



A Maharatna Company
ISO 9001 Company
ISO 50001 Company

भारत हेवी इलेक्ट्रिकल्स लिमिटेड Bharat Heavy Electricals Limited

(A Government of India Enterprise)
High Pressure Boiler Plant
Tiruchirappalli - 620 014

MATERIALS MANAGEMENT

4th Floor, 24 Bldg. HPBP BHEL, Trichy-620014

Phone: 0431 - 257 8109, 7446; E-mail: kevin@bhel.in, mohann@bhel.in; www.bhel.com

NOTICE INVITING e-TENDER

Ref: GEM/2021/43PWR

15.06.2021

Ref : Tender No. BID NO: GEM/2021/B/1283413 dt 15.06.2021

Subject : Two-part e-Tender inviting techno-commercial and price bids for supply of **Pneumatic Actuators for Coal Fired Thermal Power Plant / Bhusawal Unit-6 (660MW) project.**

General Instructions

- The tender documents shall be deemed to form an integral part of the purchase order.
- Tender can be cancelled at any stage due to unavoidable circumstances.
- Bidders are advised not to wait till the last minutes w.r.t tender closing time to submit their offer to avoid complications related with internet connectivity / network problem/ power failure etc.
- Bidders are advised take due care while quoting the technical and price bid forms in the e-procurement system. Bidders, those who tampers with tendering procedure affecting ordering process or misusing the technical information of the tender document or withdrawing their offer after price bid opening, will be penalized as per BHEL guidelines on suspension of business dealings with suppliers/ contractors. Abridged version of the guideline is available in www.bhel.com.
- It is advised that all the documents to be submitted are kept scanned or converted to PDF format in a separate folder on your computer before starting online submission.
- Prequalification of vendors will be as per the PQR document. It is mandatory to submit the PQR related documents; else the offer is liable not be evaluated or rejected.
- DISCLAIMER CLAUSE: Neither the Organization (Bharat Heavy Electricals Ltd.) nor the service provider for e-tendering is responsible for any failure of submission of bids, due to failure of internet or other connectivity problems or reasons thereof.
- Deviations, if any, may be indicated in the Sub-Delivery Enquiry Deviation Format.
- Document Submission after PO: Complete set of valid technical documents as per BHEL format viz., Datasheet, GA drawing and SQP / RQP / VQP are to be submitted within 15 days from the date of receipt of PO (e-mail copy). If there is a delay in submission of valid documents within 15 days, the delay will be accounted for the calculation of LD.
- Inspection & testing requirements: Inspection and testing requirements are to be carried out as per the specification and BHEL/customer approved QAP and all test certificates are to be submitted in complete set as indicated in our specification /QAP. In case of Vendor QP the same shall be submitted for approval along with the offer.

- Customer approval of Bidder is applicable. Bidders will be asked to submit the credentials, for customer approval. The Part-2 bid (Price bid) of the Bidder will be opened based on fulfilment of PQR criteria's, techno-commercial (Part-1 bid) qualification and subject to Customer (MAHAGENCO) acceptance.
- PRICE BREAK-UP: Since there is provision to quote only the lump sum amount of the package (as per attached list), Bidder is to submit percentage breakup of the total price against each line item, in the Format attached. This document shall be submitted along with Part-1 bid for techno-commercial evaluation.
- PAYMENT TERM: 100% payment will be released within ten (10) days of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills unless otherwise specified in STC / ATC.
- LIQUIDATED DAMAGES: If the Seller/Service Provider fails to deliver any or all of the Goods/Services within the original/re-fixed delivery period(s) specified in the contract, the Buyer will be entitled to deduct/recover the Liquidated Damages for the delay, unless covered under Force Majeure conditions aforesaid, @ 0.5% of the contract value of delayed quantity per week or part of the week of delayed period as pre-estimated damages not exceeding 10% of the contract value of delayed quantity without any controversy/dispute of any sort whatsoever.
- The terms & conditions in GeM will form part of Contract / Order.
- Any pre-bid query, kindly contact: Mr. Kevin Ark Kumar, Manager/Materials Management/BOI Tel: 0431-2578109, email: kevin@bhel.in; Mr. N Mohan, Asst./Engineer/Materials Management/BOI Tel: 0431-2577446, email: mohann@bhel.in and get your queries cleared before submitting the offer in EPS. Price once quoted online in the E-tendering Portal cannot be changed, after due date and shall remain final.

For **Bharat Heavy Electricals Limited**

Kevin Ark Kumar

Manager / Materials Management

Fourth floor, 24 Building

B.H.E.L., Tiruchirappalli – 620 014, Tamil Nadu

Phone: 0431-2578109 / Email: kevin@bhel.in

TECHNICAL CATALOGUE

PNEUMATIC ACTUATORS FOR COAL FIRED THERMAL POWER PLANT

SL No.	MATLCD	DESCRIPTION	UOM	QTY
10	L172719759901001	COLD AIR DAMPER ACTUATOR (A-H)(08 X 08)	NO	8.00
Regulating duty, pneumatic power cylinder for Cold air control damper application with SMART positioner and other accessories, as per the technical specification of the power cylinder No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24099,Rev. 02. Recommended Bore X Stroke Size in inches : 08 X 08. Torque : 50 kgm. Lever length : 270 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Tag nos. HFE 51 AA101, HFE 52 AA101, HFE 53 AA101, HFE 54 AA101, HFE 55 AA101, HFE 56 AA101, HFE 57 AA101, HFE 58 AA101. Piston Operating speed range : 7 - 9 mm/sec. Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
20	L172719759901002	HOT AIR DAMPER ACTUATOR(A-H)(08 X 16)	NO	8.00
Regulating duty, pneumatic power cylinder for Hot air control damper application with SMART positioner and other accessories, as per the technical specification of the power cylinder No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24099,Rev. 02. Recommended Bore X Stroke Size in inches : 8 X 16. Torque : 111 kgm. Lever length : 350 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Tag nos. : HFE 71 AA101, HFE 72 AA101, HFE 73 AA101, HFE 74 AA101, HFE 75 AA101, HFE 76 AA101, HFE 77 AA101, HFE 78 AA101. Piston operating Speed Range : 7 to 9 mm/second. Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
30	L172719759901003	PA FAN BLADE PITCH CONTROL ACTUATOR(A-B)	NO	2.00
Regulating duty, pneumatic power cylinder for PA fan blade pitch control application with SMART positioner and other accessories, as per the technical specification No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24099, Rev. 02. Recommended Bore X Stroke Size in inches : 04 X 08. Torque : 10 kgm. Lever length : 150 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Tag nos. : HFE 10 AA101, HFE 15 AA101. Operating time : 30 to 35 seconds Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
40	L172719759901004	FD FAN BLADE PITCH CONTROL ACTUATOR(A-B)	NO	2.00
Regulating duty, pneumatic power cylinder for FD fan blade pitch control application with SMART positioner and other accessories as per the technical specification No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per TB wiring drawing 3-97-599-24099, Rev. 02. Recommended Bore X Stroke Size in inches : 04 X 08. Torque : 10 kgm. Lever length : 150 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty				

