

1	GENERAL									
2	Project: INSTALLATION OF GTC AT GANDHAR				Job No.: B240					
3	Owner: GAIL (INDIA) LIMITED				Site: GPU GANDHAR					
4	Purchaser:				Unit: NEW COMPR. AREA		Unit No.: 910			
5	Item No.: 910-GB-901				Service: Gear Unit between Centrifugal Comp. & Gas Turbine					
6	No. reqd.: One		Working: One		Standby: None		Driver Type: Gas Turbine		Driven Eqpt. Cent. Comp.	
7	Applicable ☒ Proposals				☐ Purchase		☐ As Built			
8	☒ Scope, Option & Information specified by Purchaser. ☐ Information required from and options left to vendor. Vendor to cross (X) the selected option.									
9	Manufacturer:				Model:					
10	☒ RATING REQUIREMENTS					☐ BASIC GEAR DATA				
11	Driven Eqpt. Power (kW):		Nor.:		Max.:		Mechanical rating:		kW @ rpm	
12	Driver Power (kW):		Rated:		Max.:		Full load power loss (kW):			
13	Gear rated power (kW):						Mechanical efficiency (%):			
14	Torque @ Max. Cont. Speed (kg-m):						Pitch line velocity (m/s):			
15	Max.		kg-m @		rpm		Tooth pitting index, "K":		Actual: Allowable:	
16	Rated speed (rpm):						Tangential load, "W _t " (kg):			
17	- Input		☐ Specified ☐ Nominal				Bending stress number S _t "W _t "		Pinion Gear	
18	- Output		☐ Specified ☐ Nominal				Actual:			
19	Allow variation in gear ratio:		V				Allowable:			
20	Max continuous speed (rpm):						Material index no.:			
21	Trip speed (rpm):						Anticipated SPL:		dBA @ m	
22	Gear service factor (Min.):		(1.6 as per API 613)				Journal static weight loads:			
23	Pinion Hardness:						Pinion: kg		Gear: g	
24	Shaft assembly designation:						WR ² referred to LS shaft (kg-mm ²):			
25	- HS shaft rot. Facing coupling end		☐ CW ☐ CCW				Breakaway Torque (kgf-m) @ LS shaft:			
26	- LS shaft rot. Facing coupling end		☐ CW ☐ CCW							
27	HS shaft ☐ Cylindrical ☐ Taper ☐ 1-Key						☐ CONSTRUCTION FEATURES			
28	☐ 2-Keys ☐ Hydraulic taper ☐ Integral flange						Type of Gear ☐ Reducer ☒ Increaser			
29	LS shaft ☐ Cylindrical ☐ Taper ☐ 1-Key						☒ Single stage ☐ Double stage			
30	☐ 2-Keys ☐ Hydraulic taper ☐ Integral flange						☐ Single helical ☐ Double helical			
31	External loads:						☐ Epicyclic ☐			
32	Other operating conditions:						Teeth			
33	☐ INSTALLATION DATA				Number of teeth: Pinion:		Gear:			
34	☒ Indoor ☐ Heated ☒ Under roof				Gear ratio		Centre Distance (mm):			
35	☐ Outdoor ☒ Unheated ☒ Partial sides				Pitch Dia: Pinion (mm)		Gear (mm):			
36	☒ Grade ☐ Mezzanine ☐				Finish (RA):					
37	☐ Winterisation Required ☒ Tropicalization Required				AGMA Geometry factor "J":					
38	Electrical Area Class:		Grp: Div.:		Pinion:		Gear:			
39	Max. allow. SPL: 88		dBA @ 1 m		Helix angle (°):					
40	Elevation (m):		Barometer (kg/cm ² A):		Normal pressure angle (°):					
41	Range of ambient temperatures:				Net face width, "Fw" (mm):		Pinion L/D:			
42			Dry Bulb Wet Bulb		Normal Diametrical Pitch:		Backlash (mm):			
43	Minimum		°C		Tooth plating: ☐ Recommended ☐ Not Recommended					
44	Normal		°C		☒ Recommended ☐ Not Recommended					
45	Maximum		°C		MANUFACTURING METHODS					
46	Unusual Conditions ☒ Dust ☒ Fumes ☐ Refinery atm				Teeth generated by the:				Process	
47					Teeth finished by the:				Process	
48	☒ ADDITIONAL REQUIREMENTS				Teeth hardening method:					
49	MOUNTING PLATES				Gear to shaft: ☐ Integral ☐ Shrunk-on					
50	☒ Gear furnished with:				Rim attachment:					
