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No. EL/3.2.182

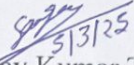
Date: As signed

Principal Chief Electrical engineer,
Southern Railway, Chennai

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: RDSO's letter no. EL/3.2.182 dated 17.01.2025.

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/RPM with effect from 23.01.2025 to 25.01.2025.

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


(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, Royapuram, Chennai: for information & necessary action.



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

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

Report No.: RDSO/2025/EL/TAR/0036 Rev '0'

Issue Date: 05.03.2025

Approved by	
PED / Traction	Signature


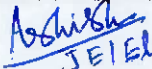

Audit Done By
RDSO, Lucknow

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

Prepared by	Checked by	Issued by
 SSE/Elect.	 JE/Elect.	

Technical Audit Report on 3-Phase TM Maintenance Practices at ELS/RPM

Electric Loco Shed, Royapuram, Suthern Railway, had experienced nine cases of Traction motor bearing failures / axle lock cases since April 2024. Due to large numbers of failures, RDSO has decided to carry out Technical Audit of Traction Motor maintenance practices & facilities of ELS/RPM/SR. Accordingly, two SSEs of RDSO had carried out the technical audit of Traction Motor maintenance practices & facilities of three phase Traction Motors type 6FRA6068 at ELS/RPM from 23.01.2025 to 25.01.2025. Observations noted during audit are as under:-

A) Bearing storage:

- (i) The bearings DE & NDE of traction motor at shop floor were kept properly on racks in a separate room. The bearings on shop floor were kept in temperature & humidity controlled area but there was no temperature/ humidity monitoring facility available (Thermometer /Hygrometer) in bearing storage room area
- (ii) In Main Store ward of Shed, bearings were kept packed in boxes & properly stacked. The main store of shed has not temperature/humidity control facility. Practice of FIFO (First in First Out) was being followed. **However around 10 bearings of M/s Scheaffler make lying waste at shop floor storage as it's Free RC is 170 micron.**
- (iii) Free radial clearance of all bearing were checked & noted on box before use of particular bearing.



Bearing Stored on shop Floor room



Bearings kept in main store

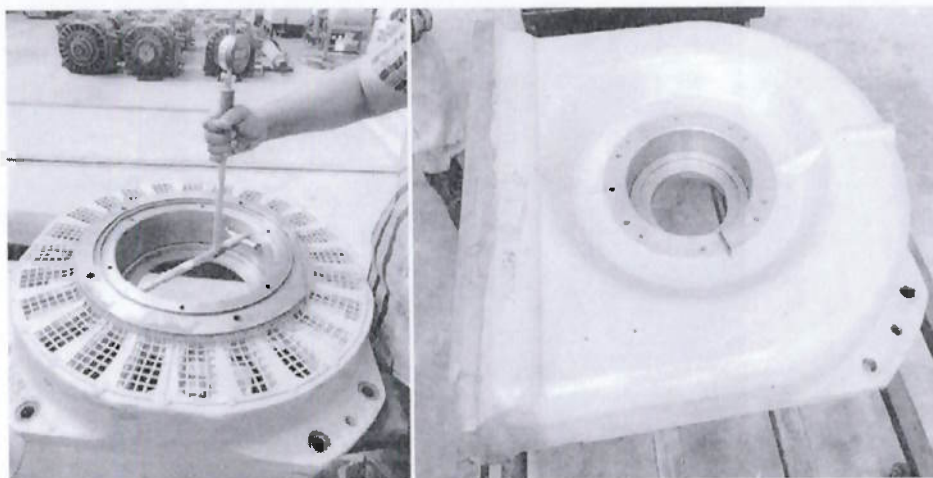
Recommendation:

Chennai is costal area and the temperature & humidity controlled space is not available in Main store of Shed, Bearing lying in main store may also be kept in Shop Floor room with proper stacking.

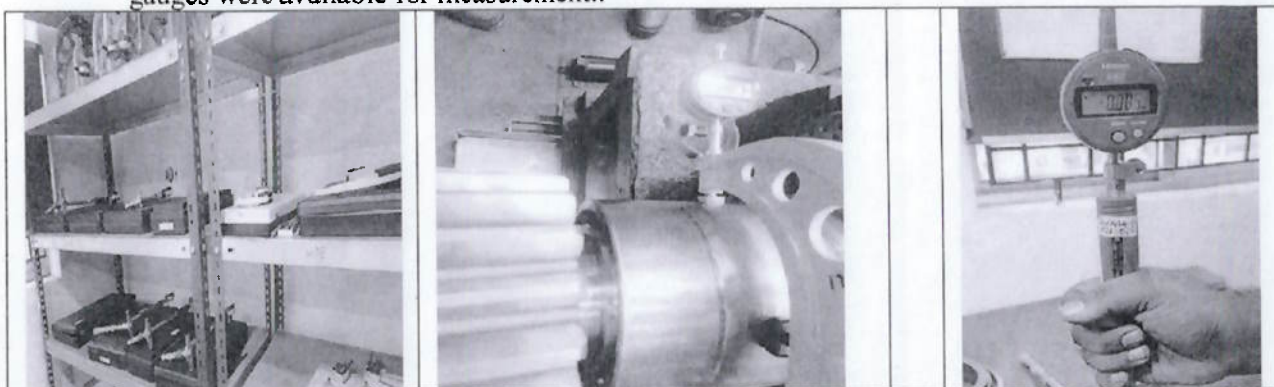
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B) Receipt, inspection & checking of associated assembly components :-

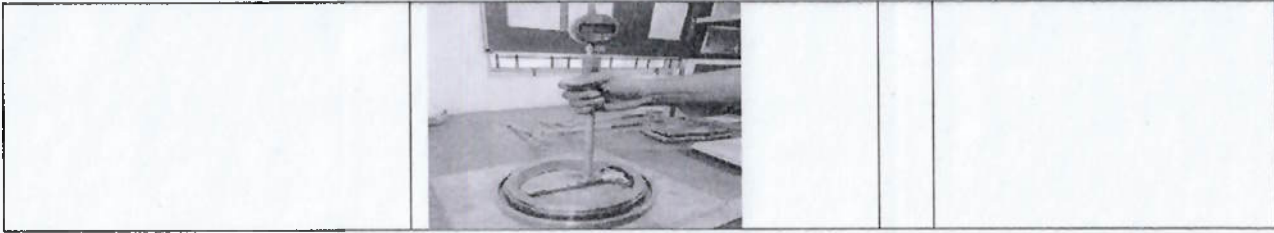
- (i) Associated assembly components (set of 11 items) are procured from CLW approved sources. Shed is procuring 9 bearing components (one PL) + End Frame DE (one PL) + End Frame NDE (one PL) through three different PL numbers.
- (ii) During the audit the CMM report were available for bearing components (9 items stocked under one PL) of M/s NEPL at portal, but CMM reports of End frames stocked under different PL could not get downloaded from portal because material was received 7 months before.
- (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 casted components. The DE/NDE side end frame available on shop floor were embossed as per this scheme.



- (iv) In shop floor, measurements of bearing components were being carried out by using bore dial gauge for ID as per SMI-318 and outside OD using digital micrometres. Snap gauges were being used for measurement of shaft OD as per SMI-314. Different ranges of Snap Gauges/ bore dial gauges were available for measurement..



