SPECIFICATION FOR SEAL GAS BOOSTER

Ref. Doc

Rev. No.	Revisions	Prep.	Checked	Appd.	Date
02	Variants Added	B. PRASAD	NARESH.V	RAM	22.07.2022

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 REQUIREMENTS**

a. The booster shall be suitable for operation of minimum 2000 hrs without any maintenance required.
b. The seal gas booster(s) shall be suitable for instant start-up without any lead time.
c. The booster material shall be SS316 / SS316L as a minimum.
d. 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 BHEL.
e. All the sizing, material selection, design etc. shall be in line with ASME standard for pressure equipment.

3.0 **DESIGN STANDARDS (AS APPLICABLE)**

a. European directive no 94/9/EC (ATEX)
b. European directive no 97/23/EC (PED)
c. ASME VIII Div. 1
d. ANSI B16.34
e. NACE MR0103 / MR0175
f. Gas Hazardous area classification: IEC Zone-1, Gas group II C, T3.

4.0 **PIPING REQUIREMENTS**

a. Piping Interface connections:

Description	Type
Process gas inlet	1” NPTF or higher
Process gas outlet	1” NPTF or higher
Vent / drain	½” NPTF or higher
Instrument air inlet	½” NPTF or higher

b. All the materials in contact with gas inlet / outlet and vent shall be of SS 316 / 316L or equivalent forging /casting materials.
c. All the materials in instrument airline shall be SS316 piping / tubing.
d. All Butt-welded joints shall be TIG welded and the welds shall be 100% radio graphed.
e. All the vent/ drain holes, if any shall be plugged with threaded plugs/caps.

5.0 **DOCUMENTATION REQUIREMENTS**

a. Along with technical offer, arranged in this sequence only:
   i. Booster technical details.
   ii. Booster Performance / operation graphs / curves.
   iii. Booster Data sheets.
   iv. Instrument air consumption.
   v. Recommended spares list along with special tools (if any).
   vi. Signed & stamped copy of this specification.
   vii. Filled in Check List.
   viii. Filled in PTR.

ix. Filled in Deviation Format.
x. Filled in Price Schedule marked 'QUOTED' for each item.
xi. Filled in Logistic Certificate.

b. Placement of Order / LOI:
i. 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.
ii. 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.
iii. Booster Data sheets.
iv. Instrument datasheets.
v. Booster Performance / operation graphs / curves.
vi. Quality assurance plan.
vii. Spares list.

c. Final Documentation: soft copy.
i. Instruction, Service and Maintenance manual
ii. Test and Inspection reports
iii. Guarantee Certificates
iv. Photographs for all views

6.0 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 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) 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.

7.0 INSPECTION AND TESTING REQUIREMENTS

All the equipment shall be subject to inspection and witness tests by Third Party Inspection agency. 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.

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 / BV / TUV etc.
2	Welding (if applicable)	Type	Manufacturing drawings.	-Review of Radiograph certificate -Welding efficiency of 1	
3	Booster	- Material Certification	-BHEL/ CUSTOMER Specification	Verification of test report / certificate	

Sl. No.	Description	Type of check Quantum of check 100%	Ref. Documents	Type of Inspection	Agency
			- Approved drgs / docs.		
4	Gas leak test	- Leakage with **HELIUM**	--Do--	Witness	
5	Name Plates	- Correctness	--Do--	Physical check	
6	Performance test	-performance	Booster shall be tested to verify pressure & flow parameters	Witness	

8.0 **MARKING AND SHIPPING**

a. 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.

b. Preparation for Shipment:

i. 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.

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

iii. Lifting Points and lifting lugs shall be clearly identified.

iv. All Loose supplied items like flanges, nut-bolt, gaskets etc. if any, shall be listed out separately in the packing list.

v. Adequate amount of silica gel or equivalent shall be provided in the box before dispatch for the removal of moisture till installation.

vi. All safety instructions for storage and handling shall be indicated on external surface of the box.

9.0 **DEVIATIONS**

Bidder shall submit duly filled deviation format along with technical offer, otherwise, it will be presumed that there are no deviations from this specification. If, there are no deviations, bidder shall submit signed copy of deviation format, mentioning “No Deviations”.

10.0 **GUARANTEE**

Refer ITB documents.

11.0 **TENDER EVALUATION CRITERIA**

a. The total price for the complete package i.e. Main System, Mandatory spares, Supervision of erection & commissioning charges shall be considered for L1 evaluation.

b. 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 PRICE SCHEDULE format).

12.0 **TENDER REJECTION**

Non-compliance to inclusion of any the following documents with technical offer shall lead to rejection of the bids.

a. Filled in Check List not included.

b. Filled in PTR not included.

c. Filled in Deviation Format not included.

d. Filled in Price Schedule marked ‘QUOTED’ for each item not included.

e. Filled in Logistic Certificate not included.

13.0 **SPECIAL NOTES**

a. 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

b. 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.

c. Vendor shall provide the relevant technical information and supporting documents whenever asked for by the customer/ consultant.

d. 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.

