position Transmitter (if provided externally)	Routine Test	MA	HV, IR, Continuity function	100%	10%	Approved Data sheet	Approved Data sheet	--	√	P/V	V	
		Degree of protection	MA	IP/NEMA Tests	One sample/ type	One sample /Lot	Approved Data sheet	Approved Data sheet	--	√	P/V	V	
6.0	<b>PAINTING</b>	Paint Thickness	MA	Measurement DFT check	100%	10%	Approved drg/data sheet	Approved drg/data sheet	Inspection Report	√	P/W	V	
7.0	<b>PACKING</b>	Soundness of Packing against transit damage	MA	Visual	100%	100%	Approved drg/data sheet	Approved drg/data sheet	Inspection Report	√	P/W	V	

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL					
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Name	Sign & Date		Name	Sign & Date	Seal			Name	Sign & Date	Seal
Prepared by:	CHETAN MALIK	 Digitally signed by CHETAN MALIK DN: cn=CHETAN MALIK, o=BHEL, ou=BHEL, email=chetan.malik@bhel.in, c=IN Date: 2024.01.04 15:35:23 +05'30'	Checked by:	SUMAN NAKWAL	 Digitally signed by Suman Nakwal DN: cn=Suman Nakwal, o=BHEL, ou=BHEL, email=suman.nakwal@bhel.in, c=IN Date: 2024.01.04 15:35:23 +05'30'			Reviewed by:			
Reviewed by:	SURESH CHAND SHARMA	 Digitally signed by Suresh Chand Sharma DN: cn=Suresh Chand Sharma, o=BHEL, ou=BHEL, email=suresh.chandsharma@bhel.in, c=IN Date: 2024.01.04 15:35:23 +05'30'	Reviewed by:	HARISH KUMAR	 Digitally signed by Harish Kumar DN: cn=Harish Kumar, o=PEM, ou=BHEL, email=Harish_kumar@bhel.in, c=US Date: 2024.02.15 16:50:05 +05'30'			Approved by:			
Approved by:	GIRISH BHAGCHANDANI	 Digitally signed by Girish Bhagchandani DN: cn=Girish Bhagchandani, o=BHEL, ou=BHEL, email=girish.bhagchandani@bhel.in, c=IN Date: 2024.02.15 16:50:05 +05'30'									

	<b>MANUFACTURER/BIDDER/ SUPPLIER NAME &amp; ADDRESS</b>			<b>STANDARD QUALITY PLAN</b>				<b>SPEC. NO : --</b>		<b>DATE: --</b>			
								<b>CUSTOMER :--</b>		<b>QP NO.: PE-QP-999-145-H 006 REV 00</b>		<b>DATE: 04.01.2024</b>	
				<b>PROJECT: --</b>				<b>PO NO.: --</b>				<b>DATE: --</b>	
				<b>ITEM: CONTROL VALVE</b>		<b>SYSTEM: S&amp;CE</b>						<b>SHEET 8 OF 8</b>	
SL NO.	COMPONENT & OPERATIONS	CHARACTERISTIC CHECKED	CATE GORY	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS		
	2	3	4	5	6		7	8	9	*	**		
					M	B/C				D	M B C		

**NOTES:**

1. Cv test shall be conducted at FCRI/ laboratory approved by Govt. Of India/BHEL approved Laboratory. Alternatively, valid Cv test certificate for a similar control valve (same size, same Cv, same trim characteristics) can be accepted.
2. 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.
3. Valve manufacturer to arrange for COC (Certificates of Conformance) for the tests w.r.t. control valve accessories mentioned at Sl. No. 5 of the QAP.

**LEGENDS:**  
 \*RECORDS, INDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,  
 \*\* **M:**SUPPLIER / MANUFACTURER/ SUB-SUPPLIER/SUB-CONTRACTOR, , **B:** BHEL/ BHEL NOMINATED THIRD PARTY INSPECTION AGENCY, **C:** CUSTOMER, **P:**PERFORM,**W:**WITNESS, **V:**VERIFICATION,AS APPROPRIATE **MA:**MAJOR,**MI:**MINOR,**CR:**CRITICAL,**RT:**RADIOGRAPHIC TEST,**UT:**ULTRASONIC TEST,**PT:**DYE PENETRANT TEST,**MT:**MAGNETIC PARTICLE TEST