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MR SSE/Elect.	Ashish SE/Elect.	Sub



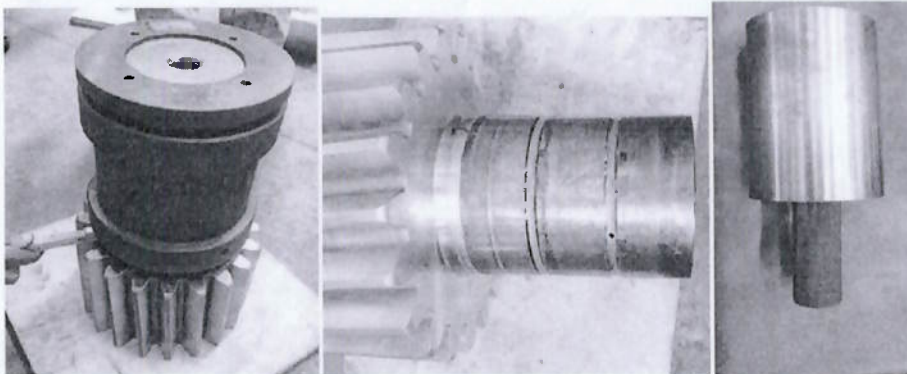
- (v) Few bearing components available on shop floor were checked with bore dial gauge. Dimensions checked were found within limits.

Name of item	Measured dimension	Standard limit
DE End frame	319.982	319.950 - 319.990
Outer Labyrinth DE	179.778	179.748 - 179.783
Inner Labyrinth DE	184.018	184.000 - 184.040
Inner Labyrinth NDE	105.020	105.000 - 105.025
NDE End frame	214.967	214.948 - 214.970
OD Shaft	180.056	180.043 - 180.068

- (vi) Based on the dimensions measured and recorded, all the interferences are being worked out before actual assembly. Shed has started using RDSO's issued Check Sheet for TM assembly issued on 2-12-2024. The Check Sheet filled during audit is attached as Annexure-1.
- (vii) The shed is not downloading the 3D-CMM measurement sheet of assembly components. The same should be downloaded for cross examination at shed level by available means otherwise 3D-CMM measurement sheet could not be downloaded from portal after 60 days.

C) Checking of Pinion & Dummy Pinion:

- (i) In shed shop floor, staff is aware for proper use of Ring Gauge as per SMI/0278 Rev. '0'. They are checking taperness of Pinion shaft as well as measuring distance between Pinion teeth face and Gauge face.
- (ii) In Shed, Blue transfer/bedding checking of new pinion was checked with rotor shaft. The procedure adopted was as per SMI-0278. The observed parameters were in the desired range.
- (iii) Shed is doing one extra practice for blue colour matching/bedding of inner racer with shaft bearing seating area. In this practice, pinion has to be inserted one time more (already 2 times required in P7 Loco pinion.)



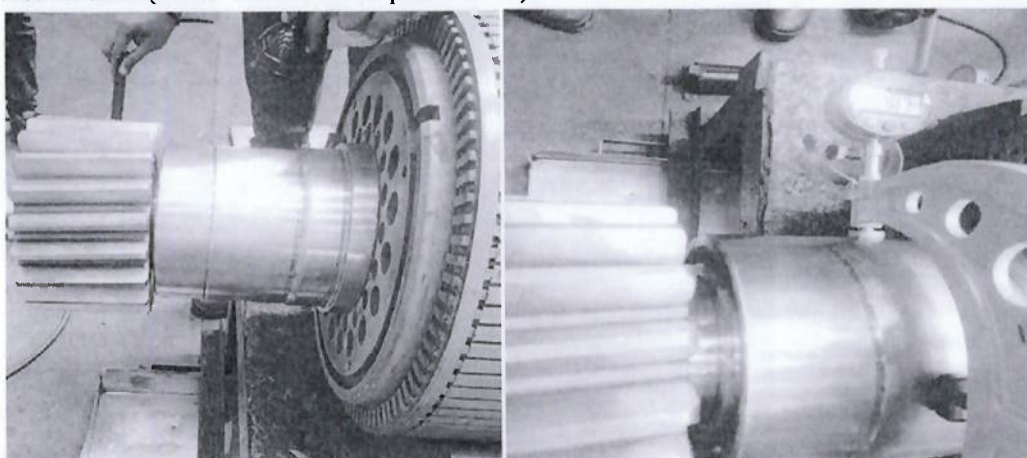
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MK SSE/Elect.	Asish SE/Elect.	SG

Recommendation:

- (i) During blue matching, color to be used in less amount for proper judgment of impression/transfer may be ensured.
- (ii) Regarding blue matching of inner racer on shaft, Shed is advised that this practice is unnecessary and will not help to indicate the proper seating/interference between shaft and inner racer.

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 (DE) within 20 minutes after insertion of pinion. However the immediate value may be more in few microns due to increased temperature by pinion insertion (by 5-7 °C). It is recommended to take OD of shaft (DE) after pinion fitment under ambient temperature for measuring correct predetermined better interference. (CLW WI:W21.410 para 4.3.11)

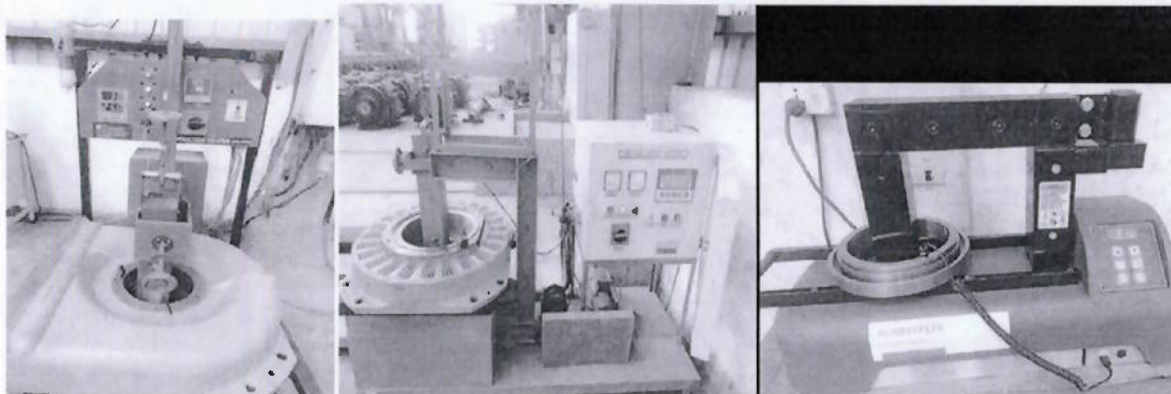
**E) Traction motor Assembly & Testing:**

- (i) Shop Floor of TM assembly area is neat & clean, Assembled motor (ready to move), failed motors, rotors, new and released components are kept at dedicated separate places. Bearing assembly area is clean and dust free. No other activity was found near the bearing assembly area.