Tag nos. : HLB 10 AA101, HLB 15 AA101. Operating time : 30 to 35 seconds. Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
50	L172719759901005	ID FAN BLADE PITCH CONTROL ACTUATOR(A-B)	NO	2.00
Regulating duty, pneumatic power cylinder for ID fan blade pitch control application with SMART positioner and other accessories, as per the technical specification No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per TB wiring drawing 3-97-599-24099, Rev. 02. Recommended Bore X Stroke Size in inches : 04 x 08. Torque : 10 kgm. Lever length : 150 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Tag nos. : HNC 10 AA101, HNC 15 AA101. Operating time : 30 to 35 seconds Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
60	L172719759901006	LINKAGE ROD FOR CAD CONTROL	NO	8.00
1) Linkage rod made of Electric Resistance welded tube, material: SA 106 Gr.B shall be provided. 2) 2 nos. of ball & socket connectors for connecting the linkage rod with the output levers. 3) 1 no. of output lever shall be supplied for actuator side alone. 4) Damper side lever will be supplied by BHEL. Further details of linkage rod shall be referred in Annexure B. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder Datasheet & BHEL Linkage rod drawing.				
70	L172719759901007	LINKAGE ROD FOR HAD CONTROL	NO	8.00
1) Linkage rod made of Electric Resistance welded tube, material : SA 106 Gr.B shall be provided. 2) 2 nos. of ball & socket connectors for connecting the linkage rod with the output levers. 3) 1 no. of output lever shall be supplied for actuator side alone. 4) Damper side lever will be supplied by BHEL. Further details of linkage rod shall be referred in Annexure B. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder Datasheet & BHEL Linkage rod drawing.				
80	L172719759901008	LINKAGE RODS FOR PA, FD, ID FAN CONTROL	NO	6.00
1) Linkage rod made of Electric Resistance welded tube, material : SA 106 Gr.B shall be provided. 2) 2 nos. of ball & socket connectors for connecting the linkage rod with the output levers. 3) 2 nos. of output lever shall be supplied for Actuator side and Fan side respectively. Further details of linkage rod shall be referred in Annexure B. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). Inspection : Approved Power Cylinder Datasheet & BHEL Linkage rod drawing.				
90	L172759759901001	PNEUMATIC ACTUATOR ASSEMBLY 08" X 08"	NO	1.00
Regulating duty, pneumatic power cylinder for Cold air control damper application with SMART positioner and other accessories, as per the technical specification of the power cylinder No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24099, Rev. 02. Recommended Bore X Stroke Size in inches : 08 X 08. Torque : 50 kgm. Lever length : 270 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Piston Operating speed range : 7 - 9 mm/sec. Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). The make and model shall match with the item supplied under main supply (NS-1) supply. Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
100	L172759759901002	PNEUMATIC ACTUATOR ASSEMBLY 08" X 16"	NO	1.00
Regulating duty, pneumatic power cylinder for Hot air control damper application with SMART positioner and other accessories, as per the technical specification of the power cylinder				

No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24099, Rev. 02. Recommended Bore X Stroke Size in inches : 8 X 16. Torque : 111 kgm. Lever length : 350 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Piston operating Speed Range : 7 to 9 mm/second. Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). The make and model shall match with the item supplied under main supply (NS-1) supply. Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
110	L1727S9759901003	PNEUMATIC ACTUATOR ASSEMBLY 04" X 08"	NO	1.00
Regulating duty, pneumatic power cylinder for Fan blade pitch control application with SMART positioner and other accessories, as per the technical specification No. TCI:143/Rev. 12, as per the technical specification of the SMART positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24099, Rev. 02. Recommended Bore X Stroke Size in inches : 04 X 08. Torque : 10 kgm. Lever length : 150 mm. Angle of rotation : 0 to 90 degrees. Duty : Regulating duty. Tag nos. : HFE 10 AA101, HFE 15 AA101. Operating time : 30 to 35 seconds Action on Loss of Power Air : Stayput. Action on Loss of 4 - 20 mA signal : Stayput. Direction of rotation of the output shaft of the power cylinder with respect to increasing demand signal shall be as per Actuator mounting arrangement furnished along with enquiry. Approved make of SMART Positioners to be followed : SIEMENS, ABB, MASONEILAN, FISHER. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision). The make and model shall match with the item supplied under main supply (NS-1) supply. Inspection : Approved Power Cylinder datasheet, Vendor drawings & Approved Quality Plan.				
120	L1727S9759901004	SEAL KITS, O-RINGS & GASKETS 08" X 08"	SET	2.00
Seal kits, O - rings and gaskets, suitable for the power cylinder of size 08" x 08" (bore x stroke in inches). The make and model shall match with the item supplied under main supply (NS-1) supply. Quality plan : QA:CI:STD:QP:42, (latest revision).				
130	L1727S9759901005	SEAL KITS, O-RINGS & GASKETS 08" X 16"	NO	2.00
Seal kits, O - rings and gaskets, suitable for the power cylinder of size 08" x 16" (bore x stroke in inches). The make and model shall match with the item supplied under main supply (NS-1) supply. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision).				
140	L1727S9759901006	SEAL KITS, O-RINGS & GASKETS 04" X 08"	NO	2.00
Seal kits, O - rings and gaskets, suitable for the power cylinder of size 04" x 08" (bore x stroke in inches). The make and model shall match with the item supplied under main supply (NS-1) supply. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision).				
150	L1727S9759901007	AIR LOCK RELAY	NO	10.00
Air lock relay as per the clause no. 4.3 of the technical specification of power cylinder TCI:143/Rev. 12. Pressure range: 3 to 7 kg/sq.cm. The make and model shall match with the item supplied under main supply (NS-1) supply. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision).				
160	L1727S9759901008	LIMIT SWITCH ASSEMBLY	NO	10.00
Limit switches with mounting accessories Type : Snap action Limit switch enclosure : Dust & weather proof, IP 65, Contacts : 2NO + 2NC of rating : 5A at 240 V AC / 0.2A at 220 V DC. The make and model shall match with the item supplied under main supply (NS-1) supply. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision).				
170	L1727S9759901009	SMART POSITIONER WITH POSITION F/B TXT.	NO	3.00
Smart positioner with mounting accessories, as per the technical specification TCI:143/Rev. 12, as per the technical specification of the smart positioner TCI:317/Rev. 06 and as per the TB wiring drawing 3-97-599-24010, Rev. 02. The make and model shall match with the item supplied under main supply (NS-1) supply. Applicable Quality plan : QA:CI:STD:QP:42 (latest revision).				

End of table

PACKAGE DETAILS

SI No.	MATLCD	DESCRIPTION	UNIT	QTY	QUOTED / NOT QUOTED	PERCENTAGE BREAK-UP
10	L172719759901001	COLD AIR DAMPER ACTUATOR (A-H)(08 X 08)	NO	8.00		
20	L172719759901002	HOT AIR DAMPER ACTUATOR(A-H)(08 X 16)	NO	8.00		
30	L172719759901003	PA FAN BLADE PITCH CONTROL ACTUATOR(A-B)	NO	2.00		
40	L172719759901004	FD FAN BLADE PITCH CONTROL ACTUATOR(A-B)	NO	2.00		
50	L172719759901005	ID FAN BLADE PITCH CONTROL ACTUATOR(A-B)	NO	2.00		
60	L172719759901006	LINKAGE ROD FOR CAD CONTROL	NO	8.00		
70	L172719759901007	LINKAGE ROD FOR HAD CONTROL	NO	8.00		
80	L172719759901008	LINKAGE RODS FOR PA, FD, ID FAN CONTROL	NO	6.00		
90	L1727S9759901001	PNEUMATIC ACTUATOR ASSEMBLY 08" X 08"	NO	1.00		
100	L1727S9759901002	PNEUMATIC ACTUATOR ASSEMBLY 08" X 16"	NO	1.00		
110	L1727S9759901003	PNEUMATIC ACTUATOR ASSEMBLY 04" X 08"	NO	1.00		
120	L1727S9759901004	SEAL KITS, O-RINGS & GASKETS 08" X 08"	SET	2.00		
130	L1727S9759901005	SEAL KITS, O-RINGS & GASKETS 08" X 16"	NO	2.00		
140	L1727S9759901006	SEAL KITS, O-RINGS & GASKETS 04" X 08"	NO	2.00		
150	L1727S9759901007	AIR LOCK RELAY	NO	10.00		
160	L1727S9759901008	LIMIT SWITCH ASSEMBLY	NO	10.00		
170	L1727S9759901009	SMART POSITIONER WITH POSITION F/ B TXT.	NO	3.00		
		TOTAL		76.00		100%

NOTE

1 The tender is floated as a single package.

2 Partial offer will be rejected.

3 **Do not mention the prices here.**

4 Since there is provision to quote only the lump sum amount of the package (as per above list), Bidder is to submit percentage breakup of the total price quoted against each line item.

5 For detailed description / details of items, refer the product catalog.

6 This document shall be submitted along with techno-commercial bid for technical evaluation.

	CONTROLS & INSTRUMENTATION (FB) PRE-QUALIFICATION REQUIREMENT (PQR)	CI:PE: PQR: PC Rev. No: 00 Dt. : 10-06-21
---	--	--

REGULATING DUTY PNEUMATIC POWER CYLINDERS (97-599)

Sl. No.	Description	Bid Requirements
1.	Vendor Capability	Vendor shall be the Original Equipment Manufacturer (OEM) of Regulating duty, Pneumatic power cylinders.
2.	Proven Track record	The offered power cylinder models, should be of proven design, already supplied to Coal fired thermal power plants in India and commissioned in critical applications such as Cold Air Damper/ Hot Air Damper/ Primary Air Fan/Forced Draft fan/Induced Draft Fan blade pitch control/ Induced Draft fan inlet damper control and the same shall be working satisfactorily for a period of minimum 2 years as on the date of techno-commercial bid opening.
3.	Past experience /Reference Projects	• Vendor to submit signed copy of the reference list of projects, where the offered pneumatic power cylinder models, was supplied earlier in the past five years. The reference list should contain the following details, Name of the projects, Customer, Capacity of the plant, location, model number of the actuator, application, year of commissioning and contact details along with relevant PO copies. • Vendor shall submit the performance Certificates from End User/ Principal Contractor (if the supplies were through agencies other than BHEL).
4.	Service & Spares support	Spares & service support shall be available in India.

