

**General Note: BHARAT HEAVY ELECTRICALS LIMITED**

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( A Government of India Undertaking )  
 HIGH PRESSURE BOILER PLANT  
 PURCHASE DEPARTMENT - FOSSIL BOILERS  
 THIRUCHIRAPALLI - 620014  
 TAMILNADU (INDIA)

PHONE : 0431-2574111  
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429-002/A

<b>OFFICE COPY</b>	<b>Collective No.</b>	<b>Enquiry Date</b>	<b>Due Date For Quotation</b>
	1802200050	19.03.2022	30.03.2022
Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order			

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	A4410S4110003001 POWER CYLINDER - SEC. AIR O/C AIR CYLINDER ASSEMBLY AS PER ENCLOSED SPECIFICATION IOCL:FS:002/REV.00 AND DRAWING 3-41-100-00658/REV.00. ENCLOSURES: 1. SPECIFICATION:IOCL:FS:002 REV.00 2. DRAWING NO.:3-41-100-00658/00 Remarks A),,All materials shall be defect free and shall be replaceable free of cost during guarantee period. B),,The performance of item shall be guaranteed for a period of 18 months from date of supply or 12 months from the date of commissioning (whichever is earlier). C),,All openings (fluid, pneumatic and electric) shall be firmly capped. D),,Item shall be packed in wooden boxes with water proof under cover. E.,,Packing and struts shall be used to arrest rolling of items and to avoid transit damages. F. o & M instruction manual in the form of soft copy-2CD's to be submitted by the vendor. ,,	NO	12.000	12.00	24.06.22

**General Note:****Enclosures:****"LD clause has to be confirmed without fail."**

The bidder along with its associate / collaborators / sub-contractors / sub-vendors / consultants / service providers shall strictly adhere to BHEL fraud prevention policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

**PR Links**

The offers should reach us 30 minutes before the time of opening of tenders.  
 The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,  
 For **BHARAT HEAVY ELECTRICALS LIMITED**

MANAGER / PURCHASE  
 (FOSSIL BOILERS)



## Specification power cylinders - open/close type

### 1.0 Ambient conditions

- 1.1 Altitude above sea level : 310m  
1.2 Ambient temperature : 80 °C  
1.3 Atmospheric conditions : Dusty, corrosive and highly polluted.  
1.4 Relative humidity : 85%

2.0 Application : For open/close of air flow control sleeve of a Burner.

3.0 Operating Medium & : Dry non-lubricated compressed air at Minimum pressure 3 kg/sq.cm. (g) and 10 Kg/sq.cm. (g) Maximum at 50° C

4.0 Actuator type : With piston rod clevis  
3 inch dia. Bore, 520 mm stroke; double acting cylinder with cushion at both ends 'C' with viton seals.

Port connection should be ¼" NPT (female) on opposite faces of head.

5.0 Mounting orientation : Horizontal

6.0 Drawing number : 3-41-100-00658 / Rev: 00.

7.0 Rate of piston movement : 12 mm/sec.

### 8.0 Materials and Construction Features:

#### a. Body:

The cylinder body shall be corrosion resistant seamless tubing, honed and hard Chrome, plated to a fine finished of 0.4 to 0.3 microns to ensure a minimum friction and long seal life. The body should be concentric with center line of the piston rod and the piston.

PREPARED BY: <b>Bimal Chowdhury</b>		CHECKED BY: <b>Shankar Naik V</b>		APPROVED BY: <b>Shankar Naik V</b>		DATE: 09.02.2022	
Rev. No.	DETAILS	REVISED BY:	APPROVED BY:	DATE:			



**b. Piston rod:**

Piston rod having a high yield strength (6500 BAR) shall be sufficiently case hardened (52HRC) and hard chrome plated to ensure a “dent resistant” surface. It shall have a fine finish (0.4 microns) to ensure long seal life.

