सत्यमेव जयते

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Government of India - Ministry of Railways
Research, Designs & Standards Organization, LUCKNOW – 226011
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No. EL/2.2.13 Date: As signed

Principal Chief Electrical engineer,
East Central Railway, Hajipur

Sub: Technical Audit Report Nos. RDSO/2025/EL/TAR/0036 Rev. '0' dated 05.03.2025 on Traction motor (6FRA6068) maintenance at Electric Loco Shed, Royapuram (SR)

Ref: (i) RDSO's letter no. EL/3.2.182 dated 31.01.2025.
(ii) MoM issued vide RDSO's letter no. EL/2.2.13 dated 03.02.2025

In Ref. to subject mentioned above the Technical audit for maintenance practices of Traction motor (type 6FRA6068) has been carried out by RDSO at ELS/GMO with effect from 05.02.2025 to 07.02.2025.

The detailed Technical Audit Report hereby enclosed for your kind information please.

5/3/25
(Sanjay Kumar Tiwari)
for Director General/Elect

Copy to:

1. ED/EE/RS- (1 & 2), Railway Board, Rail Bhawan, New Delhi-110001: for information only.
2. Sr. DEE/TRS, Electric Loco Shed, Gomoh, : for information & necessary action.

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

Technical Audit Report of Electric Loco Shed, Gomoh for maintenance of three phase locomotive Traction Motors (TM)type- 6FRA6068

Report No.: RDSO/2025/EL/TAR/0037 Rev '0'

Issue Date: 05.03.2025

Approved by	
PED / Traction	**Signature**

Audit Done By
RDSO, Lucknow

Issued by
Traction & Power Supply Directorate
Research, Designs and Standards Organisation
Manak Nagar, Lucknow-226011

Prepared By	Checked By	Issued By
SSE/Electrical	JE/Elect.	

Status of Revision

SN.	Date of Revision	Page No.	Revision	Reason for Revision
1.	-	-	0	Issued Technical Audit Report

Technical Audit Report on 3-Phase TM Maintenance Practices atELS/GMO

Electric Loco Shed, Gomoh (ECR) had experienced ten cases of Traction motor bearing failures in F/Y 2024-25. Out of total ten failures , six failure occurred in traction motors overhauled/assembled by Gomoh shed. Due to large numbers of failures, RDSO has decided to carry out Technical Audit of Traction Motor maintenance practices & facilities of ELS/GMO/ECR having holding of 254 locomotives consisting of 208 WAG9 and 46 WAP7 locomotive. Accordingly, SSE of RDSO, Lucknow had carried out the technical audit of Traction Motor maintenance practices & facilities of three phase Traction Motors type 6FRA6068 of ELS/GMO from 05.02.2025 to 07.02.2025.Observations noted during audit are as under:

A) Bearing storage:

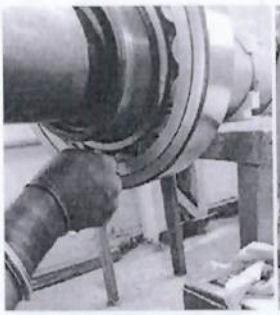
(i) The bearings DE & NDE of traction motor at shop floor were kept properly in a separate bearing assembly room. However, the some components of failed TM and new components are also kept in same room. There is no facility for temperature/ humidity control, moreover Induction Heater is also installed in same room.

(ii) In Main Store ward of Shed, bearings were kept packed in wooden boxes properly stacked. The main store of shed has not provided with temperature/humidity control facility. Practice of FIFO (First in First Out) was being followed.

(iii) Free radial clearance of all bearing were checked & notedbefore use of particular bearing.


Bearing Assly room


Bearings kept in main store


Free RC Measurement


Bearing Assly Room

Recommendation:

(i) The bearing assembly area should be neat &clean and dust free.The components of failed TM and new components may be kept separately at suitable location.

(ii) Induction Heater may be shifted to another suitable location from bearing assembly room.

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B) Receipt, inspection &checking of associated assembly components (bearing components):

(i) Associated assembly components (set of 11 items) are procured from approved CLW vendors. Shed is procuring 11items in kit form stocked against one PL and Outer Labyrinth (DE) plus Outer Bearing Cap (DE) are stocked against other PL numbers.

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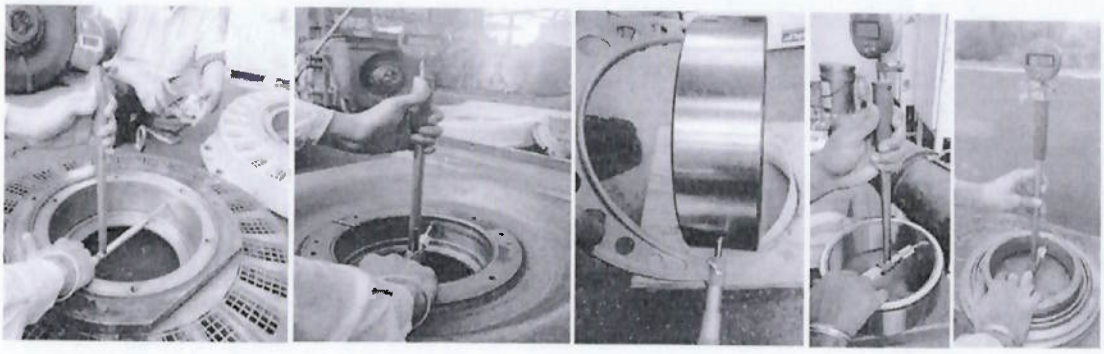
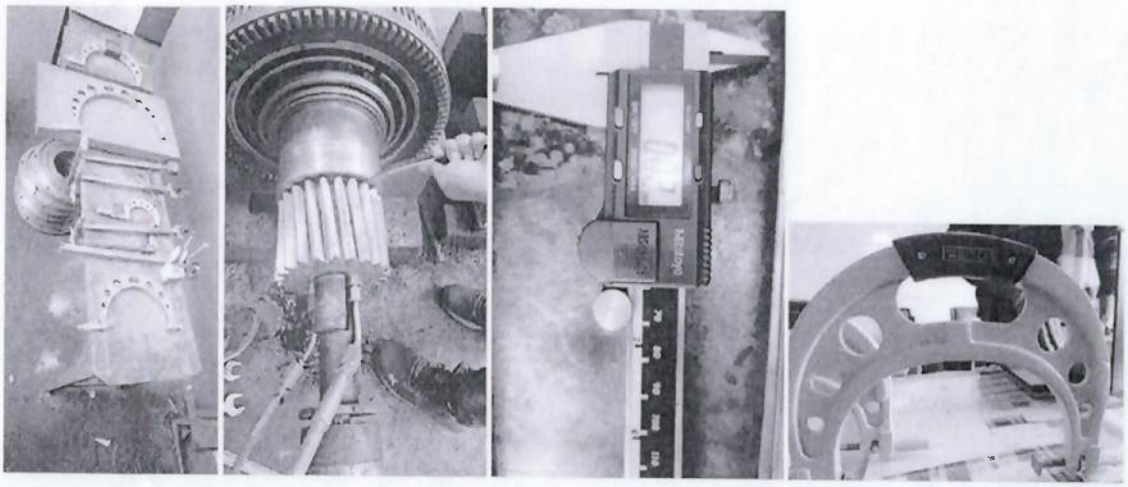
(ii) During the audit the 3D-CMM report are not available for bearing assembly components as the stock was old and 3-D CMM reports usually available maximum for 60 days on portal. Shed is using bearing components in kit form during IOH, however End shields are not changed if it is in good condition.