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. 12

Page 1 of 12

POWER CYLINDERS - REGULATING DUTY

Revision History

REV. NO.	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
01 - 09	----	General Revisions	-sd-	-sd-	-sd-
10	14 -02-18	Revised to include requirement of Metallic Enclosure and Moisture Separator unit	-sd-	-sd-	-sd-
11	08-04-19	Revised to include type test for IP55 certification & modify type of Linkage rods.	-sd-	-sd-	-sd-
12	09-11-19	Revisit	M. Ranganathan	M. Ranganathan	V. S. Srinivasan

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	100meters
2.0	General :	
2.1	Application	Damper Control and Fan Blade pitch control applications.
2.2	Actuator type	Enclosed type, Stand mount, Pneumatic power cylinder(double acting, piston operated), Regulating Duty.
2.3	Construction	• The power cylinder assembly fitted with pneumatic tubing and accessories, shall be mounted on the stand and shall be enclosed in a metallic enclosure, meeting IP 55 protection class requirements as per IEC 60529. • Pneumatic entry, Electrical entry, Output lever and Hand wheel/Lever for manual operation shall be kept outside of the enclosure. • The Enclosure and 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. • 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°). • The requirement of the direction of rotation of the output shaft of the power cylinder, with respect to increasing 4 - 20 mA demand signal shall be as per the purchase enquiry.

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS	
2.4	Air Supply	Power Air	Minimum: 3 kg/sq cm (g). Actuator to be sized for this pressure.
			Maximum : 7 kg/sq cm(g)
2.5	Duty Cycle	Continuous	
2.6	Installation	Outdoor, highly polluted, dusty environment.	
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 and Command signal (4-20mA).	Stay put (Fail freeze).	
2.10	Position indicator	1 No. local mechanical position indicator.	
2.11	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. (ASTM A276 Type 420 or EN19/IS 3930). Gaiters shall be provided to prevent piston rod from rusting.	
3.2	Piston	High Strength Steel. (ASTM A216 Gr. WCB 570/280 (or) ASTM A29 Gr. 1020 (or) Cast Steel Gr. 200-400W/IS 1030)	
3.3	Cylinder barrel	Honed & hard chrome plated, seamless Carbon steel. (ASTM A106 Grade B)	
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		

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
4.1	Limit Switch :	
4.1.1	Quantity	One for open and one for close (2 NO + 2 NC)
4.1.2	Type	Snap action
4.1.3	Limit Switch Enclosure	Dust & Weather Proof, IP 65
4.1.4	Contact Rating	5A at 240 V AC / 0.2A at 220 V DC
4.1.5	Make	Shall be as per the manufacturer's standard
4.2	Positioner	
	Type of positioner: Refer purchase enquiry. - For SMART positioner, separate technical specification has to be referred, if applicable as per purchase enquiry.) - For Pneumatic positioner, Clause 4.2.1, 4.2.2, 4.2.3 are applicable.	
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.
4.2.3	Enclosure	Dust & Weather proof, IP 65
4.3	Air Lock Device :	
4.3.1	Type	Set point has to be adjustable. Self-Reset. Metallic Enclosure.
4.4	Air filter cum regulator :	

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
4.4.1	Supply air pressure range	3 to 10 Kg / sq.cm
4.4.2	Type	Diaphragm
4.4.3	Pressure rating	15 Kg / sq.cm
4.4.4	Material :	
	a. Body	Die-cast aluminium
	b. Inner valve and seating	Stainless steel
	c. Spring	Stainless steel
4.4.5	Filter size	Pneumatic positioner - 25 microns.
		SMART positioner – 5 microns
4.4.6	Filter element	Sintered phosphor bronze
4.4.7	Make	Placka/ShavoNorgren
4.4.8	Pressure gauge :	
	a. Dial	50 mm Diameter
	b. Type	Bourdon
	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.
4.4.10	Protection Class	IP - 65
4.5	Position Transmitter: (In case of SMART positioner, the position feedback transmitter shall be inbuilt.)	

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
	a. Type	LVDT or Non-Contact type, 2 wire
	b. Output	4-20 mA, linear DC output@ 600 ohms max.
	c. Power supply	Loop Powered from the control system.
	d. Enclosure	Die-cast aluminium, Dust & Weatherproof, meeting IP 65 protection class requirements, as per IS/IEC 60529.
	e. Accuracy	$\pm 1\%$ of span
	f. Make	Shall be as per manufacturer's standard
4.6	Moisture Separator Unit and Drain facility	
4.6.1	Type	Shall be provided in the instrument air inlet before Air filter regulator, for filtering out the moisture in the instrument air.
4.6.2	Drain Facility	Level based, automatic drain facility shall be provided. The water collected from the instrument airline shall be drained automatically at periodic intervals.
4.6.3	Enclosure	Metallic Enclosure shall be provided for the moisture separator unit.
4.7	Accessories	- Hand wheel / Lever for manual operation of the power cylinder. - Foundation bolts, Fasteners.
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.

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
4.8.2	Termination of external cable to the Junction box.	As per the 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& Output Levers	Vendor to provide linkage rod as per Annexure B, with suitable ball and socket connectors at both sides (power cylinder and load side) for connecting the output levers with the linkage rod. The name of application & tag nos. have to be painted on the linkage rods for easy identification at site during erection.
6.0	Characteristics of the Power cylinder	
6.1	Sensitivity	± 0.5 % of span.
6.2	Repeatability	± 0.5 % of span.
6.3	Accuracy	± 3 % of span.
6.4	Hysteresis	± 1 % of span.
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	Type tests	
8.1	Load test	Load test shall be conducted as per the manufacturer standard for any one size of the power cylinder.

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
8.2	Durability test	Durability test shall be conducted on any one size (Bore x Dia) of Power Cylinder in each torque range as per the manufacturer standard.
		Torque Range in kgm
		0-50
		50.1 – 200
		200.1 – 1000
8.3	Enclosure protection test	Enclosure protection test (IP 55) for the power cylinder enclosure design, shall be conducted in a recognized NABL laboratories. The test shall be conducted on any one size of the power cylinder.
8.4	Type test reports	• The type test reports conducted on the power cylinders of similar design, as offered for this enquiry/contract, shall be submitted to BHEL for review. • The date of the type test reports has to be within 5 years from the date of bid opening. • If the test reports are not available, as mentioned above, then vendor has to conduct the tests meeting the specification requirements, without any cost implication to BHEL.
9.0	Painting/Finish for both Power Cylinder & Linkage rods	
	a. Paint Shade	Shall be as per manufacturer’s standard
	b. Finish	Corrosion resistant, Epoxy based paint.
10.0	Documents	

