STR No.RDSO/2007/EL/STR/0024

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE & SUPPLY OF FIELD COILS FOR DC TM OF EMU/MEMU

November' 2007

Issued by

Electrical Directorate
Research, Designs and Standards Organisation
Manak Nagar, Lucknow-226011

SCHEDULE OF TECHNICAL REQUIREMENTS FOR MANUFACTURE & SUPPLY OF FIELD COILS FOR TM OF EMU/MEMU

1. SCOPE

The Field Coils (Main Pole & Com Ploe) are vital parts of Traction Motors type-4303BY, 3701AZ/BZ, TDK 5620A (253BX/BW & 4601AZ/BZ are Potted Coils) used on EMU/MEMU on Indian Railways. These Coils are either manufactured by RCF/ICF or procured from other approved sources as per relevant drawings. In addition, Zonal Railways are procuring these coils and also getting done Electrical Rehabilitation work from the approved sources. The Schedule of Technical Requirement (STR) mentioned hereunder is issued to serve as a guide to manufacturers (called the "firm" hereafter) and should be read in conjunction with latest relevant specification and drawings of Main Pole Coils and Com Pole Coils of above traction Motors of EMU/MEMU. The firm should satisfy themselves having complied with the requirements of the drawings and STR.

The technical requirements are meant to serve as guidelines only and are not exhaustive.

2. GENERAL REQUIREMENTS

2.1 The firm should have currently valid ISO-9000 certification issued by an approved agency with the activity desired clearly mentioned in the scope of certification.

The firm shall have a Quality Manual indicating the extent of control over production.

2.2 A system of regular submission of rejection details of material giving rejection rate, cause of rejection, corrective action taken etc. on quarterly basis should be followed by the firm.

2.3 The firm shall have a system of documentation in respect of rejection at customer end, warranty replacement and failure of item supplied by them during service.

2.4 The firm shall have a system of recording the plant, machinery and control equipments remaining out of service, nature of repairs done etc.

2.5 The testing and measuring equipment shall be duly calibrated and the validity of calibration should be current and verified by physically checking the calibration certificate issued by the Calibration Agency from whom it was calibrated.

2.6 The firm shall have a system of easy traceability of the product from manufacturing stage to finished product stage. Stamped identification marking with serial number should be used for this purpose.

3.0 QUALITY ASSURANCE PLAN (QAP)

The firm shall prepare a Quality Assurance Plan (QAP) for all items for which approval is sought and submit the same as part of compliance of this STR. The QAP shall be a comprehensive document covering the following aspects:

i) Details of Quality Control Organisation of the firm along with key personnel engaged in the QC function.
ii) Quality Assurance Process of incoming materials used for the subject items.
iii) Process Flow Chart indicating process of manufacture for an individual product or for a family of products if the process is same.
iv) Quality Assurance System – Inspection & Testing Plan including the stage inspection.
v) Calibration scheme and status of calibration of equipments used in the quality process.

Details of the above aspects are described in the following paragraphs. The QAP shall be approved by RDSO and shall form basis of approval process.

4.0 QUALITY CONTROL ORGANISATION

4.1 The complete organizational setup of the Quality control key personnel and officials along with their qualification and experience should be furnished.

4.2 The Quality Control organization should be headed by a senior level official having adequate technical qualification who shall directly report to plant in-charge.

5.0 INCOMING MATERIAL

1.1 A complete Bill of Material indicating all input material items required for manufacturing of the product, governing specification and their sources of supplies as approved by the firm in accordance with Clause 7.4.1 of ISO-9001 (2000) should be furnished.

1.2 Coil manufactures shall procure all the raw materials from RDSO/CLW approved sources along with test certificates and same should be available as & when asked for.

5.2 Test results of all incoming raw materials with reference to Test Certificates issued by the suppliers and the results of internal tests carried out by the firm for verification may be submitted as part of QAP.

6.0 PROCESS OF MANUFACTURE

6.1 Complete Process Flow Chart covering all steps of process of manufacture for an individual product (or for a family of products if the process is same) shall be clearly enlisted as a part of QAP.

6.2 Formation of the coil should be done on Press Machine (Capacity 350 Tons) and winding on Automatic Edge Winding Machine from a single length of copper strip without any joint. During the coil formation, dimensions should be so maintained to meet the final critical dimensions of the MP & CP coils of EMU/MEMU Traction Motors.