51	☒ Baseplate ☐ Soleplate(s) ☐ Subplate(s)				☐ RADIAL BEARINGS					
52	☐ Mounting plate(s) furnished by:				Pinion		Gear			
53	☒ Equipment(s) on base plate: GT, GEAR UNIT & COMPRESSOR				Type					
54	☒ Baseplate with levelling pads:				Diameter mm					
55	☒ Baseplate suitable for column mounting:				Length mm					
56	☒ Grout type: ☒ Epoxy				Journal Velocity m/s					
57	☒ PAINTING: ☒ Mfr. Std. ☐				Loading kg/cm ²					
58	☒ APPLICABLE SPECIFICATIONS				Clearance (min-max) mm					
59	☒ API Std. 613 ☐				Span mm					
60	☒ Other: Job spec. B240-910-80-42-SP-5010									
61										

62	MISCELLANEOUS				☐ THRUST BEARING(S)			
63	☐ Undamped critical analysis report: ☐ Yes ☐ No						Pinion	Gear
64	☐ With damped rotor response analysis report				Location			
65	☒ Torsional analysis by ☐ Gear Vendor ☒ Other(Rem.7)				Manufacturer			
66	☐ Spare set of gear rotors				Type			
67	☐ Gear case furnished with inlet purge connection				Size			
68	☐ Orientation of oil inlet and drain connection				Area mm ²			
69					Loading kg/cm ²			
70	☒ VIBRATION DETECTORS				Rating kg/cm ²			
71	Radial:				Int. thrust load N (✓)			
72	☒ Manufacturer See Remark-3				Ext. thrust load N (✓)			
73	☒ No. at each shaft bearing		2	Total No.:	4	☒ COUPLING & GUARDS		
74	☒ Oscillator-Demodulators supplied by Comp. Mfr.						High Speed	Low Speed
75	☒ Manufacturer See Remark-3				Coupling Manufacturer			
76	☒ Monitor supplied by Comp. Vendor				Coupling Furnished by		Vendor	Vendor
77	☒ Location Remark-4 Enclosure				Coupling Type		(Remark-8)	(Remark-8)
78	☒ Manufacturer See Remark-3				Coupling Model			
79	☒ Alarm ☒ Shutdown				Coupling rating kW/100 rpm			
80	☒ Shutdown time delay seconds				Coupling Lubrication		Non Lube	Non Lube
81	Axial:				Taper mm/m			
82	☒ Manufacturer See Remark-3		No. reqd.:		Taper gauge furnished by			
83	☒ Location Remark-4				Limited end float		As Reqd.	As Reqd.
84	☒ Oscillator-Demodulators supplied by				Mount coupling halves		☒	☒
85	☒ Manufacturer See Remark-3				Cplg. gear pitch dia mm		☐	☐
86	☒ Monitor supplied by Compr. Mfr.				Cplg. pressure angle (°)		☐	☐
87	☒ Location Remark-4 Enclosure				Cylindrical / 1-key		☐	☐
88	☒ Manufacturer See Remark-3				Cylindrical / 2-keys		☐	☐
89	☒ Alarm ☒ Shutdown				Tapered / 1-key			
90	☒ Shutdown time delay seconds				Tapered / 2-keys			
91					Tapered / keyless			
92	Accelerometer:				☐ PIPING CONNECTIONS			
93	Manufacturer		No. Required			No.	Size	Type
94	Location				Service			
95	Monitor supplied by				Lube oil inlet			
96					Lube oil outlet			
97	☒ INSTRUMENTS				Casing drain			
98	☒ Other instruments as per DS no. B240-910-80-42-DS-1004				Vent			
99	☒ Bearing Temperature Monitoring System See Remark 3 & 4				Casing purge			
100	☐ CONTRACT DATA							
101	☒ Vendor's Representative at site							
102	☒ Test data prior to shipment				☒ LUBRICATION REQUIREMENTS			
103	☒ Progress reports				☒ Oil System Furnished by Compr. Vendor			
104	☒ SHIPMENTS				☐ Oil Visc.: cP @ 40°C cP @ 100°C			
105		Contract unit	Spares		Min. start-up oil temperature °C			
106	Export boxing	☒	☒		Unit oil flow(total) m ³ / hr			
107	Domestic boxing	☐	☐		Unit oil pressure kg/cm ² g			
108	Outdoor strg. over 6 months	☒	☒		Oil flow, Mesh m ³ / hr			
109					Oil flow, HS Bearings m ³ / hr			
110	MATERIALS				Oil flow, LS Bearings m ³ / hr			
