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PURCHASE SPECIFICATION
GROUP: TRACTION ENGINEERING

P.S NO. : PS4452545

REV. NO: 00

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SPECIFICATION FOR LOW VOLTAGE TRANSFORMER

Code No. TI0668100567

REVISION HISTORY SHEET

REV. NO.	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	24.12.2015	FIRST ISSUE		B. Haribhushan	Shekar R.

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24.12.2015

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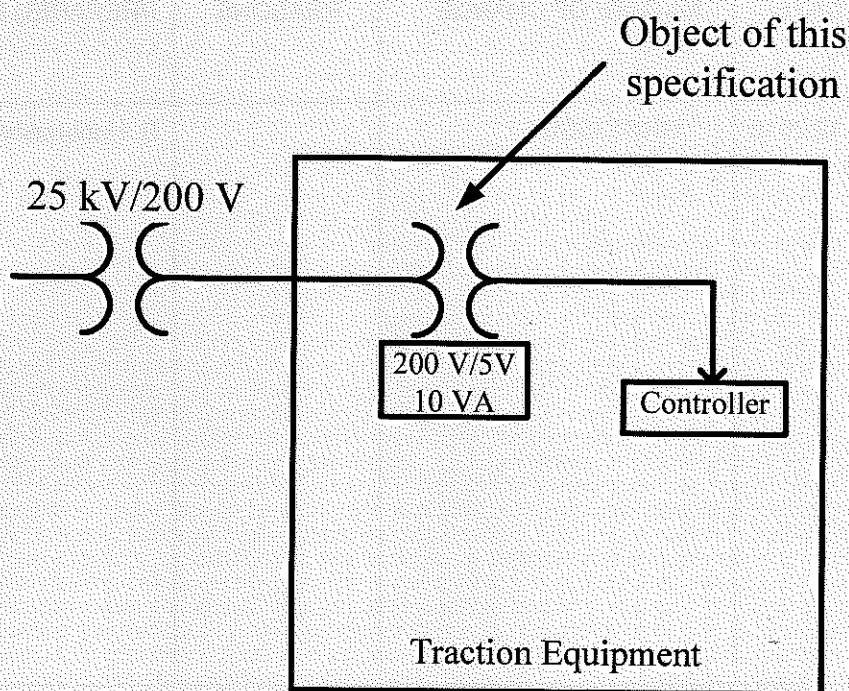
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SPECIFICATION FOR LOW VOLTAGE TRANSFORMER

1.0 Functional requirements:

This document covers specification of a Low Voltage Transformer, to be used as a synchronizing transformer in an IGBT based equipment. The Inductor will be mounted in a cabinet/enclosure and will be used in traction applications for on board mounting. The block diagram is shown below.



2.0 APPLICATION : Synchronizing transformer

3.0 TYPE : Dry Type, Air natural cooling

4.0 REFERENCE STANDARDS:

IEC 60044-2

Instrument transformers - Part 2 : Inductive voltage transformers

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SPECIFICATION FOR LOW VOLTAGE TRANSFORMER

5.0 ENVIRONMENTAL CONDITIONS:

- 5.1 Ambient Temperature : 55°C
5.2 Maximum Temperature : 70°C (when locomotive standing dead under sun)
55°C (when locomotive working)
47°C Nominal
5.3 Relative Humidity : up to 95% any moisture condensation during operation shall not lead any damage or failure
Yearly average $\leq$ 75% Rel. Humidity
5.4 Altitude : up to 1200 m above mean sea level
5.5 Atmosphere during hot weather: Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6mg/cub meter.
5.6 Air Pollution : The equipment shall be designed to work in coastal area in humidity and salt laden corrosive atmosphere. The maximum values will be as follows
(a) Maximum pH Value : 8.5
(b) Sulphate : 7mg/liter
(c) Maximum concentrate of chlorine: 6mg/liter
(d) Maximum conductivity: 130 μ Siemens/m
5.7 Climate : Tropical, Hot and humid Climate

6.0 ELECTRICAL REQUIREMENTS

- 6.1 Nominal primary voltage: 200 V_{rms}
6.2 Nominal input frequency: 50Hz
6.3 Nominal secondary voltage: 5 V_{rms}
6.4 Nominal output power: 10 VA
6.5 Phase difference between input and output voltage: 0°
6.6 Maximum primary voltage: 300 V_{rms}
6.7 Operating Temperature: -40°C to 70°C

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7.0 CONSTRUCTION

7.1 Core:

Electrical steel should be CRGO with grade of M4 or better along with test certificate.