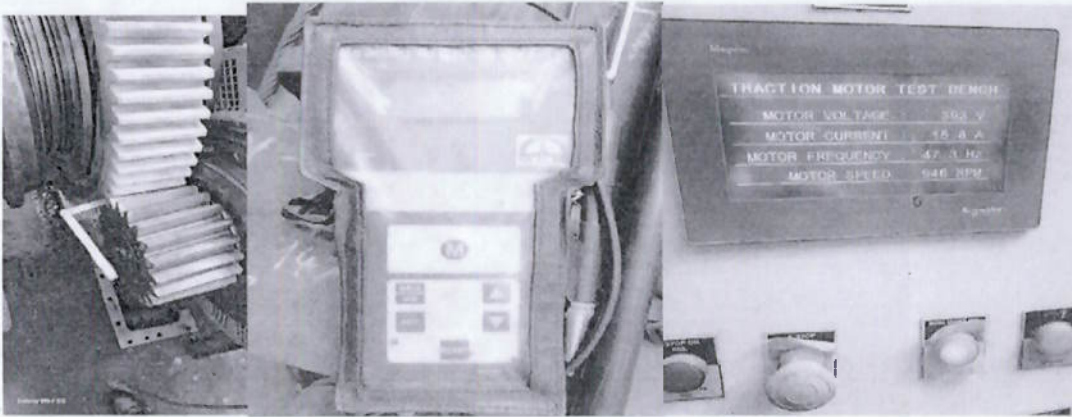
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Mr. SSE/Elect.	Asst. JE/Elect.	

- (ii) Shed is doing matching of assembly components (11 items) i.e 9 items procured under one PL and DE& NDE end frames procured under two different PL. After discussion with shop in-charge, they provide rejection advice (attached as Annexure-2) of bearing assembly components but no rejection advice for End shield. However they have the record of condemned items including End shields.
- (iii) Shed has four induction heaters with temperature control facility. At a time shed is using all four induction heaters as per requirement of size. But one of the Induction heater provided by M/s FAG is displaying more temperature than actual temperature measured. Hence there was a doubt for actual temperature of component while heating the outer labyrinth DE.



- (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 found 169 micron (range 110-190 micron).
- (vi) IR of NDE bearing as per specification is being checked and found ok.
- (vii) Only Servoplex SHC-120grease is used for TM6FRA6068 bearings. Separate storage for Grease SHC-120 is available. Digital grease gun is available for measuring the quantity of grease filled in TM bearings.
- (viii) TM assembly of TM, light run test was carried out for 1hrs (1/2hrs in one direction and 1/2 hr. in opposite direction) at 380-400 V, 16-18 Amps, to check noise and vibration if any by SPM meter. TM, if passed motor is sent for wheeler test.
- (ix) The wheel test of TMs is being under taken in bogie section, where backlash, sound & vibration are checked after fitment of TM with wheel set. The backlash between gear and pinion is being measured by filler gauge.

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MZ SSE/Elect.	Ashish JE/Elect.	SPD

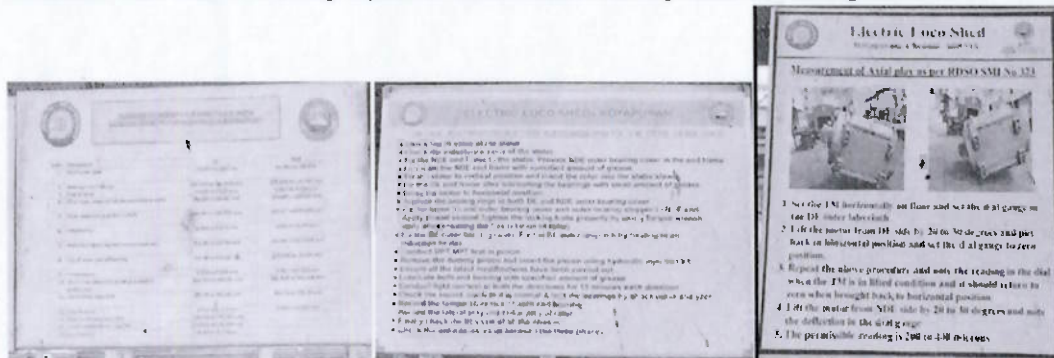


Recommendation:

- (i) Shed is advised to calibrate & cross check the temperature sensor of M/s Schaeffler make Induction heater to avoid any doubt.
- (ii) As per ABB maintenance manual the prescribed practice to measure the back lash by using thin tin wire (ABB maintenance manual D2, Document no 3EHW411433). The prescribed value of backlash given in RDSO check list issued on 2-12-2024.

F) Display Board at Shop Floor:

- (i) Different display board regarding good practices of Traction motor assembly are fixed at suitable locations. Among the boards, one board for Modified Interference between TM bearing needs to be updated as bearing seat shaft dia is mentioned 180.028 to 180.053. Shop in-charge has intimated that they are using separate dimensions sheets pasted in bearing room.




Recommendation:

Timely updation of display boards are necessary for avoiding any ambiguity during assembly.
(Shaft dia for inner racer seating area to be corrected as 180.043 to 180.068mm)

G) Summary of Audit Report & Recommendations:

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Mr. S.S.E/Elect.	Mr. J.E/Elect.	Mr. S.S.E/Elect.

- (i) As informed by shed, light run test (No load) is being carried out in both direction for 15-15 minutes. Shed is advised to increase duration of light run test of TM for 30-30 minutes in both direction similar to other major sheds of IR.
- (ii) The fitment of inner racer, labyrinth should be undertaken only after cooling of rotor shaft up to 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)
- (iii) 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).
- (iv) During assembly of TM . Shed 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).
- (v) As recommended by OEM's of bearings, Run the motor initially at 100 rpm for 5-10 minutes to ensure uniform distribution of grease and gradually increase to 1000 rpm , but these rpm shall not be higher than 1000 rpm.

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Mr. SSE/Elect.	Asst. Sd. JB/Elect.	

Assembly / Fitment of TM type - 6FRA 6068 (New / Overhauling)

Loco No. & Type

Homing Shed... Rpm

Railways... BR

Name of PUs / TM manufacturer.....

Detail of Assembled/Overhauled Traction motor :

Make of TM	<u>CLW</u>	D.O.C of TM	<u>30-9-2018</u>
Sr. No. of TM	<u>TmTh-7177</u>	Shaft Blue matching % with plug Gauge	<u>95%</u>
Make of TM Assembly components (11 items) (Labyrinths, DE/NDE end frame make)	<u>NEPL</u>		
Rotor Sr. No. & Make	<u>TMW-NKRD</u>	Stator Sr. No. & Make	<u>TmTh-7177</u>
Shaft No.	<u>21-22-128-4SD</u>	Make of Bearing DE	<u>SKF-IND-465-5934</u>
Shaft Make		Make of Bearing NDE	<u>SKF-IND-465-323</u>
Nos. of teeth on Pinion	<u>20 km</u>	Pinion Make/Month/Year	<u>KPCL-5/24-16911</u>
Type of Rotor (Sch.-1/2)	<u>SCH-I</u>	Date of TM assembly/ last overhauling	<u>25-01-25</u>

Measured parameters of during Assembly/Overhauling of TM

Sr. No. of DE Bearing	<u>SKF IND-5934</u>	Change of Bearing DE/NDE during overhauling (Yes/No)	
Sr. No. of NDE Bearing	<u>SKF IND-242A</u>		<u>Yes</u>
Date of commissioning of DE bearing in TM	<u>28-1-25</u>	Date of commissioning of NDE bearing in TM	<u>28-1-25</u>
Date of Replacement of bearing during overhauling	<u>Four years six months</u>	Last Schedule in which TM bearing replaced during overhauling	<u>30545/6</u>
Free radial clearance of (DE) bearing NU-2236 before fitment (170 to 220 μ m)	<u>210</u>	Free radial clearance of (NDE) bearing NH-320 before fitment (105 to 140 μ m)	<u>110</u>

