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एलईआरएस & 226011  
Government of India - Ministry of  
Railways  
Research, Designs & Standards  
Organization, LUCKNOW - 226011

No. EL/3.2.182

Date: 18.11.2010

### **Modification Sheet No. ELRS/MS/0355 ( Rev.'2')**

#### **Title**

Modification to support Winding overhang(double support at connection end and single support at non-connection end) and augmentation of insulation scheme of stators of Three phase traction motor type 6FRA 6068 during new manufacturing/re-winding. **This MS supersedes MS-0355 (Rev-1) & MS 0356 (Rev-1).**

#### **1.0 Object :**

- Failures of stators of three phase traction motors type 6FRA 6068 are on account of (a) Inter turn short/flushed in Overhang (NDE & DE) . (b)Stator Winding Earthed/Flushed with Slots(NDE & DE),(c)Temperature Sensor Defective,(d) Junction Box Flashed and (e)Stator Rubbed with rotors.
- To avoid lifting of locomotives for replacement of temperature sensors. RDSO has issued a Modification Sheet RDSO/2007/EL/MS/C350, Rev 0 vide RDSO's letter no. EL/3.2.182 dt 01.11.2007 introducing threaded type mounting arrangement of these sensors.
- After study and discussions, it has been concluded that unsupported overhangs of stator windings (maximum length of 167 mm) and inadequate insulation at the outlet of the slot and at knuckle points ,not commensurating with the prevailing shocks and vibrations level in service, are the main reasons for the failure of stator windings.
- This modification sheet addresses the failures of stators on account of inter turn short/flushed and stator winding earthed/flushed with slots on both connection and non-connection end sides.
- In this revision, connection end winding overhang is supported by two bracing rings and non-connection end winding overhang is supported by single bracing ring instead of one bracing ring at each end in earlier version of this modification
- The scheme has been made universal for new manufacturing as well as during rewinding.
- This modification has to be carried out in all the stators , during new manufacturing/rewinding

## 2.0 Work to be carried out:

- 2.1 Proposed modification doesn't call for any change in the design of the any existing component of traction motor e.g. stator Chambers, end frames, winding layout etc.
- 2.2 Fix 8 nos. of brackets on connection end of the stator chambers of and another 8 nos. on non connection end as per drawing no SKEL 4849 alt-1 at the locations as per drawing no SKEL 4848 Alt-1.
- 2.3 Two nos. of FRP bracing rings e.g. outer bracing ring (SKEL-4850) and inner bracing ring (drawing no SKEL-4851) are required to be tied on brackets bolted on connection end stator chambers. One FRP bracing ring (drawing no SKEL-4852) is required to be tied on brackets bolted on non-connection end stator chamber.
- 2.4 Finally the winding overhangs are to be tied with two bracing rings at connection end and with one bracing ring at non-connection ring as per arrangements shown in drawing no SKEL-4848 Alt-0.
- 2.5 Additional U section of Nomex (which has got insulation class of 220 °C) is to be provided at slot ends to prevent stator winding earthed / flashed with slots.
- 2.6 Provision of securing arrangement between adjacent coils after inserting fibre glass epoxy pieces wrapped with nomex felt between coils to fill up the available gap between coils to prevent relative movement between coils.
- 2.7 Avoid crossing of two parallel copper conductors end one above other at knuckle portion to avoid rubbing of two coil knuckles, as space between two is very less.
- 2.8 Provision of extra layer of nomex in between two knuckles.
- 2.9 Provision of interleaving of 2 mill x 25 mm Kapton tape in between turns at all 4 bends to avoid inter turn failure at all bends against stress developed on insulation during forming & shaping.
- 2.10 Provision of tying between all series joints & interconnections (jumpers) with help of Nomex felt & glass tape to prevent movements.
- 2.11 Only induction brazing under controlled temperature is to be adopted in place of existing gas brazing to customize low temperature high strength solder joint.
- 2.12 Using former to avoid damage of coils during forming against the Existing practice of using one pre -formed coil as template for several times and finally using the template coil itself in stator.

- 2.13 Curing cycle as per manufacturer's recommendations for VPI should be followed as per existing schedule. However, rotating curing has to be undertaken immediately after VPI to ensure uniform distribution of resin for first 8 hours at 5 rpm at 150°C till gel formation takes place, followed by stationary curing for adequacy of the bonding
- 2.14 Removing of Kapton layer from brazing portion of conductor by dipping in xylene instead of using gas.