BHEL				BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL				
ENGINEERING		QUALITY		Sign & Date		Doc No:				
Name	Sign & Date	Name	Sign & Date	Seal		Name	Sign & Date	Seal		
Prepared by:	CHETAN MALIK <small>Digitally signed by CHETAN MALIK DN: cn=CHETAN MALIK, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=SRM, email=chetanm@bhel.in, Date: 2024.02.15 16:50:37 +05'30'</small>	Checked by:	SUMAN NAKWAL <small>Digitally signed by Suman Nakwal DN: cn=Suman Nakwal, o=BHEL, email=s.nakwal@bhel.in, Date: 2024.02.15 16:50:37 +05'30'</small>			Reviewed by:				
Reviewed by:	SURESH CHAND SHARMA <small>Digitally signed by Suresh Chand Sharma, cn=BHEL, ou=SRM, email=s.chand@bhel.in, Date: 2024.02.15 16:50:37 +05'30'</small>	Reviewed by:	HARISH KUMAR <small>Digitally signed by Harish Kumar DN: cn=Harish Kumar, o=PEM, ou=BHEL, email=Harish_kumar@bhel.in, c=IS, Date: 2024.02.15 16:50:37 +05'30'</small>			Approved by:				
Approved by:	GIRISH BHAGCHANDANI <small>Digitally signed by Girish Bhagchandani DN: cn=Girish Bhagchandani, o=BHEL, ou=SRM, email=girishb@bhel.in, Date: 2024.02.15 16:50:37 +05'30'</small>									



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated) -**FDV**  
**(RATE CONTRACT)**

SPEC NO.: PE-TS-20-145-H104

VOLUME II B

SECTION C

REV. NO. 00

DATE 07.01.2026

**SECTION – C**

**BILL OF QUANTITY**

**BOQ FOR RATE CONTRACT - CONTROL VALVES (FDV)**

SI no.	Item Code	Item Description	DATA SHEET NO.	Accessories data sheet no.	Valve size	Body material	Trim material	Total Qty of valves (Nos)
1	<b>CVFDV.1</b>	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A1FDV and B1	A1FDV	B1	12"	WC9	SS316 STELLITED/ 17-4PH SS	8
2	<b>CVFDV.2</b>	CONTROL VALVE COMPLETE WITH ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB AS PER DATASHEETS A1FDV and B1	A1FDV	B1	14"	WC9	SS316 STELLITED/ 17-4PH SS	29
<b>TOTAL QTY =</b>								<b>37</b>
<p>NOTE :-</p> <p>1. The bidder shall include one set of packing and gasket (all types including body, bonnet) along with each control valve within the valve's quoted price.</p> <p>2. The bidder shall include pneumatic tubing viz. integral tubing as well as additional 12 metres tubing per control valve, upto the instrumentation air header;along with the fittings as per hook-up diagram and accessories' datasheets along with each control valve within the valve's quoted price.</p>								

BOQ FOR RATE CONTRACT - CONTROL VALVE COMPONENTS/ACCESSORIES/ MANDATORY SPARES				
Sl No.	Item Description	Item Code	TOTAL QTY	UOM
1	Actuator	CV-AC13-PISTON ACT-ABOVE 20 INCH PISTON	20	NOS
2	Actuator Seal Kit/ O-rings/Actuator Soft Goods kit	CV-AC16-O RING FOR ACT-ABOVE 20 INCH	120	NOS
3	Air Filter Regulator	CV-AC20-AIR FILTER REGULATOR	40	NOS
4	Air Lock	CV-AC19-AIR LOCK RELAY	90	NOS
5	Diaphragms	CV-AC7-DIAPHRAGM-ABOVE 18 INCH	20	NOS
6	Actuator Piston (Equivalent for Diaphragm incase of Piston Actuator)	CV-AC31-ACT PISTON WITH ROD & SEAL	100	NOS
7	Fitting	CV-AC39-SS CONN-1/2"NPT(M)X1/4"OD	35	NOS
8		CV-AC40-SS CONN-1/4"NPT(M)X1/4"OD	35	NOS
9		CV-AC41-SS TEE FOR 1/4" OD TUBE	35	NOS
10	Gasket	CV-AC18-GASKETS SET	60	SET
11	Limit Switch	CV-AC24-LIMIT SWITCH ASSY	75	NOS
12	Packing	CV-AC17-PACKING SET	60	SET
13	Positioner (Single Acting)	CV-AC27-SMART POSNR - SINGLE ACT	20	NOS
14	Positioner (Double Acting)	CV-AC28-SMART POSNR -DOUBLE ACT	50	NOS
15	Seal Kit – Positioner	CV-AC29-O RING KIT FOR SMART POSNR	10	NOS
16	Pressure Gauge	CV-AC22-PRESSURE GAUGE	20	NOS
17	Solenoid Valve	CV-AC23-SOLENOID VALVE	40	NOS
18	Trim	TRMFDV.1 -VALVE TRIM FOR CVFDV.1 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A1FDV	10	SET
19		TRMFDV.2 -VALVE TRIM FOR CVFDV.2 (MAIN BOQ) INCLUDING CAGE,PLUG, PLUG STEM, SEAT RINGS, GUIDE BUSHINGS, ETC. AS PER DATASHEET A1FDV	20	SET
20	Volume Booster	CV-AC21-VOLUME BOOSTER	40	NOS
21	Junction Box.	CV-AC54-Junction Box	10	NOS
22	Actuator stem	CV-AC55-Actuator Stem	10	NOS
23	Valve stem	CV-AC61-VLV SPINDLE FOR FEED CV-10 INCH	10	NOS
24	Valve stem	CV-AC37-VLV SPINDLE FOR FEED CV-12 INCH	10	NOS
25	Valve stem	CV-AC56-VLV SPINDLE FOR FEED CV-14 INCH	10	NOS
26	Stem connector	CV-AC58-STEM CONNECTOR/COUPLING	10	NOS
27	Metal seat ring / Seat Ring	CV-AC62-METAL SEAT RING/SEAT RING	10	NOS
28	Soft Goods Kit Valve (Including Packing set , Gasket set, Plug seal ring)	CV-AC63-SOFT GOOD KIT FOR VALVE	10	NOS
29	Tubing	CV-AC33-1/4" SS OR PVC INSU CU TUBE	100	MTR
30	Yoke	CV-AC64-YOKE	10	NOS
31	Moisture Separator	CV-AC65-MOISTURE SEPARATOR	37	NOS