(iii) As per latest specification 4TMS.096.068 rev-2 Alt-1 of SG Cast Iron components of 3 Ph traction motors, embossing scheme has been specified for cast components. The DE/NDE side end frame available on shop floor were embossed as per this scheme.



(iv) In shop floor, measurements of assembly components were being carried out by using bore dial gauge having least count of 1 micron for ID as per SMI-318 and outside micrometres having least count of 10 micron for OD.

(v) Snap gauges were available (1 set in shop floor & 1 set at tool room) but not being used for measurement of shaft OD as master for calibration is not available at shed and same was indented. Different dial snap Gauges/ bore dial gauges are calibrated.



(vi) Few assembly components available on shop floor were checked with bore dial gauge and outside micrometre. Dimensions checked were found within limits.

Name of item	Measured dimension	Standard limit	Equipment used with LC	Remarks
DE End frame (ID)	319.960	319.950 - 319.990	**Dial bore gauge (10μ)**	All dimensions are Within limit
Outer Labyrinth DE (ID)	179.750	179.748 – 179.783	Dial Snap gauge (1μ)	

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	ID of Inner racerDE	179.990	179.975-180.000	Dial bore gauge (1µ)	
	ID of End FrameNDE	214.955	214.948-214.970	Dial Snap gauge (1µ)	
	OD of outer racer DE	319.990	319.960-320.000	Outside micrometer(10µ)	**Dim. 179.853 may be 179.850 or 179.860 when using apparatus of 10µ L.C.**
	Shaft seating dia for (Inner racer) DE	180.060	180.043– 180.068	Outside micrometer(10µ)	
(vii)	Shaft seating dia for (Outer labyrinth.)	**179.853**	179.843-179.868	Outside micrometer(10µ)	

I

n above measured dimension i.e shaft seating dia for outer labyrinth DE as (179.853 mm) using micrometer having least count of 10 micron is not possible and measured value are written based on experience. This is not correct practice for measurement of such critical dimension hence same to be addressed by using proper snap dial guage with least count of 1 micron as prescribed in SMI 314 to avoid such measurement error. Such in accurate measurement may lead to improper interference between mating surface.

(viii) As informed by Shop in-charge, there is no rejection of assembly components (11 items)on measurement basis during last 2 years. Based on the dimensions measured and recorded, all the interferences are being worked out before actual assembly. Shed has prepared it's own check sheet based on RDSO's issued Check Sheet for TM assembly. The Check Sheet filled during audit is attached as Annexure-1.

(ix) The shead is not downloading the 3D-CMM machine measurement sheet of assembly componets. The same should be downloaded for cross examination at shead level by available means otherwise 3D-CMM machine measurement sheet could not downloaded from portal after 60 days.

Recommendation:-

Use of Dial snap gauge with least count of 1 micron to be done for measuring OD of shaft , outer racer at various location and use of bore gauge with least count of 1 micron for measurement of ID of inner racer , end frame (NDE/DE) etc as per SMI 314/318 .

C) Checking of Pinion and shaft taperness:

(i) In shed shop floor, staff is aware for proper use of Ring Gauge provided by M/s ABB. They are checking taperness of Pinion shaft using ring gauge as well as measuring distance between Pinion teeth face and ring Gauge face. They have good practice to measure Pinion shaft taperness in advance for all new pinions available in stock when staff is free.

(ii) The shed has discontinued the practice of colour matching of pinion with shaft taper as prescribed in SMI-278.Shed has informed that during blue matching they always got 95% or more contact area between rotor shaft and pinion shaft.

(iii) The practice for checking shaft taperness using plug gauge as per RDSO drawing no SKEL-5032 alt-0 is also not done as prescribed in SMI-278 and check sheet circulated by RDSO on dated 2-12-2024

Recommendation:

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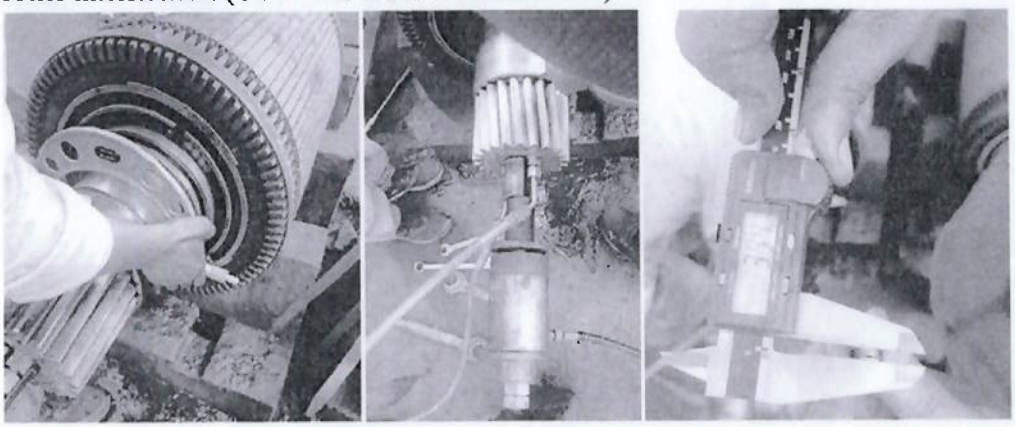
1) Shed may please continue the practice of colour matching of pinion with shaft taperness as per SMI-0278.
2) Shed may please continue the practice for checking shaft taperness using plug gauge as per RDSO drawing no SKEL-5032 alt-0 as per in SMI-278 and check sheet circulated by RDSO on dated 2-12-2024

D) Pinion insertion Process:

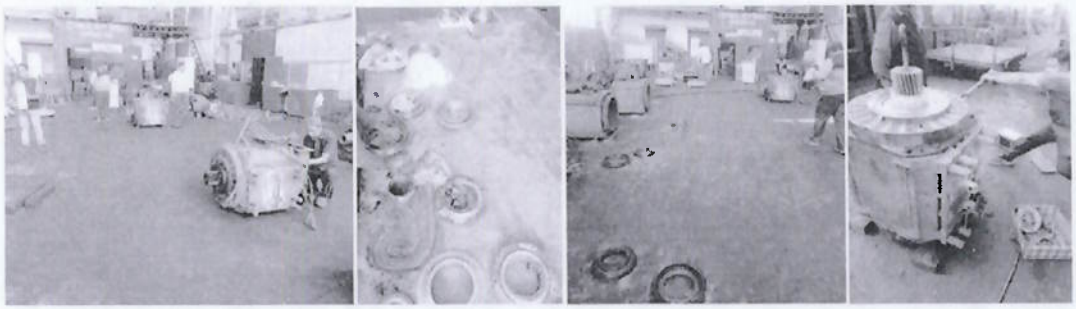
(i) The Pinion insertion procedure is adequate and as per SMI 0278.

