

TD-106-1 Rev No. 5 Form No.		PRODUCT STANDARD PUMPS HYDERABAD		FP60300																										
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.		<u>TECHNICAL SPECIFICATION FOR BOILER FEED PUMP RECIRCULATION (HIGH PRESSURE DROP) MODULATING CONTROL VALVE FOR SUPER- CRITICAL POWER PLANTS</u>																												
		1.0.0 INTENT OF SPECIFICATION: The intent of specification is to procure High-pressure drop control valve for use in the recirculation system of Boiler feed pump of thermal power plant, to ensure minimum quantity of flow through the pump. The valve shall be capable of throttling from discharge pressure of Boiler feed pump to the deaerator pressure for both hot and cold conditions of operation as given at CL. 3.1.0.																												
		2.0.0 SCOPE OF SUPPLY: Scope of supply shall include Modulating control valve with the following accessories. a) Pneumatic actuator. b) Solenoid valve. c) Limit switches. d) Air filter regulator with output gauge. e) Hand wheel for manual operation. f) Stem travel indicator. g) Pneumatic tubing. h) Terminal box for limit switches. i) One set of soft goods for each valve (Soft goods shall include total number of gaskets, "O" rings, backup rings, seals, gland packing's and any other seating items required for one valve assembly) supplier shall indicate quantities of each type of packing in the enquiry. j) Smart Positioner. k) Booster relay / volume booster shall be provided wherever required. l) Volume tank & associated accessories. m) Orifice Plate in Downstream line (RO) along with Flanges, Gaskets. n) Universal HART calibrator 1 No. per project.																												
		3.0.0 TECHNICAL PARAMETERS: Boiler feed pump is variable speed type and the valve shall be suitable for the following conditions corresponding to maximum & minimum speed and temperature.																												
		3.1.0 OPERATING CONDITIONS: <table border="1"> <thead> <tr> <th rowspan="2">Var No.</th> <th rowspan="2">Operation</th> <th rowspan="2">Feed water Temp. (°C)</th> <th rowspan="2">Inlet Pressure kg/cm²</th> <th rowspan="2">Flow (m³/hr)</th> <th rowspan="2">Orifice Plate Downstream Pressure (kg/cm²)</th> <th>Valve Inlet & Outlet Pipe OD & thk. (mm)</th> <th>Orifice Plate Inlet & Outlet Pipe OD & thk. (mm)</th> <th rowspan="2">Valve body Design pressure (kg/cm²) / Temp (°C)</th> </tr> <tr> <th>Pipe Design Pr</th> <th>Pipe Design Pr(kg/cm²) / Temp (°C)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">01 & 04</td> <td>Hot</td> <td>188.5</td> <td>367</td> <td>650</td> <td>14.3</td> <td>323.9 x 56 BW ends ANSIB16.25</td> <td>273 x 6.35 BW ends ANSI B16.25</td> <td rowspan="2">460/200</td> </tr> <tr> <td>Cold</td> <td>110</td> <td>48</td> <td>196</td> <td>3.4</td> <td>450kg/cm²</td> <td>35/200</td> </tr> </tbody> </table>				Var No.	Operation	Feed water Temp. (°C)	Inlet Pressure kg/cm ²	Flow (m ³ /hr)	Orifice Plate Downstream Pressure (kg/cm ²)	Valve Inlet & Outlet Pipe OD & thk. (mm)	Orifice Plate Inlet & Outlet Pipe OD & thk. (mm)	Valve body Design pressure (kg/cm ²) / Temp (°C)	Pipe Design Pr	Pipe Design Pr(kg/cm ²) / Temp (°C)	01 & 04	Hot	188.5	367	650	14.3	323.9 x 56 BW ends ANSIB16.25	273 x 6.35 BW ends ANSI B16.25	460/200	Cold	110	48	196	3.4
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Ref. Doc	Revisions : Refer to record of revisions.		Prepared By : ROHIT P.		Approved By : P. SRINIVAS	Date : 10.02.2017																								

