## प्रस्तावना INTRODUCTION

Three phase traction motor type 6 FRA 6068 is used on WAG9/ WAP7 class of locomotives. It is an asynchronous 6 pole squirrel cage rotor motor which operates by a three phase supply fed by 3 phase converter. It is forced air cooled through a vent in the non-drive end housing. The traction motor blower supplies filtered air to cool the traction motor. The flexible bellows connect the traction motor vent and the air outlet of the blowers on the locomotive under frame.

The rotational force from the traction motor is transmitted to the gear box by a pinion drive coupling. The opposite end of rotor shaft is enclosed by an end plate.

## तकनीकी आँकड़े TECHNICAL DATA

(Ref: ABB technical note no. HBAM 94014)

| Sr. | PARAMETERS | RATING |
|---|---|---|
| 1. | Make | ABB |
| 2. | Motor type | 6 FRA 6068 |
| 3. | Insulation | Class 200 |
| 4. | Suspension | Axle hung. Nose suspended |
| 5. | Ventilation | Forced air cooling |
| 6. | Weight | 2100 kg |
| 7. | Gear ratio | 107 : 21 WAG9, 72 : 20 WAP7 |
| 8. | Continuous Rating | 850 kW, 2180V (phase to phase), 270A, 1283 rpm, supply frequency 65 Hz, power factor 0.88, motor efficiency 0.95 |
| 9. | One-hour Rating | 850 kW, 2089V (phase to phase), 290A, 1135 rpm, supply frequency 57.5 Hz, power factor 0.86, motor efficiency 0.95 |
| 10. | Short time over-load rating | 850 kW, 1660V (phase to phase), 370A, 892 rpm, supply frequency 45.7 Hz, power factor 0.86, motor efficiency 0.95 |



## मुख्य अवयव MAIN PARTS

### स्टेटर Stator

The stator is constructed from a stack of laminated plates secured together by wrap-around rings and traction rails welded to the end plates.

### रोटर Rotor

It is a squirrel cage rotor consists of rotor bars whose ends are short circuited by means of end rings. The rotor plates are laminated and fitted directly on to the shaft.

### रोटर बियरिंग Rotor Bearings

i. DE side - NU 2236

ii. NDE side - NJ 320

The rotor is supported and guided at both ends on two grease lubricated cylindrical roller bearings.

### स्पीड सेंसर असेम्बली Speed Sensor Assembly

(i) **Probe Housing**

(ii) **Sensor Ring**

***(iii)*** **Speed Sensor**

# टी.एम. 6 एफआरए 6068 के लिए विशेष अनुरक्षण निर्देश
# SPECIAL MAINTENANCE INSTRUCTIONS FOR T.M. 6 FRA 6068.

| Sr. | SMI No. | Description |
|---|---|---|
| 1. | RDSO/2011/EL/SMI/0273 (Rev. 0) dtd. 23.12.2011 | Detection of rotation of outer race of bearing and assembly components in 3 phase traction motors type 6FRA 6068 & 6FXA 7059. |
| 2. | RDSO/2011/EL/SMI/0272 (Rev. 0) dtd. 02.12.2011 | Extreme pressure lubricant phase for shafting of rotors of traction motor type 6FRA 7059 to prevent damage to stampings and scoring of shafts at the time of removal of shaft. |
| 3. | RDSO/2011/EL/SMI/0269 (Rev. 0) dtd. 18.05.2011 | Maintenance of traction motor support plate and bogie nose to prevent crack/ breakage of traction motor support plate (holder for traction motor suspension) |
| 4. | RDSO/2010/EL/SMI/0262 (Rev. 0) dtd. 10.06.2010 | Detection of rotor bar crack & stator defect for traction motor type 6FRA 6068 used on WAG9 / WAP7 locomotives. |
| 5. | RDSO/2008/EL/SMI/0252 (Rev. 0) dtd. 01.05.2008 | Testing of "Weigand" speed sensor fitted with traction motor in WAG9, WAG9H, WAP7 & WAP5 locos. |
| 6. | ELRS/SMI/0211-99 (Rev. 0) dtd. 31.05.1999 | Improved method of brazing of terminal bus rods on the respective phase ring of the stator windings of three phase traction motor type 6FRA 6068. |
| 7. | ELRS/SMI/0210-99 (Rev. 0) dtd. 31.05.1999 | Modified method of VPI for three phase asynchronous traction motor type 6FRA 6068. |
| 8. | ELRS/SMI/0209-99 (Rev. 0) dtd. 31.05.1999 | Provision of silicon rubber compound RTV -738 in the terminal box of three phase asynchronous traction motor type 6FRA 6068. |