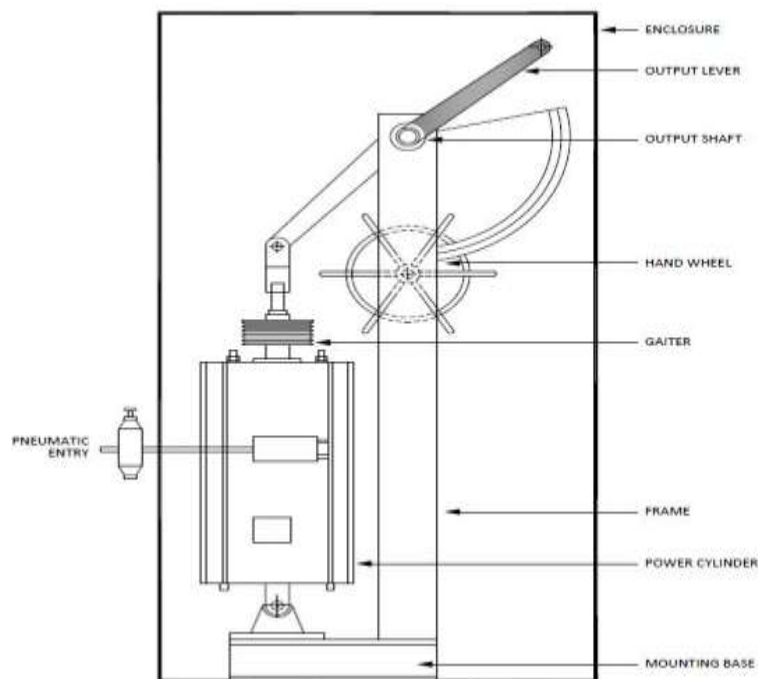
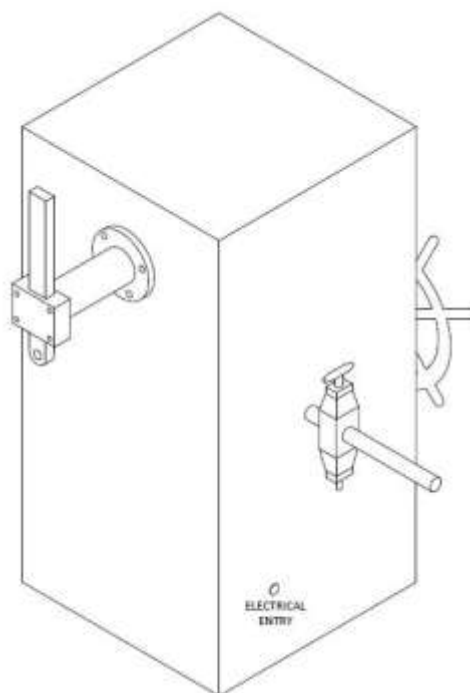
SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
10.1	Documents to be submitted along with the offer.	• The Sub-Delivery Enquiry Deviation format shall be filled in with the details of BHEL's enquiry, project, technical specification of the power cylinder, technical specification of the SMART Positioner (as applicable), 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". • 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.
10.2	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 corrected to pdf version. 3. Dimensional drawings of the linkage rod. 4. Tubing drawing indicating all the accessories. 5. Wiring drawing with terminal blocks numbers. 6. Type test reports as per Clause No. 08 for BHEL's review.

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
10.3	Operation & Maintenance Manuals	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. 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.
11.0	Packing	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. The inner side of the wooden box used for packing, shall be fixed with plastic covers to avoid water entry.

SL. NO.	DETAILS	TECHNICAL REQUIREMENTS
12.0	Bill of material/Scope of supply (brief) for a stand-mount power cylinder assembly.	• <i>Enclosed type, stand mount, Pneumatic operated power cylinder with following accessories</i> ✓ <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>Moisture Separator unit with Auto drain facility</i> ✓ <i>Manual Isolation Valve for Power air.</i> ✓ <i>Equalizing Valve.</i> ✓ <i>Piston movement speed restrictor.</i> ✓ <i>Quick Exhaust Valve (as applicable to meet with the piston operating speed).</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> 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.

Note :-

Foundation bolts, Fasteners, Linkage Rods and other loose items shall be identified separately in shipping list/Delivery challan.

View of Power cylinder assembly with Front side enclosure cover removed**Isometric View of power cylinder with enclosure**

Bharat Heavy Electricals Limited
High Pressure Boiler Plant, Tiruchirappalli-620 014.

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

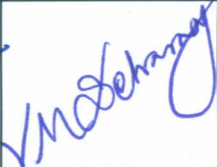
Specification No. TCI : 317

Page 01 of 04

Technical specification

Of

SMART POSITIONER

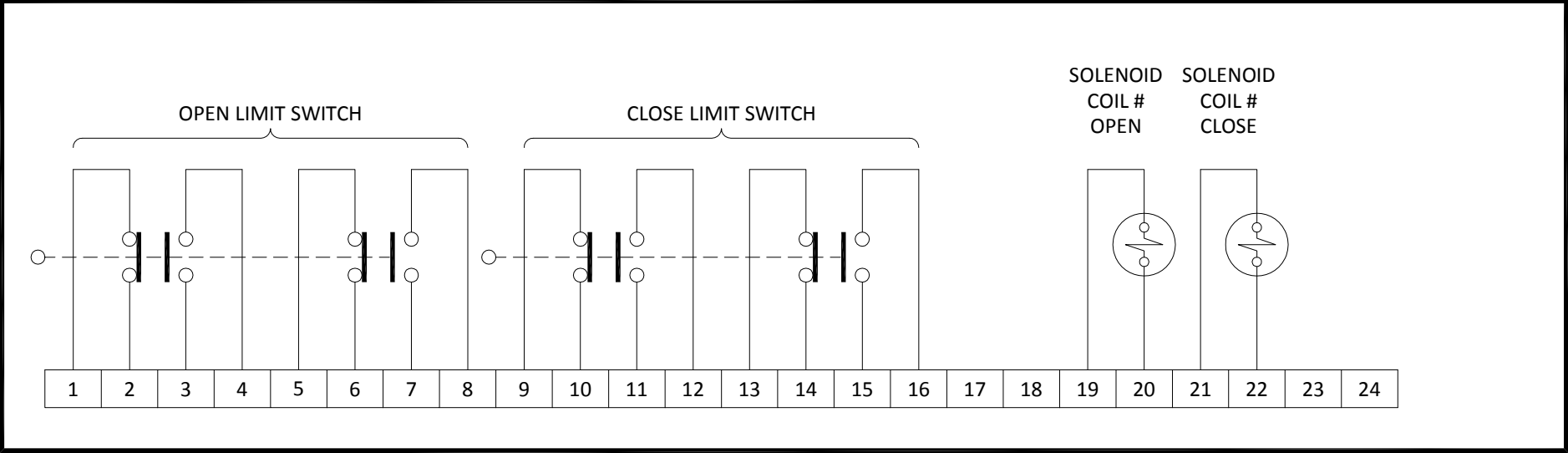
Rev. No.	Date	Description	Prepared	Reviewed	Approved
00 - 05	19-09-18	Initial Release	-sd-	-sd-	-sd-
06	17-10-19	Revised after revisit			

Sl. No	Technical Description/ Requirement	
1	SITE CONDITIONS:- Altitude above Sea Level Atmosphere Relative humidity Operating temperature	500 Meters Tropical, Dusty, Windy & Heavily polluted atmosphere 100 % -30 to 80 degree Celsius
2	Input demand signal	4-20 mA demand signal from DCS.
3	Power Supply	2 wire system, Loop powered from output card of DCS.
4	Operational signal range	4-20 mA. Split range operation shall also be possible if required as per the application.
5	Air Supply	Shall be suitable for 3 – 7 kg/ cm ² Shall be suitable to work with instrument air of quality - Class 2 or Class 3 meeting the requirements of the standard ISO 8573.1
6	Type of Action (Direct/ Reverse)	Shall match with the requirement of the Control Valve/ damper application.
7	Flow Characterization	Shall match with valve characteristics, Linear/ Equal percentage etc.
8	Stroke time	Shall match with the requirement of the Control Valve/ damper application.
9	Single/ Double Acting	Shall match with the requirement of the Control Valve/ damper application.
10	Pneumatic Process Connection	Shall match with the requirement of the Control Valve/ damper application.
11	Communication by Hart Protocol	SMART positioner shall be compatible for Remote calibration & Diagnostics using HART protocol.

Sl. No	Technical Description/ Requirement	
12	Calibration	SMART positioner shall be compatible for Auto Start with self-calibration, Remote calibration using Hart protocol & local/ manual calibration using push buttons available on the positioner.
13	Position feedback Sensing & Transmitter	Position Sensing shall be integral to the SMART positioner. 4-20 mA hardwired current signal for Position feedback shall be provided from the positioner.
14	Electrical Cable entry	Side or bottom entry to avoid water ingress.
15	Protection Class	IP 65
16	Action required during failure of 4 to 20 mA control signal.	Shall be configured for the fail safe position as per the requirement of Control Valve/ damper application.
17	Characteristic Deviation	$\leq 0.5\%$ of span or better.
18	Influence of temperature rise on positioner	$\leq 0.01\%$ per degree Celsius.
19	Accessories	Pressure Gauge Block:- For Supply & output pressure, pressure gauges shall be provided on the positioner. Operator panel:- The positioner shall have a display with push buttons for configuration and for read out. Valve Mounting accessories:- Required mounting accessories & fasteners for mounting the positioner on valve actuators shall be taken care of by the valve vendor.
20	Electro Magnetic Compatibility	SMART positioner shall conform to EMC requirements as per the relevant international standards IEC/ EN.

Sl. No	Technical Description/ Requirement	
21	Hardwired Digital Output Signals from the positioner.	Fault signal output.
22	Diagnostic Features	Positioner shall be provided with diagnostic features for monitoring.
23	Test reports & Catalogues	1. Test Certificates as per Manufacturer's Standard. 2. SMART positioner catalogues & O&M manuals.
24	General Note	The SMART positioner with its accessories/ electronic cards shall be sourced completely from the OEM.