14.0 **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	Mandatory spares list included.	
6	Signed & stamped copy of this specification included.	
7	Filled in PTR included.	
8	Filled in Deviation Format included.	
9	Filled in Price Schedule marked 'QUOTED' for each item included.	
10	Filled in Logistic Certificate included.	
11	**Pressure relief valve required at the booster outlet.**	

VENDOR SIGNATURE WITH SEAL

15.0 **Logistic support certificate:**

CERTIFICATE FOR LOGISTIC SUPPORT

(TO BE SIGNED BY **VENDOR'S PRINCIPAL** (Original equipment manufacturer) CORPORATE LEVEL SIGNATORY ON COMPANY LETTERHEAD)

I, ON BEHALF OF M/s, ---------- CONFIRM THAT THE SEAL GAS BOOSTER QUOTED BY M/s ---------- ----------FOR <PROJECT NAME OF BHEL / BHEL CUSTOMER> (INDIA) SHALL CONTINUED TO BE SUPPORTED BY US AND QUOTED SYSTEM SHALL NOT BE WITHDRAWN FROM "INDIAN" MARKET AS A MATTER OF CORPORATE POLICY.

I, FURTHER CONFIRM THAT IN CASE OF PLACEMENT OF ORDER ON US, <BHEL / BHEL CUSTOMER> (INDIA) SHALL BE SUPPORTED 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.

(SIGNATURE WITH SEAL)

16.0 **PROJECT SPECIFIC BOOSTER TECHNICAL DATA & PRICE SCHEDULE:**

a. **UTILITY**: INSTRUMENT AIR:

SLNO	PARAMETER	MIN	NOR	MAX	MECH. DESIGN
i.	Pressure (kg/cm^{2}g)	3.5	5	7	10.5
ii.	Temperature (°C)	35	40	40	65

b. DESIGN CONDITIONS-DGSB for Hydrogen Service with H2S Applications:

DGSB for Hydrogen / toxic service with H2S upto 10%, Flow: ~8 to 10 m^3/Hr per Booster Unit			
Variant No	**21**	**22**	**23**
Material Code	TC9765442211	TC9765442220	TC9765442238
Item Description	DGSB-85BAR-NACE_H2S	DGSB-160BAR-NACE_H2S	DGSB-280BAR-NACE_H2S
Design Pressure (BAR)	85 BAR	160 BAR	280 BAR
Min & Max Working Temperature	0 - 200 DEGC	0 - 200 DEGC	0 - 200 DEGC
Gas leak test @1.5X design pressure	HELIUM	HELIUM	HELIUM
Gas Composition	Hydrocarbon + H2: 90% to 98% H2S: 2 % to 10% Ammonia: Traces (50ppm)	Hydrocarbon + H2: 90% to 98% H2S: 2 % to 10% Ammonia: Traces (50ppm)	Hydrocarbon + H2: 90% to 98% H2S: 2 % to 10% Ammonia: Traces (50ppm)
DGSB FLOW	10 m^3/Hr	10 m^3/Hr	10 m^3/Hr
DGSB QTY	Refer RFQ	Refer RFQ	Refer RFQ
DGSB model no			
DGSB Unit Price			
DGSB Rebuild Kit / Spares:			
Variant No	**41**	**42**	**43**
Material Code	TC9765442416	TC9765442424	TC9765442432
Item Description	DGSB-85BAR-NACE_H2S_SPARE	DGSB-160BAR-NACE_H2S_SPARE	DGSB-280BAR-NACE_H2S_SPARE
DGSB Rebuild Kit / Spares model no			
DGSB Rebuild Kit / Spares Unit Price			

c. DESIGN CONDITIONS-DGSB for Ammonia, Nitrogen & Propylene Service:

DGSB for Ammonia, Nitrogen & Propylene Service, Flow: ~8 to 10 m^3/Hr per Booster Unit			
Variant No	**26**	**27**	**28**
Material Code	TC9765442262	TC9765442270	TC9765442289
Item Description	DGSB-85BAR-NH3	DGSB-85BAR-N2	DGSB-85BAR-PROPYLENE
Design Pressure (BAR)	85 BAR	85 BAR	85 BAR
Min & Max Working Temperature	-40 - 200 DEGC	0 - 200 DEGC	-40 - 200 DEGC
Gas leak test @1.5X design pressure	NITROGEN	NITROGEN	NITROGEN
Gas Composition	Ammonia (NH3): 100%	Nitrogen (N2): 100%	Propylene: 100%
DGSB QTY	Refer RFQ	Refer RFQ	Refer RFQ
DGSB model no			
DGSB Unit Price			
DGSB Rebuild Kit / Spares:			
Variant No	**46**	**47**	**48**
Material Code	TC9765442467	TC9765442475	TC9765442483
Item Description	DGSB-85BAR-NH3_SPARE	DGSB-85BAR-N2_SPARE	DGSB-85BAR-PROPYLENE_SPARE
DGSB Rebuild Kit / Spares model no			
DGSB Rebuild Kit / Spares Unit Price			