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Discipline
Engineering Standard - NSW

Category
Signalling

Title
**Single Phase Air Cooled, Isolating
Transformer for Signalling Applications**

Reference Number
SPS 23 - (RIC Standard: SC 09 10 01 00 SP)

Document Control

Status	Date	Prepared	Reviewed	Endorsed	Approved
Issue 1 Revision 3	May 05	Standards and Systems	Standards Engineer	GM Infrastructure Strategy & Performance	Safety Committee
		Refer to Reference Number	H Olsen	M Owens	Refer to minutes of meeting 12/08/04

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About This Standard

This Specification describes the technical requirements for Single-phase, Air-cooled, Isolation Transformers (ready for service) and Centre-tapped Electrolysis Bond Chokes for use in the Australian Rail Track Corporation network in Signalling Applications.

Document History

Primary Source – RIC Standard SC 09 10 01 00 SP Version 3.0

List of Amendments –

ISSUE	DATE	CLAUSE	DESCRIPTION
1.1	01/09/2004		Reformatting to ARTC Standard
1.2	14/03/2005	Disclaimer	Minor editorial change
1.3	06/05/2005	All	Document reformatted

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1. Introduction

This Specification describes the technical requirements for Single-phase, Air-cooled, Isolation Transformers (ready for service) and Electrolysis Bond Chokes to be used on the Australian Rail Track Corporation network for Signalling Applications.

The Transformers used for signalling applications shall be as detailed in Appendix B.

Transformers with ratings above 3KVA shall be in accordance with ARTC Specification EP 17 00 00 11 SP

2. Applicable Standards

All equipment and material, where not otherwise specified, shall comply with the following Australian Standards and ARTC Specifications as appropriate.

2.1. Australian Standards:

AS2735 - Dry-type Power Transformers

AS2374 - Power Transformers

AS 3108 - Approval & test specification-Isolating Transformers and Safety Isolation Transformers

2.2. ARTC Standard Specifications:

SPS 04 - General Requirements for Labelling of Equipment

EP 17 0000 11 SP - Low Voltage Isolation Transformers

3. Specific Requirements

3.1. Environmental Conditions

Temperature: 10oC to +70oC

Humidity: Relative Humidity 0 - 95%

3.2. Type & Rating

The transformers shall be of the single-phase, air-cooled, indoor type for operation on 50Hz supply.

The particular ratings of transformers shall be as specified in Appendix B.

3.3. Construction

Transformers shall be constructed as specified in Appendix B and relevant drawings in Appendix D. However other forms of designs shall also be considered as far as the transformers meet the performance and application requirements.

Unless otherwise stated each transformer shall be provided with a suitable ventilated metal cover to protect the windings and insulation from rodents. A separate terminal shall be provided for earthing the core and cover.

When specified, transformers shall be provided with a copper earth shield of approved type and thickness between primary and secondary windings and connected to the Earth terminal. The Earth shield shall be arranged to prevent leakage of current from any part of the primary windings to any part of the secondary windings of the transformer.

6mm threaded brass terminals shall be provided for both primary and secondary windings on transformers rated 100VA and above. Each terminal shall be locked to the terminal board with one nut and washer, and two nuts and washers shall be provided for terminating the incoming wiring.

Transformers require a means to secure the wiring.

All nuts used in the construction of the core shall be adequately locked by means of spring washers, soldering or other locking devices.

3.4. Impedance Voltage

Impedance voltage of the transformer expressed as a percentage at 75°C shall preferably be less than 5%. Values which exceed this shall be mentioned in the quotation.

3.5. Magnetizing Currents

Iron losses at 50Hz normal voltage and at 75°C shall not be over 20% of rated output.

3.6. In-rush current

Transformers shall be designed to limit in-rush current at turn-on to a level, which does not affect the reliable operation of the fuses or circuit breakers protecting them. Generally, in-rush current shall be not greater than 8 times the rated input current of the transformer.

To meet the requirements of this Specification, the magnitude of the transformer's in-rush current, measured under the conditions stated below, shall lie below the minimum limits of the published time / current curve for the specified standard circuit breaker (Heinemann CF2, curve 2).

The test method to demonstrate compliance with this requirement shall be that given in AS 3108 - Paragraph 19.8. The rating of the protective device used in this test shall be equal to the nominal rating of the transformer. Test results shall include oscillograph traces of the actual input current taken during the test.

3.7. High Voltage Test

A voltage of 2 KV AC, 50Hz shall be applied for one minute between each winding, between windings and core without breakdown. The insulation test shall be performed at the end of the high voltage test.