**Details of various parameter during assembly/Overhauling of Traction Motor type
6FRA6068**

SN	Activity	Standard Value	Observed/Measured value
1.	Motor assembled with original pinion or dummy pinion (Yes/No)	As per assembly procedure issued vide SMI:278 Amendment-2 dated 29/3/2022	Dummy Pinion
2.	Check the pinion shaft taper ness using ring gauge as per drawing no SKEL-5043 Alt-0 as per SMI-278 Amend.-1	Distance between gauge face and pinion teeth face should be $15 \pm 0.3\text{mm}$	Checked & Ensured
3.	Pinion mounting pressure of Pump	1700- 2000 bar	1900 bar
4.	Pinion Shaft UT and DPT Test	No cracks / Flaws	No cracks
5.	Checking of rotor shaft taper ness using plug gauge as per drawing no SKEL-5032 Alt-0 , as per SMI-278 Amendment-1	Distance between plug gauge face & shaft outer face should be $1 \pm 0.3\text{mm}$	Ensured
6.	Advancement of pinion during fitment	Ensure actual pinion is inserted in the shaft before mounting of inner racer. Measure the bore diameter of inner racer and bearing seat diameter of shaft and ensure there shall be interference between them 50-65 micron. This can be done by selecting right match of inner racer for a given shaft.	Ensured
7.	Gap between Shaft outer face & Pinion inner face	3.0 mm to 5.00 mm	4.4 mm
8.	Types of Labyrinths (Yes/No)	Modified as per MS 0478 issued on July/2019 or Not. As per RDSO letter no EL/3.2.172 Dated 4/9/24	Yes
9.	Shaft Diameter and inner labyrinth diameter (DE)	Shaft Diameter:- 184.050 to 184.079 mm Inner labyrinth ID:- 184.00 to 184.040mm	Shaft OD:- 184.068 Inner labyrinth ID:- 184.018 Interference:- 0.050
10.	Shaft Diameter (OD) and inner racer Bearing(ID) of (DE)	Shaft diameter :- 180.043 to 180.068mm Inner racer ID :- 179.975 to 180.00mm	Shaft Diameter:- 180.056 Bearing(ID) 179.990 Interference (50-65μ)*: 0.066
11.	DE inner Labyrinth(OD) and End Frame inner diameter of DE	Outer diameter of inner labyrinth:- 305.060 to 305.080 mm Inner diameter of end frame(DE):- 305.025 to 305.050mm	Inner labyrinth:- 305.067 ID of DE end frame: 305.030 Interference: 0.037

12.	OD of outer racer bearing and ID of end frame (DE)	OD of outer racer of DE bearing:- 319.960 to 320.000mm ID of end frame (DE):- 319.950 to 319.990mm	Outer racer (OD):- 319.992
			DE end frame (ID):- 319.982
			Interference (10-25μ)**: 0.010
13.	Shaft diameter and outer labyrinth/deflector (DE)	Shaft diameter:- 179.843 to 179.868mm ID of outer labyrinth/Deflector:- 179.748 to 179.783mm	Shaft Dia:- 179.858
			Outer labyrinth(ID): 179.778
			Interference: 0.080
14.	Shaft Diameter and inner labyrinth diameter (NDE)	Shaft Diameter:- 105.037 to 105.059 mm Inner labyrinth ID:- 105.00 to 105.025mm	Shaft Diameter: 105.054
			Inner labyrinth ID: 105.020
			Interference: 0.034
15.	Shaft Diameter and inner racer of Bearing(ID) of (NDE)	Shaft diameter :- 100.023 to 100.045mm Inner racer ID :- 99.985 to 100.00mm (SKF) Inner racer ID :- 99.980 to 100.00mm (FAG) Inner racer ID :- 99.980 to 100.00mm (NEI)	Shaft diameter: 100.044
			Inner racer (ID): 99.996
			Interference (35-60μ)#: 0.048
16.	NDE inner Labyrinth and End Frame inner diameter of NDE	Outer diameter of inner labyrinth:- 205.050 to 205.070 mm Inner diameter of end frame(NDE):- 205.010 to 205.040mm	Labyrinth (OD): 205.061
			End frame (ID): 205.022
			Interference: 0.039
17.	OD of outer racer of (NDE) bearing and ID of end frame (NDE)	OD of outer racer of NDE bearing:- 214.980 to 215.000mm (SKF) OD of outer racer of NDE bearing:- 214.970 to 215.000mm(FAG/NEI) ID of end frame (NDE):- 214.948 to 214.970mm	Outer racer (OD):- 214.990
			End frame (ID) 214.967
			Interference(10-25μ)###: 0.023
18.	Shaft diameter and clamp plate ID of (NDE)	Shaft diameter:- 100.023 to 100.045mm Clamp plate inner diameter:- 100.000 to 100.013mm	It should be ensured that clamp plate should be tight fitted on shaft.
19.	Clearance between outer face of End frame (DE) & inner face of outer bearing cap (DE) to be ensured as per MS-0466	0.20 mm to 0.95 mm	0.65 mm
20.	Clearance between outer face of End frame (NDE) & inner face of bearing cap (NDE) to be ensured as per MS-0460	0.25 mm to 0.95 mm	0.30 mm

100.044
100.009
0.035 mm

21.	Radial clearance of assembled traction motor 6FRA-6068:- (a) Radial clearance measured value (b) Final (effective) value of RC	(a) 130-220 μ m	0.197mm.
		(b) Measured value X 0.86=110 to 190 μ m (as per SMI-278 amendment-1 dated 08.03.2021)	0.169mm.
22.	Axial clearance of assembled traction motor 6FRA 6068	200-400 μ m (as per SMI-278 amendment-1 dated 08.03.2021))	0.22mm.
23.	Check Radial clearance of (NDE) bearing after fitment	0.060 to 0.110 mm	0.04mm.
24.	Complete traction motor has been procured from trade with actual pinion or Not	As per RDSO letter no. EL/3.2.182 dated 04.03.2022	No.
25.	Grease outlet hole diameter of end frame (DE) has been increased from 9mm to 12mm or NOT	As per MS-485 dated 17/3/22.	holes provided.
26.	Check the Radial clearance between Resistance Ring and rotor end ring (Applicable during new manufacturing/Repair of Scheme-II rotor)	2.5 mm at three dovetail joints & 3.0 mm at remaining three dovetail joints as per MS/0438 Rev. 0 dated 27.08.2015.	NA.
27.	Mounting arrangement of leather bellow	As per MS-476 (Rev-0) Dated 22/1/2019	Yes followed.
28.	Ensure tightness of traction motor bellow plate with end frame (NDE) using Hex Socket CSK head screw (M10X25mm SS bolt grade A2-70)	As per MS-472 (Rev-0) Dated 20/8/2018 (8 nos per TM)	Ensured.
29.	Ensure tightening of all bolt using torque wrench at prescribed torque.	Done or not	Done.
30.	i) Measure base tangent length 'K' value of 15 teeth Pinion (SKDP-3436) ii) Measure 'K' value of 77 teeth Bull gear (SKDP-3435)	i) 77.783 mm Min / 77.802 mm Max. (over 3 Teeth), Condemning limit = 77.426mm ii) 261.668 mm (Min)/261.696mm(Max) (over 9 Teeth), Condemning limit = 261.156 mm iii) Backlash = 0.254mm (Min) - 0.458mm (Max)	Carried out - by MI Section.
	i) Measure base tangent length 'K' value of 20 teeth Pinion (SKDP-3473) ii) Measure base tangent 'K'	i) 78.470 mm Min / 78.491 mm Max. (over 3 Teeth), Condemning limit = 78.129mm ii) 260.958 mm	78.49mm.