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		5.0.0 CONTROL VALVE SIZING & CONSTRUCTION: 5.1.0 Control valve body shall be selected as per the ISA Guideline. The valve body shall be of forged steel. 5.2.0 The control valve sizing (Cv / Kv) shall be based on following guidelines: a) The valves shall pass normal flow (MCR condition) with 60 to 70 percent opening for linear characterised valves and between 70 to 80 percent opening for equal percentage characterised valves. b) The valves shall have adequate range ability to pass the minimum and maximum flows at 10% and 85% of the valve opening respectively. Valve stem travel range from minimum to maximum flow condition shall not be less than 50% of the total valve stem travel. c) Valve Cv shall be selected in such a way that the valve shall be capable of handling at least 120% of required maximum flow. d) The valve selection shall be based on the highest size dictated by the above considerations unless noise, flashing or other factors dictate the final selection. e) Trim exit outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec for steam services and 50/% of sonic velocity for flashing services The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard. 5.3.0 Each recirculation line will be routed independently to deaerator storage tank. An orifice, with a small pressure drop, shall be fitted in each line near the deaerator to prevent any flashing in the pipeline. This Orifice plate along with counter flanges and fasteners to be supplied along with RC Valve. 5.4.0 Bidder to furnish detailed calculation for trim exit velocity and valve outlet velocity in technical proposal stage. 5.5.0 Bidder to furnish detailed noise calculation for all valves. Which will be subject to Employer's approval during detailed engineering. 5.6.0 Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and downstream piping. Thus for cavitation/flashing service, only valve with anti-cavitation trim shall be provided. Bidder shall furnish in his proposal detailed calculations to establish whether cavitation will occur or not under any operating condition for a particular application. These calculations clearly indicating shall be subject to BHEL review and approval and in case it is established at any stage of the contract that cavitation will occur, the Bidder shall provide anti-cavitation trim for the same at no extra price. Further the Bidder shall furnish in his proposal the detailed write up, technical literature etc. clearly indicating as to how the occurrence of cavitation shall be prevented by the design of this offered anti-cavitation trim. The valve design which only shifts the occurrence of cavitation for minimizing the erosion will not be acceptable. 5.7.0 Control valves shall have leakage class equal or better than class-VI with metal-to-metal seating. 5.8.0 The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.		
Ref. Doc		5.9.0 Bidder shall furnish the Control valve manufacturer's data sheets and sizing calculations including the inlet/outlet velocity calculations with the proposal, which will be subjected to BHEL approval during detailed engineering stage.		

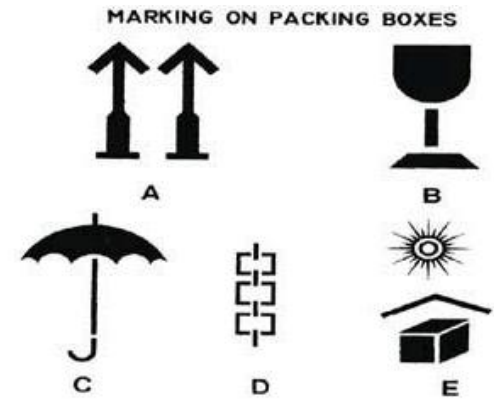
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		5.10.0 The exact characteristic (i.e. Linear/equal percentage/quick-opening type) for each of the control valves shall be selected to match the process requirements and shall be subjected to BHEL approval during detailed engineering stage. 6.0.0 VALVE CONSTRUCTION: 6.1.0 All valves shall be of globe body design. 6.2.0 a) Valves with high lift cage guided plugs & quick-change trims shall be supplied. The quick change trim shall consist of a cage and a seating clamped in the valve body by the valve bonnet and sealed with a spiral wound stainless steel asbestos gasket. The trim shall be removable through the top after bonnet removal without any cutting or welding of the valve. Where applicable, plugs shall be designed to include pressure balancing for cage guided valves. b) The valve offered shall have pressure reduction through multi-stage, multi-path, axial flow/radial flow anti-cavitation design. The trim / stack shall be provided with parallel sets of multiple axial/radial holes. The flow path through the holes shall be staggered and shall be determined by the valve plug. Pressure reduction through contours or steps formed on the valve stem/spindle is not acceptable. 6.3.0 Cast Iron valves are not acceptable. 6.4.0 Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable. 6.5.0 Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems. 6.6.0 All valves connected to vacuum on downstream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing) 6.7.0 Valve characteristic shall match with the process characteristics. 6.8.0 Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C. 6.9.0 Flanged valves shall be rated at no less then ANSI press class of 300 lbs. 6.10.0 The gland material shall be chosen to suit the operating temperature. However Asbestos is not to be used. 6.11.0 All control valves shall have stems, guide bushings, plugs, seat rings, stem lock pin, stuffing box parts and other trim parts made of stainless steel. Valve guide posts and bushings shall be stellited faces for applications involving high pressure drop as well as for flashing and cavitation applications. 6.12.0 Stem travel indicators shall be provided on all valves. 6.13.0 Each valve shall have an arrow fixed permanently on the valve body to indicate the correct direction of flow. 6.14.0 Each valve shall have a stainless steel name plate permanently fastened to the yoke which shall be visible when the valves are in service. The name plate shall indicate valve serial no., body material, size, pressure rating, trim material & type, action in air failure, steam travel, Rated Cv etc.		
Ref. Doc		6.15.0 Suitable lugs shall be provided on the valve body/Assembly for lifting/handling and to assist placement of the valve assembly in the desired position. 6.16.0 Valve orientation (inlet/outlet) shall be as per Annexure-1.		