**BOQ FOR RATE CONTRACT - CV test FOR CONTROL VALVES**

Sl no.	Item Code	Item Description	Valve body size	Qty (Nos)
1	TT5	CV test of control valve(12")	12"	10
2	TT6	CV test of control valve(14" and above)	14" and above	20

**NOTE :-**

1. Cv test shall be conducted at Fluid Control Research Institute(FCRI),Palakkad/laboratory approved by Govt. of India/BHEL approved laboratory.



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPECIFICATION NO. PE-TS-20-145-H104A

VOLUME II-B

SECTION D

REV. NO. 00

DATE: 07.01.2026

## **SECTION – D**

- **EQUIPMENT SPECIFICATION**
- **SPECIFICATION FOR SMART POSITIONER**
  - **HOOK-UP DIAGRAMS**
  - **GUIDELINES FOR PACKING**
- **SUGGESTIVE SUB-VENDOR LIST**
- **DOCUMENTATION REQUIREMENT**
- **COMPLIANCE CERTIFICATE**



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPECIFICATION NO. PE-TS-20-145-H104-A

VOLUME II-B

SECTION D

REV. NO. 00

DATE : 07.01.2026

**SECTION-D**  
**EQUIPMENT SPECIFICATION**

	<b>EQUIPMENT SPECIFICATION</b> for <b>Control Valves with Accessories</b> (Pneumatically Operated)-FDV <b>(RATE CONTRACT)</b>	SPECIFICATION NO.: PE-TS-20-145-H104-A	
		VOLUME	II B
		SECTION	D
		REV. NO.	00

## 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 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

## 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 Not used.
- 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.

	<b>EQUIPMENT SPECIFICATION</b> for <b>Control Valves with Accessories</b> (Pneumatically Operated)-FDV <b>(RATE CONTRACT)</b>	SPECIFICATION NO.: PE-TS-20-145-H104-A	
		VOLUME	II B
		SECTION	D
		REV. NO.	00

Asbestos shall not be used for the packing or any other component.

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. Cast Iron (CI) yokes are not acceptable for any services.

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	:	85% valve lift.
	-	Min. Flow	:	>15% valve lift.

Valve with Equal percentage Characteristic	-	Normal Flow (Design Point)	:	75-85% valve lift.
	-	Max. Flow	:	85% valve lift.
	-	Min. Flow	:	>15% 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   | <= | 7 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 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.

	<b>EQUIPMENT SPECIFICATION</b> for <b>Control Valves with Accessories</b> (Pneumatically Operated)-FDV <b>(RATE CONTRACT)</b>	SPECIFICATION NO.: PE-TS-20-145-H104-A	
		VOLUME	II B
		SECTION	D
		REV. NO.	00

3.1.13 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.

3.1.14 In case of wrong selection/ deviated behavior in operation of control valve assembly (including actuator, positioner & other accessories) during guarantee period, the bidder shall make the replacement suitably with a modified/new valve design as approved by purchaser and all the expenses for replacement, rectification/modification including transportation both ways will be borne by the bidder.

3.2 **ACTUATORS-** The control valves shall be operated pneumatically (with pneumatic actuator)

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 3-5 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. If the project specific requirement calls for multi-spring opposed diaphragm actuator, the same shall be provided by the bidder without any commercial implication to BHEL.

3.2.2 The pneumatic actuator for open/close duty shall be suitable for fast opening/closing of the associated valve. The travel time of pneumatic actuators shall not exceed 10 seconds.

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 SS tube and flare-less SS fittings etc. as per the hook up diagram enclosed in this specification.

	<b>EQUIPMENT SPECIFICATION</b> for <b>Control Valves with Accessories</b> (Pneumatically Operated)-FDV <b>(RATE CONTRACT)</b>	SPECIFICATION NO.: PE-TS-20-145-H104-A	
		VOLUME	II B
		SECTION	D
		REV. NO.	00

3.3.1 Moisture Separator - Separate moisture separator unit, if required, shall be provided for ensuring dryness of air entering I/P as well as the pneumatic actuator/power cylinder shall be supplied with each control valve, as per the hook-up diagram enclosed in the specification. The moisture separator unit shall be based on coalescence/leverage & buoyancy/other equivalent principle for its operation.