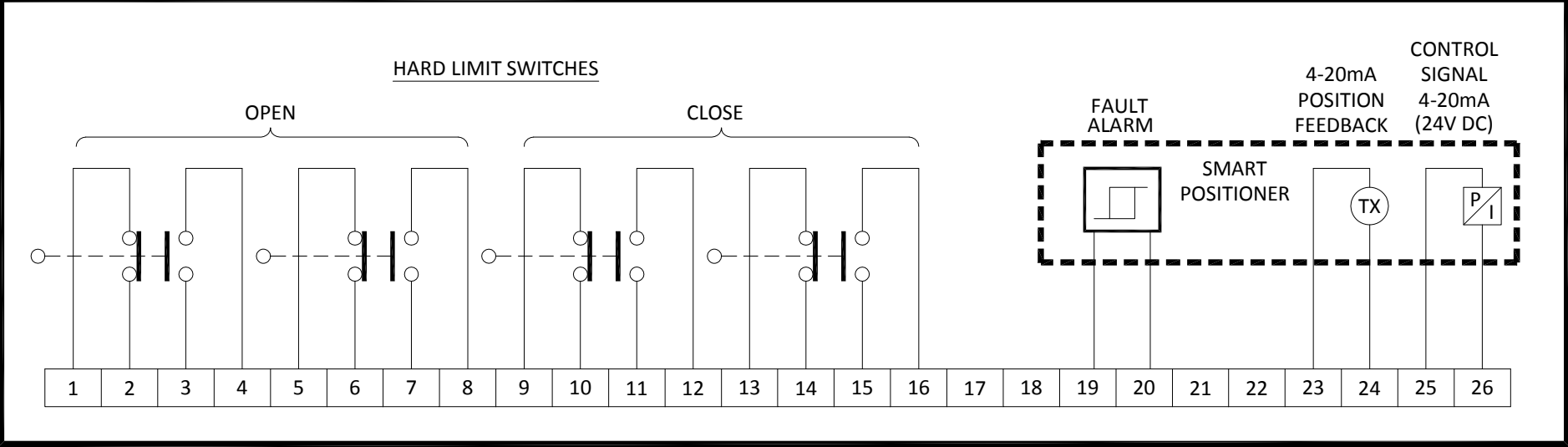
TB DIAGRAM OF OPEN/CLOSE DUTY PNEUMATIC ACTUATOR



NOTE

APPLICABILITY & QUANTITY OF LIMIT SWITCHES SHALL BE AS PER VALVE DATA SHEETS / SPECIFICATION.
- SINGLE OR DUAL SOLENOID FOR THE RESPECTIVE APPLICATION SHALL BE AS PER VALVE SPECIFICATION / DATA SHEET.

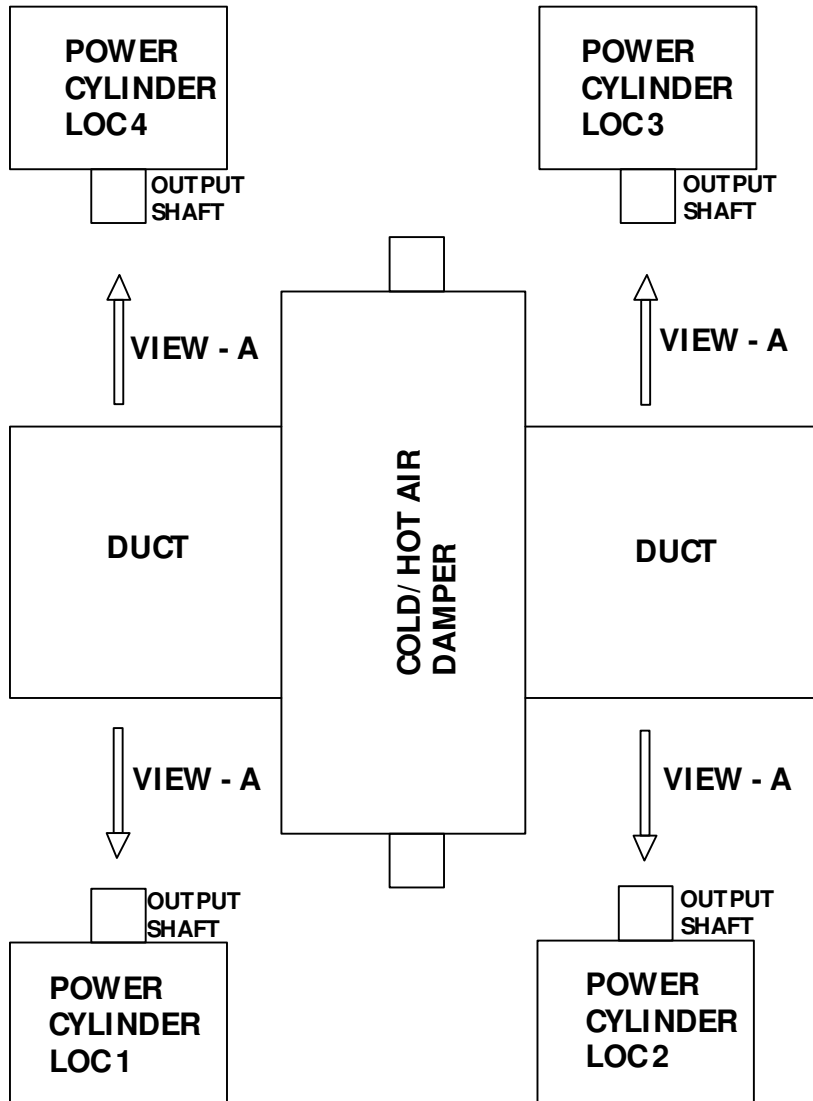
TB DIAGRAM OF REGULATING DUTY PNEUMATIC ACTUATOR



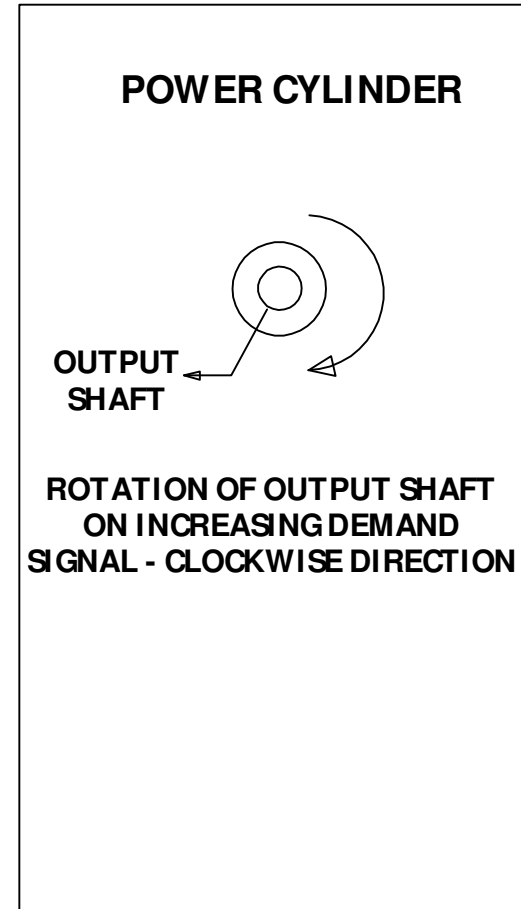
REV	DATE	ALTERED : CHD. / APPD. :	REV	DATE	ALTERED : CHD. / APPD. :
02	211119	211119	01	231019	Sd.\MM/VMS
ZONE	REVISED AFTER REVISIT.		ZONE	REVISED AFTER REVISIT.	