7.2 Winding:

Windings to be of electrolytic Grade copper conductor

7.3 Cooling Type:

Natural Air Cooling

7.4 Insulation:

Class H, all windings to be uniformly insulated

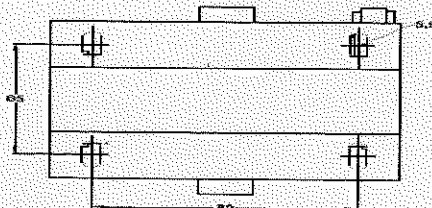
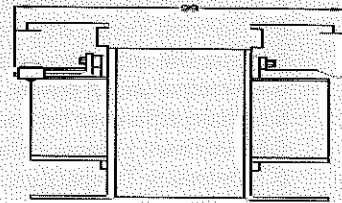
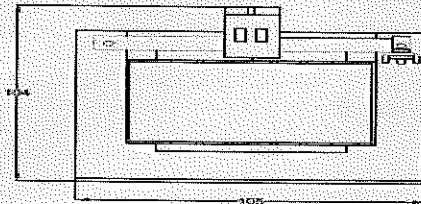
7.5 Impregnation:

Low voltage transformer assembly impregnated under vacuum with epoxy based resin for achieving high hygroscopic acid & alkali resistant insulation. The complete winding should have smooth finish after impregnation to ensure high Mechanical strength. Thickness of the resin should be uniform. The insulation should be self-extinguish type.

7.5 Termination: As per existing transformer

8.0 MECHANICAL DIMENSION LIMITATION

The low voltage transformer dimensions (overall & mounting) shall not exceed the dimensions indicated in the below sketch. This sketch is given for guidance only for limiting dimensions



Supplier to prepare detailed drawing & submit to BHEL for approval before commencing manufacturing process

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9.0 TESTS TO BE CONDUCTED AT SUPPLIER'S WORKSPACE

Low Voltage Transformer		
Name of the test	Routine test	Type test
Visual inspection	Yes	No
Functional test	Yes	No
Dielectric test	Yes	No
Phase angle difference test	Yes	No
Hot operation test	No	Yes

9.1 Visual inspection:

Check of dimensions and terminations as per drawing

9.2 Functional test:

Voltage ratio to be checked and it should be maintained constant from 125 V_{rms} to 248 V_{rms} of primary voltage at rated power output.

9.3 Dielectric test:

9.3.1 2 kV_{rms}, 50 Hz for 1 minute duration between shorted input terminals and other points (Earth)

9.3.2 500 V_{rms}, 50 Hz for 1 minute duration between shorted output terminals and other points (Earth)

9.4 Phase angle difference test:

The phase angle displacement between the input and output voltage should be zero when measured with respect to same ground point.

9.5 Hot operation test:

The test 9.2 shall be repeated at the maximum ambient temperature.

10.0 TEST PROTOCOL

Supplier shall submit test protocol for Routine & Type tests along with techno-commercial offer. List of tests are as per clause 5.0 of this specification.

11.0 DOCUMENTATION

12.1 Information required along with techno commercial offer without which offer is liable for rejection.

12.2 Supplier shall furnish clause wise confirmation/comments to the technical specification in the Typical format given below. Deviation, if any, shall be clearly brought out indicating the clause Number, original specification, deviation sought with proper technical backup (catalogue, Technical brochure, international standards, calculations etc.

If no deviations required, then supplier shall furnish certificate indicating "NO DEVIATION REQUESTED" and we comply fully with all the technical requirements of this specification no.

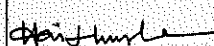
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- 12.3 Supplier shall take a copy of this specification and sign on each page and submit the signed copy along with offer.
- 12.4 Supplier shall furnish winding material, winding resistance, winding cross section.
- 12.5 Supplier shall furnish the type of core used along with technical details of core.
- 12.6 Information required after the placement of order
- 12.7 Detailed dimensional drawing for BHEL approval
- 12.8 Test protocol for BHEL approval.
- 12.9 Information required along with material supply.
- 12.10 Two sets of Test certificates.
- 12.11 BHEL engineer witnessed Pre inspection report.

12.0 ACCEPTANCE

- 13.1 Dimensions as per approved drawing
- 13.2 Routine test certificate
- 13.3 Type test certificate

13.0 PRE-SHIPMENT INSPECTION

Pre-shipment inspection will be carried out by BHEL engineer as per the approved test protocol. BHEL engineers will witness Routine & Type tests before dispatch.

14.0 RATING PLATE DETAILS

Weather proof Rating Plate (with following information) shall be fixed at a suitable position..

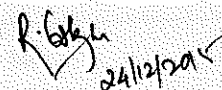
- 15.1 Rated Primary Voltage
- 15.2 Rated Secondary Voltage
- 15.3 Rated Power
- 15.4 Rated Current
- 15.5 Serial number
- 15.6 Month & Year of Manufacture
- 15.8 Ambient Temperature
- 15.11 Manufacturer' Name
- 15.12 Insulation level/Insulation Class
- 15.14 Rated Frequency
- 15.15 Type of Cooling

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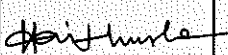
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