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Ref. Doc			7.0.0 VALVE MATERIALS: I. Body : As per ASTM-A217 Gr. WC9 II. Trim : SS 440 C However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified Material for BHEL consideration and approval. 8.0.0 END PREPARATION: Valve body ends shall be butt welded type as per ANSI B 16.34 for control valves of sizes 65 mm and above. Valve inlet and outlet pipe size details are given at Cl. No. 3.1.0. Required valve edge preparation details will be furnished during contract execution stage. Bidder shall offer valve body such that it is directly weldable to pipe size without any cost implication to BHEL. Orifice plate flanges to ends shall be butt welded type as per ANSI B 16.34. Recirculation line size details are given at Cl. No. 3.1.0. Required Flange edge preparation details will be furnished during contract execution stage. Bidder shall offer Flanges such that it is directly weld able to pipe size without any cost implication to BHEL. 9.0.0 VALVE ACTUATORS: The control valves shall be furnished with pneumatic actuators. Spring-diaphragm type actuators shall generally be used. Piston type actuators shall be offered in case of high shut-off pressure & quick response requirement. The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the Pressure drop and maximum shut off pressure and leakage class requirements. The Valve actuators shall be capable of operating at 80 deg C continuously. 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. Diaphragms shall be designed for 200% maximum operating pressure. Nylon reinforced neoprene is preferred as diaphragm material. Air connection size shall be 1/4" NPT (F) unless otherwise dictated by process response time. Integral tubing shall be stainless steel. All actuators shall be of fail safe design signifying that the spring direction will tend to move the valve to open in case of air failure. "Failure to Open" shall be marked on the actuator. Actuators shall be supplied with name plates which indicate the diaphragm air pressure at full open and full closed positions. For single seated valves the pressure shall be listed for maximum differential and for zero differential across the valve. Opening and Closing time of the valve shall be less than 10 seconds. 10.0.0 CONTROL VALVE ACCESSORY DEVICES: 10.1.0 All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements	

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Ref. Doc		11.6.0 Bar stock for valves stem shall be subjected to UT. Finish machined valve stem shall be subjected to magnetic particle examination/dye penetration test. 11.7.0 Wall thickness measurement by ultrasonic for critical and highly stressed zones of the castings / forging shall be carried out.		

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		11.9.0 Hydrostatic shell test: 11.9.1 Valves shall be subjected to hydrostatic shell test in accordance with ANSI-B 16.34 prior to seat leakage test. If the valves are reworked on the pressure parts for any reason after hydrostatic test, they must be retested. 11.9.2 Valves shall be hydrostatically tested in manufacturer's works in accordance with code requirements. All hydrostatic testing and inspection shall be completed before any paint is applied to valve body. Certificates of inspection shall be executed in accordance with the latest and required codes and shall be forwarded to the Engineer. 11.9.3 All gaskets used for test shall be of the same material and designs as specified for the finished product. Where mechanical gasket joints and broken following tests, new gasket shall be furnished with the equipment and the joints shall be re-tested. 11.10.0 Leakage Test: 11.10.1 Valve closure test and seat leakage tests shall be performed in accordance with ANSI/FCI 70.2 and as per applicable leakage class. Seat leakage test shall be carried out by closing the valve with the help of job actuator. Actuator body shall be subjected to pneumatic test and no leakage is permitted. 11.10.2 If valves are disassembled after the completion of the valve closure and seat leakage tests for any rectification, these tests shall be repeated. 11.11.0 Functional Tests: The fully assembled or completed valves including the actuators control devices and accessories shall be functionally tested to demonstrate the operability and response time of the valve and the actuator. This may be done by cycling the valves 3 or 4 times from open to close position. The same controller can be used to test each valve. These tests shall also include the verification of control valve operation features such as stay put operation, fail to open, fail to close on air failure, control signal failure etc. in line with the specification requirement. 11.12.0 Life Cycle Test (Type test): Type test certificate carried out earlier by the vendor on similar design size and the type of valve and actuator shall be furnished. The certificate shall contain the model no. /size of the valve and actuator. The actuators of the valves shall be tested for compliance with the life cycle data in line with the relevant standards. The voltage, current rating and insulation class of solenoid operated valve shall be tested for compliance with specification requirement. 11.13.0 Cv Test: Cv test shall be carried out as per approved test procedure on each size, type and design of the each Purchase Order. As per ISA-75.02 standard from 0 to 100% of the valve travel in steps of 20% and test values shall meet published catalogue requirements taking into consideration the allowable tolerances as per ISA-75.11 and test report shall be furnished for BHEL approval. Before commencing the test, Cv type test procedure shall be submitted for BHEL review and approval. 11.14.0 WITNESSING OF TESTS BY BHEL/END USER/TPIA: The following tests shall be offered for Witness by BHEL/End User/TPIA - Physical Dimensions of the Valve - Hydro Test - Performance Test - Seat leakage Test - Cv Type Test (one valve of each type, size & design of each purchase order)		
Ref. Doc				