6.3 Details of Jigs and fixtures used during manufacture should be furnished along with the manufacturing process wherever used.

6.4 List of typical M & P required for manufacture is furnished in **Annexure- I.** The list is for general guidance only and actual manufacturing operations shall be submitted and got approved by the firm as a part of QAP.

7.0 QUALITY ASSURANCE PROCESS- INSPECTION AND TESTING PLAN

7.1 Complete Inspection and testing Chart covering all steps of process of manufacture for an individual product including final inspection should be clearly enlisted as a part of QAP.

7.2 The following details of measuring instruments/equipments/jigs/fixtures used for all the steps of measurement operations should be included:

- Make and model of the measuring equipment
- Accuracy
- Quantity to be measured and acceptable value range.

7.3 Stage inspection detailing inspection procedure, inspection parameters, and method of testing/test procedure including sample sizes for destructive and non-destructive testing. Record of test results of stage inspection should be available and furnished.

7.4 The list of Testing and Measuring instruments are furnished in **Annexure-II & III** respectively for general guidance only. However the specific Testing & measuring instruments, gauges used by the firm will also form part of QAP, which shall be submitted and got approved by the firm.

ANNEXURE-I

MACHINERY & PLANT (M& P) FOR MANUFACTURING

The following is the indicative list of M&P facilities to be available with the firm:

1. Hydraulic Press 350 tons Capacity.
2. Automatic Edge Winding Machine.
3. Water Sealed Annealing Furnace with automatic temperature recorder (Max. temp. range: 800ºC) with vacuum pump (-30 PSI)
4. VPI Plant with chilling plant: Refrigerant: R-22
   Vacuum capacity: 0.1 Torr
   Pressure capacity: 10 Kg/cm
5. Baking Oven with auto cut-in & cut-off facility: (Max. temp. range: 400ºC)
6. Forming Jigs & Fixture
7. Brazing Zigs & Fixture for MP & CP coils
8. Suitable Baking Jigs for MP & CP Coils
9. Suitable Gauges for Dimensional checking
10. Acid Pickling Plant
11. Degreasing Plant
12. DC High Current Source capable of current injection of 2500A for 10 minutes.
13. Electric Brazing Transformer
14. Shaper machine for Milling & Chamfering coil
15. Temperature controlled Re-frigerated Storage facility
16. Dust free & well illuminated enclosure
17. Facilities for stamping of identification markings as per specification
18. Crane with proper handling facility as per requirement.
19. Calibrated templates for insulation cutting
20. GO & No-GO gauges.
21. Core Welding facility
22. Belt Sander, Wire Brush, Flexible Shaft Grinder
23. Fixtures should be available

ANNEXURE-II

LIST OF TESTING FACILITIES:

1.0 Calibration of the Testing / Measuring Equipments should be done at least once in a year unless stated otherwise.

2.0 Inspection Staff conducting all testing shall be adequately trained and qualified by recognized agency and shall have adequate experience.

3.0 Staff conducting tests like High Voltage and High frequency test shall have adequate skill & competence and shall have under gone sufficient training. Skill of such staff shall periodically be qualified by making them carry out tests on blind samples.

Following testing facilities should be available with the firm:

1. HV Tester (0-10 KV)

2. Surge Comparision Tester (0-5KV)

3. High Frequency test set up: capable to generate 3000 Hz.

4. Dielectric Test Set up: 10 KV

5. Viscosity meter

6. Impulse Voltage test set up: 2000V

ANNEXURE-III

List of Measuring Instruments

Calibration of the Testing / Measuring Equipments should be done at least once in a year unless stated otherwise.

1. Vernier Calipers, Micrometers, inside & outside Calipers and All Other Gauges Required during Matching Operations and Dimensional Checks.

2. Micrometer

3. Direct reading Hardness Tester of capacity 30-150 BHN

4. Vernier Height Gauge (600 mm)

5. Radius Gauge

6. Digital Ohm Meter

7. Meggar (1.0 KV)

8. Micro-Ohm meter

9. DC Ammeter & Voltmeter of various ranges

10. Digital Multimeter

- Checking gauges and fixtures of Main Pole & Commutating Pole as per requirement of manufacturing documents.

The gauges should be hard and ground to avoid any lapses of accuracy.

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