

Bharat Heavy Electricals Limited

HIGH PRESSURE BOILER PLANT , TIRUCHIRAPPALLI 620 014.

TECHNICAL DELIVERY CONDITIONS
FOR SUB - DELIVERY COMPONENTS OF
CONTROLS AND INSTRUMENTATION/FB

TCI :143, Rev. 09

PAGE 01 OF 12

POWER CYLINDERS - REGULATING TYPE

Revision History

REV. NO.	DATE	DESCRIPTION	PREPARED	REVIEWED		APPROVED
				Engineering	Quality	
01 - 08	----	General Revisions	-sd-	-sd-	-sd-	-sd-
09	21 -12-15	Revised to include typical GA drawing				

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
1.0	Site conditions :	
1.1	Ambient temperature	50° C
1.2	Relative humidity	100 %
1.3	Atmosphere	Dusty, Salty, Highly Polluted & Corrosive in nature.
1.4	Altitude above MSL	1000 metres
2.0	General :	
2.1	Application	Regulating Duty.
2.2	Actuator type	Pneumatic operated power cylinder, double acting, piston rod type.
2.3	Actuator assembly	Stand arrangement The power cylinder shall be mounted on the stand. Stand arrangement shall be made of steel structural material. It should have the base for mounting the cylinder and provision for fixing the foundation bolts. The entire arrangement should be able to withstand the load and torque requirements. All the components fixed on to the stand-structural material by using SS Bolt, Plain Washer, Spring washer and Nut arrangement. Vendor to choose the exact mechanical arrangements and dimensions accordingly. Output Shaft and Output Lever The piston rod shall be connected to the output shaft through a lever. The fixing arrangement of lever and output shaft shall be such that the lever should not slip on the shaft. The output lever for driving the load shall be connected to

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		the output Shaft. This arrangement should be such that the output lever shall be capable of fixing at any position/orientation around the shaft (360°). A typical arrangement has been indicated in page 09.	
2.4	Air Supply	Power Air	Minimum : 3 kg/sq cm (g)
			Maximum : 7 kg/sq cm(g)
		Signal Air	Minimum : 0.2 to 1kg/sq cm(g)
2.5	Duty Cycle	Continuous	
2.6	Installation	Outdoor	
2.7	Angle of Travel	Refer Purchase Enquiry	
2.8	Piston operating speed	Refer Purchase Enquiry	
2.9	Action on Loss of Power Air Supply.	Stay put (Fail freeze)	
2.10	Action on Loss of Command Signal.	Stay put (Fail freeze)	
2.11	Position indicator	1 No. local mechanical position indicator is required.	
2.12	Provision for reversal of action	Actuator assembly to be configured in Direct acting. Provision to change to reverse action shall be provided	
3.0	Material :		
3.1	Piston rod	Hard chrome plated high strength steel. Leather bellows / Gaiters shall be provided to prevent piston rod from rusting.	
3.2	Piston	High Strength Steel.	
3.3	Cylinder barrel	Honed & hard chrome plated seamless Carbon steel.	

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
3.4	Piston & Cylinder seals	Viton.
3.5	General	Necessary surface treatment shall be provided for all the components (as applicable) to prevent rust and corrosion.
4.0	Accessories	
4.1	Limit Switch :	
4.1.1	Quantity	One for open and one for close
4.1.2	Number of contacts	In case of Conventional positioner, 2 NO + 2 NC
		In case of SMART positioner, 1 NO + 1 NC
4.1.3	Type	Snap action
4.1.4	Limit Switch Enclosure	Dust & Weather Proof, IP 65
4.1.5	Contact Rating	5A at 240 V AC / 0.2A at 220 V DC
4.1.6	Make	Shall be as per the manufacturer's standard
4.2	Positioner :	
4.2.1	Features	Input Signal Air: 0.2 to 1kg/sq cm (g). Positioner shall be suitable for working at an air pressure of 3 to 7 kg/sq.cm.(g) Shall be integrally mounted on the power cylinder and shall be suitable for both direct and reverse acting. Each Positioner shall be provided with three pressure gauges. One for Signal Air and one each on either side of the power air to the cylinder.
4.2.2	Cam characteristics	1 No. linear cam to be fixed on the positioner. 1 No. equal percentage, 1 No. square root and 1 No. blank cam to be supplied extra along with the Positioner in a separate pack. (Refer to Note-2)
4.2.3	Enclosure	Dust & Weather proof, IP 65