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		* Tests indicated at d) & e) above, shall be witnessed by BHEL. 12.0.0 PACKAGE : 12.1.0 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. ✓ The Vendor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Packing shall be Sea-worthy. ✓ 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. MARKING ON PACKING BOXES  A B C D E A UPRIGHT B FRAGILE C PROTECTION FROM FALLING OR CONDENSING MOISTURE D SLING POSITION E PROTECTION FROM DIRECT RADIATION 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			
		Ref. Doc			

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		✓ Marking showing umbrella (i.e. for machines/components to be stored under covered storage). 12.3.0 PROTECTION All coated surface shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with parts which are likely to get rusted, due exposure to weather should also be properly treated and protected in a suitable manner. EMI/static charge proof packaging should be used for PLC/Electronic hardware. 13.0.0 PRESERVATIVE SHOP COATING: 13.1.0 All exposed metallic surface to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall before hand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scale oxide and other coatings are Prepared in the shop, the surfaces that are to be finish painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Transformers and other electrical equipment, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colours shall be as per manufacturer's standards to be selected and specified by the Engineer at a later stage. 13.2.0 Shop primer for all steel surface which will be exposed to operating temperature below 95°C shall be selected by the Contractor. Special high temperature primer shall be used on surface exposed to temperature higher than 95°C. 13.3.0 All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Contractor. 14.0.0 RATING PLATES, NAME PLATES AND LABELS: 14.1.0 Each main and auxiliary item of plant is to have permanently attached to it in a conspicuous position rating plates of non-corrosive material upon which is to be engraved manufacturer name, equipment, type or serial number together with details of the loading conditions under which the item of plant in question has been designed to operate and such diagram plates as may be required by the Engineer. 14.2.0 Each item of plant is to be provided with nameplate or label designing the service of the particular equipment. The inscriptions are to be approved by the Engineer or as detailed in the appropriate sections of the Technical Specifications. 14.3.0 Such nameplates or labels are to be of white non-hygroscopic materials with engraved back lettering or alternatively in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back. 14.4.0 Terms of plant such as valves and dampers, which are subject to handling, are to be provided with engraved chromium plated or label with engraving filled with enamel. The nameplates for valves shall be marked in accordance with MSS standard Sp-25 and ANSI B 16.34 as minimum.		
Ref. Doc				