(ii) After insertion of pinion, shed is taking OD of shaft for bearing seating area within 20 minutes after insertion of pinion. However the immediate value may be more by few microns due to increased temperature by pinion insertion (5-7 °C). It is recommended to take OD of rotor shaft (DE & NDE) after pinion fitment under ambient temperature for measuring correct predetermined better interference. (CLW WI: W21.410 Para 4.3.11)



E) Traction motor Assembly & Testing:

(i) Shop Floor of TM assembly area is constraint all cleaning work, dismantling & assembly is carrying out at same place. Therefore shop floor is sticky and dirty. There is no adequate space to perform separate activity at separate area. Assembled motor (ready to move), failed motors, rotors, new and released components are kept at same places.



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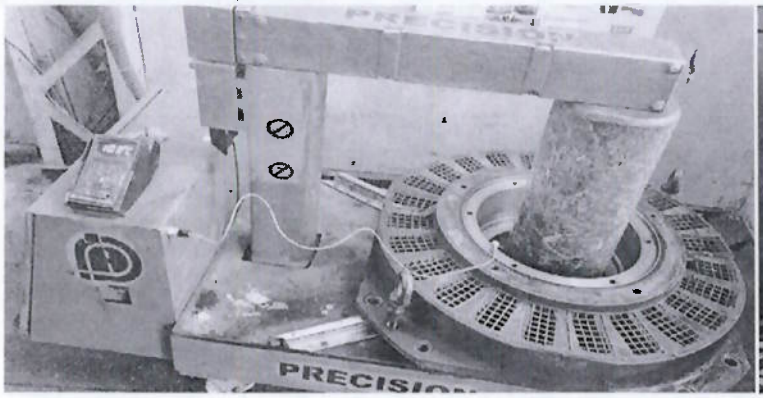
(ii) Shed is doing matching of mechanical components to achieve adequate interference among Shaft Vs Inner racer, End Shields Vs Outer racer and Shaft Vs Outer labyrinth DE.

(iii) Shed has two induction heaters with temperature control facility for heating of End Frames, Inner racers & labyrinths.



(iv) Assembly of one Traction motor was witnessed. The process of TM assembly was as per instructions issued from time to time by RDSO and ABB's assembly procedure.

(v) After assembly measured radial clearance on DE side was measured found 154 micron (range 110-190 micron).

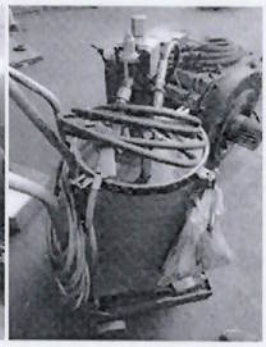
(vi) IR of NDE bearing as per specification is not checked and informed by shed that this practice is discontinued.

(vii) Shed is ensuring lateral thrust as per MS/0460 &0466.

(viii) For electrical testing shed has regular practice to measure Inductance variance, IR of all TMs.

(ix) Only Servoplex SHC-120grease is used for TM6FRA6068 bearings. Separate storage for Grease SHC-120 is available. Grease gun is available for measuring quantity of grease filled in TM bearings. During filling of grease, 26 grams grease goes into 10 strokes of grease gun.





(x) During new fitment of bearing, shed has practice to fill the grease into bearings and mating labyrinths by hand. Full greasing is not being carried out after assembly. As informed by shed, as the loco comes in first schedule, sample for metal content is collected, if ok, then full greasing is done.

(xi) TM assembly of TM, light run test was carried out 30 minutes in one direction only at 264V approx. During test, temperature is monitored. Shed has very old auto transformer (for DC motor testing) for performing this test. With this drive amount of current& RPM can not be monitored moreover tachometer is not available in TM section. TM section is not measuring noise & vibrations as old equipment is out of order and purchase of new SPM is under process. However, VVF Drive is available for wheeler test which is being conducted by TM Section.

(xii) The wheeler test of TMs is being under taken by TM section, where backlash, sound & vibration are checked after fitment of TM with wheel set. The backlash between gear and pinion is being measured by thin tin wire as prescribed by M/s ABB.

Recommendation:

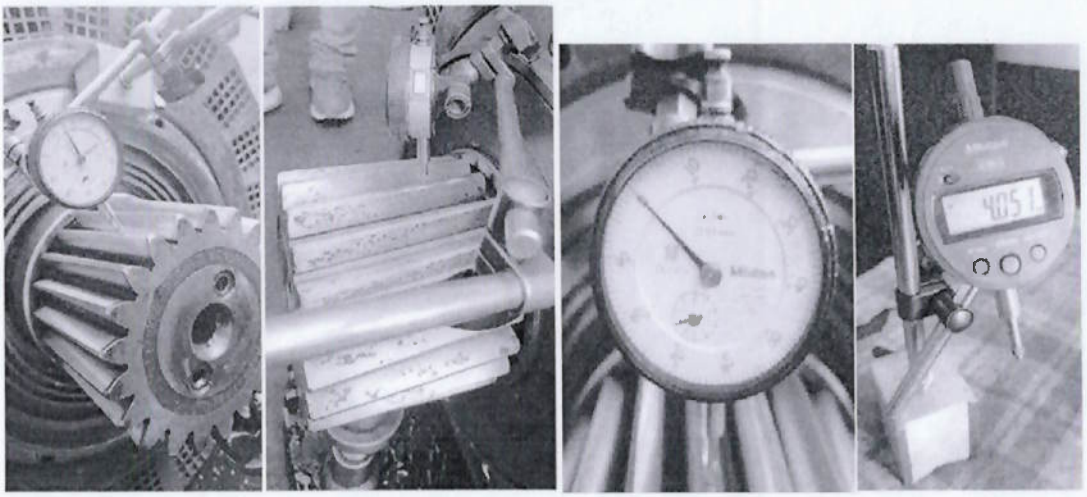
(i) Shed is advised to procure VVF Drive for light run testing at TM section.
(ii) Shed may procure digital grease gun having the display of delivered quantity of grease to avoid the counting of stroke.
(iii) Shed is recommended to carry out light run test in both direction for 30-30 minutes and monitor temperature, noise and vibrations.

F) Measurement of Radial Clearance:

(i) Shed is measuring radial clearance of each and every TM, assembled motors or released motor for any schedule.
(ii) As per SMI/0278, RC is to be measured by putting the pointer of dial gauge at 40 mm away from the face of Outer labyrinth DE, while shed has practice to measure RC by putting the pointer of dial gauge 40 mm away from outer pinion face (approx. 90 mm away from outer labyrinth DE face).
(iii) During technical audit, RC was measured at both places for understanding. It was observed that the measured value of RC when positioning the pointer of dial gauge 40 mm away from outer

pinion face is approx. 10μ more than the value of RC measured with positioning of pointer 40 mm away from outer labyrinth (as per SMI-278).