3.4 **Painting** of the control valve assembly shall be as per the Customer's Painting Specification, to be furnished during project specific enquiry. In the absence of specification for painting, bidder to submit their standard painting procedure/specification for BHEL's approval.

Epoxy based paint (corrosion-resistant) to be provided for control valves for coastal environment. This shall be informed during the project specific enquiry and bidder to comply the same without any commercial implication to BHEL.

3.5 **Sub-vendor list –**

Suggestive sub-vendor list has been enclosed in this specification. Bidder may propose sub-vendors other than those listed in the specification, with supporting documents/credentials for their proven track record. However, all sub-vendors are subjected to BHEL's and/or Customer's approval without any commercial implication to BHEL.

**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 include one set of packing and gasket (all types including body, bonnet) along with each control valve within the valve's quoted price.

**5.2 Parts of Control valve assembly, valve accessories**

The bidder shall quote for all the other items viz. Control valve sub-assembly items and other accessories in their offer, in the price format. The requirement shall be given during project specific enquiry.

	<b>EQUIPMENT SPECIFICATION</b> for <b>Control Valves with Accessories</b> (Pneumatically Operated)-FDV <b>(RATE CONTRACT)</b>	SPECIFICATION NO.: PE-TS-20-145-H104-A	
		VOLUME	II B
		SECTION	D
		REV. NO.	00

## 6.0 DRAWINGS AND DOCUMENTS

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

- 6.1.1 Schedule of prices in the Price Format.
- 6.1.3 Quality Plan - duly signed & stamped.
- 6.1.4 Compliance certificate duly signed & stamped.
- 6.1.5 List of Alternate trim material offered against each datasheet - supported by documentary evidence authenticating superiority of trim material.
- 6.1.6 The following documents for low load feed control valve :-
  - (i) Credentials/proven track record of the valve model supplied by the bidder.
  - (ii) Catalog along with other required technical details of the valve model offered.

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

#### A) PRIMARY DOCUMENTS

- ✓ DATA SHEET, CALCULATION, BOQ/BOM, GA DRAWING, EDGE Preparation details & HOOK UP /INSTALLATION DRAWING for Control Valves
- ✓ QAP for Control Valves

#### B) SECONDARY DOCUMENTS

- ✓ O&M Manual for Control Valves

## 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 in the specification(Document no. PE-GL-999-145-H021).

	<b>EQUIPMENT SPECIFICATION</b> for <b>Control Valves with Accessories</b> (Pneumatically Operated)-FDV <b>(RATE CONTRACT)</b>	SPECIFICATION NO.: PE-TS-20-145-H104-A	
		VOLUME	II B
		SECTION	D
		REV. NO.	00

## 8.0 APPLICABLE DATA SHEET FORMS

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

- Data Sheet A for Control Valve with Pneumatic Actuator : Data Sheet No. A1FDV
- Data Sheet A for Accessories (Modulating Duty) : Data Sheet No. B1



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPECIFICATION NO. **PE-TS-20-145-H104-A**

VOLUME **II-B**

SECTION **D**

REV. NO. 00

DATE : 07.01.2026

**SECTION-D**

**SPECIFICATION FOR SMART POSITIONER**



Technical specification for Control Valves with Accessories  
(Pneumatically Operated)-FDV  
(RATE CONTRACT)

PE-TS-20-145-H104-A

Rev. No. 00

Date : 07.01.2026

**SPECIFICATIONS FOR MICROPROCESSOR BASED SMART POSITIONER**

SL.NO	AREA	DESCRIPTION	DETAILS
1	Electrical	a) Input Demand Signal	4-20 mA for HART compatible
		b) Power Supply	Loop Powered from the output card of Control System.
		c) HART Protocol	Compatibility for Remote Calibration & Diagnostics (Super-imposed HART signal on input Signal 4-20 mA.)
		d. Valve position sensing	4-20 mA output signal for HART compatible
2	Environment	a) Operating temp.	(-)30 To 80 Deg. C
		b) Humidity	0-95 %
		c) Protection class	IP-65 Minimum
3	Software for Configuration and Diagnostics	Software	Software shall meet the requirements for Configuration, Diagnostics, Calibration and Testing of the actuator.
		Diagnostic/Test features	Advanced diagnostic features like Stroke counter or Travel counter, Leakage in actuators, Valve Signature analysis, Air Supply Failure, Step Response test, Valve friction /Jamming detection etc to be provided.
4	Test reports/ Certificates		Factory Valve Signature Tests Reports (Pr Vs Valve travel and Travel Vs I/P signal)
			Test certificates as per approved QAP
5	Configuration/ Calibration.		Remote & Local Calibration with Auto & Manual feature shall be provided.
6	Operating Range	Full range	
7	Modes	Valve Action	Direct / Reverse
		Flow Characterization	Possible to fit Valve Characteristic Curves based on Control valve data sheet
8	Fail Safe/Fail Freeze		Fail Safe/Fail Freeze feature is to be provided as per valve positioning on signal failure as per control valve data sheet
9	Pneumatic	Air capacity	Sufficient to handle the valves & actuators selected/ Boosters to be supplied, if required.
		Air pressure	To suit the air supply pressure (maximum 7 kg/sqcm) /quality available.
		Process connection	As per Hook Diagram
10	Performance	Characteristic deviation	<=0.5 % of span.
		Ambient temp effect	<=0.01 %/ deg C or better.
11	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
12	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
		Hand Held Hart Calibrator	Positioner shall be compatible with Universal HART Calibrator to be provided by EDN
		Press Gauge Block	Two/Three based on Single/Double acting actuator
		Electrical Cable Entry	1/2"NPT, side or bottom entry to avoid water ingress
		Mounting	On actuator body