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
4.2.4	Applicability of SMART Positioner	Refer Purchase enquiry. Separate technical specification for SMART positioner will be attached, if applicable.
4.3	Air Lock Device :	
4.3.1	Type	Set point has to be adjustable. Self Reset.
4.4	Air filter cum regulator :	
4.4.1	Supply air pressure	7 Kg / sq.cm
4.4.2	Type	Diaphragm
4.4.3	Pressure rating	15 Kg / sq.cm
4.4.4	Material : (If there are project specific requirements then the same will be indicated in the purchase enquiry)	
	a. Body	Die-cast aluminium
	b. Inner valve and seating	Stainless steel
	c. Spring	Stainless steel
4.4.5	Output pressure	0 – 7 Kg / sq.cm
4.4.6	Filter size	Pneumatic positioner - 25 microns.
		SMART positioner – 5 microns
4.4.7	Make	Placka/Shavo Norgren
4.4.8	Pressure gauge :	
	a. Dial	50 mm Diameter
	b. Type	Bourdon

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
	c. Material	Phosphor bronze (Bourdon)
	d. Range	0 – 10 Kg / sq cm
	e. Accuracy	± 5%
	f. Make	Shall be as per manufacturer's standard
4.4.9	Air connection inlet	Air connection inlet shall be suitable for accepting ¼" OD PVC sheathed copper tubing
4.5	Position Transmitter :	
	a. Type	Electronic, Inductive – Non-Contact type, 2 wire
	b. Output	4-20 mA, linear DC output@ 600 ohms max.
	c. Power supply	24VDC, Loop Powered from the control system
	d. Enclosure	Die-cast aluminium, Dust & Weatherproof IP 65
	e. Accuracy	± 1% of span
	f. Make	Shall be as per manufacturer's standard
4.6	Hand wheel / Lever	To be provided along with power cylinder for manual operation.
4.7	I/P convertor	Refer purchase enquiry for applicability.

4.8	Junction Box	
4.8.1	Junction Box	All the electrical connections from the accessories, shall be wired suitably as per the wiring drawing to the junction box. Protection Class: IP-65. Terminal blocks shall be of Cage-Clamp type, suitable for 2.5 sq.mm. Cable.
4.8.2	Termination of external cable to the Junction box.	As per wiring drawing and Purchase Enquiry, 3 nos. of double compression type brass with nickel plated weather proof cable glands suitable for cable OD of 18 mm. or 3 nos. of 9 pin plug & socket connector with socket mounted on terminal box and plug may be supplied as loose to suit cable of OD 18 mm.
5.0	Linkage rods	The Linkage rods shall be supplied as per the drawings referred in the purchase enquiry. The application names & tag nos. have to be painted on the linkage rods for easy identification.
6.0	Characteristics Power cylinder with Positioner	
6.1	Sensitivity	± 0.5 % of input span under no load.
6.2	Repeatability	± 1 % of output span under no load.
6.3	Accuracy	± 3 % of output span under no load
6.4	Hysteresis	± 1 % of output span under no load.
7.0	Inspection & testing	As per quality plan CI:QAC:STD:QP:42 (latest revision) or project specific quality plan. The applicable quality plan will be indicated in the purchase enquiry.