	value of 72 teeth Bull gear (SKDP-3474)	(Min)/260.992mm(Max) (over 9 Teeth), Condemning limit =260.451 mm iii)0.254 mm Min. / 0.458 mm Max.	Carried out by MI Section.
	i) Measure base tangent length 'K' value of 21 teeth Pinion (SKDP-3847) ii) Measure base tangent 'K' value of 107teeth Bull gear (SKDP-3848)	i)77.530 mm Min / 77.58 mm Max. (over 4 Teeth), Condemning limit = 77.115mm ii) 317.09 mm (Min)/317.17mm(Max) (over 15 Teeth), Condemning limit =316.494 mm iii)0.290 mm Min. / 0.490 mm Max.	Carried out by MI Section.
31.	If backlash is within range then trial run (2 nd State) the motor assembly for half an hour , to check the assembly for any abnormal sound vibration and temperature by works inspection.	Procedure of wheel run test of traction motor type 6FRA6068 to be followed as per CLW's letter no. CLW/TM/8021 dated 01.12.2020.	Carried out by MI Section.
32.	Use of latest drawing for associated components (11items) for traction motor type 6FRA-6068	As per letter no EL/3.2.172 Dated 4/9/24. It enhance the clearance between mating surface from min 0.25 mm to 0.35 mm (DE outer labyrinth & DE bearing cap)	Yes followed.
33.	Compliance of MS/SMI		
34.	SMI-314: Use of dial snap gauges with least count of 1micron for measurement of shaft diameter.		Yes.
35.	SMI-318: Use of Bore gauges with least count of 1micron for measurement of internal diameter of end frame and racer.		Yes.
36.	MS-478: Adoption of TM labyrinths as per original dimension given by ABB		yes
37.	MS-415 followed by Amnd. 1, 2 ,3 & 3 (Rev-1): To ensure adequate interference between assembly component.		Followed.
38.	SMI-301: Use of induction heater for heating of end frames for bearing fitment		Yes followed.
39.	Remarks if any:-		

*Ensure actual pinion is inserted in the shaft before mounting of inner racer (DE). Measure the bore diameter of inner racer (DE) and bearing seat diameter and ensure there shall be interference between 50 -65 micron. This can be done by selecting right match of inner racer for a given shaft. (MS-415 Amend-1 and SMI-278 Amend-1 &2).

** Measure the outer diameter of the outer racer of the bearing (DE). Measure the bore diameter of bearing end frame (DE). Interference in the range of 10 -25 micron shall be ensured. This can be achieved by ensuring appropriate combination of bearing and bearing end frame. (MS-415 Amend-1, SMI-278 Amend-1 &2)

Measure the bore diameter of inner racer (NDE) and bearing seat diameter and ensure there shall be interference between 35 -60 micron. This can be done by selecting right match of inner racer for a given shaft. (MS-415 Amend-1)

Measure the outer diameter of the outer racer of the bearing (NDE). Measure the bore diameter of bearing end frame (NDE). Interference in the range of 10 -25 micron shall be ensured. This can be achieved by ensuring appropriate combination of bearing and bearing end frame. (MS-415 Amend-1)

Electrical Tests details during assembly/Overhauling Traction Motor type 6FRA6068

SN	Activity	Standard Value	Observed/Measured value
1	Measure the inductance Luv, Lvw and Luw and its difference between the phase at TM terminal box	Compare the difference in inductance value between two phases. It should not be more than 0.015 milli henry at TM terminals as per SMI- 0262 dated 10.06.2010.	Luv - 4.709. Lvw - 4.709. Luw - 4.702 0.007mH
2	Checking of Insulation resistance of Stator with 1kv megger	Min. 100 MΩ	500MΩ
3	Checking of Insulation resistance of NDE bearing using 1 KV insulation tested- as per SMI-0278	Min 50 MΩ	150MΩ
4	No Load Run test parameters of Assembled TM:		389 V 49°C 51°C DE - A86 NDE - A49.
	a. Run the TM with 3 phase supply of (380-400 V) and measure phase current		
	b. Temperature rise of bearings (i) DE side (ii) NDE side	Max. 40°C above ambient	
	c. SPM reading (i) DE side (ii) NDE side	Condition (green, red, yellow)	
5	Checking of Temperature sensor assembly (cold condition) i) IR value with 500volt megger ii) Resistance of elements	>50 Mega Ohm Calculate the temperature which should not vary more than 2° C.	i) 150MΩ ii) AB-112.1Ω CD-112.1 Ω

Southern Railway Chennai Division Electric Loco Shed, Royapuram	Overhauling Chart of 6FRA6068
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ANNEXURE - I

INSPECTION AND TESTING PROFORMA FOR TM type 6 FRA 6068

1. Before dismantling:

SN	Inspection /Test	Standard value	Actual value
1.	Check the TM visually and note down the defects and deficiency	Checked	checked
2.	Check IR value by using 2.5 KV Megger for all three phases	10 MΩ (min.)	u- 500MΩ v- 500MΩ w- 500MΩ
3.	Check the inductance value of the motor (As per RDSO/SMI/262)	Difference between each phase not more than 15 micro Henry	uv - 4.709 vw - 4.709 uw - 4.702 Diff. - 0.002
4.	Check the resistance value of the motor	Difference between each phase not more than 5%	uv- 97.44mΩ vw- 97.44mΩ uw- 97.89mΩ
5.	Check the clearance between outer face of NDE endframe and inner face of NDE bearing cap	0.25 to 0.95mm	0.25mm
6.	Measure the distance between the shaft and the pinion	Value to be recorded	4.4mm
7.	Note the individual phase current by run test giving three phase supply	Current - 16 to 18 A at 370- 400 Volt	u- 16.4 A v- 16.3 A w- 16.4 A
8.	Remove the pinion by hydraulic extractor	Done	done

2. After dismantling:A. STATOR

SN	Inspection /Test	Standard value	Actual value
1.	Clean the stator by compressed air and clean cloth	Cleaned	cleaned
2.	Bake the stator at 120 °C for 8 hours in oven	Done	done
3.	Check IR value by using 2.5 KV Megger for all three phases	10 MΩ (min.)	u- 500MΩ v- 1000MΩ w- 1000MΩ
4.	Check the general condition of stator coils, slots, overhangs, wedges, punchings, chord loosening on overhang portion.	Checked normal	checked
5.	Check the condition of terminal insulator for any cracks/ worn out threads. Replace if required	Good/Replaced	good

Southern Railway Chennai Division Electric Loco Shed, Royapuram	Overhauling Chart of 6FRA6068
--	--------------------------------------

6.	In terminal box check the condition of stator winding lugs for any overheating marks	No overheating	NO overheating.
7.	Check the condition of threads of threads of temperature sensor housing	Checked Normal/ Plate welded	checked.
8.	Check the condition of all helical inserts. Replace if required	Good/Replaced	Good.
9.	Check the inductance value of the stator	Values to be recorded	uv - 6.088mH - vw - 6.091mH - uw - 6.090mH
10.	Carry out surge comparison test	Done	Done.