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

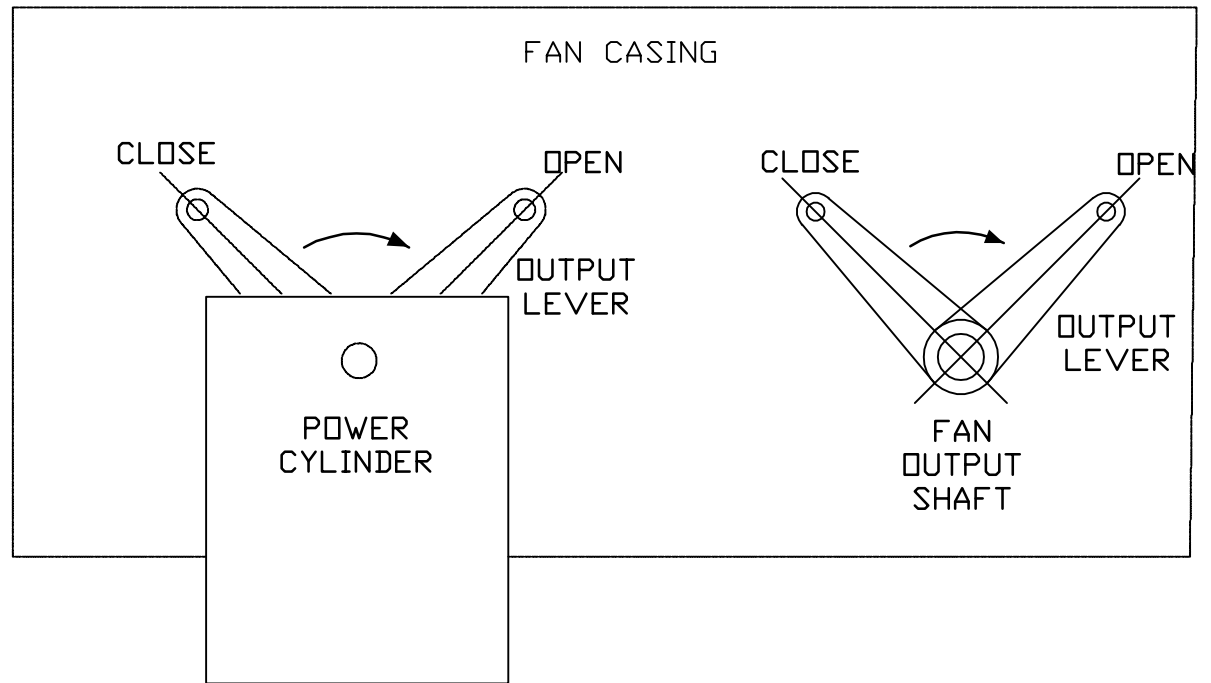
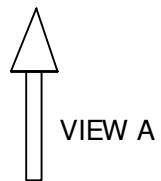
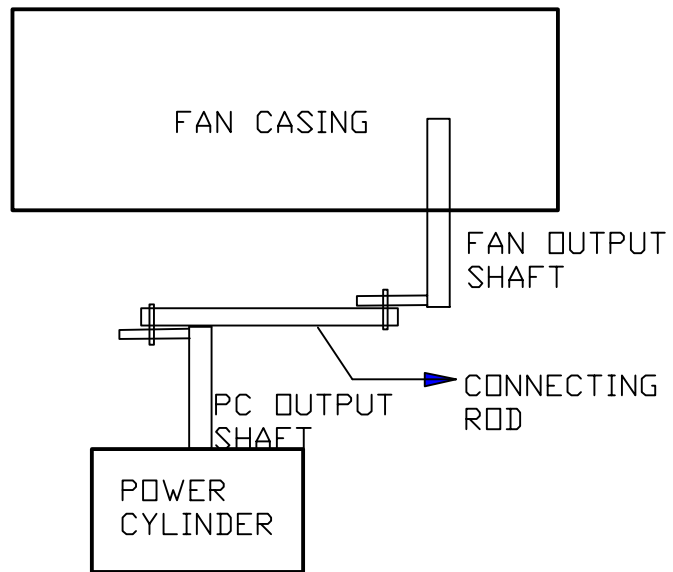
OWNER :		MAHARASHTRA STATE POWER GENERATION COMPANY LIMITED			
PROJECT :		BHUSHAWAL TPS EXPANSION PROJECT 1 X 660 MW, STAGE-IV, UNIT-6, Cust. No. 1727			
CONSULTANT :		DEVELOPMENT CONSULTANTS PRIVATE LIMITED, MUMBAI			
	Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014	DRN	NAME A. Thamburaj	SIGNATURE 280319	DATE 28-03-19
		CHD	M.Muruga Prabu	Sd. / MM	28-03-19
		APPD	V.M.Selvaraaj	Sd. / VMS	28-03-19
DEPT. - C&I		SCALE NTS	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO
CODE - 392					
TITLE TERMINAL BLOCK DIAGRAM FOR PNEUMATIC ACTUATOR (DRAWN FOR INTERMEDIATE POSITION OF ACTUATOR) Sheet 01 of 01			CARD CODE U 01	DRAWING NO : 3-97-599-24099	REV 02



**PLAN VIEW SHOWING CAD/ HAD
WITH POWER CYLINDER MOUNTING
LOCATIONS LOC1/ 2/ 3/ 4**



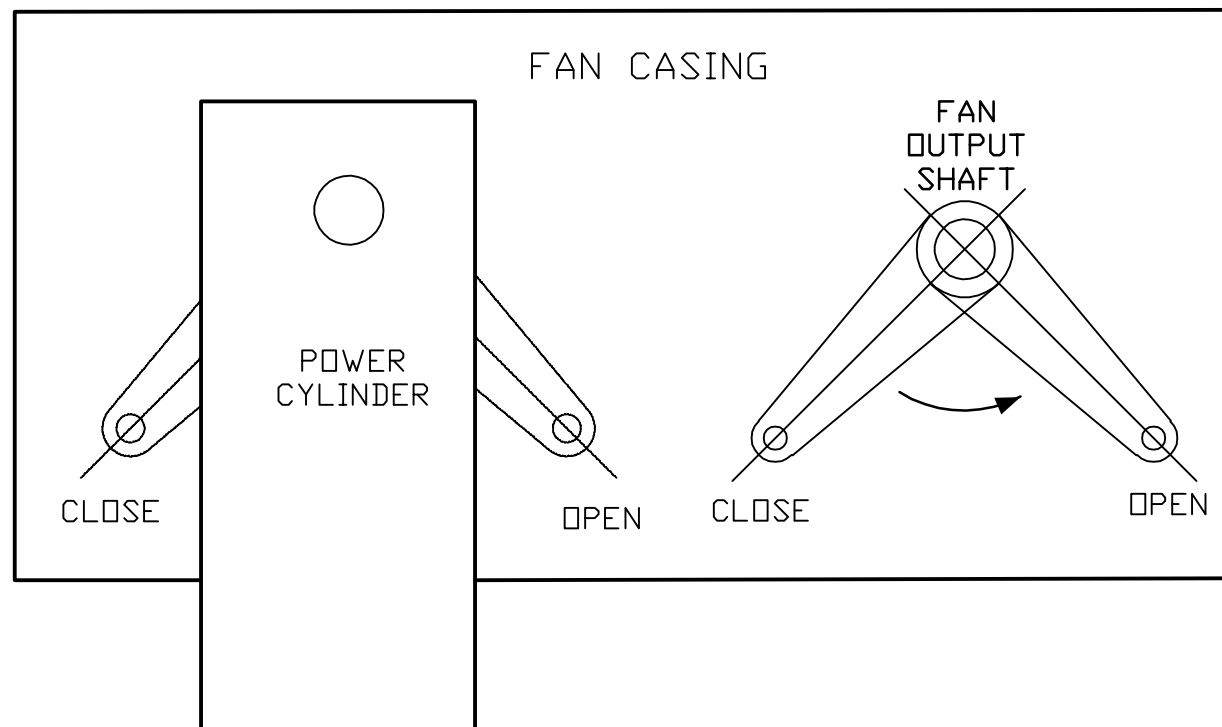
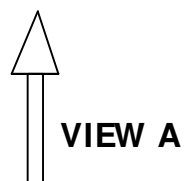
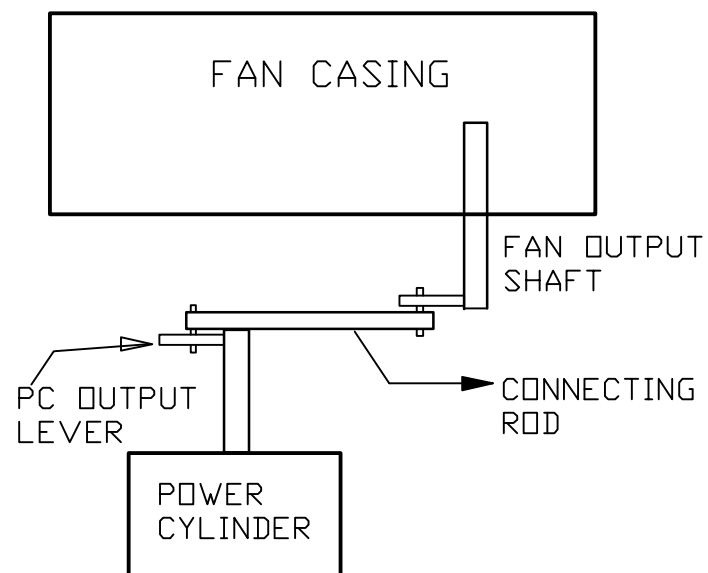
**VIEW - A TOWARDS
POWER CYLINDER SHAFT**



