



PRODUCT STANDARD
TURBINES & COMPRESSORS
 HYDERABAD

TC-6-2638

Rev.No. 00

SHT 1 OF 8

This job specification shall be completely filled-in, duly signed by supplier and enclosed along with offer.

OFFER FOR SPEED INCREASING GEAR BOX

PROJECT: BPCL KRL NET GAS

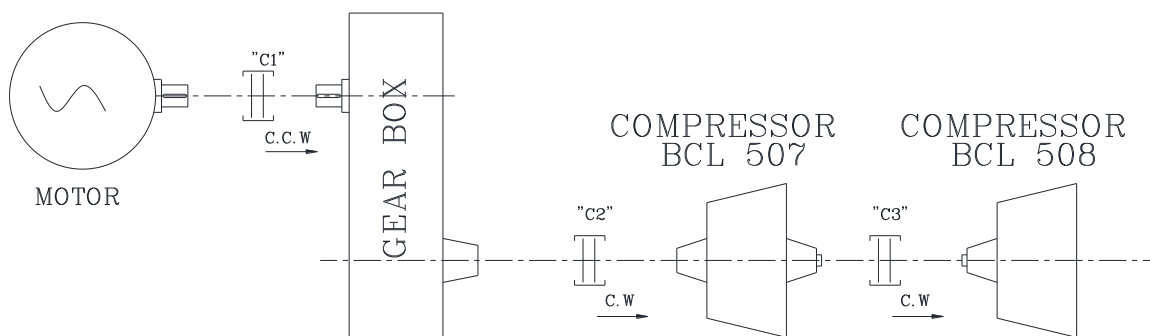
TYPE: _____

REF: _____

Technical Offer

MANUFACTURER: _____

"FIGURE 1"
CONFIGURATION



As shown in the above schematic the drive motor is provided with a Variable frequency drive (VFD) system to vary the output speed. The harmonics that may develop during startup, operation and shutdown of compressor due to VFD system shall be considered while designing the gearbox. These harmonics, gear box critical speeds and gear mesh frequencies shall not interfere with each other and shall be sufficiently away from operation speed range of the system.

TD-106-2 Rev.5	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD		TC-6-2638
					Rev.No. 00
					SHT 2 OF 8

TECHNICAL OFFER
 OFFER FOR SPEED INCREASING GEAR BOX

1.0 Compressor train :

Enquiry / Indent No. : _____

Supplier : _____

Ref. No. of Supplier : _____

1.1.1 Gear Box Details

Configuration : Type-A of BHEL Spec TC 5 2203

Type of Driver : Electric Motor (With VFD)

Type of Driven Equipment : Centrifugal Compressor

Type of Gear : ☒ Speed Increaser ☒ Single Stage

Lay out (TC52203) : Type ☒ A ☐ B ☐ C ☐ D

Type of Gearing * : ☐ Single OR ☐ Double helical

Construction * : ☐ Cast OR ☐ Fabricated

1.1.2 Applicable Specifications: :

Gear Box : TC62638 / TC52203 / TC52204 / API613, 5th edition

1.1.3a) Design Parameters:

Driven Equipment Power : 5127 KW

Driver Rating : 5640 KW

Short Circuit Torque : Min times of Nominal Torque

Gear Box Rating : 6204 KW

Input Speed : 1485 rpm

Output Speed : 9424 rpm

MCS of Driven Equipment : 9895 rpm

Nominal Torque (Gear) : 4066 kgf-m (6204 KW @ 1485 rpm)

Gear Service Factor : 1.6

Pinion Hardness (Case Hardened) : As Per API

Couplings- HS end dia. : Conical with 1:20 Taper (refer Notes below)

LS end dia. : ☒ Cylindrical with ☒ one key ☐ Two keys

: ☐ Conical with 1:20 taper (refer Notes below)

Notes

- Interference with shaft 2.5‰ (2.5 per thou)
- The shaft shall be machined for the applicable coupling size as per the dimensions provided in TC52204.
- The Taper Grinding of the shaft shall be carried out by using vendor's own shop gauges.



PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD

TC-6-2638

Rev.No. 00

SHT 3 OF 8

1.1.3b) Different operating conditions in case of VFD

S.no	Description	Compressor Power (kW)	Compressor Speed (rpm)
1	Max power and speed case	5127	9347
2	Min power and speed case	3237	8416

1.1.4 Installation

☒ Out door ☐ Indoor

☒ Un heated

Max Allowable SPL.

85 dBA at 1m from the Machine

Ambient Temp. (Deg C)

Min: 20°C Max: 38°C

Relative Humidity

95 % @ 38°C & - % @ - °C

1.1.5 Gear sizing:

Mech Rating KW : *
 Full Load Power Loss KW : *
 Mech Efficiency % : *
 Pitch Line Velocity m/sec : *
 WR² referred to LSS Kgm² : *
 Starting torque required Kgm : *
 GEAR Manufacture Method : *
 Gear Heat Treatment : Case Carburizing
 Type of plating on Gear teeth : *
 (if Provided) :

1.1.6 Gear Data:

Power Loss KW : *
 Heat to be removed Kcal/hr : *
 Oil Supply Bearings L/m : *
 Gear Mesh L/m : *
 Total L/m : *

1.1.7 Bearing details

Journal bearing (High Speed)

Type : Tilting Pad
 Size : *
 Make : *

Journal Bearing (Low Speed)

Type : Tilting Pad/4 lobe/offset halves
 Size : *
 Make : *

Thrust Bearing (Low Speed)

Type : Tilting pad with self-leveling features
 Size : *
 Make : Kingsbury/eq.