111	Gear Casing		Oil Seals		Oil flow, Thrust Bearing(s) m ³ / hr			
112	Radial Bearings				Additional Requirements			
113	Thrust Bearing(s)				Filter breather location			
114	HS Shaft		LS Shaft					
115	Pinion(s)		Hardness					
116	Gear Rim(s)		Hardness					
117	Low Temp. Operation							
118	REMARKS:							
119								
120								
121								
122								

123	☐ INSPECTION AND TESTS				☐ GEAR DATA			
124	Reqd.	Observe	Witness	Test log				
125	Shop Inspection	■	■		Power loss each HS bearing			
126	Cleanliness inspection	☐	☐	☐	Power loss each LS bearing			
127	Hardness verification Insp	■	■	☐	Pinion Gear			
128	Dismantle-Reassembly Insp.	■	☐	■	Outside diameter mm			
129	Contact check	■	■	☐	Root Diameter mm			
130	Contact check tape lift (2.5.2.2)	☐	☐	☐	Center Groove Diameter mm			
131	Journal runout check	■	■	☐	Durability Power			
132	Axial stability check	☐	☐	☐	Strength Power			
133	Rotor balancing machine	☐	☐	☐	Face overlap ratio			
134	Sensitivity Check				Transverse contact ratio			
135	Residual Unbalance Check	☐	☐	☐	Length line of action mm			
136	Mech. run test	■	☐	■				
137	Mech. run test (Spare rotors)	☐	☐	☐	☐ WEIGHTS & DIMENSIONS			
138	Add'l mech. Test	☐	☐	☐	Net Weight:			
139	Part or full load and full speed test	☐	☐	☐	Gear Box: kg Auxiliaries: kg			
140	Full torque slow roll test	■	☐	■	Max. Maintenance Weight [Identify]: kg			
141	Full torque static test	☐	☐	☐	Total Shipping Weight: kg			
142	Back-to-back locked torque test	☐	☐	☐	Total Shipping Dimensions: L: m W: m H: m			
143	Sound level test	■	☐	■				
144	Add'l gear tooth test	☐	☐	☐				
145	Use shop lube system	■	☐	■				
146	Use job lube system	☐	☐	☐				
147	Use shop vibration probes, etc.	☐	☐	☐				
148	Use job vibration probes, etc.	■	☐	■				
149	Other:	☐	☐	☐				
150	Final assembly maintenance & running clearance	■	☐	■				
151								
152	Oil system cleanliness	■	■	☐				
153	Oil system casing joint tightness	■	■	☐				
154	Warning and protection devices	☐	☐	☐				
155								
156								
157								
158								
159								
160								
161	REMARKS:							
162	1. The gear unit rated power shall be, as a minimum, equal to the installed power of the driver i.e. Gas Turbine ISO Rating							
163	2. The oil system for gear unit shall be common with the main equipment i.e. Rich Gas Compressor and Gas turbine							
164	3. The make and model of bearing temperature monitoring system , vibration and axial displacement monitoring system shall be as per Instrumentation specification forming part of inquiry document.							
165								
166	4. The location of bearing temperature monitoring system , vibration and axial displacement monitoring system shall be as per Instrumentation specification forming part of inquiry document.							
167								
168	5. Complete unit test shall be done as per the requirements indicated in the job specs. B240-910-80-42-SP-5010							
169	6. Vendor shall furnish all utilities required for the Gear Unit.							
170	7. The torsional analysis of the complete train comprising of Gas Turbine, gear unit and compressor shall be done by comp. vendor.							
171	8. Coupling type shall be Metallic Flexible Element (Diaphragm / SS Flexible membrane).							
172								
173								
174								
175								
176								
177								
178								

25/03/2019	A	AS	NK
Date	Rev	Job Engineer	Rev. & Approved By