B. Rotor

SN	Inspection /Test	Standard value	Actual value
1.	Clean the rotor by compressed air and clean cloth	Cleaned	Cleaned.
2.	Check the condition of balance weight, resistance ring, copper bars, end punching and mid punching	Checked Ok	checked.
3.	Check the condition of rotor stamping for any deformation, crack, looseness, overheat marks etc	No defects	No defects.
4.	Carry out growler test on the rotor	Passed	Passed.
5.	Replace old bearing with new bearing during IOH	Replaced/ Not replaced	Replaced.
6.	Check the condition of inner race, pitting mark, dent, burning or discoloration.	No such symptoms Good	No such symptoms.

C. End frame and Bearing

SN	Inspection /Test	Standard value	Actual value
1.	Clean the DE/NDE endframe thoroughly with compressed air and compressed air	Cleaned	cleaned.
2.	Visually inspect the inner labyrinth seat area of DE/NDE endframe for any rubbing/discoloration	No rubbing/No discoloration	NO rubbing.
3.	Ensure grease inlet/outlet path if free from block	No block	NO block.

Southern Railway Chennai Division Electric Loco Shed, Royapuram	Overhauling Chart of 6FRA6068
--	--------------------------------------

4.	Check the DE endframe mesh for any damage and weld/ replace if required	Good/Replaced	Good.
5.	Check the condition of M16 tapped holes of DE endframe.	Good/Taping done	Good.
6.	Replace old bearing with new bearing during IOH	Replaced/ Not replaced	Replaced.
7.	Condition of bearing – Check for pitting mark, dent, burning or discoloration.	No such symptoms Good	No Such Symptoms
8.	If New Bearing Provided (As per RDSO Modification Sheet No.RDSO/2012/EL/MS/0415 Amendment 2)		
	a) DE side (in Rotor)		
	1) Initial OD of inner racer:		214.827mm
	2) OD of inner race after 20 teeth pinion fitment:		214.870mm
	3) Bulging:		0.043mm

D. Assembly

SN	Inspection /Test	Standard value	Actual value
1.	Assemble the traction motor as per the procedure	Done	Done.
2.	Replace the sealing ring in DE/NDE labyrinth	Replaced	Replaced.
4.	Check the clearance between DE Bearing Cap and DE outer labyrinth.	0.6 to 0.7mm	0.65mm.
5.	Check the tightness of NDE & DE end frame fixing bolts by using torque wrench	37 Kgm	Tightened by 37 kgm.
6.	Check the tightness of the NDE bearing locking bolt by using torque wrench.	20 Kgm	Tightened by 20 kgm.
7.	Check the resistance value of the motor	Difference between each phase not more than 5%	uv - 97.41m Ω vw - 97.48m Ω uw - 98.41m Ω

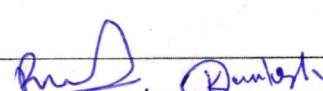
D. Pinion fitment

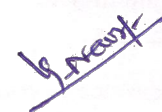
SN	Inspection /Test	Standard value	Actual value
1.	Clean the tapered portion thoroughly. Pinion must be free from any oil/dust	Cleaned	Cleaned.
2.	Remove the dummy pinion by oil injection method	Pressure 1500 Bar for 10 min	1700 Bar.
3.	Apply pressure and remove the pinion	Max 2000 Bar	Done.
4.	Apply pressure by hydraulic pump and at the same time push the pinion steadily inside by hollow ram jack	1700 Bar. Max 2000 Bar	1950 bar Pressure applied.
5.	Charging of lubricant (Do greasing in DE and NDE until grease comes out of outlet)	Charged	Charged.

Southern Railway Chennai Division Electric Loco Shed, Royapuram	Overhauling Chart of 6FRA6068
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E. Testing

SN	Inspection /Test	Standard value		Actual value	
1.	Run the TM with 3 phase supply of (380-400 V)	Phase running current of 16 to 18 A		16.4.	
a)	Vibration	No Vibration		No vibration.	
b)	Bearing Noise i) DE side ii) NDE side.	Normal Noise Normal Noise		normal.	
d)	SPM reading to be recorded.	DE Side	NDE Side	DE Side	NDE Side
		A	A	A	A
		4 & Above	4 & Above	8	4
		G	G	6	6.

SIGNATURE		
NAME	Ravi, Kumar	
DATE	28-1-25.	
DESIGNATION	TECHNICIAN	JE


SSE/TM/ELS/RPM

Material Condemnation Report for Locomotive spares

1) SECTION: **TM**

2) DETAILS OF THE ITEM:

Description of the Item:	End frame for 30 TM type 6FRA 6068.
Qty.	05 Nos.
Sl. No	
Make:	
Codal Life:	
Composition:	Ferrous - 100%.

3) REASON FOR SCRAP:

A) The above items are released from IOH / TOH locos as per the competent authority's instruction as a Must change item.


B) The above items are released from Loco No. Various Loco. For the following reasons, Damaged / Worn-out / Mal-functioning / completed codal life, hence it reached unserviceable Condition and it is not advisable to put in service further.

SSE/ TM/ELS/RPM

By name
20/11/24
SSE/ST/ELS/RPM

APPROVED BY:

ADEE/RS/RPM	<i>Out</i>
DEE/RS/RPM	
Sr. DEE/RS/RPM	

	Southern Railway		ELECTRIC LOCO SHED , ROYAPURAM	
	RECEIPT INSPECTION NOTE (Routine Inspection)			
	ISL No.	ISL Date	Challan No. and date	
	R1240120	18/05/24	20 dated 08/05/24	
Purchase Order No.		PO Date	Name and Address of Supplier	
26221160101029		31/03/23	NARMADA EQUIPMENTS PVT.LTD- BHOPAL	
Receipt Case No.		RB Ward		
2024077		R1		
RR type	RR/MTR No.	RR/MTR Date	Station From	Station to
MTRNo.	B4002218261	08/05/24		
Insp.Authority	Packages sent		Inspection Reference	
MITES	1 W/BOX		W/SR/W23030854/NDK Dated: 04/05/24	
PL No.	For Depot	Dely.Date	Order Quantity	Aprox.Value
29940096		31/05/24	3	132750
<p>Item Description : Set of Labyrinth and bearing cap Driving end (DE) fo WAP7 Traction Motors type 6FRA 6068 consisting of 4 items and set of Labyrinth Ring, Bearing Cap and clamp plate Non driving end (NDE) for WAP7 Traction Motors type 6FRA 6068 consist of 4 items and speed probe housing (Machined) as below A-1) Inner Labyrinth Driving End (DE) as per CLW Spec.No. 4TMS.096.068 Rev-2 and CLW Drg.No. 4TWD.096.043 Alt-7 - 01 No./Set. A-2) Outer bearing cap Driving End (DE), Machined as per CLW Spec.No. 4 TMS.096.068 Rev-2 and CLW Drg.No.1TWD.096.006 Alt-7 - 01 No./Set A-3) Inner Labyrinth Driving End (DE) as per CLW Spec No.4TMS.096.068 Rev-2 and CLW Drg.No. 4TWD.096.028 Alt-6 - 01 No./Set A-4) Outer Labyrinth Driving End (DE) as per CLW Spec No.4TMS.096.068 Rev-2 and CLW Drg.No. 4TWD.096.029 Alt-7 - 01 No./Set B-1) Inner Labyrinth Non Driving End (NDE) as per CLW Spec.No. 4TMS.096.068 Rev-2 and CLW Drg.No. 4TWD.096.042 Alt- 7 - 01 No./Set B-2) Inner Labyrinth Non Driving End (NDE) as per CLW Spec.No. 4TMS.096.068 Rev-2 and CLW Drg.No. 4TWD.096.031 Alt-6 - 01 No./Set B-3) Bearing cap Non Driving End (NDE), Machined as per CLW Spec.No.4TMS.096.068 Rev-2 and CLW Drg.No.3TWD.096.032 Alt-8 - 01 No./Set B-4) Clamp plate Non Driving End (NDE), Machined as per CLW Spec.No. 4TMS.096.068 Rev-2 CLW Drg. No.2TWD.096.033 Alt-8 - 01 No./Set C) Speed Probe housing (Machined) as per CLW Specn No. 4TMS.096. 0068 Rev.2 and CLW Drg.No. 1TWD.096.077 Alt-5 - 01 No./Set Same as above. Make / Brand : NEPL</p>				
DRR No. / CH-REGNo.	Recd.Date	Qty.Dispatched	Total Qty. Recieved	Qty. Recieved (in Good Condition)
R1240116 / 2400113	17/05/24	3.000 Set	3 Set	3 Set
Gate Pass No.	GP Date	Qty. for Test	Details of Inspecting Laboratory	
<p>Sample as per details mentioned above is/are being sent here with for test and report regarding its suitability or otherwise. Kindly specify the nature of test conducted. Incase sample found un-suitable, please intimate specific reasons and testing charges (if any).</p>				
CMT/LAB/	DEPOT OFFICER		DMS/RECEIPT WARD	

Please advise suitability

REJECTED

SSE / STORES

ELS / RPM

ADEE / RS / RPM
स.स.वि.इ. / स.स्टाक / रायपुर

18-May-24, 11:41 AM

Let Item not suitable.

A. Dine
24.05.24.

REJECTED

राइट्स लिमिटेड

(भारत सरकार का उपक्रम)

पश्चिमी क्षेत्र

5 वी मंजिल, प्लॉट-208, रीजेन्ट चेंबर्स,
जमनालाल बजाज मार्ग, नरीमन पॉइंट,
मुंबई-400021, दूरभाष : 68943400
ई-मेल : wrinspn@rites.com



RITES

THE INFRASTRUCTURE PEOPLE

कॉ.प.सं./ CIN : L74899DL1974GOI007227
निरीक्षण प्रमाण पत्र / INSPECTION CERTIFICATE

राइट्स कार्यालय प्रति
RITES Office Copy

RITES LIMITED

(Schedule 'A' Enterprises Govt. of India)

WESTERN REGION

5th Floor, Plot 208, Regent Chambers,
Jamnalal Bajaj Marg, Nariman Point,
Mumbai - 400 021. Tel.No.: 68943400
E-mail : wrinspn@rites.com

समाविष्ट

अनुवर्ती कागज

Contains _____ Continuation Sheets

बुक सं./Book No.	सेट सं./Set No.
5113	026

बुक सं Book No.	सेट सं Set No.
5113	026

RITES LTD, WESTERN REGION, MUMBAI

निरीक्षता पत्रक शामिल

Contains 0 Continuation Sheets

प्रमाणपत्र पत्र सं. Certificate No.
W/SR/W23030854/NDK

दिनांक Date
04/05/2024

प्रस्तावित किस्त सं.

Offered Instt. No. 1

किस्त सं. पारित Passed Instt. No. 1ST & FINAL

ठेकेदार Contractor M/s NARMADA EQUIPMENTS PVT.LTD. 2/3,INDUSTRIAL ESTATE,GOVINDPURA, BHOPAL	निरीक्षण का स्थान Place of Inspection M/s NARMADA EQUIPMENTS PVT.LTD. 2/3,INDUSTRIAL ESTATE,GOVINDPURA, BHOPAL
---	--

संविदा संदर्भ Contract References PO NO. 26221160101029 Upto Latest 4 Amendments M.A.No.006187	दिनांक Date 31/03/2023 14/12/2023	बिल अदायगी अधिकारी Bill Paying Officer FA & CAO (W&S), SOUTHERN RAILWAY, PERAMBUR
--	--	---

प्रेषिती Consignee AMM/ELSD/SR/ROYAPURAM, SR (Tamil Nadu)	क्रय अधिकारी Purchasing Authority SMM/TRACTION/PER/SR/CHENNAI
---	---

मद सं Item No.	भंडार का विवरण Description of Stores	आदेशित मात्रा Quantity on Order	पहले प्रस्तावित संचयी मात्रा Cumulative Qty Offered Previously 4	पहले स्वीकृत मात्रा Qty Prev Passed	अब प्रस्तावित मात्रा Qty Now Offered	अब स्वीकृत मात्रा Qty Now Passed	अब अस्वीकृत मात्रा Qty Now Rejected	बकाया मात्रा Qty Still Due
1	SET OF LABYRINTH AND BEARING CAP DRIVING END (DE) FO WAP7 TRACTION MOTORS TYPE 6FRA 6068 CONSISTING OF 4 ITEMS AND SET OF LABYRINTH RING, BEARING CAP AND CLAMP PLATE NON DRIVING END (NDE) FOR WAP7 TRACTION MOTORS TYPE 6FRA 6068 CONSIST OF 4 ITEMS AND SPEED PROBE HOUSING (MACHINED) AS BELOW A-1) INNER LABYRINTH DRIVING END (DE) AS PER CLW SPEC.NO. 4TMS.096.068 REV-2 AND CLW DRG.NO. 4TWD.096.043 ALT-	3 SET	NIL	NIL	3 SET	3 SET	NIL	NIL
QUANTITY NOW PASSED THREE SET ONLY, MAKE: NEPL, SL NO. 001 TO 003.(PO Sl. No. 002)								

जांच की गयी इकाइयों की सं. No. of items checked ONE	बुलाने की तारीख Date of call 24/04/2024	दौरों की संख्या No. of Visits TWO	निरीक्षण की तारीखें Date(s) of Inspection 02.05.2024, 03.05.2024	TR Rec. dt.
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सील बंदी मोहर बंदी का स्वरूप और सील मोहर का स्थान Pattern of sealing/stamping & location of seal/stamp/sticker RITES Hologram From Sl No.W0846971 TO W0847186 Affixed on Each set Near Manufacturer Identification Mark	मुहर / स्टाम्प की प्रतिकृति Facsimile of seal/stamp/sticker	निरीक्षण अभियंता Inspecting Engineer Signature valid Digitally Signed by: NAND KUMAR RITES LIMITED WRIO MUMBAI Date: 2024-05-04T20:52:30.6780644+05:30
अस्वीकृति का कारण Reason of rejection N/A		नंद कुमार/NAND KUMAR Manager (A)

नोट - सामग्री यथाशीघ्र प्रेषित किया जाना चाहिए। यह प्रमाणपत्र सामग्री के प्रेषण के लिए तीस दिनों की अवधि के लिए वैध है।
Note - The Material should be dispatched as early as possible. This Certificate is valid for a period of 30 days for dispatch of material.
पंजीकृत कार्यालय : स्कोप मीनार, लक्ष्मी नगर, दिल्ली 110 092.
Registered Office : Scope Minar, Laxmi Nagar, Delhi - 110 092.