**3.0 Application :**

All stators of traction motors type 6FRA 6068 used on WAG-9 and WAP-7 class of locomotives.

4.0 **Material Required:** As per drawing.

5.0 **Material rendered surplus :** Nil

6.0 **Modification Drawing No.:**

SKEL-4848 Alt-'0'  
SKEL-4849 Alt-'0'  
SKEL-4850 Alt-'0'  
SKEL-4851 Alt-'0'  
SKEL-4852 Alt-'0'

7.0 **Periodicity of Implementation :**

During new manufacturing or when ever these stators are taken up for repair/rewinding

8.0 **Agency of Implementation :**

- i) CLW on all new stators of IM type 6FRA6068.
- ii) Approved sources for manufacturing of Traction motors type 6FRA 6068.
- iii) Traction motor workshop/shed carrying out repair and re-winding of traction motors type 6FRA 6068

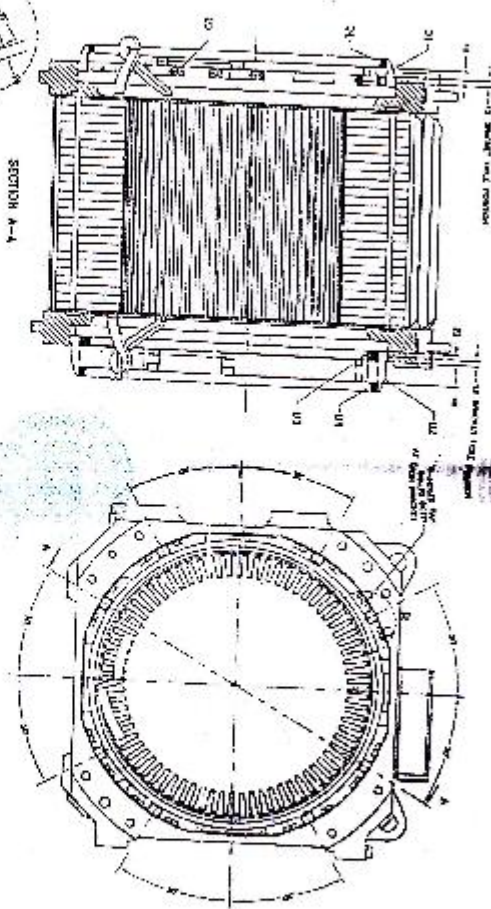
9.0 **Distribution:**

As per enclosed list

DA: as above

  
(Ganesh)  
for Director General (Elec.)





DEFINITION - B  
SCALE - 1:1

SECTION A-A

Bl	15-11-10
D	15-11-10
C	15-11-10
15	15-11-10

STATUS	ALT.	REF. NO.	DESCRIPTION	APPROV.	UNIT

RDSO.ELECT.DTE. SKEL-4848  
ALT '0'

STATOR WINDING OVERLAP BRACING  
ARRANGEMENT FOR TM-67R40068

10.11.2010

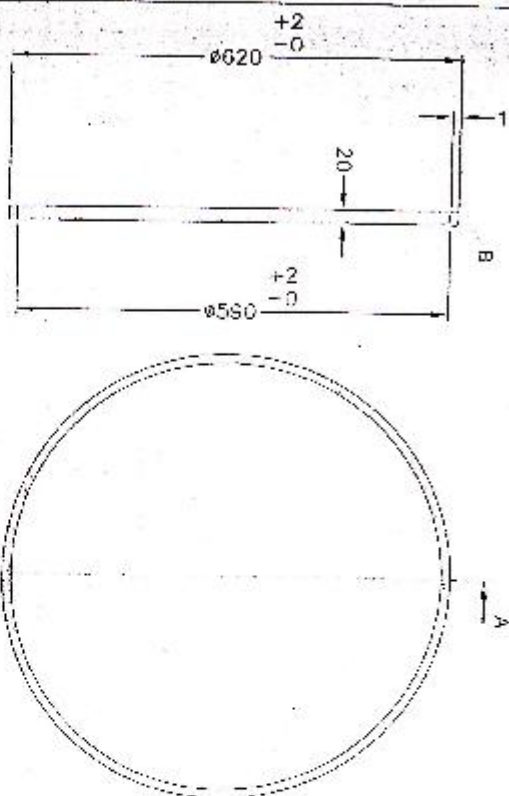
SUPERVISOR

ITEM NO.	DESCRIPTION	UNIT	QTY.	DATE	STATUS
01	1. SKEL-4848	1	1	10.11.2010	
02	2. SKEL-4848	1	1	10.11.2010	
03	3. SKEL-4848	1	1	10.11.2010	
04	4. SKEL-4848	1	1	10.11.2010	
05	5. SKEL-4848	1	1	10.11.2010	
06	6. SKEL-4848	1	1	10.11.2010	
07	7. SKEL-4848	1	1	10.11.2010	
08	8. SKEL-4848	1	1	10.11.2010	
09	9. SKEL-4848	1	1	10.11.2010	
10	10. SKEL-4848	1	1	10.11.2010	
11	11. SKEL-4848	1	1	10.11.2010	
12	12. SKEL-4848	1	1	10.11.2010	