(iv) As informed by shed they are more comfortable to measure RC by analogue dial gauge (10μ LC) in comparison to digital dial gauge of least count of 1μ.



Recommendation:

(i) RC is vital measurement for reliable traction motor performance on line, shed is advised to follow SMI/0278 for measurement of RC as followed by other shed. It is worth to mention that as per existing practice of ELS/GMO for measured RC , it is 10 micron more than the RC measured as prescribed in SMI-278.

(ii) Shed may procure analogue dial gauge with least count of 1μ for measurement of RC .

G) Display Board at Shop Floor:

(i) Different display board regarding pinion assembly of Traction motor assembly and must change items during TOH/IOH are fixed at shopfloor locations however the location is not proper with respect to height.

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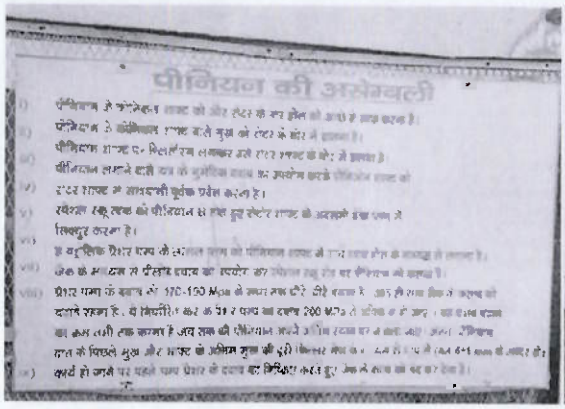

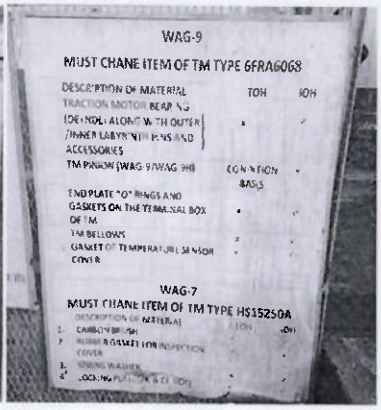

Recommendation: Shed is advised to hang one more board indicating the dimensions of various critical bearing as well as assembly components along with their interference between mating surface.

H) Summary of Technical audit report & Recommendations:

(i) As discussed in para B (VI & VII) above, measured dimension i.e shaft seating dia for outer labyrinth DE as (179.853 mm) using micrometer of least count 10 micron is not possible and measured value are written based on experience. This is not correct practice for measurement of such critical dimension hence same to be addressed by using proper snap dial guage with least count of 1 micron as prescribed in SMI 314 to avoid such measurement error. Such in accurate measurement may lead to improper interference between mating surface.
Use of Bore gauge and snap dail guage with least count of 1 micron to be ensured as per SMI-318 & 314.

(ii) As per SMI/0278, RC is to be measured by putting the pointer of dial gauge at 40 mm away from the face of Outer labyrinth DE, while shed has practice to measure RC by putting the pointer of dial gauge 40 mm away from outer pinion face (approx. 90 mm away from outer labyrinth DE face). Measurement of RC with prevailing practice at ELS/GMO always show more RC (up to 10μ).It is advised to follow SMI/0278 for measurement of RC.

(iii) Shed is not doing colour matching of pinion shaft taperness as per SMI-0278. Same should be ensured.

(iv) Shed is not doing checking rotor shaft taperness using plug gauge as per RDSO drawing no SKEL-5032 alt-0 as per SMI-278 and check sheet circulated by RDSO on dated 2-12-2024.Same should be ensured.

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(v) The fitment of inner racer, labyrinth should be undertaken only after cooling of rotor shaft upto ambient temperature based on OD of rotor shaft (DE & NDE) measured after pinion fitment under ambient temperature condition as per guideline/Work instruction (CLW WI: W21.410 Para 4.3.11)

(vi) The shed is not downloading the 3D-CMM machine measurement sheet of assembly componets. The same should be downloaded for cross examination at shead level by available means otherwise 3D-CMM machine measurement sheet could not downloaded from portal after 60 days

(vii) During assembly of TM, shed is not measuring the clearance between outer edge of Inner labyrinth (DE) to outer edge of Inner labyrinth (NDE) is 696±0.2 mm as per CLW's Drawing No 1TWD.096.111 for balanced rotor assembly (modified).It should be measured during assembly of TM using gauge no 3TJF.096.040. (CLW WI:-W21.514)

(viii) During assembly of TM . Shed is not measuring the distance between inner labyrinth (DE) to shaft end face (139.5±0.1 mm) and distance between inner labyrinth (NDE) to shaft end face (72mm) using depth gauge and same to be ensured.(CLW WI:-W21.514)

(ix) As discussed in para E (IX),Shed is advised to carry out this no load test of assembled TM in both duration for 30-30 minutes as per existing practice in other major sheds of IR.

(x) As recommended by OEM's of bearings, the run the motor initially at 100 rpm for first 5-10 minutes to ensure uniform distribution of grease and gradually increase to 1000 rpm but rpm shall not be higher than 1000 rpm

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ATE - 04/02/25 to 05/02/25 PAGE - 04/01

TRACTION MOTOR OVERHAULING CHECKSHEET

LOCO NUMBER	TM POSITION	SCHEDULE	REASON OF OVERHAULING
31060	TM-4	IC/2024	Defective Lot of NBC Bearing changing

	STATOR SERIAL NUMBER/MAKE	ROTOR SERIAL NUMBER/MAKE/VERSION
OUT	TMTG-5111	13028254 (Sch-II)
IN	Same	Same

ASSOCIATE COMPONENT	MAKE	IN SERIAL NUMBER	REASON FOR OUT
DE OUTER BEARING CAP	SES	06/23/S-1501	Un-modified out & New Ref. 7 fitted
DE OUTER LABYRINTH	SES	06/23/S-1543	
DE INNER LABYRINTH (SHAFT)	NIR		
DE INNER LABYRINTH (END FRAME)	AS -	09/24-2072	Inner Lab changed due to slightly pitmark
DE END FRAME	K.M		
NDE BEARING CAP	K&W-SL-02-(06/18)		Same
CLAMP PLATE	KM -		
NDE INNER LABYRINTH (SHAFT)	NIR		
NDE INNER LABYRINTH (END FRAME)	AS -	09/24-2072	New fitted at the time of bearing changing
NDE END FRAME	KM	85-5-14-SGCI	

PINION - 20 Teeth ☐ OR 21 Teeth ☑		MAKE - KPC	DOC. - 03/12/2024
PINION NO: (OUT): GGAL-9152 (2/20)		REASON - For New Pinion fitment	
PINION NO: (IN): KPCL-24E161319 (new)		BTL: 77.54	DOF. - 05/02/25
ADVANCEMENT OF PINION DURING FITMENT	STD. VALUE: 12±0.1 mm		MEASURED VALUE: 12.0
GAP BETWEEN PINION AND OUTER FACE OF SHAFT:	STD. VALUE: 4 ± 1 mm		MEASURED VALUE: 3.95
PINION SHAFT TAPPERNESS USING RING GAUGE	STD. VALUE: 15 ± 0.3 MM		14.75

REMARKS - (i) GGAL pinion out for spare use.
(ii) New KPC make pinion fitted, as New Bearing fitted both side.