CHITTARANJAN LOCOMOTIVE WORKS

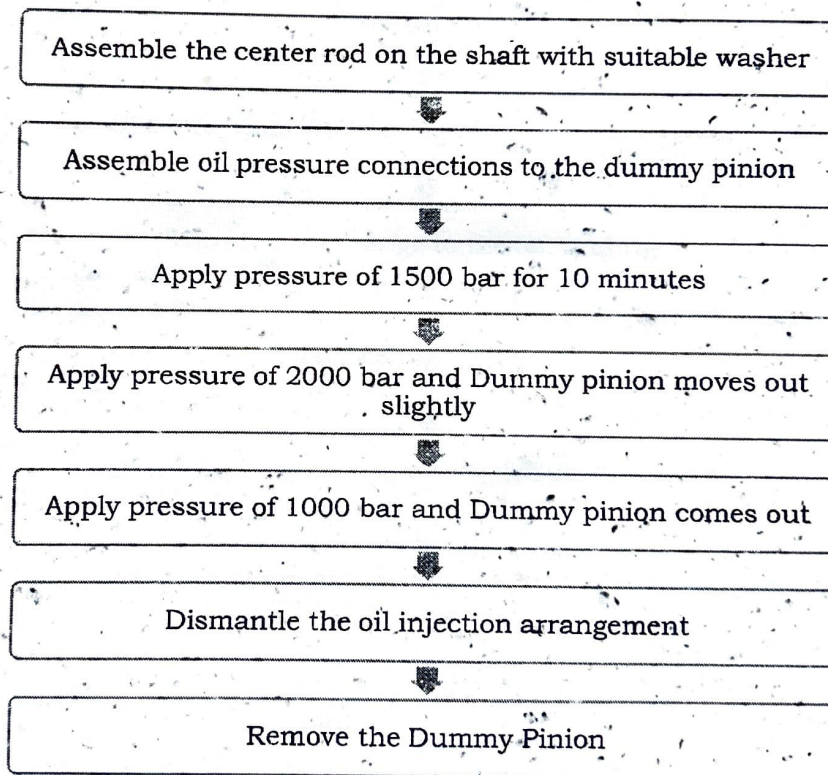
WORK INSTRUCTION	W.I. NO.	: W21.410
DISMOUNTING OF DUMMY PINION AND MOUNTING OF ACTUAL PINION	VERSION	: 05
	EFFECTIVE DATE	: 02.05.2024
	PAGE NO.	: 03 OF 06

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 dismantling of Dummy Pinion:



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

CHITTARANJAN LOCOMOTIVE WORKS

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:


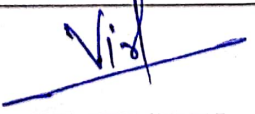
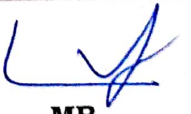
Three Phase Traction Motor Type 6FRA 6068.

4.0 INSTRUCTION/PROCEDURE:Reference Documents:

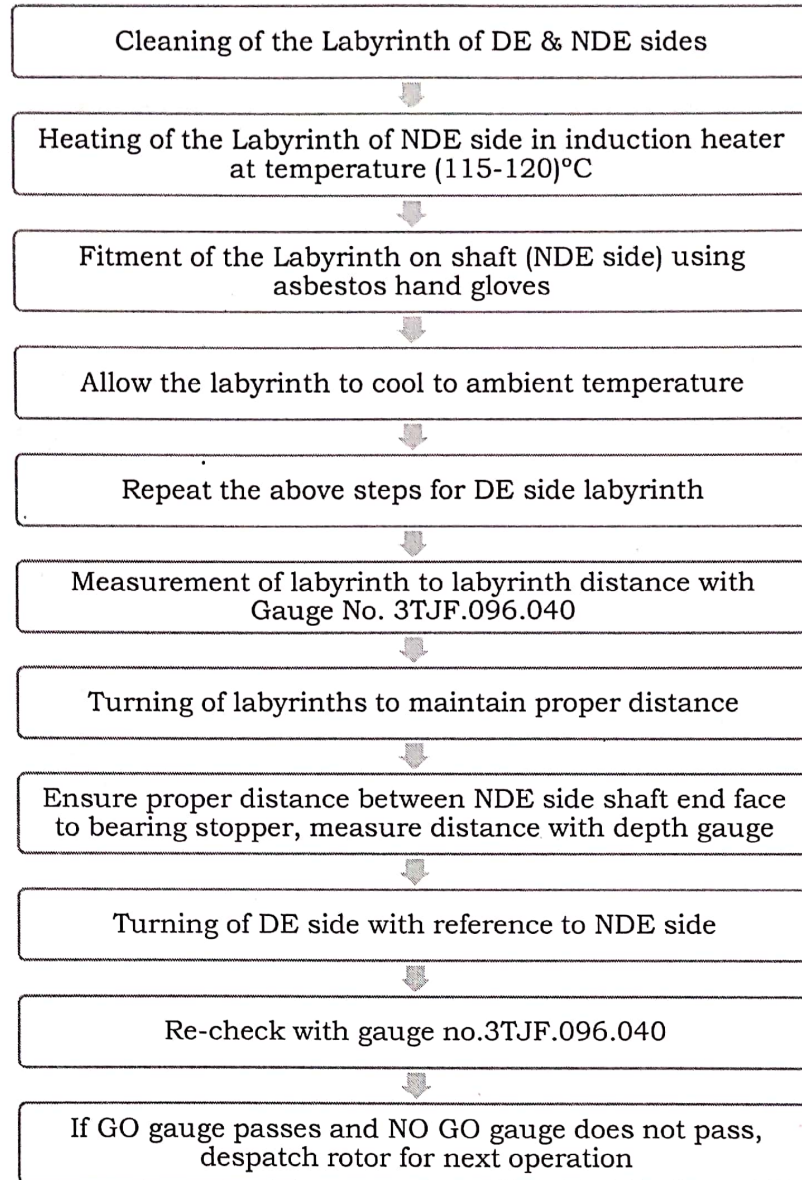
Drg. Of Labyrinth (DE) : 4TWD.096.043




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

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

5.0 PROCESS FLOW CHART:

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

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

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:


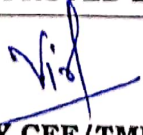
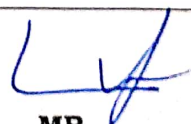
Details of Control Plan available in IRIS document ID – CLW/TM-21/F-15.

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