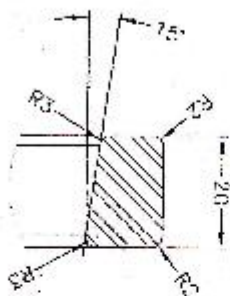








SECTION A-A



DETAIL B

- NOTE:
1. MATERIAL & TEST: AS PER IS 10192 OR EP-3
  2. GLASS FIBRE REINFORCEMENT - CONTINUOUS
  3. CLASS - 1" GLASS FIBRE Roving 30 OR 60 ENDS
  4. RESIN - EPOXY
  5. RINGS TO BE MOULDED IN STEEL Moulds TO
  6. ACHIEVE DIMENSIONAL CONSISTANCY.
  7. RING TO BE REMOVED FROM Mould AFTER COULD
  8. SETTING (HOURS) AT ROOM TEMP.

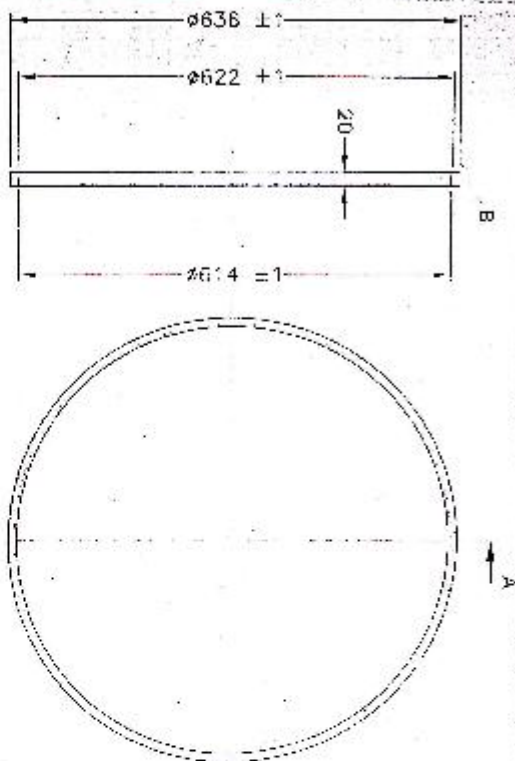
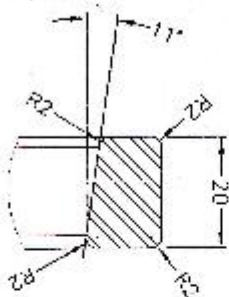
DT	15.11.10
By	SKL
Check	SKL
File No.	EL/12.102

STATUS	ALT.	REF. NO.	DESCRIPTION	APPROVED BY	DATE

NO.	10192	DESCRIPTION	LEGAL DES. NO.	NO./JCO	DATE	SPEC.
<p align="center"><b>INNER BRACING RING</b> (CONNECTION END) FOR TM 6FRA6068</p>						
<p align="center"><b>RDSO.ELECT.DTE.</b></p>				<p align="center"><b>SKEL-4851</b></p>		
<p align="center">ALT '0'</p>				<p align="center">SUPERSEDES BY</p>		
<p align="center">FIRST ISSUE 15.11.2010</p>						
<p align="center">SIGNED BY</p>						



STATUS	ALT.	REF. NO.	DESCRIPTION	APPD. BY	DATE

SECTION A-A

1. MATERIAL & FIN. AS PER IS 10192 Q. E-3
2. CLASS FIBRE REINFORCEMENT CONTINUOUS CLASS 'E' GLASS FIBRE RIVETING 30 OR 60 ENDS
3. RESIN: EPOXY
4. BINS TO BE MOUNTED IN STEEL MODULES TO ACHIEVE ENVIRONMENTAL CONSISTENCY.
5. KING TO BE REMOVED FROM SHED AFTER COULD SETTLE EQUIPMENT AT ROOM TEMP.