MEASUREMENT OF TRACTION MOTOR (6FRA6068)

INDUCTANCE (mH)	UV 3.981	VW 3.981	UW 3.975		
WINDING RESISTANCE	UV 96.3	VW 96.2	UW 96.3		
INSULATION RESISTANCE	300 MΩ				
SPEED SENSOR: 14R7 conversion O/P			GAP:		
TEMPERATURE SENSOR – AB - 113.1Ω CD - 113.1Ω E-PIN - Only			LENGTH - 102 mm	MS 437 - Yes	

SL. NO.	DESCRIPTION	STD. VALUE (in mm) as per RDSO MS 0415	DRIVE END MEASURED VALUES (In mm)
	DRIVING END PARAMETERS		
1	Bearing (Out) - NBC - 2/22 (UA-338)	REASON - Defective lot of NBC bearing	
2	Bearing (In) - SKF - X (ECMRD - 5874) (New)	DOC. - 30/12/24	DOF. - 05/02/25
3	Inner Dia of inner racer	179.975 to 180.000 mm	179.990
	Shaft Dia at Inner Racer Portion	180.043 to 180.068 mm	180.060
	Interference	0.043 to 0.093 mm	0.070
4	Shaft Dia at Inner Labyrinth Portion	184.050 to 184.079 mm	N/R
	Inner Dia of Inner Labyrinth on Shaft	184.000 to 184.040 mm	
	Interference	0.010 to 0.079 mm	
5	(A) Outer Dia of Inner Racer before Fitment	--	214.825
	(B) Outer Dia of Inner Racer after Fitment	--	214.890
	(C) Swell = (B-A)	--	0.065
	Bore Dia of Bearing seat area on End Frame	319.950 to 319.990 mm	319.960
6	Outer Dia of Outer Racer of Bearing	319.960 to 320.000 mm	319.990
	Interference	0.010 to 0.050 mm	0.030
	Outer Dia of Labyrinth of End Frame	305.060 to 305.080 mm	305.072
7	Inner Dia of End Frame at Inner Laby. Portion	305.025 to 305.050 mm	305.047
	Interference	0.010 to 0.055 mm	0.025
	Shaft Diameter at Outer Labyrinth Portion	179.843 to 179.868 mm	179.853
8	Inner Dia of Outer Labyrinth	179.748 to 179.783 mm	179.750
	Interference	0.060 to 0.120 mm	0.103
	Outer Dia of Outer Labyrinth	211.315 to 211.400 mm	211.360 } Alt-X
	Inner Dia of Outer Bearing Cap	212.100 to 212.185 mm	212.000 } Alt-X
9	Clearance	0.70 to 0.87 mm	0.64 } Alt-X
	Final Clearance Value (measured Clearance/2)	0.35 to 0.435 mm	0.32 ≈ Alt-X
10	Lateral Thrust	0.20 to 0.95 mm	0.70
	Free Radial Clearance	0.170 to 0.220 mm	0.190
11	Radial Clearance (Jack Value)	0.130 to 0.220 mm	0.18
	Final Radial Clearance (Jack Value x 0.86) (As per SMI-278)	0.110 to 0.190 mm	0.154
12	Axial Clearance of Assembled TM (As per SMI-278)	SKF: 210 to 410 µ FAG: 200 to 395 µ	250 µ
13	Diameter of Grease Outlet of End Frame (As per MS-485 dated 17.03.22)	9 to 12 mm	12 mm

DATE - 04/02/25 to 05/02/25

SL. NO.	DESCRIPTION	STD. VALUE (in mm) as per RDSO MS 0415	NDE MEASURED VALUES (in mm)
	NON-DRIVING END PARAMETERS		
1	Bearing (Out) - NRC-22-E-0126(5/22)	REASON - Defective Lot of NRC bearing	
2	Bearing (In) - SKF-X (4472)	DOC. - 30/12/24	DOF. - 05/02/25
3	Inner Dia of inner racer	99.985 to 100.00 mm (SKF)	99.990
		99.980 to 100.00 (FAG)	
	Shaft Dia at Inner Racer Portion	100.023 to 100.045 mm	100.030
	Interference	0.023 to 0.060 mm (SKF)	0.040
		0.023 to 0.065 mm (FAG)	
4	Shaft Dia at Inner Labyrinth Portion	105.037 to 105.059 mm	
	Inner Dia of Inner Labyrinth on Shaft	105.000 to 105.025 mm	N/R
	Interference	0.012 to 0.059 mm	
5	(A) Outer Dia of Inner Racer before Fitment	--	127.390
	(B) Outer Dia of Inner Racer after Fitment	--	127.410
	(C) Swell = (B-A)	--	0.020
6	Bore Dia of Bearing seat area on End Frame	214.948 to 214.970 mm	214.955
	Outer Dia of Outer Racer of Bearing	214.970 to 215.000 mm (FAG)	
		214.980 to 215.000 mm (SKF)	214.990
	Interference	0.010 to 0.052 mm (SKF)	
		0.022 to 0.052 mm (FAG)	0.035
7	Outer Dia of inner Labyrinth on End Frame	205.050 to 205.070 mm	205.060
	Inner Dia of End Frame at Inner Laby. Portion	205.010 to 205.040 mm	205.030
	Interference	0.010 to 0.060 mm	0.030
8	Clamp plate NDE	139.840 to 139.900 mm	139.880
	Bearing Cap NDE	140.600 to 140.660 mm	140.640
	Clearance	0.70 to 0.82 mm	0.760
	Final Clearance (Measured clearance/2)	0.35 to 0.41 mm	0.380
9	Shaft Diameter at Clamp Plate Portion	100.023 to 100.045 mm	100.030
	Inner Dia of Clamp Plate	100.000 to 100.013 mm	~~100.030~~ 100.010
	Interference	0.010 to 0.045 mm	0.020
10	Lateral Thrust	0.05 to 0.95 mm	0.65
11	Free Radial Clearance	0.105 to 0.140 mm	0.113
	Radial Clearance (Jack Value)	0.070 to 0.130 mm	0.09
	Final Radial Clearance (Jack Value x 0.86) (As per SMI-278)	0.060 to 0.110 mm	0.077

SPM	DE: 0.3 mm/s	NDE: 0.2 mm/s	
TEMP (°C) (Light run test)	DE	NDE	AMB.
	45°C	41°C	25°C

Sl. No.	Name of Staff	Date	Signature of Staff
1.	T.D. Kumar + Chandan	04/02/25 Dismantle	
2.	Vishwajeet		
3.	M.P. Rajak	05/02/25 ~~Assemble~~	
4.	Mohid		

(3) Bijay + Mohid 05/02/25 Assemble

Next Bearing fitment

Vijay M Mohato 05/02/25

REMARKS

(i) At first both side radial checking done, found DE side radial below range (0.120-0.86 = 0.103 mm).

