



Bharat Heavy Electricals Ltd
Boiler Auxiliaries Plant
Ranipet-632 406

EDC / AIR PREHEATERS
TECHNICAL SPECIFICATION
Effective Date: 27.06.2019

Specification No : RAH 549

Rev. No : 02

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01 Item : Main Drive Speed Reducer 9APU (3 Input, Up Shaft Output, 3 ORC)

02 Application

Used for driving the rotor of Regenerative Air Preheater in coal fired power stations. Two input shafts are required to connect them to the main Electric Motor drive and to the standby Electric Motor. A third input shaft is also required to connect to the emergency compressed Air Motor drive. All the input shafts should have over-running clutch built-in as a part of the speed reducer. A pinion is mounted on the output shaft of the reducer, which engages to a Pin rack provided in the rotor of the air heater. All the drive motors are mounted in brackets, which are to be attached to the speed reducer casing.

03 Prime Movers
a) Main / Standby - Electric motor 3 Ph, 50 Hz.
b) Emergency - Air motor of lower speed & lower KW

04 Input RPM 1450

05 Output RPM 14.74

06 Transmitting Power
a) Continuous - 37 KW
b) Peak - 111 KW
c) Motor Rating - 37 KW (Design condition)

07 Peak Input Torque 74 Kg-m

08 Material, Finish & Accuracy	Material	Gear profile finish	Gear accuracy grade
a) Helical Gears & Pinions	18CrNiMo7-6 or Equiv	Profile Grinding	DIN-6 or better
b) Bevel Gears & Pinion	18CrNiMo7-6 or Equiv	Profile Grinding or Hard Cutting	DIN-6 or better
c) Output shaft	Steel 070 M55 En9 / C60E or Equiv	-	-
d) Gear box casing	Cast Iron FG260, IS 210	-	-

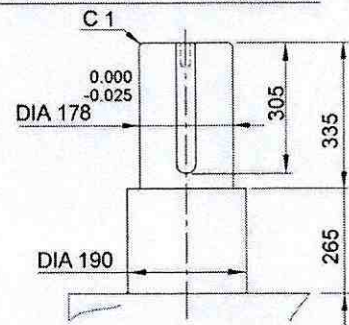
09 Conditions of service
a) Duration : Continuous - 24 hours daily
b) Nature of load : Smooth
c) Starting torque : 50 Kg-m
d) Momentary Max over load : 400 %
e) Ambient Temperature : 55°C
f) Environment : Dusty humid and outdoor installation.
g) Direction of rotation of high speed shaft : Must be capable of rotating in either direction (clockwise or counter-clockwise)

02	27.06.19	<i>Hdng</i>	<i>Sammitha</i>	<i>spary</i>	Clause 08 added & Clause 12.d updated.
01	14.12.18	VMR	SCH	KP	Painting schedule of QA referred (Clause 13.a)
00	13.10.18	GA	KP	KP	Fresh issue

Rev.No	Date	Prepared	Checked	Approved	Record of Revisions.
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10	Coupling method - High speed shaft - Electric motor by fluid coupling & Air motor by flexible coupling. - Low speed shaft - Pinion mounted(Pitch circle dia of pinion - 1270 mm, Pressure angle - 20°)	
11	General arrangement of Assembly, Input shaft details & Output Shaft details.	As per sketch in page 03 of 03
12	General - Reducer shall be designed with 4 stages of reduction and overall dimensions mentioned in the sketches are not to be exceeded. Reducer & Motor brackets mounting dimension, Shaft diameter/centerline/extension dimension and center distance shall be maintained as per sketch for interchangeability. - Speed reducers have to satisfy AGMA specifications for durability of 120,000 hours life at rated KW. - Service factor 1.25 minimum. - Bearings to have minimum B-10 life of 50,000 hours at rated KW. All bearings shall be of 'SKF' or 'FAG' or 'TIMKEN' or 'NSK' make only. At 400% of motor rating, tooth stress should not exceed 70% of yield point of tooth material. - Lubricating oil pump has to be provided to lubricate top bearings, gear meshing points above oil level and all over running clutches. - All input shafts shall have over running clutches built-in as a part of the speed reducer and mounted such that when reducer is driven by one input shaft, the other two input shaft(s) shall not rotate. - The Over Running Clutch shall be without Oil Seal and shall be suitable for Sump Oil Lubrication. It shall be of size FSO 600 or equivalent and shall be of Formsprag / Daido / Renold / Ringspann / Steiber make only. - A double seal is required at high speed shafts and at low speed shaft to avoid oil leakage. - In the event of first order on a vendor, the first lot of Speed Reducers will be subject to test at our works. The procedure before each starting is to obtain full backlash inside the Reducer plus 1 degree backlash between the tooth of pinion on the low speed shaft and a stop. The motor is then turned on. This is to be done 500 times without fracture of Speed Reducer components. - All the motor brackets will be attached to the speed reducer casing. - All input and output shafts shall be supplied with keys. - Speed Reducer component shall be packed properly to avoid damage during transit. 3 copies of O & M manual to be supplied along with Reducer. - Only latest revision shall be referred for all the standards specified.	
13	Painting Surface preparation & painting shall be as per Painting schedule of QA.	
14	Vendor shall submit the Dimensional drawing indicating Materials of Construction of all the parts with weight, for our approval. - In the event of first order on a vendor, the vendor shall submit (i) Gear calculations as per AGMA, (ii) Tooth stress calculations at 400% rated power and (iii) Quality Plan, for our approval.	
15	Inspection - Inspection by BHEL as per Quality Plan SQP:APH:111. - Necessary Material Compliance Certificate and No-load Run Test certificate (indicating Noise level, Vibration, and Temperature Rise) shall be submitted.	

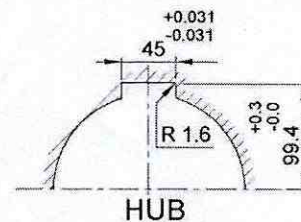
OUTPUT SHAFT DETAILS



Technical drawing of a mechanical part showing dimensions and tolerances:

- Top View Dimensions:**
 - Overall width: 45
 - Width of central feature: 15
 - Radius of central feature: R 1.6
 - Dimension from center to edge of central feature: 0.000 / -0.025
- Side View Dimensions:**
 - Overall height: 25
 - Height of central feature: 15
 - Radius of central feature: R 1.6
 - Dimension from top surface to center of central feature: +0.000 / 0.062
 - Dimension from bottom surface to center of central feature: 0.000 / -0.052
- Other Features:**
 - Surface finish symbol: C 2
 - Thread specification: Tap M16
 - Thread depth: Depth 40
 - Diameter of main body: DIA 178

OUTPUT SHAFT END

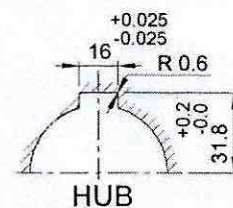


HUB

Technical drawing of a mechanical part with the following dimensions and tolerances:

- Overall diameter: DIA 55
- Overall length: 10
- Top flange diameter: 16
- Top flange thickness: 6
- Top flange outer radius: R0.6
- Top flange inner radius: R0.8
- Top flange height: 0.02 (+0.000, -0.0)
- Top flange width: 0.043 (+0.000, -0.0)
- Top flange depth: 0.036 (0.000, -0.036)
- Bottom flange diameter: 55
- Bottom flange height: 33
- Bottom flange thread: Tap M12

INPUT SHAFT END



Tolerance for untoleranced dimensions are as per Medium Class of IS 2102 Part I (Latest revision)