

	Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD				TC 65207	
							Rev No. 03	
							Page 1 of 13	
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.		SPECIFICATION FOR SEAL GAS BOOSTER						
		Ref. Doc		Rev. No.	Revisions	Prep.	Appd.	Date
	03		New variants added. Pneumatic booster specified.	RAM	PSVS	29.11.2016		
	02		EQC requirements updated	RAM	PSVS	06.11.2014		
	01		Updated	RAM	PSVS	16.08.2014		
	00		First Issue	RAM	VVS	02.08.2012		



PRODUCT STANDARD
TC ENGINEERING
HYDERABAD

TC 65207

Rev No. 03

Page 2 of 13

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.

Ref.	Doc
------	-----

TABLE OF CONTENTS	
CLAUSE NO.	TITLE
1	SCOPE
2	TECHNICAL DATA
3	TECHNICAL REQUIREMENTS
4	SPARES REQUIREMENT
5	NACE COMPLIANCE
6	DESIGN STANDARDS (AS APPLICABLE)
7	PIPING REQUIREMENTS
8	DOCUMENTATION REQUIREMENTS
9	EQUIPMENT QUALIFICATION CRITERIA (EQC)
10	PROVEN TRACK RECORD
11	INSPECTION AND TESTING REQUIREMENTS
12	MARKING AND SHIPPING
13	DEVIATIONS
14	GUARANTEE
15	TENDER EVALUATION CRITERIA
16	TENDER REJECTION
17	SPECIAL NOTES
18	TABLE-1: CHECK LIST
19	TABLE-2: PTR FORMAT
20	TABLE-3:DEVAITION FORMAT
21	CERTIFICATE FOR LOGISTICS SUPPORT
22	TABLE-4: PRICE SCHEDULE

1.0 SCOPE

This specification defines the scope of supply for a seal gas booster (s) that shall be used to ensure seal gas flow to centrifugal compressor dry seals during compressor start-up or when compressor is in pressurized shutdown.

The seal gas booster (s) is realized as pneumatic driven, reciprocating (single or double acting) compressor. The booster (s) shall be suitable for horizontal or vertical mounting.

2.0 TECHNICAL DATA

2.1 **Utility:** Instrument Air (for pneumatic drive)

SL NO	PARAMETER	MIN	NOR	MAX	MECH. DESIGN
a	Pressure (kg/cm ² g)	3.5	5.2	7.0	10.0
b	Temperature (°C)	35	40	40	60

2.2 Design conditions-Process

SL NO	PARAMETER	VALUE
a	Design Pressure	63.3 kg/cm2g
b	Design Temperature	200 °C
c	Helium Gas leak test Pressure	95 kg/cm2g

2.3 Operating conditions:

SL NO	PARAMETER	VALUE		
a	Operating case	Case-1	Case-2	Case-3
b	Inlet Pressure (Kg/Cm2g)	34.56	34.56	3.76
c	Inlet Temperature	110.4	110.4	42
d	Gas Mol Wt.	2.097	2.097	28.016
e	Flow (min. required)	22	20	32
f	Pressure increase (ΔP required, Kg/Cm2)	2.0	8.9	2.0

2.4 Gas Composition:

SL NO	COMPONENT	Mol. Wt.	Case-1 & 2 (Mol%)	Case-3 (Mol%)
a	Hydrogen	2.016	99.5	0
b	Nitrogen	28.016	1000 ppmv	100
c	Carbon dioxide	44.010	50 ppmv	0
d	Hydrogen Sulphide	34.076	Balance	0
e	Chlorine	35.453	1 ppmv	0
f	Average Mol. Wt.		2.097	28.016

Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207
			Rev No. 03
			Page 4 of 13

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.

2.5 **Hazardous area classification:**
 2.5.1 IEC Zone-1, Gas group IIC, T3.