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-**FDV**  
(RATE CONTRACT)

SPECIFICATION NO. PE-TS-20-145-H104-A

VOLUME II-B

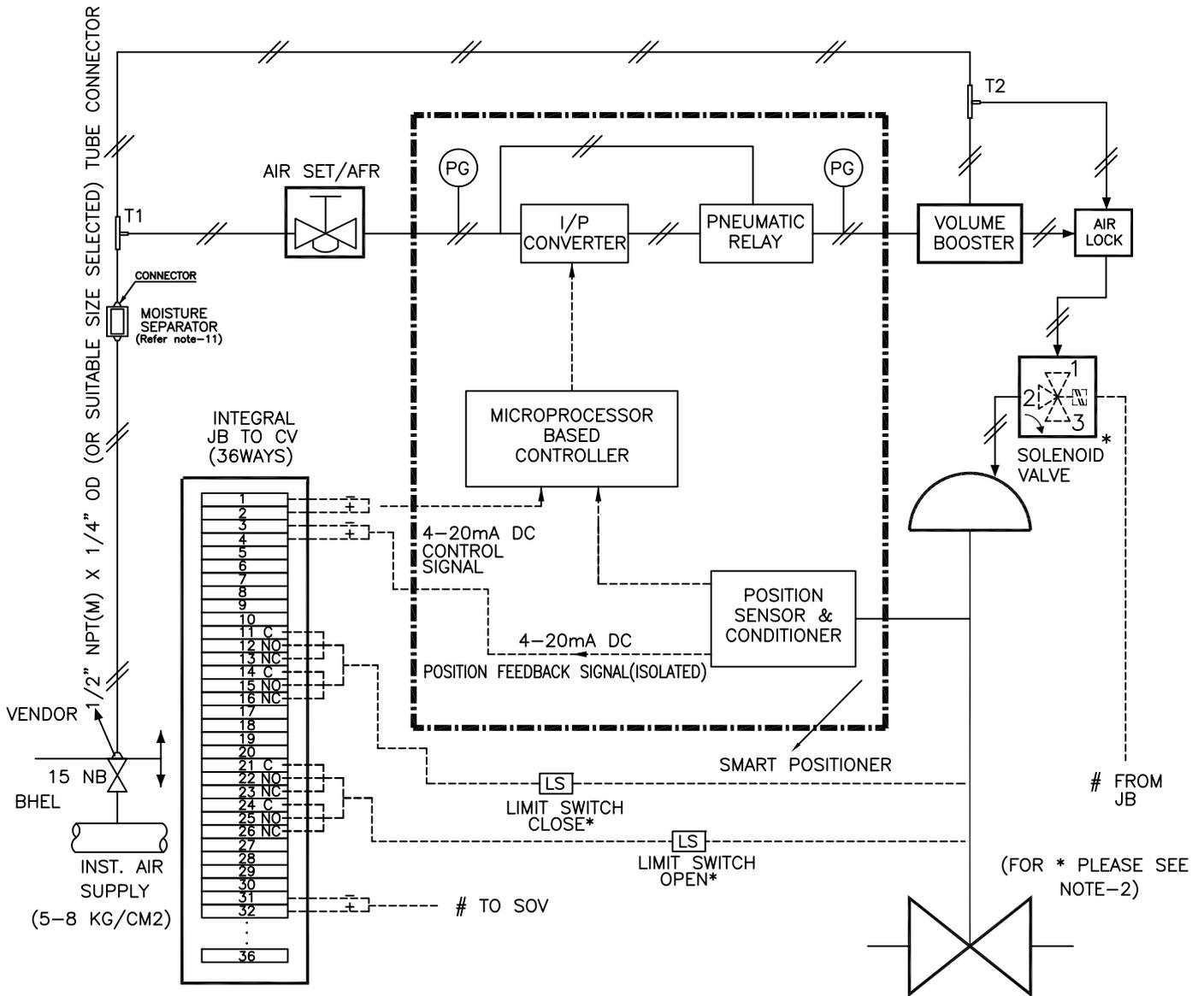
SECTION D

REV. NO. 00

DATE : 07.01.2026

**SECTION-D**  
**HOOK-UP DIAGRAM**

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



**NOTES :-**

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY IF INDICATED IN DATA SHEET OF PROJECT SPECIFIC ORDER.
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 AT INLET AND OUTLET OF SMART POSITIONERS.
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. TUBING AND FITTINGS TO BE PROVIDED AS FOLLOWS:-  
(a) TUBING: MATERIAL- SS316; SIZE- 1/4" OR SUITABLE SIZE SELECTED FOR EACH CONTROL VALVE ASSEMBLY; LENGTH- 12 METER PER CV.  