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		15.0.0 DOCUMENTS TO BE FURNISHED ALONG WITH OFFER: - GA drawing (shall include weld end details , outline dimensions and other terminal details) for BHEL review and approval. - Sectional drawing (including Part list with Material of construction) - Data sheet for BHEL review and approval. - CV & anti-cavitation calculations along with outlet velocity calculation. - Detailed velocity calculation across each discrete stage for BHEL review and approval. - Catalogue for valve, actuator and accessories. Model nos. chosen shall be marked on the catalogues. - Quality plans and reference documents (if other than international standards are referred) - Test Procedure for the following tests to be submitted for BHEL review and approval. - Performance Test - Seat leakage Test - Cv Type Test 16.0.0 DOCUMENTS TO BE FURNISHED AFTER PLACEMENT OF ORDER: - GA drawing (shall include weld end details , outline dimensions and other terminal details) for BHEL review and approval. - Sectional drawing (including part list with Material of construction) & Data Sheet for BHEL review and approval. - Hook-up diagram of Control Valve with Actuator & Accessories. - Valve Edge preparation details. - All calculations like CV & anti-cavitation calculations, Noise Level, Trim Exit Velocity, Valve Outlet Velocity, Actuator sizing etc. - All relevant catalogues for the models of the valves as well as accessories finalized. - O & M instructions. - Preservations and storage instruction write up for valve and its accessories. - Detailed velocity calculation across each discrete stage for BHEL review and approval. - Quality plans shall be in BHEL format - Documentation package (Quality file) - Test Procedure for the following tests to be submitted for BHEL review and approval. - Performance Test - Seat leakage Test - Cv Type Test For (a) & (b) as listed above reproducible shall be furnished. Final approved drawings shall be furnished in CD-ROM. 16.1.0 Guarantee shall be as specified in the enquiry.		
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	17.0.0 Quality Assurance plan of Control valve & actuators shall be as per BHEL format.																			
	18.0.0 <u>VARIANT NOS & MATERIAL CODES:</u> <table border="1" data-bbox="339 434 1500 810"> <thead> <tr> <th>VAR. No</th> <th>DESCRIPTION</th> <th>BHEL Material Code</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>RC VALVE MODULATING TYPE FOR 800MW</td> <td>FP9760300010</td> </tr> <tr> <td>02</td> <td>RC VALVE MODULATING TYPE 50% 800MW</td> <td>FP9760300028</td> </tr> <tr> <td>03</td> <td>RC VALVE MODULATING TYPE 30% 800MW</td> <td>FP9760300036</td> </tr> <tr> <td>04</td> <td>RC VALVE MODULATING TYPE 800MW (YADADRI)</td> <td>FP9760300044</td> </tr> <tr> <td>05</td> <td>RC VALVE MODULATING TYPE 50% 660MW (PANKI)</td> <td>FP9760300052</td> </tr> </tbody> </table>			VAR. No	DESCRIPTION	BHEL Material Code	01	RC VALVE MODULATING TYPE FOR 800MW	FP9760300010	02	RC VALVE MODULATING TYPE 50% 800MW	FP9760300028	03	RC VALVE MODULATING TYPE 30% 800MW	FP9760300036	04	RC VALVE MODULATING TYPE 800MW (YADADRI)	FP9760300044	05	RC VALVE MODULATING TYPE 50% 660MW (PANKI)
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Ref. Doc	19.0.0 <u>SPARES</u> (A) Mandatory spares to be considered as separate package. Mandatory spares to be packed in different color & shipped separately. Marking on mandatory spares must be in different color from main supply so that these are easily identifiable at site. (B) Recommended Spares: In addition to the Mandatory spares mentioned, the bidder shall also furnish a List of Recommended spares for 3 years of normal operation of the Control valves/ Accessories. BHEL/Customer reserves the right to buy any or all of the recommended spares. The prices of these spares will remain valid for a period of minimum 6 months after the placement of order. (C) Start-up & Commissioning Spares: Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Control Valves. All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III. The Start-up and commissioning spares indicated by the bidder shall be a part of the main Control valves supply. However bidder to indicate prices separately. The list of these spares required is enclosed in the section-D of this specification. Bidder to indicate the service life expectancy period for the spare parts under normal working conditions. The spares shall be treated and packed for long storage, under climatic conditions prevailing at site. Small items shall be packed in sealed transparent plastic bags with desiccators' packs as necessary.																			

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(D) For Spare Variant Table:

S.No	Description	Material Code	Remark/Applicable
1	LIMIT SWITCH FOR MOD RC VALVE	FP9760300516	Applicable for Var- 01
2	POSITIONERS	FP9760300524	Applicable for Var- 01
3	ACTUATOR PISTON SEAL KIT	FP9760300532	Applicable for Var- 01
4	COMPLETE SOFT SEAL FOR	FP9760300540	Applicable for Var- 01
5	VALVE DISC & VALVE SPINDLE	FP9760300559	Applicable for Var- 01
6	VALVE SEAT FOR	FP9760300567	Applicable for Var- 01
7	ACTUATOR SUB ASSEMBLY	FP9760300575	Applicable for Var- 01
8	GUIDE	FP9760300583	Applicable for Var- 01
9	COUPLING NUT	FP9760300591	Applicable for Var- 01
10	ACTUATOR PISTON WITH ROD& SEAL	FP9760300605	Applicable for Var- 01
11	VALVE TRIM	FP9760300613	Applicable for Var- 01
12	SOLENOID VALVE	FP9760300621	Applicable for Var- 01
13	*****NOT USED*****	FP9760300630	---
14	*****NOT USED*****	FP9760300656	---
15	FEEDBACK LINKAGES	FP9760300664	Applicable for Var- 01

