

WOSS 501/3

British Railways Board

Director of Mechanical and Electrical Engineering

Resurfacing of Commutators

WORKSHOP OVERHAUL STANDARD SPECIFICATION

REVISION RECORD

This Specification will be updated when necessary by the issue of amended pages accompanied by revision letters. The amended or additional part of re-issued pages will be marked with a vertical black line.

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WOSS 501/3

This Specification applies to equipment fitted to the vehicles indicated 'X' below, but it is only to be implemented when authorised by an appropriate maintenance/overhaul document.

LOCOMOTIVES

| | |
|----|---|
| 03 | X |
| 08 | X |
| 09 | X |
| 20 | X |
| 25 | X |
| 26 | X |
| 27 | X |
| 31 | X |
| 33 | X |
| 37 | X |
| 43 | X |
| 45 | X |
| 47 | X |
| 50 | X |
| 56 | X |
| 58 | X |

| | |
|----|---|
| 73 | X |
| 81 | X |
| 85 | X |
| 86 | X |
| 87 | X |
| 88 | X |
| 89 | X |
| 91 | X |

DMU's

| | |
|-----|---|
| 101 | X |
| 104 | X |
| 107 | X |
| 108 | X |
| 110 | X |
| 111 | X |
| 114 | X |
| 115 | X |
| 116 | X |
| 117 | X |
| 118 | X |
| 119 | X |
| 121 | X |
| 122 | X |
| 128 | X |
| 140 | X |
| 141 | X |
| 142 | X |
| 143 | X |
| 150 | X |
| 151 | X |

EMU's

| | |
|-----|---|
| 302 | X |
| 303 | X |
| 304 | X |
| 305 | X |
| 307 | X |
| 308 | X |
| 309 | X |
| 310 | X |
| 311 | X |
| 312 | X |
| 313 | X |
| 314 | X |
| 315 | X |
| 317 | X |
| 318 | X |
| 319 | X |

| | |
|-----|---|
| 411 | X |
| 412 | X |
| 413 | X |
| 414 | X |
| 415 | X |
| 416 | X |
| 419 | X |
| 421 | X |
| 422 | X |
| 427 | X |
| 432 | X |
| 455 | X |

| | |
|-----|---|
| 485 | X |
| 486 | X |
| 487 | X |
| 488 | X |
| 489 | X |

| | |
|-----|---|
| 504 | X |
| 507 | X |
| 508 | X |

DEMU's

| | |
|-----|---|
| 201 | X |
| 202 | X |
| 203 | X |
| 204 | X |
| 205 | X |
| 207 | X |

COACHING STOCK

| | |
|-------------------|---|
| Mk 1 | X |
| Mk 2, 2a-c | X |
| Mk 2d-e | X |
| Mk 2f | X |
| Mk 2 DBSO | X |
| Mk 3a | X |
| Mk 3b | X |
| Mk 3 (HST) | X |
| Mk 3 SLE and SLEP | X |
| Non Passenger | X |

RESURFACING OF COMMUTATORS

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TOOLS AND MATERIALS

Lathe - must be free from any vibration which would cause the finished commutator profile to be unacceptable.

Tungsten carbide tipped turning tool - suitable for copper.

Diamond tipped turning tool - suitable for copper.

Milling cutter - suitable for undercutting mica separators, not for chamfering.

Combination milling cutters suitable for undercutting mica separators and chamfering copper segments in one pass.

Single point "V" chamfering tool - suitable for copper.

Dial indicator - graduated in 0.001 mm divisions.

Profile recorder - Feinpruff machine or other approved type

TOOLS AND MATERIALS (Cont'd)

BR Cat No.

Nylon hand brush

Aluminium oxide cloth - grade 120

1/5210

Air drying varnish

)

28/30820

)

28/30821

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Flexible sanding block

1. EXAMINATION

Resurface any commutator which exhibits any of the following features:-

1.1 Burning, pitting or other erosion of the working face.

1.2 Copper dragging.

1.3 Mica undercut depth less than 1 mm below the working face.

1.4 Radial wear of the working face greater than 0.125 mm.

1.5 Gradual radial variation of more than 0.0125 mm in any group of five adjacent commutator segments.

1.6 Eccentricity (total indicated reading) with respect to the bearing seat / coupling flange / mandrel greater than:

1.6.1 0.075 mm for any machine not included in sub sections 1.6.2 or 1.6.3.

1.6.2 0.05 mm for any traction motor not included in sub sections 1.6.3.

1.6.3 0.025 mm for any of the following machines:

| | |
|---------|----------|
| G417 | (G.E.C.) |
| G310 | (G.E.C.) |
| G315 | (G.E.C.) |
| TM61-53 | (Brush) |
| TM68-46 | (Brush) |
| EE538 | (E.E.) |
| EE546 | (E.E.) |
| 282 | (A.E.I.) |

02. STANDARD OF RESURFACING

2.1 For the purposes of commutator resurfacing two standards apply:-

2.1.1 Grade 1 - Traction motors and motor alternator sets.

2.1.2 Grade 2 - All machines not included in Grade 1.

NOTE: If facilities are not available to carry out the resurfacing in accordance with Grade 2 standards then Grade 2 machines may be treated as grade 1. Grade 1 machines must not be treated as Grade 2.