# 3 फेस ट्रैक्शन मोटर के लिए अनुरक्षण सूची
# MAINTENANCE SCHEDULE FOR 3 PHASE TRACTION MOTOR
(Ref : RDSO letter No.EL/3.1.35/16 dtd. 30.03.2007)

| Sr. | Equipment | TI | IA/ IB | IC |
|---|---|---|---|---|
| 1. | Examine all traction motors for signs of damage, dents or other defects caused by ballast. Check air outlets are not obstructed in any way. | ✓ | ✓ | ✓ |
| 2. | Check traction power cables, speed sensor and temperature sensor cables and ensure that they are not chamfered or damaged in any way. | ✓ | ✓ | ✓ |
| 3. | Lubricate the both end bearings using a grease gun with specified grease. | × | × | ✓ |
| 4. | Tightness of both end cover bolts of Traction Motor. | × | ✓ | ✓ |
| 5. | Check the intactness of the junction box cover and bolt. | × | ✓ | ✓ |
| 6. | Check the condition of bearing by seeing the grease, which comes out from grease inlet. Check the condition of grease too. | × | × | ✓ |
| 7. | The locking plate arrangement of support plate, if not available please provide. | ✓ | ✓ | ✓ |
| 8. | Check the condition of traction motor spheriblocks. Replace if required. | ✓ | ✓ | ✓ |
| 9. | Check the condition of speed pulse generator unit on TM (NDE) for any grease ingress. | × | × | ✓ |
| 10. | Check the suspension tube bearing grease (NDE end) & do the greasing. (For WAG9/ WAG9H/ WAP7). | × | × | ✓ |
| 11. | Open TM junction box at body side and check the tightness of connections. | × | ✓ | ✓ |
| 12. | Check the condition of bellows and replace if required. | × | ✓ | ✓ |

## एण्ड प्लेट End Plates (End Frame)

There are two end plates one at drive end and other at non drive end.

(i) NDE

(ii) DE

Bore Diameter - 214.96 mm

Bore Diameter - 319.96 mm

Terminal Board

Temperature Sensor
(Resistance Element PT-100)

**Pinion**

WAG9 - 21 teeth

WAP7 - 20 Teeth

## बियरिंग विवरण BEARING DETAILS

| Rotor bearings | DE side | NDE side |
|---|---|---|
| Type of bearings | NU 2236 | NJ 320/ NH 320 |
| Manufacturer | SKF/ FAG | SKF/ FAG |
| Inner dia | 180 + 0, - 0.025 mm | 100 + 0, - 0.020 mm |
| Outer dia | 320 + 0, - 0.040 mm | 215 + 0, - 0.030 mm |
| Radial clearance of free bearing when new | 0.170- 0.220 mm | 0.105- 0.140 mm |
| Radial clearance of bearing when installed | 0.110- 0.190 mm | 0.060- 0.110 mm |



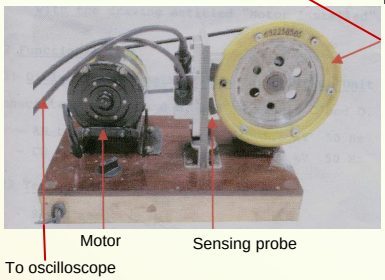
# विश्वसनीयता में सुधार के लिए अनूरक्षण निर्देश
## MAINTENANCE INSTRUCTION TO IMPROVE RELIABILITY

1. Check the metal content in grease sample during IC/ AOH to detect the rotation of outer race of bearing and assembly components to avoid failures on account of bearing seizure. It shall not be more than 0.25% for NDE & DE side bearings. (Ref : SMI 273).