3.0 **TECHNICAL REQUIREMENTS**

3.1 The booster shall be suitable for operation of minimum 2000 hrs without any maintenance required.

3.2 The seal gas booster(s) shall be suitable for instant start-up without any lead time.

3.3 The booster material shall be SS316 / SS316L as a minimum.

3.4 The booster shall be supplied in completely assembled condition. BHEL shall connect the gas inlet & outlet lines, instrument connection. Vendor to inform accessories required (like air filter & regulator, SOV) etc. to be supplied by purchaser.

3.5 All the sizing, material selection, design etc. shall be in line with ASME standard for pressure equipment.

4.0 **SPARES REQUIREMENT**

4.1 Commissioning spares required for commissioning the offered equipment as per vendor recommendation for all pneumatic equipment shall be included in Vendor's scope of supply along with the main equipment. Vendor to submit a list of such spares required along with the offer.

4.2 Mandatory spares shall be as follows to be included in vendor's scope of supply. The word "TYPE" means the make, model no, range, size/length, rating, material as applicable.

4.2.1 Pneumatic actuated booster:

- Pneumatic circuit spares (as applicable): all wear & tear parts and seals including:
- Pneumatic cylinder-01 no
- Air filter reducer-01 no
- Snubber-01 no
- Pneumatic distributor-01 no

4.2.2 Process side Booster spares: 01 set of all wear & tear parts and seals including:

- gaskets
- seals
- o-rings
- check valve

4.2.3 Special tools kits & tackles: as per vendor recommendation.

5.0 **NACE COMPLIANCE**
 The wetted parts of booster shall be compliant to NACE MR-0103 / MR-0175 latest edition.

6.0 **DESIGN STANDARDS (AS APPLICABLE)**

6.1 European directive no 94/9/EC (ATEX)

6.2 European directive no 97/23/EC (PED)

6.3 ASME VIII Div. 1

6.4 ANSI B16.34

6.5 NACE MR-0103 / MR-0175

7.0 **PIPING REQUIREMENTS**

7.1 **CONNECTIONS**

Description	Type
Process gas inlet	Vendor to inform

Ref.
Doc

Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD		TC 65207						
				Rev No. 03						
				Page 5 of 13						
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.	<table border="1"> <tr> <td>Process gas outlet</td> <td>Vendor to inform</td> </tr> <tr> <td>Vent / drain</td> <td>Vendor to inform</td> </tr> <tr> <td>Instrument air inlet</td> <td>Vendor to inform</td> </tr> </table>				Process gas outlet	Vendor to inform	Vent / drain	Vendor to inform	Instrument air inlet	Vendor to inform
	Process gas outlet	Vendor to inform								
Vent / drain	Vendor to inform									
Instrument air inlet	Vendor to inform									
7.2 All the materials in contact with gas inlet / outlet and vent shall be of SS 316 / 316L or equivalent forging / casting materials. 7.3 All the materials in instrument airline shall be SS316 piping / tubing. 7.4 All Butt-welded joints shall be TIG welded and the welds shall be 100% radio graphed. 7.5 All the vent/ drain holes, if any shall be plugged with threaded plugs/caps. 8.0 DOCUMENTATION REQUIREMENTS 8.1 Along with technical offer, arranged in this sequence only: 8.1.1 Booster technical details. 8.1.2 Booster Performance / operation graphs / curves. 8.1.3 Booster Data sheets. 8.1.4 Instrument air consumption. 8.1.5 Recommended spares list along with special tools (if any). 8.1.6 Signed & stamped copy of this specification. 8.1.7 Filled in Check List (Table-1). 8.1.8 Filled in PTR (Table-2). 8.1.9 Filled in Deviation Format (Table-3). 8.1.10 Filled in Price Schedule (Table-4) marked 'QUOTED' for each item. 8.1.11 Filled in Logistic Certificate. 8.2 Within 2 weeks of Placement of Order / LOI: Vendor shall submit following for approval for the documents as mentioned below within 2 weeks of Placement of PO /LOI: 8.2.1 General Arrangement drawing of seal gas booster giving overall dimensions. It shall show location / disposition of various equipment / Instruments on the booster and location of customer termination connection. 8.2.2 Bill of Material of all the equipment, instruments, components etc. The Bill of Material should clearly show the make and model of each component, which are subjected to BHEL / CUSTOMER approval. 8.2.3 Booster Data sheets. 8.2.4 Instrument datasheets. 8.2.5 Booster Performance / operation graphs / curves. 8.2.6 Quality assurance plan. 8.2.7 Spares list. 8.3 Final Documentation: Vendor shall furnish the following: 8.3.1 Documents mentioned 8.2.1 above. 8.3.2 Instruction, Service and Maintenance manual 8.3.3 Test and Inspection reports : 3 copies. 8.3.4 Guarantee Certificates : 3 copies. 8.3.5 Photographs for all views : 2 sets (In DVD, the digital photos shall be provided). 9.0 EQUIPMENT QUALIFICATION CRITERIA (EQC) Seal Gas Booster shall be identical in frame size and identical or validly similar in terms of application (seal gas supply to compressor seals), Type of drive, inlet and discharge pressures, inlet temperatures, flow, number and materials etc. as compared to at least two units designed, manufactured, tested and supplied from the proposed manufacturing plant in last fifteen years at least one of these units shall have been										
Ref. Doc										

Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207
			Rev No. 03
			Page 6 of 13

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.

operating satisfactorily in the field for at least 8000 hours without any major problems as on the date of issue of enquiry.
 Vendor shall furnish complete reference list / details (Proven track record as per Table-2) along with the offer. These details shall include Plant name, year of commissioning, number of operating hours completed and name of contact person(s) etc. for the seal gas booster similar to one being offered.

10.0 PROVEN TRACK RECORD
 Vendor shall submit filled in PTR (Table-2) as per EQC listed in above clause.

11.0 INSPECTION AND TESTING REQUIREMENTS
 All the equipment shall be subject to inspection and witness tests by Lloyd's / DNV. The schedule of quality checks shall be furnished by the vendor in the quality plan which is subject to the approval of BHEL. The minimum shall be as indicated in below table.

Quality Plan					
Sl. No.	Description	Type of check Quantum of check 100%	Ref. Documents	Type of Inspection	Agency
1	Assembly of Booster	- Location of equipment - Correctness of flow Schematics - Overall dimensions	- Approved GA drawing	Physical check	Lloyd's / DNV
2	Welding (if applicable)	Type	Manufacturing drawings.	-Review of Radiograph certificate -Welding efficiency of 1	Lloyd's / DNV
3	Booster	- Material Certification	-BHEL/ CUSTOMER Specification - Approved drgs / docs.	Verification of test report / certificate	Lloyd's / DNV
4	Gas leak test	- Leakage with helium	--Do--	Witness	Lloyd's / DNV
5	Name Plates	- Correctness	--Do--	Physical check	Lloyd's / DNV
6	Performance test	-performance	Booster shall be tested to verify pressure & flow parameters	Witness	Lloyd's / DNV

12.0 MARKING AND SHIPPING

12.1 Name plates: The Individual components shall be provided with Nameplates giving important details like make, model etc. Each component shall be provided with stainless steel Tag plates duly punching Tag Nos. as applicable on it.

12.2 Preparation for Shipment:

12.2.1 Equipment shall be suitably prepared for shipment. The preparation shall make the equipment suitable for 6 months of outdoor storage from the date of shipment.

12.2.2 Seal gas booster assembly shall be marked with details like, drawing no, job number, PO No. etc. at a convenient location.