3. SETTING UP OF ARMATURE IN LATHE

3.1 Place the armature in the lathe and support it using either:-

3.1.1 The centres in the armature shaft and appropriate centres on the lathe.

3.1.2 A chuck and a steady rest, taking care that machined faces are adequately protected.

3.2 Align the armature in the lathe, taking the bearing seats / coupling flange / mandrel as the reference, so that the limits laid out in section 1.6 can be achieved on the finished commutator.

4. ROUGH TURNING OF COMMUTATORS

4.1 Set up the lathe with a tungsten carbide tipped tool, a tool feed of 0.25 mm per revolution and as high a cutting speed as possible without undue vibration.

4.2 Take a cut from the working face of the commutator, removing only the MINIMUM amount of copper necessary to achieve a concentric cylindrical surface.

4.3 Continue resurfacing as follows:-

4.3.1 Grade 1 machines - treat in accordance with operation 5.

4.3.2 Grade 2 machines - leave the armature set up in the lathe and treat in accordance with operation 9.

5. UNDERCUTTING OF MICA SEPARATORS - GRADE 1 MACHINES

NOTE: Use a parallel sided milling cutter 0.05 mm to 0.075 mm thinner than the mica separators.

5.1 Set the armature up in a suitable machine such that the milling cutter will be cut to a depth of 1.25 mm to 1.5 mm across the full working face.

- 5.2 Undercut the mica separators on the working face. As work proceeds check for chattering, removal of copper from the sides of the slots and fins of mica in the slots. If any of these conditions become apparent check the automatic indexing (if appropriate) and/or renew the milling cutter and rectify the defects.

6. CHAMFERING OF COPPER SEGMENTS - GRADE 1 MACHINES

- 6.1 If the copper segments have a thickness of 2.5 mm or more, chamfer the edges on the working face to a nominal 0.25 mm width at an included angle of 60° using the "V" tool. The chamfer must be even and without chatter marks.
- 6.2 If the copper segments have a thickness less than 2.5 mm, no chamfer is required.

7. FINISH TURNING OF COMMUTATOR - GRADE 1 MACHINES

- 7.1 Return the armature to the lathe and set up as laid out in section 3.
- 7.2 Set the lathe up with the diamond tipped tool, a tool feed of 0.125 mm per revolution and as high a cutting speed as possible without undue vibration.
- 7.3 Take a cut from the working face to a depth of 0.05 mm to 0.075 mm.
- 7.4 Reset the tool feed to 0.05 mm per revolution and take a second cut to a depth of 0.0125 mm to 0.025 mm.
- 7.5 Check the finish on the working surface for smoothness and freedom from chattering and intermittent lines. Rectify the cause of any defect and repeat 7.4.
- 7.6 Remove any slivers of mica and copper from the slots with a nylon hand brush.
- 7.7 Using new aluminium oxide cloth on a flexible sanding block, remove the highly polished finish from the working surface and obtain a smooth matt finish.

8. PROFILE CHECK - GRADE 1 MACHINES

- 8.1 Ensure that one commutator riser segment is painted with air drying varnish.
- 8.2 Recheck the bearing seats for concentricity.
- 8.3 Take a record of the bearing seat nearest the commutator and of the commutator using the profile recorder. Mark the record with the armature number and date and examine the record.

8.4 Any commutators which are outside the limits laid down in 1.6 must be rectified by repeating the operations from 4 or 7 as applicable, after the cause of the deficiencies has been rectified.

8.5 Pass the records to the A.Q.M. B.R.B.

9. FINISH TURNING OF COMMUTATORS - GRADE 2 MACHINES

9.1 Set the tool feed to 0.05 mm per revolution and as high a cutting speed as possible without undue vibration.

9.2 Take a cut from the working face to a depth of 0.025 mm to 0.05 mm.

9.3 Check the finish on the working surface for smoothness and freedom from chattering and intermittent lines. Rectify the cause of any defects and repeat 9.2.

10. UNDERCUTTING AND CHAMFERING - GRADE 2 MACHINES

NOTE: Use a combination milling cutter with a parallel section 0.05 mm to 0.075 mm thinner than the mica separators and a chamfering section at an included angle of 60°.

10.1 If the copper segments have a thickness less than 2.5 mm, undercut in accordance with Section 5 and do not chamfer.

10.2 Set the armature up in a suitable machine such that the milling cutter cuts to a depth of 1.25 mm to 1.5 mm and chamfers to a nominal 0.25 mm width.

10.3 Undercut and chamfer the commutator on the working face. As work proceeds check for unevenness, chattering, removal of copper from the sides of the slots and fins of mica in the slots. If any of these conditions become apparent, check the automatic indexing (if appropriate) and/or renew the milling cutter and rectify the defects.

10.4 Using new aluminium oxide cloth on a flexible sanding block, remove the polished finish and burrs from the working surface and obtain a smooth matt finish.

10.5 Remove, with a nylon hand brush any slivers of mica and copper from the slots.

11. PROTECTION OF COMMUTATOR

11.1 Fit a covering of suitable material eg. leatheroid over the commutator working surface, so that the commutator is protected whilst it is awaiting refitting into a frame.