(ii) Both side dismantle done, and both side's defective set of NDE removal done and kept in store with inner race.

(iii) Both side end frame dimension checking done.

(iv) Both side perp. examine new SKF make bearing fitted.

(v) New KPCL make pinion fitted along with new bearing.

(vi) On-modified labyrinth set out.

(vii) New pure DE labyrinth set fitted (Alt. 7)

- DE bearing cap :- SES/6-23/S-1501
- DE outer labyrinth :- SES/6-23/S-1543

Clearance :- 0.32

Signature of JE/SSE
Manoj Kumar
SSE/TM

BOGIE RUN TEST FORMAT

LOCO NO. - 31060 | SCHEDULE :- TOH | SHIFT :- 16-24 | DATE :- 07/02/2025

Reason of lifting :- TOH WORK

Name of Supervisior/~~Staff~~- KUMAR SOURAV (BG1 & 2) Sign-- Kumar Sourav (BG1 &2)

TM Make & Serial No	TM-1	TM-2	TM-3	TM-4	TM-5	TM-6
	TMTG-2839 CLW	TMTG-6018 CLW	223014848R SAINI	TMTG-5111 CLW	21904638 SAINI	2212202-3481 CGL

Measured Temperature

BG 1 Amb.- 25°C — Clockwise Direction — BG 2 Amb.- 25°C

BG 1 Start Time :- 17:45 — BG 2 Start Time :- 15:15

TIME LAPS FOR BG 1	TM-1 DE	TM-1 NDE	TM-2 DE	TM-2 NDE	TM-3 DE	TM-3 NDE	TM-4 DE	TM-4 NDE	TM-5 DE	TM-5 NDE	TM-6 DE	TM-6 NDE	TIME LAPS FOR BG 2
18:00	35	40	36	39	36	39	34	38	34	40	31	38	15:30
18:15	36	41	37	39	37	40	35	39	35	41	32	40	15:45
18:30	36	41	38	40	38	42	36	40	36	42	33	42	16:00
18:45	38	43	39	42	39	43	37	42	37	44	34	44	16:15
	BG 1 Amb.- 24°C — Anti-Clockwise Direction — BG 2 Amb.- 25°C												
	BG 1 Start Time :- 18:50 — BG 2 Start Time :- 16:20												
19:05	39	44	40	43	40	44	38	43	38	44	35	45	16:35
19:20	40	45	41	44	41	45	40	44	39	45	36	46	16:50
19:35	41	47	42	46	42	47	41	45	40	47	37	47	17:05
19:50	42	48	42	48	44	48	42	47	42	49	38	49	17:20
	Greasing date-						PPM Report after Bogie Run Test						
	580	529			334	638							

REMARKS :-

OVERHAULING

IOH

LOCO NO: 37082-G DATE: 28/2/24

STATOR NO: 4636886				
ROTOR NO: 720-01 SSS AR (SCH II) 1893				
PINION (OUT): Bhel ABBH233	Out for above use as BTL Low			
PINION (IN): GGAG-4278 (1st)	BTL: 78.43		GAP: 4.90	
BEARING (OUT)	DE: SKF-P ← Out		NDE: ~~FAG-R~~	
BEARING (IN)	DE: SKF-W (ECMRD-1662)		NDE: SKF-W	(40)
	I/R VALUE: 300 MΩ (65)		SPEED SENSOR:	
TEMP. SENSOR	AB:		CD:	
	J/BOX CHECKED: Ok		BLOWING: Done	
	GREASE: SHC-120		TESTING:	
W/R	UV:	UW:	VW:	
R/C	UV: 3.963	UW: 3.962	VW: 3.961	
RACER SEAT DIA	DE: 180.065 (RANGE:180.043-180.068/180.028-180.053mm)		NDE: 100.040 (RANGE:100.023-100.045)	
RACER INNER DIA	DE: 179.990 (RANGE:179.975-180.000mm)		NDE: 99.985 (RANGE:99.980-100.000mm)	
BEARING OUTER DIA	DE: 319.990 (RANGE:319.960-320.000mm)		NDE: 214.990 (RANGE:214.980-215.000mm)	
BORE DIA	DE: 319.950 (New Cover) (RANGE:319.950-319.990mm)		NDE: 214.965 (New cover) (RANGE:214.949-214.978mm)	
RADIAL CLEARANCE	DE: 0.16 x 0.86 (RANGE:0.110-0.190mm)		NDE: 0.08 x 0.86 (RANGE:0.060-0.110mm)	
AXIAL CLEARANCE	DE: 270 (RANGE:SKF-210-410 micron, FAG-200-395 micron)		NDE: (RANGE:	
LABYRINTH (LATERAL THRUST)	DE: 10.40 - 9.65 = 0.75		NDE: 9.60 - 8.90 = 0.70	
	WIPER SEAT DIA: 179.860 (RANGE:179.843-179.868mm)		WIPER INNER DIA: 179.755 (RANGE:179.748-179.783mm)	
S.P.M	DE: 0.2		NDE: 0.3	
TEMP.	DE: 45	NDE: 50	AMB: 25	

* Both Side dismantle for new brg fitment in all new asociate components.

Sl. no - SEFW · [redacted] 04

PO → 0321406510049 8 (11.2.22).

① f.c.R

② Ravi Bhatt

Signarure of Staff

Signature of SSE/JE

OVERHAULING

DATE: 25/1/24-d, 26/1/24-A

LOCO NO: 30621-2

STATOR NO: 7766			
ROTOR NO: CLWRTG 1373 E592 CLW YFB 142 (2012)			
PINION (OUT): GGAG-4699			GAP: 4.75
PINION (IN):		BTL: 78.39	NDE: SKF-R
BEARING (OUT)	DE: SKF-T (ECMRD-2348)		NDE:
BEARING (IN)	DE:		SPEED SENSOR:
	I/R VALUE:		CD:
TEMP. SENSOR	AB:		BLOWING: Done
	J/BOX CHECKED: OK		TESTING:
	GREASE: SHC-120		VW:
W/R	UV:	UW:	VW:
R/C	UV:	UW:	
RACER SEAT DIA	DE: 180.060 (with dummy) (RANGE:180.043-180.068/180.028-180.053mm)		NDE: (RANGE:100.023-100.045)
RACER INNER DIA	DE: (RANGE:179.975-180.000mm)		NDE: (RANGE:99.980-100.000mm)
BEARING OUTER DIA	DE: (RANGE:319.960-320.000mm)		NDE: 214.990 (RANGE:214.980-215.000mm)
BORE DIA	DE: (RANGE:319.950-319.990mm)		NDE: (214.980) out, In new 214.96 (RANGE:214.949-214.978mm)
RADIAL CLEARANCE	DE: 0.17x0.86 (RANGE:0.110-0.190mm)		NDE: 0.09x0.86 (RANGE:0.060-0.110mm)
AXIAL CLEARANCE	DE: 260 (RANGE:SKF-210-410 micron, FAG-200-395 micron)		NDE: (RANGE:
LABYRINTH (LATERAL THRUST)	DE: 10.50-9.70=0.80. New		NDE:
	WIPER SEAT DIA: 179.850 (with dummy) (RANGE:179.843-179.868mm)		WIPER INNER DIA: 179.760 (RANGE:179.748-179.783mm)
S.P.M	DE: 0.3		NDE: 0.3
TEMP.	DE: 36	NDE: 39	AMB: 19

