



A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT SPECIFICATION

REQUIREMENTS FOR A 1.8 Milli Henry DC REACTOR FOR 3kV DC TRACTION SUBSTATIONS.

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1.0 SCOPE

This specification covers the design and supply of a 1.8 milli Henry DC reactor for 3kV DC traction substations.

2.0 BACKGROUND

The DC reactor is installed in series with the 3kV DC output of the rectifier of the traction substation. The reactor protects the system against the rise of current under fault conditions and reduces harmonics generated by the rectifier.

3.0 STANDARDS AND PUBLICATIONS

The reactor shall comply with all relevant requirements of the latest editions of the following standards and publications unless otherwise specified.

3.1 SOUTH AFRICAN NATIONAL STANDARDS

SANS 60168: Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 000 V.

SANS 60815: Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles.

3.2 TRANSNET FREIGHT RAIL

BBB0041: Preparation of Drawings for Transnet Freight Rail Infrastructure.

BBB5994: Technical Documentation Management Policy.

4.0 TENDERING PROCEDURE

4.1 Tenderers shall indicate clause by clause compliance with the specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance.

4.2 A statement of non-compliance shall be motivated by the tenderer.

4.3 Equipment type test certificates as specified shall be submitted with the tender. These shall be in English or a certified translation.

4.4 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

4.5 Failure to comply with clauses 4.1, 4.2, 4.3 and 4.4 could preclude a tender from consideration.

5.0 SERVICE CONDITIONS.

5.1 ATMOSPHERIC CONDITIONS

5.1.1 The reactor shall be designed to operate under the following service conditions.

Altitude: 0 – 1800 meters above sea level.

Ambient Temperature Range: -10°C to +55°C.

Relative Humidity: 10% to 90%

Lightning Conditions: 12 Ground flashes per square kilometre per annum.

5.2 ELECTRICAL CONDITIONS

5.2.1 Nominal voltage 3150V DC which can vary between 2,4kVDC and 3,9kV DC.

5.3 MECHANICAL CONDITIONS

5.3.1 The reactor will be subjected to vibrations as it is installed in close proximity to railway lines.

6.0 TECHNICAL REQUIREMENTS

- 6.1 The reactor shall be designed for indoor installation.
- 6.2 The inductance of reactor shall be 1.8 milli-Henry
- 6.3 The reactor shall be air cored and naturally air cooled.
- 6.4 The continuous full load current rating of the reactor is be 1500 Amperes, but the reactor may subjected to the following overload conditions:
 - 2 times full load for thirty minutes.
 - 3 times full load for one minute.
 - 3 ½ times full load for ten seconds.
- 6.5 The rated short time current shall be at least 30kA for 200milli seconds.
- 6.6 The mechanical withstand force shall be at least 70kA peak.
- 6.7 The reactor and its support insulators shall be capable of withstanding the forces generated under the voltage and current conditions in clauses 6.4 and 6.5.
- 6.8 The reactor shall be terminated with two terminating bars minimum size 100mm X10mm thick.
- 6.9 Sufficient space shall be allowed for access to the reactor for maintenance and inspection purposes.
- 6.10 The supplier shall submit details of the total height, outside diameter and net mass of the reactor to Transnet Freight Rail as certain substations have space constraints.

7.0 INSULATION AND CLEARANCES

- 7.1 The reactor with its support insulators shall be able to withstand a test voltage of 10,5kV AC rms for one minute to earth.
- 7.2 The selection and testing of the insulators shall be done in accordance to SANS 60815 and SANS 60168.
- 7.3 The minimum clearance between the reactor and any metal frame and earth shall be not less than 100mm.
- 7.4 The insulation temperature index shall be class F with a limiting ambient temperature of 40°C.
- 7.5 If epoxy resin impregnation is offered the tenderer shall supply full electrical, mechanical and chemical details thereof.

8.0 INSPECTION AND TESTING.

- 8.1 Transnet Freight Rail reserves the right to carry out inspection and any tests on the equipment at the works of the supplier/ manufacture.
- 8.2 Arrangements must be made timeously for such inspections to be carried out before delivery of the equipment to the client.

9.0 QUALITY ASSURANCE

- 9.1 Transnet Freight Rail reserves the right to carry out inspection and tests on the equipment at the works of the supplier/manufacture.
- 9.2 Arrangements must be made timeously for such inspections and tests in accordance with the equipment specifications are carried out before delivery of the equipment to the site.
- 9.3 Test sheets of the equipment shall be forwarded to the Project Manager.

10.0 DRAWINGS, INSTRUCTION MANUALS AND SPARES LISTS

- 10.1 Drawings, instruction manuals and spare parts catalogues shall be supplied in accordance with Transnet Freight Rail specification BBD5994.
- 10.2 The preparation of the drawings shall comply with Transnet Freight Rail's specification BBB0041.

- 10.3 The contractor shall submit details of spares required in accordance with specification No. BBD5994.
- 10.4 All spares recommended for normal maintenance purposes that are not available locally (requires importation) must be highlighted.
- 11.0 GUARANTEE AND DEFECTS**
- 11.1 The contractor shall guarantee the satisfactory operation of the complete electrical installation supplied and installed by him and accept liability for maker's defects, which may appear in design, materials and workmanship.
- 11.2 The guarantee period for all substations shall expire after:- A period of 12 months commencing on the date of completion of the contract or the date the equipment is handed over to Transnet Freight Rail whichever is the later.
- 11.3 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract e.g., faulty locomotive or overhead track equipment, etc., shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the Maintenance manager and at the cost of the Contractor.
- 11.4 If urgent repairs have to be carried out by Transnet Freight Rail staff to maintain supply during the guarantee period the contractor shall inspect such repairs to ensure that the guarantee period is not affected
- 11.5 Should the repairs be covered by the guarantee, the contractor shall reimburse Transnet Freight Rail the cost of material and labour

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