(b) FITTINGS: MATERIAL- SS, DOUBLE COMPRESSION TYPE; TUBE CONNECTOR- 1/2" NPT(M) X 1/4" OR SUITABLE SIZE SELECTED FOR EACH CONTROL VALVE ASSEMBLY; FITTINGS FOR CONNECTION TO AIR FILTER REGULATOR, AIR LOCK RELAY, IA HEADER ISOLATION VALVE AND EQUAL TEES.
10. VOLUME BOOSTER/DUMP VALVE AND ITS RELATED TUBING & CONNECTORS SHALL BE PROVIDED, IF REQUIRED TO ACHIEVE THE DESIRED TRAVEL TIME (<10Sec). AIR CONNECTION TO VOLUME BOOSTER/DUMP VALVE SHALL ALSO BE PROVIDED.
11. MOISTURE SEPARATOR TO BE PROVIDED AS PER REQUIREMENT IN PROJECT SPECIFIC ORDER. NECESSARY HARDWARE AND SUITABLE CONNECTOR FOR MOUNTING THE MOISTURE SEPARATOR SHALL ALSO BE PROVIDED BY THE BIDDER.



## RATE CONTRACT

TITLE:-

**CONTROL VALVE HOOK-UP DIAGRAM**

**DRG. No.**

**PE-TS-20-145-H104**

**REV No.**

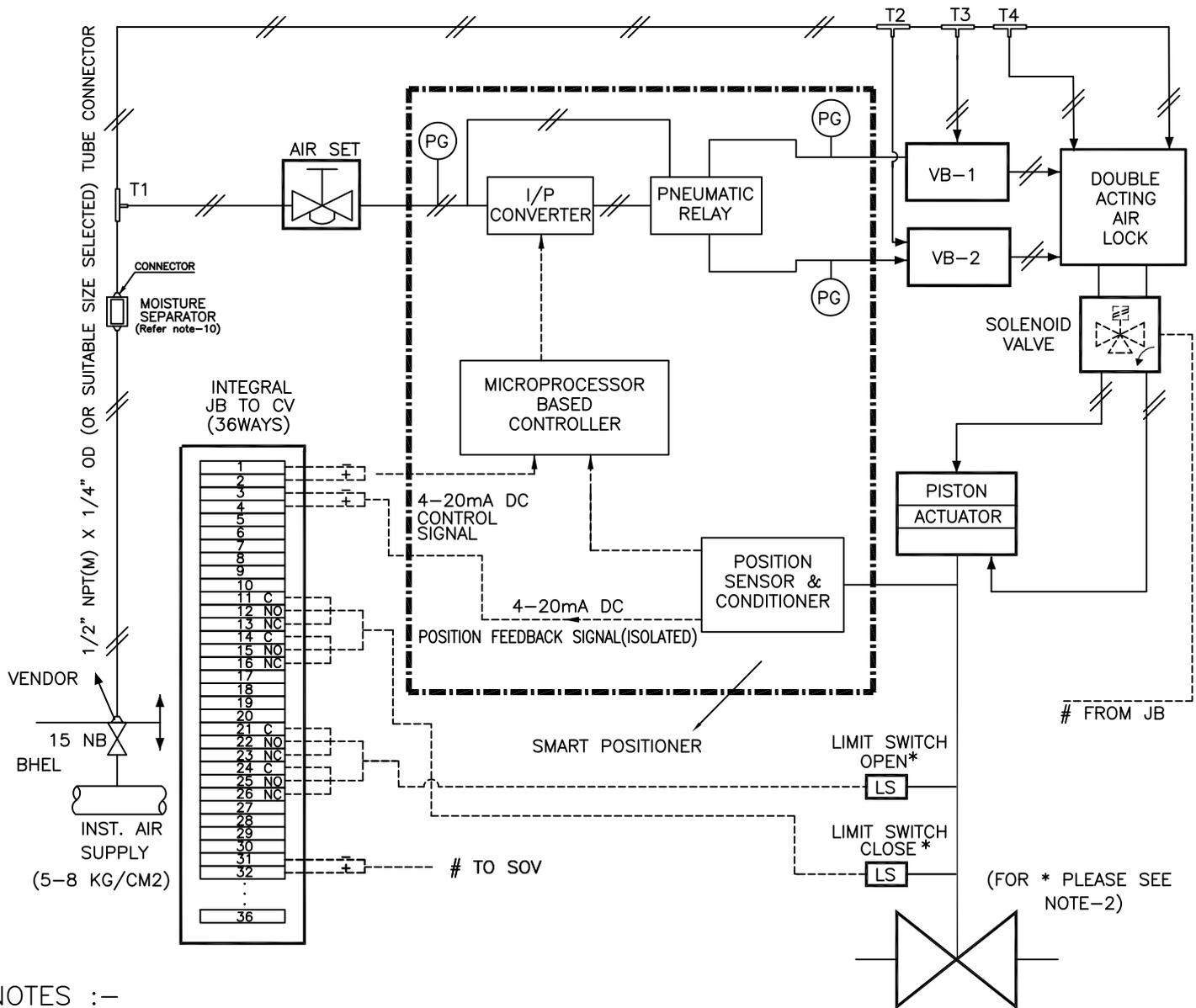
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**DATE: 15.01.2026**