* Both side dismantle for OH & NDE E/F PPM high attention.
* Pure laby found already ~~same~~ New fitted. due wiper I.D. 4

Laby- SES/11/23/S- 1932
wiper- SES/11-23/S. 2021
flange- 0.28

① F.C.R /dis
② Bijay /dis

Signarure of Staff

① M.P.R /Asr
② Bijay /Asr

Signature of SSE/JE

OVERHAULING

LOCO NO: Assemble New - TM DATE: 25/6/24

New	STATOR NO: TMTG-3644		
New	ROTOR NO: CLW-RTG-Z-1642-VFL-603-F-839 (Sch.I)		
	PINION (OUT):		
Taken from loco	PINION (IN): CGMG-568 11/20	BTL: 78.47	GAP: 4.10
	BEARING (OUT) DE:		NDE:
New	BEARING (IN) DE: SKF-X (ECMRD-1569)		NDE: SKF-X-1469
	I/R VALUE: 300 MΩ		SPEED SENSOR:
TEMP. SENSOR	AB: 113.1Ω		CD: 113.1Ω
	J/BOX CHECKED: Ok		BLOWING: Done
	GREASE: SHC-120		TESTING:
W/R	UV:	UW:	VW:
R/C After Assembly	UV: ~~5.983~~ 4.267	UW: ~~5.98~~ 4.263	VW: 4.266
RACER SEAT DIA	DE: 180.050 (RANGE:180.043-180.068/180.028-180.053mm)		NDE: 100.033 (RANGE:100.023-100.045)
RACER INNER DIA	DE: 179.990 (RANGE:179.975-180.000mm)		NDE: 99.990 (RANGE:99.980-100.000mm)
BEARING OUTER DIA	DE: 319.995 (RANGE:319.960-320.000mm)		NDE: 214.990 (RANGE:214.980-215.000mm)
BORE DIA	DE: 319.955 (SEFW-Sl.no-0049) (RANGE:319.950-319.990mm)		NDE: 214.965 (SEFW-Sl.no-0043) (RANGE:214.949-214.978mm)
RADIAL CLEARANCE	DE: 0.16×0.86 (RANGE:0.110-0.190mm)		NDE: 0.09×0.86 (RANGE:0.060-0.110mm)
AXIAL CLEARANCE	DE: 260 (RANGE:SKF-210-410 micron, FAG-200-395 micron)		NDE: (RANGE:
LABYRINTH (LATERAL THRUST)	DE: 10.35-9.60 = 0.75 New Pyre		NDE: 9.70-8.90 = 0.80
	WIPER SEAT DIA: 179.850 (RANGE:179.843-179.868mm)		WIPER INNER DIA: 179.750 (RANGE:179.748-179.783mm)
S.P.M	DE: 0.2		NDE: 0.3
TEMP.	DE: 48°C	NDE: 51°C	AMB: 33°C

Stator R/C
5.983
5.982
5.983
5.98mΩ

** Spare TM assemble with all new components.

① K.R
② Binod

** New Laby set given -
Laby :- SGCI-SES/11/23/S-2055
wiper :- SGCI-SES/11/23/S-2060
Flange :- 28

Signature of Staff Signature of SSE/JE

OVERHAULING

R/c Differ

LOCO NO: 30640-1 DATE: 06/08/23

STATOR NO:	TMTY-729		out	In new Rotor
ROTOR NO	SKF-0514-6426-9-3052-111-02-05 (V2B2)		[CLW-RTG-2-1309 F-185 GIV-687] Sch.I	
PINION (OUT):	GGAY-954 (09/17)			
PINION (IN):	Same	BTL: 78.42	GAP: 4.85	
BEARING (OUT)	DE: FAG-W		NDE: FAG-W	
BEARING (IN)	DE:		NDE:	
	I/R VALUE: 200 MΩ		SPEED SENSOR:	
TEMP. SENSOR	AB: 113.1Ω		CD: 113.0Ω	
	J/BOX CHECKED: OK		BLOWING: Done	
	GREASE: SHC.120		TESTING:	
I/R	UV: 98.5	UW: 98.6	VW: 98.6	
R/C After assembled	UV: 4.318	UW: 4.319	VW: 4.316	
RACER SEAT DIA	DE: 180.030 with dummy (RANGE:180.043-180.068 / 180.028-180.053 mm)		NDE: 100.030 (RANGE:100.023-100.045)	
RACER INNER DIA	DE: 179.995 (RANGE:179.975-180.000 mm)		NDE: 99.990 (RANGE:99.980-100.000 mm)	
BEARING OUTER DIA	DE: (RANGE:319.960-320.000 mm)		NDE: (RANGE:214.980-215.000 mm)	
BORE DIA	DE: (RANGE:319.950-319.990 mm)		NDE: (RANGE:214.949-214.978 mm)	
RADIAL CLEARANCES	DE: 0.19×0.86 (RANGE:0.110-0.190 mm)		NDE: 0.11×0.86 (RANGE:0.060-0.110 mm)	
AXIAL CLEARANCES	DE: 280 (RANGE:SKF-210-410 micron, FAG-200-395 micron)		NDE: (RANGE:	
LABYRINTH LATERAL THRUST)	DE: 10.40-9.60 = 0.80 New		NDE: N/Remove	
	WIPER SEAT DIA: 179.860 (with dummy) (RANGE:179.843-179.868 mm)		WIPER INNER DIA: 179.765 (RANGE:179.748-179.783 mm)	
R.P.M	DE: 0.2		NDE: 0.3	
TEMP.	DE: 44°C	NDE: 49°C	AMB: 28°C	

* B/side dismantle for R/c-differ
* Mix Laby out
* No any (abnormal found visually in rotor, but due to R/c differ kept in defective
* In New good rotor with all same components.
* New Laby sed fitted
Laby - SES/02-23/S-930
wiper. SES/02-23/S-1049
flange gap. 0.28

① Md Gyas
② Pramod
Signature of Staff

Signature of SSE/JE
M. Kr

for some time so that glycerin spreads on the complete inside surface. Ensure that under no circumstances pressure exceeds 2000 bar.

4.3.8 Apply the pressure on the secondary pump also. Hence the pinion moves inside the shaft and measure the distance of pinion travel.