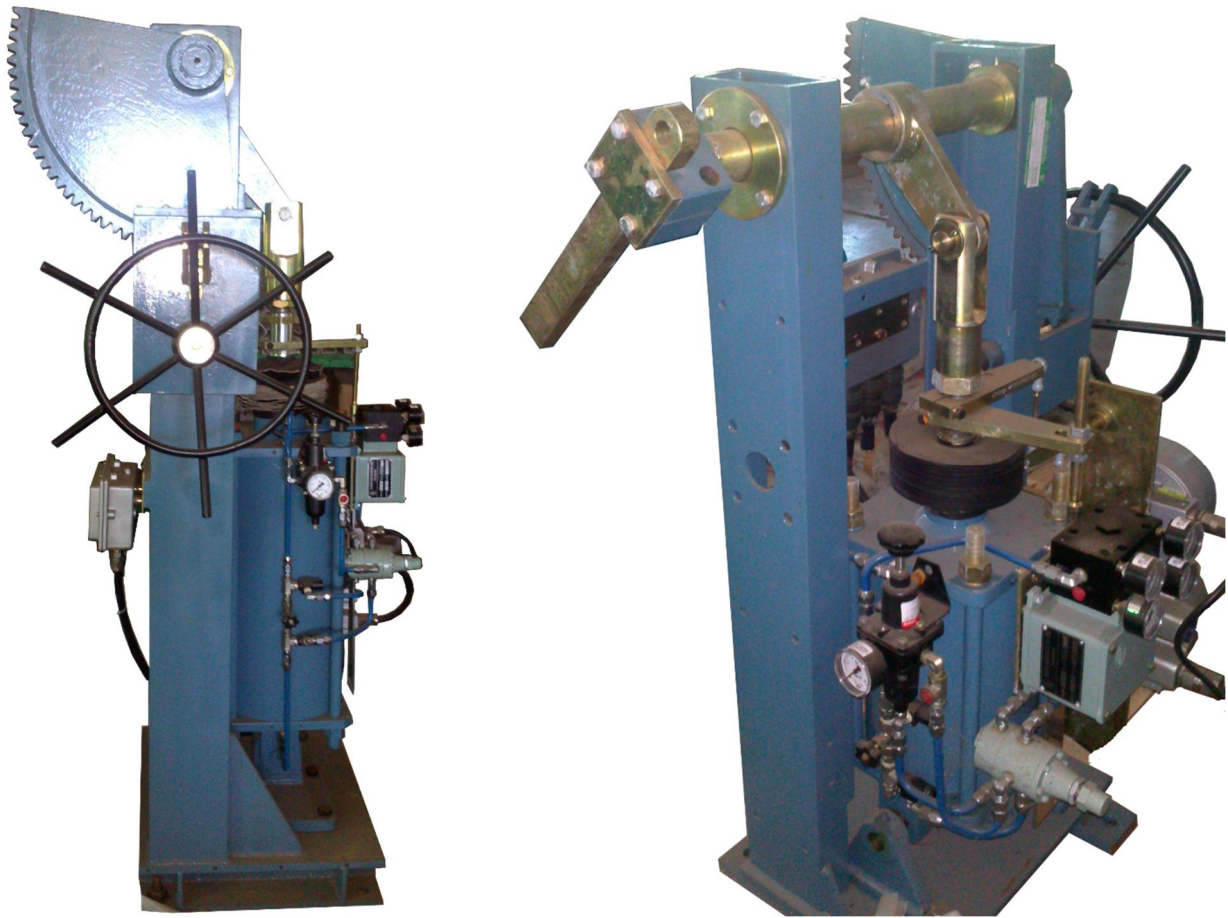
8.0	Painting/Finish for both Power Cylinder & Linkage rods	
	a. Paint Shade	Shall be as per manufacturer's standard
	b. Finish	Corrosion resistant, Epoxy based resin.
9.0	Documents	
9.1	Documents to be submitted along with the offer.	1. The Sub-Delivery Enquiry Deviation format shall be filled in with the details of BHEL's enquiry, project, technical specification of the power cylinder, technical specification of the SMART Positioner (as applicable), Project Specific Annexure (as applicable) & technical specification of the I to P Converter (as applicable), terminal block wiring drawing, Quality plan & Packing procedure. Vendor to conform to the requirements of all the above documents/drawings and indicate "No Deviation". 2. Any deviation taken by the vendor shall only be indicated in the Sub-Delivery Enquiry Deviation form. Deviations indicated elsewhere in the offer shall not be considered. 3. Offer for : a) Commissioning spares b) Maintenance spares for two years operation