**c. Piston:**

Piston shall be off single piece construction. It should be concentrically fitted with unique. Three point support. It shall have a large surface contact area to reduce the bearing loads during mechanical deflection. Piston faces shall be essentially flat to reduce the upswept volume for higher pressure buildup. A self-centering cushion sleeve shall be provided at the head and side of the piston.

**d. Piston seal:**

It shall be of good quality to adjust to Mechanical deflection and wear. It shall be of Viton material to withstand the service temperature.

**e. Piston rod glands:**

It shall have long bearing surface with suitable leak proof seals assuming lubrication from inside the cylinder. Teflon dirt wipers shall be provided to remove dirt from the piston rod.

**f. Piston rod gaiter:**

The piston rod shall be provided with protective expansion bellow type boots to avoid dust setting on the piston rod, suitable for 120°C temperature.

**g. Ports shall be so provided as to ensure unobstructed flow without interference from the gland. The cylinder shall contain cushion adjusting needle valve or pre-adjusted cushions.**

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**9.0. Standards:**

**Shall be in accordance with NFPA & JIC standards for shut off application.**

**10.0. Following works test certifications shall be furnished along with supplies.**

- a. Leak test**
- b. Routine operating test**
- c. Type test for endurance and cycle operations**
- d. Certificate of material & dimensional compliance.**

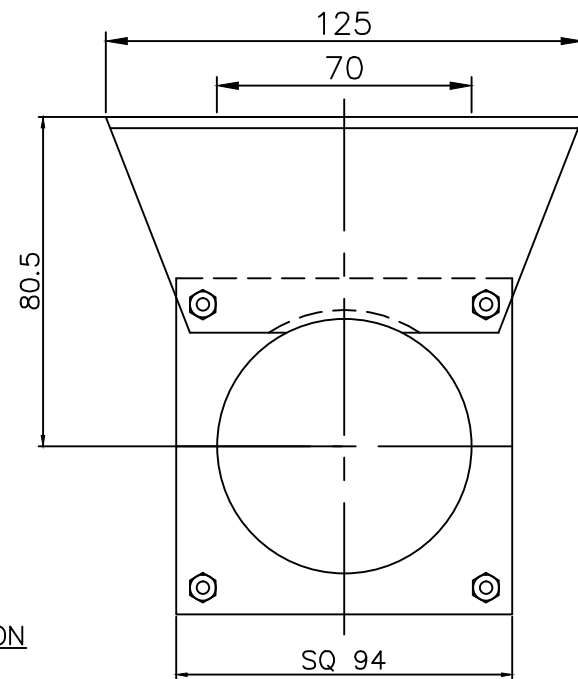
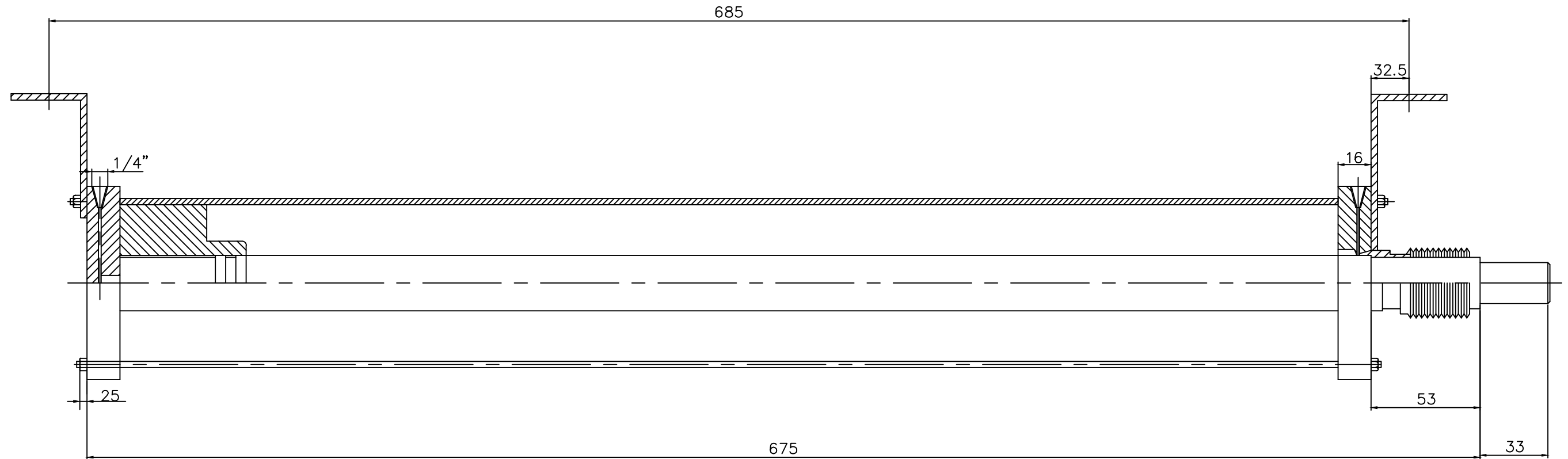
**11.0. Along with other technical details and catalogues the offer shall contain the following information:**