VIEW A

ACTUATOR MOUNTING ARRANGEMENT

FD/ PA FAN APPLICATION

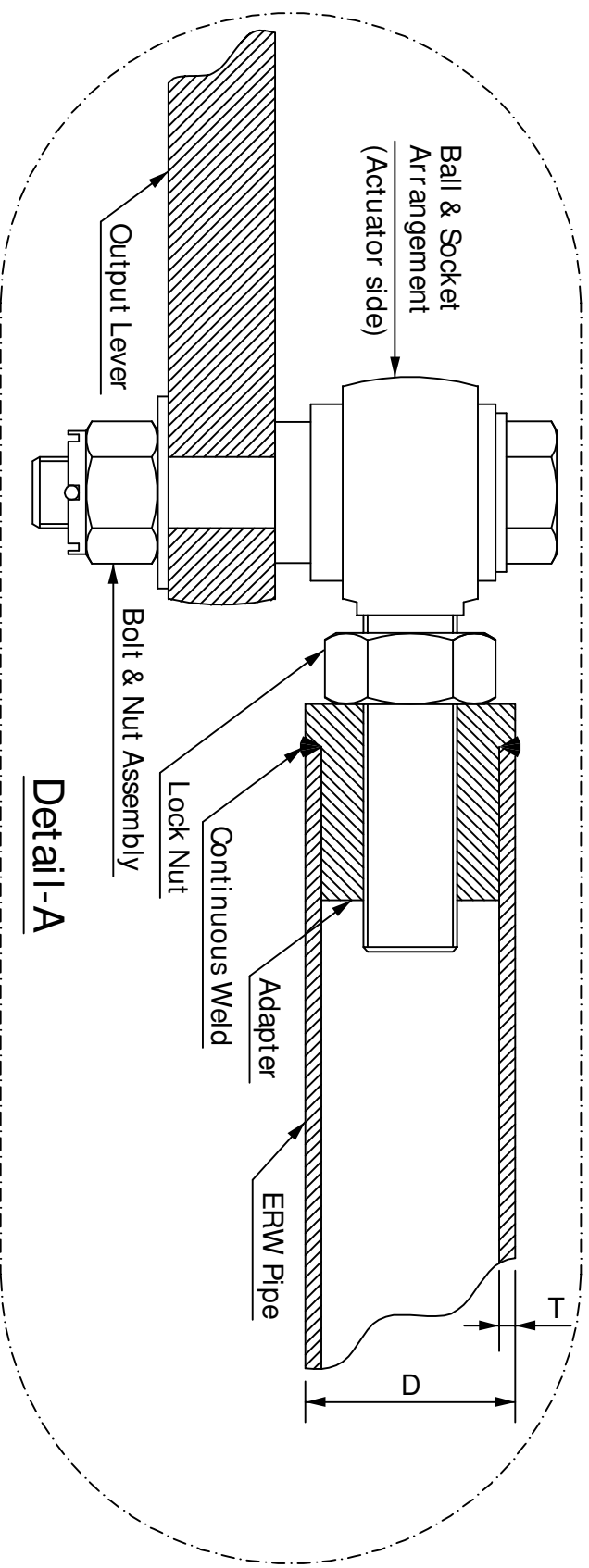
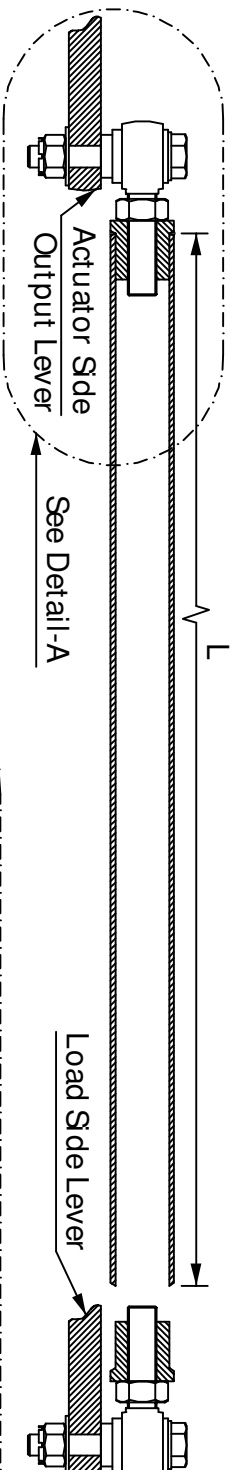


VIEW A

ACTUATOR MOUNTING ARRANGEMENT
ID FAN APPLICATION

ANNEXURE-B

(Details of Ball & Socket type Linkage Rod)



NOTE :-

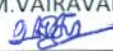
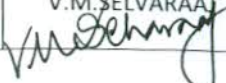
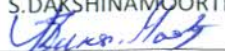
1. The design of the Ball & Socket type Linkage Rod assembly shall be suitable for the rated Torque.
2. The Ball & Socket arrangement and the Adapter shall have Right hand thread on one side and Left hand thread on the other side.
3. The Ball & Socket arrangement at the actuator side shall be factory welded at vendor's works and the Ball & Socket arrangement on the other side shall be supplied as a loose item (to be welded at site).
4. All the items, except the load side lever are in the scope of vendor.
Vendor to refer the purchase enquiry and supply load side lever as per the applicability.
5. The Material used for Ball & Socket arrangement shall be of corrosion resistant.
6. The Length of the Bolt required at the Load side will be indicated during the approval of Dimensional/ GA drawing.

Sl. No.	Torque (kgm)	ERW Pipe Dimensions D x T x L (mm)
1	Upto 50	48.3 x 4 x 1000
2	51 to 150	60.3 x 4.5 x 1000
3	151 to 250	76.1 x 4.5 x 1000



CONTROLS AND INSTRUMENTATION/QA/FB

STANDARD QUALITY PLAN FOR PNEUMATIC ACTUATOR (POWER CYLINDER) (OPEN / CLOSE AND REGULATING TYPE)

REV	DATE	PREPARED	REVIEWED		APPROVED	REVISION HISTORY
00	14/05/1993	Sd/-	Sd/-		Sd/-	Initial release.
01	16/06/1997	Sd/-	Sd/-		Sd/-	Format revised
02	21/06/2002	Sd/-	Sd/-		Sd/-	Department name changed, CTQ requirements added & general revisions
03	08/01/2004	Sd/-	Sd/-		Sd/-	Revised to include the Comments / feedback of internal discussion
04	14/09/2010	Sd/-	Sd/-		Sd/-	Format changed. Revised as per feedbacks from QC and Engineering during discussion
05	16/05/2017	V.AVINASH 	RM.VAIRAVAN 	V.M.SELVARAJ 	S.DAKSHINAMOORTHY 	Revised to update the standards. Endurance test definition given in detail.

	BHARAT HEAVY ELECTRICALS LIMITED TIRUCHIRAPPALLI - 620014	QUALITY PLAN FOR PNEUMATIC ACTUATOR	QA:CI:STD:QP:42 Rev: 05 Page: 2 of 5
---	--	--	---

