

STR.No.13/RS/STR/PCCC/0001

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

SCHEDULE OF TECHNICAL REQUIREMENTS

FOR

POLYIMIDE COVERED COPPER CONDUCTOR

FOR

DC TRACTION MOTORS
OF
ELECTRIC LOCOMOTIVES

APRIL, 2003

ISSUED BY
ELECTRICAL DIRECTORATE
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Schedule of technical requirements for Polyimide covered copper conductor for DC traction motor

1. General :

- 1.1 Indian Railways are procuring polyimide covered copper conductors for dc traction motors to RDSO Specification No. E.I.R.S/SPBC/TM/313 (Rev.1) of Jan., 2003, called "Specification." hereafter. The Schedule of Technical Requirements mentioned hereunder is issued to serve as a guide to the manufacturer's (called "the firm" hereafter), and should be read in conjunction with the above said specification. The firm should satisfy themselves about having complied the requirements of the Specification and the Schedule of Technical Requirements. The Technical Requirements are meant to serve as guideline only and are not exhaustive.

- 1.2 The firm should have currently valid ISO-9003 certification including the subject item under its range of manufacture.

2. Raw Material :

- 2.2 The polyimide insulation shall be purchased by the firm only from the sources as mentioned in RDSO List of approved sources for Electric Locomotives. The firm shall produce document as proof of purchase in this regard.
- 2.3 Copper shall be purchased to specification from reputed sources only.
- 2.4 The firm should preferably have its own Metallurgical & chemical testing laboratory, otherwise services of a Government approved Test Laboratory can be availed.
- 2.5 A record of each sub-supplier clearly showing the quantity purchased and rejected, as well as cases of late delivery shall be kept.

3. Manufacturing :

- 3.2 The manufacturing shall be carried out in dust free, clean and enclosed environment.
- 3.3 List of M&P required for manufacturing shall be as per Annexure-1. The list does not specify the capacity and quantity of various M&P which may vary according to the manufacturing capacity of the individual firm.

4 Testing :

4.2 List of testing facilities to be maintained in firm's laboratory shall be as per Annexure II. The accuracy and capacity of the testing and measuring equipment shall be adequate to meet the requirements of the specification.

4.3 Meticulous record of each batch of production shall be maintained along with a sample for verification and investigation, if necessary.

Annexure-I

Details of Machinery & Plants.

1. Copper conductor manufacturing :

- | | | | |
|-----|-----------------------------|---|---|
| 1.1 | Wire Drawing Machine | - | For Copper strip making |
| 1.2 | Flattening Machine | - | -do- |
| 1.3 | Strip Rolling Machine | - | -do- |
| 1.4 | Drawing cum shaving machine | - | For base preparation of copper wire rod |
| 1.5 | Vacuum Annealing Furnace | - | For annealing of copper strips. |

2. On-line Polyimide Covering & Testing :

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|-----|--|---|--|
| 2.1 | Dust Free AC Set up for covering of polyimide film over copper conductors | | |
| 2.2 | Double taping heads with microprocessor based Hysteresis Tension control system. | - | For polyimide film taping on copper strip with uniform tension. |
| 2.3 | Ultra High Frequency Induction - Heating Furnace. | - | For on line heat sealing of polyimide film with copper strip. |
| 2.4 | Radiation furnace | - | For 2 nd stage of heat sealing of Polyimide film. |
| 2.5 | Intra Red Temperature Scanner | - | For monitoring of actual sealing. |
| 2.6 | High frequency sine-wave spark Tester (0-15 kV) | - | For on line HV testing of polyimide covered copper conductor. |
| 2.7 | Pin Hole Tester | - | For online pin hole checking of polyimide covered copper conductor |

3. Material Handling & Miscellaneous Facilities :

- | | | | |
|-----|---|--|--|
| 3.1 | Picking & Degreasing Plants | | |
| 3.2 | Crane to handle raw materials & finished products. | | |
| 3.3 | Dust free storage facility for keeping polyimide film and other insulation material and finished Polyimide covered copper conductors. | | |

Details of Testing Equipment

1. General Lab Test Facilities :

- 1.1 Universal Tensile Testing Machine
- 1.2 Hardness Tester
- 1.3 R.D.V. tester
- 1.4 Profile Projector
- 1.5 Kelvin Double Bridge
- 1.6 Digital Micro Ohm Meter
- 1.7 Conductivity Meter
- 1.8 Electric Oven with Thermostat and Recorder
- 1.9 Digital Physical Balance
- 1.10 Weighting Machine
- 1.11 Radius Gauge
- 1.12 Micrometer
- 1.13 Digital/Dial Vernier Caliper.

2. Facilities Specific for Testing of Polyimide Covered Copper Conductors :

- 2.1 Peel off tester
- 2.2 Springiness apparatus
- 2.3 Mandrel Winding Tester
- 2.4 Flexure/tortuosity test
- 2.5 Stiffness tester
- 2.6 Edge-wise & Flat wise bending fixture
- 2.7 Alternate bending fixture