Form No.		 HYDERABAD	PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207
				Rev No. 03
				Page 7 of 13
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.		12.2.3 Lifting Points and lifting lugs shall be clearly identified. 12.2.4 All Loose supplied items like flanges, nut-bolt, gaskets etc. if any, shall be listed out separately in the packing list. 12.2.5 Adequate amount of silica gel or equivalent shall be provided in the box before dispatch for the removal of moisture till installation. 12.2.6 All safety instructions for storage and handling shall be indicated on external surface of the box.		
		13.0 DEVIATIONS Bidder shall submit duly filled deviation format (Table-5) along with technical offer, otherwise, it will be presumed that there are no deviations from this specification. Offer without this deviation list will not be evaluated & shall be considered for rejection. If, there are no deviations, bidder shall submit signed copy of deviation format, mentioning "No Deviations".		
		14.0 GUARANTEE The Seal Gas Booster and each component of the unit shall be guaranteed for 18 months of trouble free performance from the date of shipment or 12 months from the date of commissioning whichever is earlier.		
		15.0 TENDER EVALUATION CRITERIA 15.1 The total price for the complete package i.e. Main System, Mandatory spares, Supervision of erection & commissioning charges shall be considered for L1 evaluation. 15.2 Duly signed & stamped un-priced price schedule and unit prices shall be submitted along with technical offer by bidder as a token of concurrence that all items are quoted without which the offer will not be evaluated. For unpriced bid bidder to fill 'Quoted' for each item and submit (refer Table-5 for PRICE SCHEDULE format).		
		16.0 TENDER REJECTION Non-compliance to inclusion of any the following documents with technical offer shall lead to rejection of the bids. 16.1 Filled in Check List (Table-1) not included. 16.2 Filled in PTR (Table-2) not included. 16.3 Filled in Dev Format (Table-3) not included. 16.4 Filled in Price Schedule (Table-4) marked 'QUOTED' for each item not included. 16.5 Filled in Logistic Certificate not included.		
		17.0 SPECIAL NOTES 17.1 Vendor shall confirm that the bill of material furnished along with offer is only indicative and the final BOM, which shall be furnished during detailed Engineering (after order placement) for the approval of BHEL. The additional items, if any required at later stage for complying BHEL specification or for the satisfactory working of the seal gas booster shall be supplied by vendor without any price/delivery implications 17.2 Vendor should bring out in his offer clause wise deviations if any, with respect to proposed supply along with price adder for withdrawing the deviation to comply with specification. Failure to highlight the same will be construed as acceptance on the part of the vendor to meet the requirement of this specification totally. 17.3 Vendor shall provide the relevant technical information and supporting documents whenever asked for by the customer/ consultant. 17.4 Vendor to clearly bring out any additional requirements which are essential for proper functioning of the Seal Gas Booster. This shall be included in the offer.		

Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207
			Rev No. 03
			Page 8 of 13
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.	18.0 Table-1: Check List (To be filled by the vendor and submitted along with the offer without which offer will not be considered)		
	Sl. No	Description	Vendor Confirmation (Yes/No)
	1	Booster technical details, catalog included.	
	2	Booster Performance / operation graphs / curves included.	
	3	Booster Data sheets included.	
	4	Instrument air consumption included.	
	5	Commissioning spares list included. (As per vendor recommendation)	
	6	Mandatory spares list included.	
	7	Special tools (if any) included.	
	8	Signed & stamped copy of this specification included.	
	9	Filled in Check List (Table-1) included.	
	10	Filled in PTR (Table-2) included.	
	11	Filled in Deviation Format (Table-3) included.	
	12	Filled in Price Schedule (Table-4) marked 'QUOTED' for each item included.	
13	Filled in Logistic Certificate included.		
VENDOR SIGNATURE WITH SEAL			
Ref. Doc			

Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207			
			Rev No. 03			
			Page 9 of 13			

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.

19.0 Table-2: PTR Format

19.1 Name of the Bidder

19.2 Whether manufacturer & supplier:

19.3 Whether System Integrator & Supplier:

19.4 Name of Packager:

Sl.No	PTR Requirement	Ref-1	Ref-2	Ref-3	Ref-4
1	Description of item as manufactured & Supplied/ engineered (identify bidder's scope of work)				
2	Plant / Purchaser's name, address, Tel no, Fax no, email and contact person				
3	Application (seal gas supply to compressor seals)				
4	Type of drive,				
5	Inlet and discharge pressures, flow				
6	Material				
7	Make & model no of the booster supplied.				
8	Date of order placed				
9	Contractual completion date				
10	Actual completion date/ month & year of commissioning				
11	Number of operating hours completed				
12	Reasons of delay if any				
13	Details of major break down till date.				