- 11.1. Dimensional drawings of power cylinders and piston, the type and size of threads at the rod and the rod eye, dimensional details of pin and mounting base plates.**
- 11.2. Free air consumption of the power cylinders in scfm or N cu.m/hr.**
- 11.3. Weight of the each power cylinders in kg.**
- 11.4. Cross sectional drawings of the offered equipment showing piston rods, seals, gland and cushion with adjusting needles.**
- 11.5. Offer shall bring out clearly the materials of construction for each and every part of the cylinders.**

<b>PREPARED BY:</b> <b>Bimal Chowdhury</b>		<b>CHECKED BY:</b> <b>Shankar Naik V</b>		<b>APPROVED BY:</b> <b>Shankar Naik V</b>		<b>DATE:</b> 09.02.2022	
<b>Rev. No.</b>	<b>DETAILS</b>			<b>REVISED BY:</b>	<b>APPROVED BY:</b>	<b>DATE:</b>	

DRAWING NO: 3-41-100-00658

FOR TOLERANCES OF UNTOLERANCED  
DIMENSIONS DURING MANUFACTURE  
REFER PLANT STD.NO TP 023 0299



**SPECIFICATION**

BORE : 3"  
 STROKE : 520 MM  
 PISTON ROD DIA : 25 MM  
 TYPE : DOUBLE ACTING BOTH ENDS CUSHIONED  
 OPERATING PR. RANGE : 3-7 KG/SQ.CM  
 MOUNTING : FRONT HEAD MOUNT  
 MAX. WORKING PRESSURE : 10 KG/SQ.CM  
 TEST PRESSURE : 15 KG/SQ.CM

REV	DATE	ALTERED :
01		CHD & APPD:
ZONE		



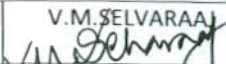
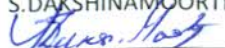
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.				TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT			
				DEPT FS CODE 129		ALL DIMENSIONS ARE IN MM	
DEPT 355-055		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		WEIGHT (Kg)		REF TO ASSY / OLD DWG	
DRN Srinivas CHD Srinivas APPD Farooq		NAME Srinivas		SIGNATURE -sd-		DATE 04.07.07 05.07.07 05.07.07	
TITLE POWER CYLINDER FOR SEC.AIR O/C						DRAWING NO : 3-41-100-00658	
						REV 00	





## 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.



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	
<b>A</b>	<b>Raw materials &amp; Brought Out items inspection</b>											
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	-	-	



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>B</b>	<b>In-Process Inspection</b>											
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	-	



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			

2. 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.
3. 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.
4. All Measuring and Testing Instruments shall be periodically calibrated by the Laboratory accredited by NABL and certificate shall be provided during inspection.
5. All Test certificates/ Report shall be submitted to GSECL/DCPL for verification.
6. Type test certificate shall not be earlier than 5 years from the date of Purchase enquiry.
7. 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:

<b>Torque Range</b>	<b>No. of cycles to be conducted</b>
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.