9.2	Documents to be submitted by the vendor after placement of Purchase order.	1. Duly filled in power cylinder datasheet furnished by BHEL for evaluation. 2. General Arrangement drawing of Power Cylinder assembled with accessories indicating the dimensional details, mounting arrangement & foundation details. Vendor has to submit a neat & legible, soft copy of the Auto Cad drawing in pdf version. 3. Tubing drawing indicating all the accessories. 4. Wiring drawing with terminal blocks numbers.
9.3	Operation & Maintenance Manuals	1. 1 set of soft copy (loaded on a DVD) & 1 set of Hard Copy of the O&M manual comprising of the following documents shall be submitted to BHEL Trichy. • Operation & Maintenance instruction set. • Power Cylinder datasheets. • Dimensional/GA drawing of the assembled power cylinder. • Tubing drawing. • Wiring Drawing. • Erection/Calibration procedure. • Catalogues of the power cylinder & its accessories. 2. 1 No. of O&M manual and erection/calibration procedure shall be placed in each power cylinder package for usage at Site during erection & commissioning activity.

10.0	Packing	Shall be as per manufacturer's standard practice. The packing shall be suitable for safe transport, safe delivery at site and shall be suitable to avoid damages due to water entry and shall withstand the environmental conditions during storage at site.
11.0	Pre Qualification Requirements (For open tender case only)	Vendor should have supplied and commissioned Stand-mount type, regulating power cylinder of suitable ratings to thermal power plant applications and the same shall be working satisfactorily for a period of minimum 2 years as on the date of techno-commercial bid opening. Vendor can offer and supply such equipment with collaboration or valid license agreement for design, engineering, manufacture, supply of such equipment in India provided the collaborator meets the above provenness criteria.
12.0	Bill of material/Scope of supply (brief) for a stand-mount power cylinder assembly.	• <i>Pneumatic operated power cylinder, double acting, piston rod type.</i> • <i>Stand arrangement</i> The power cylinder shall be mounted on the stand. Stand arrangement shall be made of steel structural material. It should have the base for mounting the cylinder and provision for fixing the foundation bolts. The entire arrangement should be able to withstand the load and torque requirements. All the components shall be fixed on to the stand-structural material by using SS Bolt, Plain Washer, Spring washer and Nut arrangement. Vendor to choose the exact mechanical arrangements and dimensions of the stand/base accordingly. • <i>Output Shaft and Output Lever</i>

		The piston rod shall be connected to the output shaft through a lever. The fixing arrangement of lever and output shaft shall be such that the lever should not slip on the shaft. The output lever for driving the load shall be connected to the output Shaft. This arrangement should be such that the output lever shall be capable of fixing at any position/orientation around the shaft (360°). • <i>Pneumatic or SMART positioner (as per the enquiry).</i> • <i>Position Feedback transmitter.</i> • <i>Air Lock Relay.</i> • <i>Air Filter regulator.</i> • <i>Manual Isolation Valve for Power air.</i> • <i>Piston movement speed restrictor.</i> • <i>Equilising Valve</i> • <i>Limit Switch assembly.</i> • <i>Hand wheel/lever arrangement.</i> • <i>Integral Junction box.</i> • <i>Cable glands or Plug & Socket connectors (as per the enquiry)</i> • <i>Linkage rod.</i> • <i>I to P Converters (applicability-as per the enquiry).</i> Vendor to supply all the above indicated items/accessories. Over and above, if any other items/accessories are required for complete functioning of the power cylinder, vendor to take care of the same.
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1. Foundation bolts, Fasteners, Spare Positioner cams and Linkage Rods shall be m identified separately in shipping list/Delivery challan.



Typical arrangement of Pneumatic actuator assembly