Sl. No	Component & Operation	Characteristics	Class	Type of Check	Quantum of check		Ref Doc. & Acceptance STD	Format of record	AGENCY			Remarks
					M	B/ C			M	B	C	
A	Raw materials & Brought Out items inspection											
1	cylinder	a. Material	Major	CHEM	OSPL	-	P.O Specification	TC/LGB	V	V	-	
		b. dimension	Major	MEAS	100%	-	Mfr. standard	LGB	P	-	-	
		c. Finish	Major	MEAS	100%	-	Mfr. standard	LGB	P	-	-	
2	Piston rod, Piston Cylinder caps, Piston rings	a. Material	Major	CHEM	OSPL	-	P.O Specification	TC/LGB	V	V	-	
		b. dimension	Major	MEAS	100%	-	Mfr. standard	LGB	P	-	-	
		c. Finish	Major	MEAS	100%	-	Mfr. standard	LGB	P	-	-	
3	“o “ ring	a. Material	Major	CHEM	OSPL	-	P.O Specification	TC/LGB	V	V	-	
		b. dimension	Major	MEAS	100%	-	Mfr. standard	LGB	P	-	-	
4	House & Cover	a. Material	Major	CHEM	OSPL	-	Mfr. standard	TC/LGB	V	V	-	
		b. dimension	Major	MEAS	100%	-	Mfr. standard	LGB	P	-	-	
5	Air filter regulator	a. Make & Type	Major	PHYS	100%	-	P.O Specification/ Data sheet	LGB	P	V	-	
		b. Dimension of Process Connection, Filter size	Major	MEAS	100%	-	P.O Specification/ Data sheet	LGB	P	-	-	
		c. Pressure gauge range	Major	PHYS	100%	-	P.O Specification/ Data sheet	LGB	P	-	-	
		d. Calibration / accuracy test, Functional test	Major	PHYS	100%	-	Mfr. standard	LGB	P	v	-	
6	Limit switch	a. Make & Type	Major	PHYS	100%	-	P.O Specification/ Data sheet	LGB	P	v	-	
		b. Functional Check	Major	ELEC	100%	-	Mfr. standard	LGB	P	-	-	
7	Air lock relay	a. Make & Type	Major	PHYS	100%	-	P.O Specification/ Mfr. standard	LGB	P	-	-	
		b. Functional Check	Major	PHYS	100%	-	Mfr. standard	LGB	P	-	-	
8	Solenoid valve	a. Make & Type	Major	PHYS	100%	-	P.O Specification/ Data sheet	LGB	P	v	-	
		b. Functional Check	Major	ELEC	100%	-	Mfr. standard	LGB	P	-	-	
		c. Hydro test	Major	MECH	100%	-	Mfr. standard	TC/LGB	v	-	-	

M - MANUFACTURER/ SUB-VENDOR; **B** - BHEL / TPI ; **C** - CUSTOMER / TPI
P - PERFORM ; **W** - WITNESS **V** - VERIFICATION; **OSPL**: ONE SAMPLE PER LOT

	BHARAT HEAVY ELECTRICALS LIMITED TIRUCHIRAPPALLI - 620014	QUALITY PLAN FOR PNEUMATIC ACTUATOR	QA:CI:STD:QP:42 Rev: 05 Page: 3 of 5
---	--	--	---

Sl. No	Component & Operation	Characteristics	Class	Type of Check	Quantum of check		Ref Doc. & Acceptance STD	Format of record	AGENCY			Remarks
					M	B/ C			M	B	C	
9	Positioner (applicable only for regulating Type)	a. Make & Type	Major	VISU	-do-	-	P.O Specification/ Data sheet	LGB	P	V	-	Performance to be Checked during complete assembly testing
		Calibration / Hysteresis and accuracy test	Major	VISU	-do-	-	P.O Specification/ Data sheet	LGB	P	V	-	
10	Position feedback transmitter (applicable only for regulating Type)	a. Type	Major	VISU	100%	-	P.O Specification/ Data sheet	LGB	P	V	-	
		b. Functional type	Major	VISU	100%	-	P.O Specification/ Data sheet	LGB	P	V	-	
B	In-Process Inspection											
1	Routine test	a. Physical Verification of Mounting & Finish	Major	PHYS	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	
		b. Dimensional Check including process connections	Major	MEAS	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	
		c. Linkage Rod dimension	Major	MEAS	100%	20%	Drawing	IR	P	W	-	
		d. Verification of BOM	Major	PHYS	100%	20%	Data sheet	IR	P	W	-	
		e. Stroking length & Operating time	Critical	PHYS	100%	20%	Data sheet	IR	P	W	-	
		f. No load test	Critical	PHYS	100%	20%	Mfr. standard	IR	P	W	-	
		g. Pressure resistance test	Critical	PHYS	100%	Sample /size	Mfr. standard	IR	P	W	-	
		h. Response time test	Critical	PHYS	Sample /size	Sample /size	Mfr. standard	IR	P	W	-	
		i. Functional & Performance test (sensitivity , Repeatability, Accuracy & Hysteresis)	Major	MECH	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	
		j. PFT feedback/functional verification	Major	MECH	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	

M - MANUFACTURER/ SUB-VENDOR; **B** - BHEL / TPI ; **C** - CUSTOMER/ TPI
P - PERFORM ; **W** - WITNESS **V** - VERIFICATION; **OSPL** : ONE SAMPLE PER LOT

	BHARAT HEAVY ELECTRICALS LIMITED TIRUCHIRAPPALLI - 620014	QUALITY PLAN FOR PNEUMATIC ACTUATOR	QA:CI:STD:QP:42 Rev: 05 Page: 4 of 5
---	--	--	---

Sl. No	Component & Operation	Characteristics	Class	Type of Check	Quantum of check		Ref Doc. & Acceptance STD	Format of record	AGENCY			Remarks
					M	B/ C			M	B	C	
		k. Positioner - functional check	Major	MECH	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	
		l. Stay put device operation	Critical	VISU	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	
		m. Solenoid valve- coil voltage, duty cycle & coil insulation Resistance Test	Major	VISU	100%	20%	P.O Specification/ Data sheet	TC/ COC	V	V	-	Applicable for Open / close type
		n. Air filter element size in microns	Major	VISU	100%	20%	P.O Specification/ Data sheet	COC	V	V	-	
		o. Manual operation check	Major	MECH	100%	20%	P.O Specification/ Data sheet	IR	P	W	-	
2	Type test	a. Load test	Critical	PHYS	One of design		Mfr. standard	TC	V	V	-	
		b. Durability test	Critical	PHYS	One of design		Mfr. standard	TC	V	V	-	In each Torque Range Refer Note :11



C.NOTES:

1.LEGENDS:

MECH	:	Mechanical	MEAS	:	Measurement
ELEC	:	Electrical	LGB	:	Log Book
CHEM	:	Chemical	TC	:	Test certificate
VISU	:	Visual	IR	:	Inspection Report
PHYS	:	Physical	COC	:	Certificate of compliance
OSPL	:	One sample per lot			

- The vendor at their works shall arrange all testing facilities. Tests for which facilities are not available are to be carried out at recognized National Test Houses like ETDC/CIL/NPL/ERTL etc., at vendor cost.
- Through Log Book / any other documents available at the vendor's works, it shall be possible to correlate the finished products with raw material and in process stage checks/ inspection carried out.
- All Measuring and Testing Instruments shall be periodically calibrated by the Laboratory accredited by NABL and certificate shall be provided during inspection.
- All Test certificates/ Report shall be submitted to GSECL/DCPL for verification.
- Type test certificate shall not be earlier than 5 years from the date of Purchase enquiry.
- BHEL approved specification, drawing and data sheet shall be used

8. Vendor to given tentative inspection program in advance and confirm exact date two weeks in advance for arranging inspection.

9. Packing shall be as per the "PACKING PROCEDURE" indicated in the specification.

10. Inspection / verification will be carried out by BHEL / Authorized Inspection Agency at vendor works.

11. Durability Test: The number of stroking cycles shall be conducted as below:

Torque Range	No. of cycles to be conducted
0-50kgm	250000
50-200kgm	200000
200-1000kgm	100000

One Cycle consist of nominal 90 degree angular travel in both the directions (90 degree to open and 90 degree to close). For angular other than 90 degree, the endurance shall be agreed between the purchaser and manufacture / supplier. This test shall be conducted on any one size (Bore x Dia) of Power Cylinder.



429-024

**PURCHASE / MM / BOI
ENQUIRY DEVIATION**

PAGE

1 OF 1

**SCHEDULE OF DEVIATION TO
BOI ENQUIRY NO:****GEM/2021/B/1283413****DATE****15.06.2021****DESCRIPTION****PNEUMATIC ACTUATORS FOR COAL FIRED THERMAL POWER PLANT****SPECIFICATION****Power Cylinder: TCI: 143/R12
SMART Positioner: TCI:317/R06****QUALITY PLAN****SQP:42/R5****DRAWINGS****TB Wiring: 3-97-599-24099/ R02
Annexure-A / Actuator Mounting Arrangement
Annexure-B / Linkage Rod drawing****DOCUMENT REFERENCE****BHEL ENQ. CALLED FOR****FIRM'S ALTERNATIVE OFFER****CERTIFIED THAT OTHER THAN THE ABOVE DEVIATIONS, WE ARE ACCEPTING ALL THE OTHER
SPECIFICATIONS AND REQUIREMENTS IN FULL TO YOUR ENQUIRY.****STATION:****DATE:****SIGNATURE OF FIRM'S REPRESENTATIVE****FIRM SEAL**

- NOTE**
1. Deviations should be taken only in the extreme case.
-
2. If necessary, use additional sheets with page control number.