2. Measure the temp. of bearing housing (NDE) with the help of non-contact thermometer whenever loco arrives just after service at out-pits or in loco shed, it shall be less than 25°C over ambient temperature to detect the rotation of outer race inside frames and any rubbing of metal parts. (Ref : SMI 273).

3. Measure the inductance $L_{UV}$, $L_{VW}$, $L_{UW}$ respectively at SR terminals with digital LCR meter during AOH or whenever there is any of following three fault messages is logged in DDS. (Ref : SMI 262)

   i. ASC1/2: 0081 PS Fault storage CGP
   ii SLG1/2: 0022 Motor temperature above limit.
   iii. SLG1/2: 0024 Temperature difference motor bogie > limit.




4. The "Weigand" speed sensor shall be tested in both directions of rotation on fixture as shown from speed 30 rpm to 900 rpm or above. The sensor probe is fitted at a gap of 0.5 mm to 1.0 mm from pulse generating ring which is connected to oscilloscope. (Ref : SMI 252)

5. DPT should be conducted on TM support plate lug portion as well as TM bogie nose of WAP7/ WAG9 during MOH/ IOH/ POH to prevent crack/ breakage of TM support plate (Holder for traction motor suspension. (Ref : SMI 269)

## क्या करें DO'S

- ✓ Use anti-rusting solvent after cleaning the bearings and their components.
- ✓ Tight all bolts and screws with recommended torque value as given below:
  M6- 9.5 Nm, M8- 23 Nm, M10- 46 Nm, M12- 80 Nm, M14- 125 Nm,
  M16- 195 Nm, M18- 270 Nm, M20- 380 Nm
- ✓ Ensure that the modification/ special maintenance instructions are being implemented.
- ✓ Ensure that washers and locking plates are properly provided while assembling the traction motor.
- ✓ Ensure that the oven/ induction heater is working at the recommended temperature.
- ✓ Use Shock Pulse Meter (SPM) for monitoring the condition of bearings.
- ✓ Ensure that the all specified clearances are maintained properly.
- ✓ Ensure that the recommended lubricants of approved make are being used.
- ✓ Keep the terminal box & bellow holes of ready motor covered.
- ✓ Cover the ready end shields with polythene.
- ✓ Keep loose parts in a tray while dismantling & assembling.

## क्या न करें DON'TS

- × Don't use cotton waste or fluffy cloth for cleaning of motor as left over fluffs or fibres might cause electrical or mechanical failures.
- × Don't reuse used grease or lubricant oil.
- × Don't use higher voltage meggar than specified.
- × Don't compromise with clearances of bearings.
- × Don't mix up the greases of same grade but different make.
- × Don't carry run test of a motor without pinion or dummy.
- × Don't spoil the work floor with oil/ grease.

## डिस्क्लेमर Disclaimer:

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सत्यमेव जयते

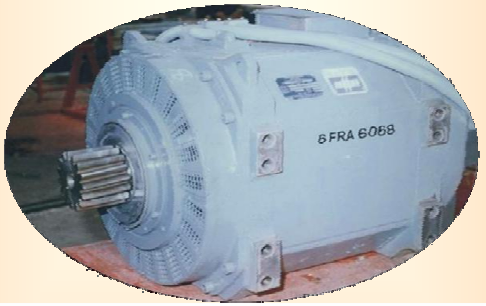
भारत सरकार **GOVERNMENT OF INDIA**
रेल मंत्रालय **MINISTRY OF RAILWAYS**

# 3 फेस ट्रैक्शन मोटर 6एफआरए 6068 (डब्ल्यू ए जी 9/डब्ल्यू ए पी 7) पर पैम्फलेट

# PAMPHLET ON

# 3 PHASE TRACTION MOTOR 6FRA 6068 (WAG9/WAP7)

*CAMTECH/E/2013-14/3-Ph TM 6FRA/1.0*
*May2013*

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