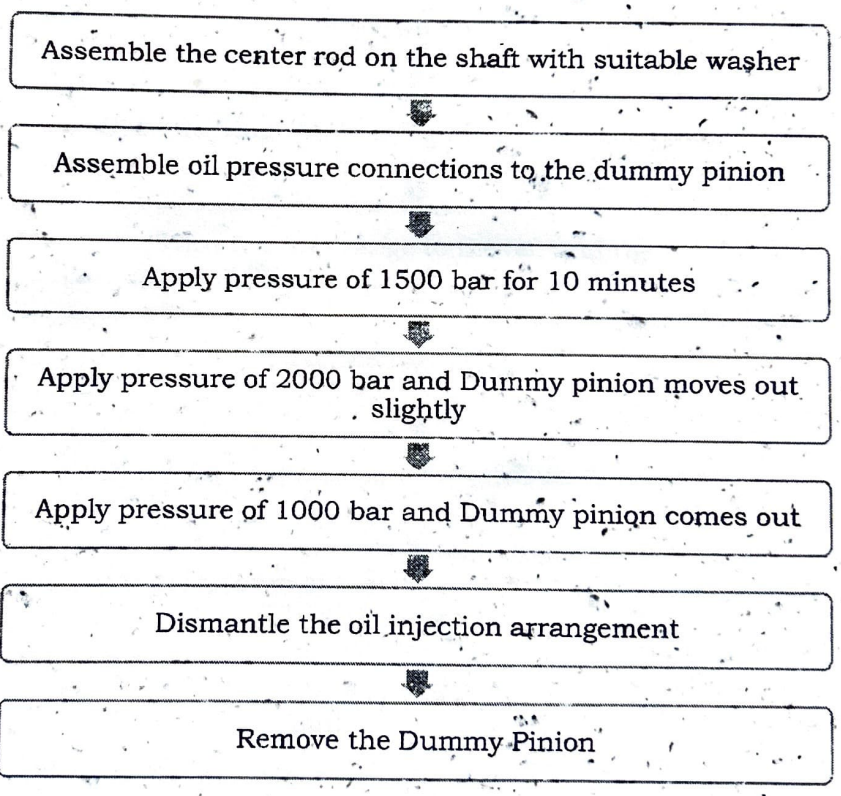
4.3.9 Release the pressure of glycerin when pinion travels inside the shaft 12 ± 0.1 mm as per its initial length, but keep the pressure of secondary pump intact. This allows all the glycerin to drain back into the glycerin chamber of hypress machine. Around 10 to 15 minutes will be sufficient.

4.3.10 Dismantle all the fixtures and hypress connection.

4.3.11 Measurement of rotor shaft OD (DE & NDE) after pinion fitment under ambient temperature.

5.0 PROCESS FLOW CHART:

5.1 Process flow chart for dismounting of Dummy Pinion:



WORK INSTRUCTION	W.I. NO.	: W21.514
INNER LABYRINTH FITMENT	VERSION	: 02
	EFFECTIVE DATE	: 02.05.2024
	PAGE NO.	: 01 OF 03

1.0 INTRODUCTION:

Fitment of Inner Labyrinth in 3-phase Rotor shaft.

2.0 CHARACTERISTICS OF PROCESS, PRODUCT & SERVICE:

It is a fitment work which involves heating the labyrinth before fitting on the rotor. It also involves turning which is a machining process.

3.0 SCOPE:

Three Phase Traction Motor Type 6FRA 6068.

4.0 INSTRUCTION/PROCEDURE:

Reference Documents:

Drg. Of Labyrinth (DE) : 4TWD.096.043

Drg. Of Labyrinth (NDE) : 4TWD.096.042

4.1 Clean Labyrinth of both D.E. & N.D.E. sides properly and make it smooth.

4.2 Clean the D.E. side & N.D.E. sides Labrinth sitting zone of the shaft.

4.3 Place the N.D.E. side labyrinth in induction heater and set the temperature between 115°C to 120°C.

4.4 After the labyrinth attains the set temperature take the hot labyrinth and fit it on the N.D.E. side of the Rotor. (NOTE- At the time of handling the hot labyrinth, asbestos hand gloves must be used).

4.5 Allow to cool to ambient temperature.

4.6 Repeat the same process for the DE side also.

4.7 Measure the labyrinth to labyrinth distance with Gauge No. 3TJF.096.040.

4.8 To maintain the proper distance labyrinths are to be faced on a Profile Turning M/c.

4.9 To ensure proper distance between N.D.E. side shaft end face to labyrinth face, distance is to be measured with depth gauge.

4.10 With reference to N.D.E. side, D.E. side may be faced.

4.11 If necessary, facing of the labyrinth is to be done to achieve the proper distance between labyrinth face and the shaft end (DE side 139.5±0.1mm & NDE side 72.5±0.5 mm).

4.12 Re-Check with Gauge No: 3TJF.096.040 – if GO gauge passes and NO GO gauge does not pass then rotor is ready for next operation.

PREPARED BY	APPROVED BY	ISSUED BY
SSE/TM-21	DY.CEE/TMM	MR

5.0 PROCESS FLOW CHART:

Cleaning of the Labyrinth of DE & NDE sides

↓

Heating of the Labyrinth of NDE side in induction heater at temperature (115-120)°C

↓

Fitment of the Labyrinth on shaft (NDE side) using asbestos hand gloves

↓

Allow the labyrinth to cool to ambient temperature

↓

Repeat the above steps for DE side labyrinth

↓

Measurement of labyrinth to labyrinth distance with Gauge No. 3TJF.096.040

↓

Turning of labyrinths to maintain proper distance

↓

Ensure proper distance between NDE side shaft end face to bearing stopper, measure distance with depth gauge

↓

Turning of DE side with reference to NDE side

↓

Re-check with gauge no.3TJF.096.040

↓

If GO gauge passes and NO GO gauge does not pass, despatch rotor for next operation

6.0 MACHINES/TOOLS USED IN THE PROCESS:

6.1 Induction heater.

6.2 Depth gauge.

6.3 GO/NO GO gauge no.- 3TJF.097.018.

7.0 RISK AND OPPORTUNITIES ASSOCIATED WITH THE PROCESS:

7.1 **RISK AND OPPORTUNITIES RELATED TO RQMS & QMS (ISO 22163 & 9001):** Risk and Opportunities identified in IRIS document ID – CLW/TM-21/F-04.

7.2 **RISK AND OPPORTUNITIES RELATED TO OH&S (ISO 45001):** Risk and Opportunities identified in document ID – FMR.008 of TM-21.

7.3 **RISK AND OPPORTUNITIES RELATED TO EMS (ISO 14001):** Risk and Opportunities identified in document ID – FMR.009 of TM-21.

8.0 PERSON(S) INVOLVED IN THE PROCESS AND THEIR COMPETENCE:

8.1 Supervisors (SSE and JE).

8.2 Technicians.

9.0 WORK ZONE PARAMETERS:

Details of work zone parameters available in document ID – TME-21/OH&S.

10.0 CONTROL PLAN:

Details of Control Plan available in IRIS document ID – CLW/TM-21/F-15.

11.0 ABBREVIATIONS:

11.1 DE – Driving End.

11.2 NDE – Non Driving End.

12.0 RECORDS:

12.1 Rotor Inspection records.

12.2 Rotor Despatch records.

PREPARED BY	APPROVED BY	ISSUED BY
SSE/TM-21	DY.CEE/TMM	MR