**SHEET**

**4 OF 7**

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



**NOTES :-**

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY IF INDICATED IN DATA SHEET OF PROJECT SPECIFIC ORDER.
3. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
4. MOUNTING ACCESSORIES AS REQUIRED.
5. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
6. 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
7. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
8. 12 METERS 1/4" SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF SS FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
9. 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.
10. MOISTURE SEPARATOR TO BE PROVIDED AS PER REQUIREMENT IN PROJECT SPECIFIC ORDER. NECESSARY HARDWARE AND SUITABLE CONNECTOR FOR MOUNTING THE MOISTURE SEPARATOR SHALL ALSO BE PROVIDED BY THE BIDDER.



## RATE CONTRACT

TITLE:-  
**CONTROL VALVE HOOK-UP DIAGRAM**

DRG. No.	PE-TS-20-145-H104		
REV No.	01	DATE: 15.01.2026	
SHEET	7	OF	7



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-**FDV**  
**(RATE CONTRACT)**

SPECIFICATION NO. PE-TS-20-145-H104-A	
VOLUME II-B	
SECTION D	
REV. NO. 00	DATE: 07.01.2026

**SECTION – D**

**GUIDELINES FOR PACKING**  
**(DOC No: PE-GL-999-145-H021)**



GUIDELINE FOR PACKING  
(CONTROL VALVES)

DOCUMENT NO.: PE-GL-999-145-H021

REV. NO. 01

DATE : 07.01.2026

SHEET

**Guidelines for Packing**

- ✓ After inspection of control valves assembly. Smart Positioner along with Pressure Gauge shall be disassembled & packed separately.
- ✓ Packing shall ensure no deterioration in mechanical or functional integrity during transportation, storage, and handling until commissioning. Bidder shall be fully responsible for any damage arising due to inadequate packing or preservation.
- ✓ Valve stem shall be mechanically locked at mid-travel (approx. 40–50%) using travel locking devices. Free movement of valve stem or actuator during transportation shall not be permitted.
- ✓ Threaded connection of Smart Positioner & Pressure Gauge shall be shipped with threaded metallic or polymer plugs (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.
- ✓ Other items like PC and smart positioner's configuration/diagnostic software (as applicable), shall be duly packed in separate packaging boxes/cartons. Inner packing material shall consist of bubble wrap sheets to absorb moisture. Corners of these cartons shall be protected with foam/thermocool cushioning to avoid damage during transit.
- ✓ Proper care shall be taken to avoid damage to the painted surface during transit.
- ✓ All valves & smart positioner along with pressure gauges shall be packed properly with good quality wooden planks with proper wooden frame support. ESD-safe bubble wrap or foam sheets in Moisture Barrier Bags (MBBs) & desiccants in temper proof hard plastic boxes for Smart Positioner. Also, the valves are internally covered with polythene sheets to protect from the water and moisture entry. Humidity indicator card inside crate shall be provided.
- ✓ Stronger shock absorbing cover material like expanded Polyurethane which can take any direct impact on it shall be used for packing.
- ✓ Butt welded ends shall be protected by polythene caps/rubbers and protectors.
- ✓ 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.

**Smart Positioner Protection**

Smart positioners shall be provided with:

- ✓ OEM protective covers or rigid protective shrouds
- ✓ Electrical conduit entries sealed with dummy glands
- ✓ Positioner feedback levers, cams, and linkages shall be rigidly immobilized to prevent relative movement.
- ✓ The positioner housing, shaft, or feedback arm shall not be subjected to any mechanical load.

### Marking on the Packing Cases/ Boxes

- ✓ Marking for Fragile & Condensing environment shall be done on the packing box as indicated below :-



### The Following Details are to be marked on the Packing Cases/boxes

- Address of consignee
- Purchase order no.
- Description of items or title of packing list(including valve tag nos., sl. No. of items as per Purchase Order)
- 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) -FDV  
(RATE CONTRACT)

SPECIFICATION NO. PE-TS-20-145-H104-A

VOLUME II-B

SECTION D

REV. NO. 00

DATE : 07.01.2026

**SECTION-D**

**SUGGESTIVE SUB-VENDOR LIST**



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

SPEC NO.: PE-TS-20-145-H104-A

VOLUME II B

SECTION D

REV. NO. 00

DATE : 07.01.2026

### **SUGGESTIVE SUB VENDOR LIST**

(FOR ACCESSORIES)