Thrust Bearing (High Speed)#

Type : Tilting pad with self-leveling features
 Size : *
 Make : Kingsbury/eq.

- # Thrust bearing (High Speed) is applicable for Single helical Gear Box only.

TD-106-2 Rev.5	Form No.		PRODUCT STANDARD	TC-6-2638
			TURBINES & COMPRESSORS	Rev.No. 00
			HYDERABAD	SHT 4 OF 8

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1.1.8 Gear box connections:

LO inlet	Location	:	*
	Size	:	*
LO outlet	Location	:	*
	Size	:	*
Filter Breather	Location	:	Required
	Size	:	*
Provision for coupling guard		:	Required

Remarks: * Furnish data required wherever “*” mark is indicated.

1.2 INSTRUMENTATION:

Area Classification (Tentative, will be confirmed at the time of order):
 Ingress protection: IP 65 min as per IEC 60529.

Hazardous Area

IEC zone 1 Gas Gr IIA/B, T3
 IEC zone 1 Gas Gr IIC, T3
 IEC zone 2 Gas Gr IIA/B, T3
 IEC zone 2 Gas Gr IIC, T3

√

a) RTD Material : Duplex RTD Platinum 100 Ω at 0°C 3 wire
 Calibration : IEC 751

Quantity :

i) Journal Bearings 2 RTDs per bearing
 Thrust Brg. Low speed 3 Shoes on active side &
 ii) 2 Shoes on non-active side

should be provided with RTDs
 (Total 5 Nos for Double Helical ; 10 Nos for Single Helical)

b) Vibration Probes (provision) Qty 4 (2 on each Journal Bearing)

c) Axial Probes (provision) Qty 2 (1 at Thrust Bearing and ☐ on pinion shaft)

d) Key Phasor Probes (provision) Qty 2 (one each on high speed and low speed shaft)

e) Accelerometer (provision) Qty 2 (Refer ANNEXURE1)

Remarks: * Furnish data required wherever “*” mark is indicated.
 (Refer Cl No.7 & 8 of standard specification for instrumentation details))

1.3 MATERIAL CODES

S.No	Description	Material Code
1	Gear Box	TC9762638018
2	Set of RTDs (Refer Note**)	TC9762638026
3		
4		
5		
6		

**** Note:** The quantity for 01 (ONE) set is as follows:

- 01 (ONE) set contains total 06 (SIX) RTD's (03 nos RTD's for Journal Bearing and 03 nos RTD's for Thrust Bearing)

Ref.Doc

TD-106-2 Rev.5	Form No.		PRODUCT STANDARD TURBINES & COMPRESSORS HYDERABAD		TC-6-2638
					Rev.No. 00
					SHT 5 OF 8

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1.4 INSPECTION & TESTING REQUIREMENTS

Gear box shall meet the Inspection/testing requirements as indicated below

	Required*	Observation	Third party witness	Test log
Shop Inspection (4.1.1.1)	✓	✓	✓	
Cleanliness Inspection (4.2.3.2)	✓			
Hardness Verification Inspection (4.2.3.3)	✓	✓	✓	✓
Dismantle - Reassembly Inspection (4.3.2.3.1)	✓		✓	
Contact Check (2.5.2.2)	✓	✓	✓	✓
Journal run out Check (2.5.2.1)	✓	✓		✓
Axial Stability Check (2.5.2.3) (for double helical Gear box)				
Rotor balancing machine sensitivity check (2.6.2.3)	✓		✓	
Residual unbalance check (2.6.6.2)	✓		✓	✓
Final assembly maintenance & running clearance (4.2.1.1.e)	✓		✓	✓
Mechanical run test (4.3.2)	✓		✓	✓
Mechanical run test (spare rotors) (4.3.2.4)				
Part or Full load & full speed Test (4.3.3.2)				
Full Torque, slow roll Test (4.3.3.2)				
Full torque static Test (4.3.3.3)				
Oil system cleanliness (4.3.2.1.3)	✓	✓		
Sound level test (4.3.3.5 item 5)	✓		✓	✓
Use shop lube system	✓			
Use shop vibration probes, etc	✓			
Oil system casing joint tightness (4.3.2.1.4)	✓	✓		

☒
To be Confirmed by Vendor

☐
Exception, if any to be indicated in the offer

Remarks: * Supplier shall carry out all the required tests and the data be recorded and Submitted to BHEL in approved vendor quality control system formats.

Wherever observation is indicated, the same shall be done by the End Customer

Note:

- Clause Nos. mentioned above are referred to API 613
- Third party Inspection shall be included in the offer.

Ref.Doc



**PRODUCT STANDARD
TURBINES & COMPRESSORS
HYDERABAD**

TC-6-2638

Rev.No. 00

SHT 8 OF 8

RECORD OF REVISIONS

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