S.No	Description	Material Code	Remark/Applicable
1	SMART POSITIONERS & ACCESSORIES	FP9760300672	Applicable for Var- 02
2	COMPLETE SOFT SEAL KIT	FP9760300680	Applicable for Var- 02
3	VALVE STEM WITH PLUG ASSEMBLY	FP9760300699	Applicable for Var- 02
4	ACTUATOR ASSEMBLY	FP9760300710	Applicable for Var- 02
5	SEAT RING / VALVE SEAT	FP9760300702	Applicable for Var- 02
6	DIAPHRAM/PISTON,ORINGS,SEALS ETC	FP9760300729	Applicable for Var- 02
7	STACK / CAGE ASSEMBLY	FP9760300737	Applicable for Var- 02
8	SOLENOID VALVES	FP9760300745	Applicable for Var- 02
9	E/P CONVERTERS	FP9760300753	Applicable for Var- 02
10	FILTER REGULATORS	FP9760300761	Applicable for Var- 02
11	PRESSURE GUAGES OF ALL TYPES	FP9760300770	Applicable for Var- 02

S.No	Description	Material Code	Remark/Applicable
1	SMART POSITIONERS & ACCESSORIES	FP9760300788	Applicable for Var- 03
2	COMPLETE SOFT SEAL KIT	FP9760300796	Applicable for Var- 03
3	VALVE STEM WITH PLUG ASSEMBLY	FP9760300800	Applicable for Var- 03
4	ACTUATOR ASSEMBLY	FP9760300826	Applicable for Var- 03
5	SEAT RING / VALVE SEAT	FP9760300818	Applicable for Var- 03
6	DIAPHRAM/PISTON,ORINGS,SEALS ETC	FP9760300834	Applicable for Var- 03
7	STACK / CAGE ASSEMBLY	FP9760300842	Applicable for Var- 03
8	SOLENOID VALVES	FP9760300850	Applicable for Var- 03
9	E/P CONVERTERS	FP9760300869	Applicable for Var- 03
10	FILTER REGULATORS	FP9760300877	Applicable for Var- 03
11	PRESSURE GUAGES OF ALL TYPES	FP9760300885	Applicable for Var- 03

Ref. Doc



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10	AIR LOCK RELAYS	FP9760300397	Applicable for Var- 05																																																																																																																													
11	SOFT GOODS KIT FOR RC VALVE	FP9760300389	Applicable for Var- 05																																																																																																																													
12	METAL SEAT SET	FP9760300370	Applicable for Var- 05																																																																																																																													
13	SEAT RING SET	FP9760300362	Applicable for Var- 05																																																																																																																													
14	SPINDLE ASSY	FP9760300354	Applicable for Var- 05																																																																																																																													
15	ACTUATOR SOFT GOODS KIT	FP9760300346	Applicable for Var- 05																																																																																																																													
16	AIR FILTER REGULATORS	FP9760300338	Applicable for Var- 05																																																																																																																													
Ref. Doc																																																																																																																																

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FIGURE-1
(OUTLINE DIM. OF RC VALVE)

Note: Dimension (in mm) to be furnished by vendor along with technical Offer.

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		Rev. No.	Date	Revision Details	Revised By	Approved By
		00	10.02.2017	First Issue	-	-
		01	22.11.2018	Cl.no. 4.0.0, 5.0.0, 7.0.0, 9.0.0, 11.10.0, 11.13.0, 11.14.0, 15.0.0, 16.0.0 updated.	Rajesh Ch	KHRK
		02	14.12.2018	Var02, 03, 04 added. Var02, 03, 04 spares list added.	Rajesh Ch	KHRK
		03	02.05.2019	Clause no 3.1.0, 4.4.0, 6.2.0 b), 2.0.0 i) updated. Clause no 3.2.0 added. Clause no 4.5.0 deleted. Pt "n" added in clause no 2.0.0.	K.Sangeetha.	KHRK
		04	19.09.2019	Var 05 and spares list for Var 05 added. Spec generally revised.	K.Sangeetha.	KHRK
		Ref. Doc.				