VENDOR SIGNATURE WITH SEAL

Vendor to furnish the complete exhaustive reference list separately for our review.

Ref. Doc

Ref. Doc	Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD			TC 65207																															
						Rev No. 03																															
						Page 10 of 13																															
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. 20.0 Table-3:Devaition Format <table><tr><th rowspan="2">Sl.No</th><th rowspan="2">Clause No. of Specification</th><th rowspan="2">Deviation</th><th rowspan="2">Reason for deviation</th><th colspan="2">Deviation category</th></tr><tr><th>Product/design limitation</th><th>Optimization</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> VENDOR SIGNATURE WITH SEAL						Sl.No	Clause No. of Specification	Deviation	Reason for deviation	Deviation category		Product/design limitation	Optimization																								
Sl.No	Clause No. of Specification	Deviation	Reason for deviation	Deviation category																																	
				Product/design limitation	Optimization																																

Ref. Doc	Form No.	 HYDERABAD	PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207
				Rev No. 03
				Page 12 of 13
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. CERTIFICATE FOR LOGISTIC SUPPORT _(TO BE SIGNED BY "Bidders VENDOR" CORPORATE LEVEL SIGNATORY ON COMPANY LETTERHEAD) Applicable for all major sub-systems bought-out by the bidder I, ON BEHALF OF M/S, ----- CONFIRM THAT THE ----- - QUOTED BY THROUGH M/S----- FOR <PROJECT NAME OF BHEL / BHEL CUSTOMER> (INDIA), SHALLCONTINUE TO BE SUPPORTED BY US AND OUR PRINCIPAL M/S ----- I, FURTHER CONFIRM THAT IN CASE OF PLACEMENT OF ORDER ON US, WE SHALL CONTINUE TO SUPPORT M/S <BHEL / BHEL CUSTOMER> (INDIA) IN PROVIDING BACK-UP ENGINEERING, MAINTENANCE SUPPORT AND SPARE PART SUPPORT FOR A PERIOD OF NOT LESS THAN TEN (10) YEARS FROM THE DATE OF PLACEMENT OF ORDER. <u>(SIGNATURE WITH SEAL)</u>				

Form No.		PRODUCT STANDARD TC ENGINEERING HYDERABAD	TC 65207
			Rev No. 03
			Page 13 of 13

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.

22.0 Table-4: PRICE SCHEDULE

22.1 Offer ref no.:

22.2 Offer date:

22.3 Enquiry ref. no:

22.4 Enquiry date:

Sl. No.	DESCRIPTION	Qty	PRICE
1	Seal Gas booster (TC9765207034) along with commissioning spares / special tools (as per vendor recommendation clause 4.1 & 4.2.3)	1 set	
2	Mandatory Seal Gas booster spares (TC9765207042) as listed in clause 4.2.1 & 4.2.2	1 set	
3	Commissioning Supervision services		
3a	Commissioning Assistance for seal gas booster for 5 days at site / BHEL works and one visit inclusive of Travel, boarding, lodging, and local conveyance.	Lump sum	
3b	Per diem for Commissioning Assistance for seal gas booster at inclusive of Travel, boarding, lodging, and local conveyance if required in addition to 3a above.	Per diem	
4	Additional price to withdraw the deviations if any taken by vendor for respective clause of BHEL specification.	Clause wise	
	Total Price for L1 Evaluation • 1+2+3a+4		

Notes:

- The price for the spares against sl no 02 above is valid for one year.
- Any additional requirements which are essential for proper functioning of the seal gas booster but not indicated in specification are included in the offer.

VENDOR SIGNATURE WITH SEAL

Ref. Doc