SI. No.	ITEM DESCRIPTION	SUB-VENDORS
1.	SMART POSITIONER	(a)SIEMENS,GERMANY (b)ABB, USA (c)EMERSON(FISHER ROSEMOUNT),USA (d)MASONEILAN(DRESSER),FRANCE (e)FLOW SERVE, USA (f)FOX BORO, GERMANY (g)METSO (NELES),USA
2.	AIR FILTER REGULATOR	(a)SHAVO-NORGREN, INDIA(MUMBAI) (b)FAIRCHILD, USA (c)SMC PNEUMATICS, INDIA(NOIDA) (d)PLACKA, INDIA(CHENNAI)
3.	AIR LOCK RELAY	(a)PLACKA, INDIA(CHENNAI) (b)SHAVO-NORGREN, INDIA(MUMBAI) (c)SCHRADER SCHORILL DUNCAN LTD., INDIA(MUMBAI) (d)FAIRCHILD, USA (e)SMC PNEUMATICS, INDIA(NOIDA)
4.	SOLENOID VALVE	(a)ASCO, USA (b)ROTEX, INDIA(VADODARA) (c)SCHRADER, INDIA(PUNE) (d)AVCON, INDIA(PUNE) (e)HERION-NORGREN, GERMANY (f)IMI-NORGREN, GERMANY (g)JAFFERSON, ARGENTINA
5.	VOLUME BOOSTER	(a) FAIRCHILD, USA (b) RK CONTROLS, INDIA(THANE) (c)PHILVIN
6.	JUNCTION BOX	(a) K.S. INSTRUMENTS PVT.LTD., INDIA (Bangalore) (b) Shrenik & Company, INDIA(Ahmedabad) (c) SUCHITRA INDUSTRIES, INDIA (Bangalore) (d) FLEXPRO ELECTRICALS PVT. LTD., INDIA(Gujarat) (e) AJMERA INDUSTRIAL & ENGINEERING WORKS, INDIA(Mumbai)



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPECIFICATION NO. PE-TS-20-145-H104-A

VOLUME II-B

SECTION D

REV. NO. 00

DATE : 07.01.2026

**SECTION-D**  
**DOCUMENTATION REQUIREMENT**



Technical specification for  
Control Valves with Accessories  
(Pneumatically Operated) -FDV  
(RATE CONTRACT)

PE-TS-20-145-H104-A

Rev. No. 00

Date : 07.01.2026

### DOCUMENTATION REQUIREMENT

#### DRAWINGS & DOCUMENTS TO BE SUBMITTED BY ALL THE BIDDERS ALONG WITH THE BID

Sl. No.	DOCUMENT TITLE
1	PQR CREDENTIALS
2	COMPLIANCE CERTIFICATE

#### DRAWINGS & DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT ALONG WITH SUBMISSION SCHEDULE

Sl. No.	DOCUMENT TITLE	FIRST SUBMISSION SCHEDULE
1	CONTROL VALVE DATA SHEETS, DIMENSION DRAWING, Cv & NOISE CALCULATION	Within 15 days from PO
2	Cv TEST REPORTS	Test Report to be submitted prior to final inspection

#### BHEL/Customer comments/approval and Vendor Resubmission schedule

BHEL 1st Comment	Within 10 days of Vendor submission.
Vendor Resubmission	Within 10 days of BHEL/ Customer Comments.
BHEL /Customer Comment/Approval on subsequent revision	Within 18 days of Vendor submission/Resubmission

#### DRAWINGS & DOCUMENTS TO BE SUBMITTED AS FINAL/AS-BUILT DOCUMENT

Sl. No.	DOCUMENT TITLE	SUBMISSION SCHEDULE
1	APPROVED DOCUMENTS	Along with dispatch
2	Cv TEST REPORT	
3	O&M MANUAL	
4	ALL TEST CERTIFICATES	



Technical specification for  
**Control Valves with Accessories**  
(Pneumatically Operated)-FDV  
**(RATE CONTRACT)**

SPECIFICATION NO. PE-TS-20-145-H104-A

VOLUME II-B

SECTION D

REV. NO. 00

DATE : 07.01.2026

**SECTION-D**  
**COMPLIANCE CERTIFICATE**

	<b>Technical specification for Control Valves with Accessories (Pneumatically Operated)-FDV (RATE CONTRACT)</b>	PE-TS-20-145-H104-A
		Rev. No. 00
		Date : 07.01.2026

<b>COMPLIANCE CERTIFICATE</b>	
1	It is hereby confirmed that the technical specification(including Quality plan) has been read and understood. We confirm compliance to the tender specification including any prebid clarification and amendments issued prior to techno-commercial bid opening without any deviation.
2	It is hereby declared that any technical submittals which was not specifically asked by BHEL in the NIT shall not to be considered as part of bid and shall not be evaluated by BHEL.

Signature of authorised Representative

Name and Designation :

Name & Address of the Bidder

Date