3.8. Insulation Resistance

The minimum Insulation resistance values measured with appropriate test voltages as laid down in AS 3000 shall be as follows:

- Between input or output terminals and Earth stud - 10 M Ohm

- Between input and output terminals - 10 M Ohm

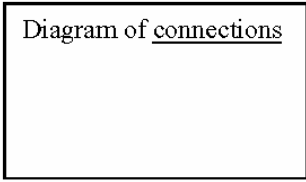
3.9. Painting

Transformer cases shall be carefully cleaned, dried and an external anti-corrosive structural priming paint and one finishing coating (in mid-grey) shall be applied.

3.10. Nameplates

A metal nameplate shall be firmly attached to the outside of each Transformer. The nameplate shall inscribed with the following information:

Example:

Track Transformer (Store No. 47)		
VA rating	zzz VA	
Rated Frequency	50Hz	
	<u>Primary</u>	<u>Secondary</u>
Rated input/output Voltages	V xxx	V yyy
& Currents	A xxx	A yyy
Insulation Class	xx	
Serial No	zzzz	
<Month and Year of manufacture>	May 1998	
<Manufacturer's name>	ABC Pty Ltd.	

The transformer shall have the primary and secondary terminals, and the taps, plainly marked in accordance with the nameplate. The markings shall be stamped on to the terminal board of the transformer.

4. Acceptance Tests

Complete test reports showing the parameters and performance of the Transformer shall be supplied (information as in Appendix A).

5. Warranty

Transformers shall be warranted free of defect for a period of two (2) years from date of supply.

6. Labelling & Packaging for Delivery

The labels shall be as per the specification SPS 04 *General Requirements for Labelling of Equipment*, and clause 3.5 of this Specification

The Transformers shall be individually and securely packed suitably for delivery without damage. Packaging shall also be labelled with the following information:

- 1) Name of Supplier

- 2) Transformer type
- 3) Part and serial No
- 4) Date of despatch

Appendix A – Information to be Supplied with Quotation/Tender

Characteristics

The information and guaranteed performance figures shall be stated as follows which shall apply to all Transformers covered by this specification.

- 1) VA Rating of the Transformer
- 2) Rated voltage at no-load
Primary Voltage
Secondary Voltage:
- 3) Maximum output current at rated voltage and at 75°C
- 4) Impedance Voltage
- 5) Regulation at 75°C
- 6) Efficiency at 75°C (at Full Load)
- 7) Magnetizing current
- 8) In-rush current (peak value)
- 9) Copper Losses at Full Load and at 75°C
- 10) Type of lamination
- 11) Iron Losses, at normal voltage & 50Hz
- 12) HV withstand test
- 13) Temperature Class of Insulation
- 14) Overall dimensions of transformer
(Dimensional sketch to be supplied if it deviates from the specification)
- 15) Weight of the transformer complete
- 16) Number of weeks required for delivery
- 17) Company Name:

Contact Person

Tele.:

Facsimile:

Signature of the Representative:

Date:.....

Note: This schedule must be completed and signed, as otherwise the quotation is liable to rejection.

Appendix B - Single-Phase, Air-Cooled, Isolating Transformers for Signalling Applications (Summary)

Transformer VA Rating	Rated Primary Voltage	Rated Secondary Voltage	Remarks
5	110V	12V	Bell ringing, signal box diagram indicator; Magnetizing current
10	120V	8V - 12V	Signal Lighting 2+2w lamp
30	120V	0.5V,10.5V, 1V, 1V	GEC colour light signal SL35 Lamps
30	108V	8.5V, 0.5V, 1V	Signal Lighting 10v 18w and 10v 18+3.5w lamps
40	120V	0.5V, 10.5V, 1V, 1V	Signal lighting SL 35 lamp; Magnetizing current to be <60mA
30	120V	8V to 12V	Westinghouse signal SL35 lamp(8, 8.5, 9,9.5, 10,10.5,11,11.5,12v)
50	120V, 120V	4V, 16V, 2V	Two independent primary windings
40	120V, 120V	8V, 24V, 4V	Two independent primary windings
40	115V-120V	60V	
100	120V, 120V	4V, 16V, 2V	Track feed, two independent primary windings
100	120V, 120V	6V, 24V, 2V, 2V	Track Feed with two independent primary windings
100VA	110V-120V-125Vac 50Hz	110V-120V-125Vac 50Hz	Isolating Transformer
500VA	105-110-115-120-125Vac 50Hz	105-110-115-120Vac	SSI Isolating Transformer single output for Signal Module See wiring diagram
2x 500VA	105-110-115-120-125Vac 50Hz	Output 1, 2= 105-110-115-120Vac	SSI Isolating Transformer dual independent output for Signal Modules
120VA	105-110-115-120-125Vac 50Hz	105-110-115-120-125-140 Vac	SSI Isolating Transformer single output for Points Modules See wiring diagram
2x 120VA	105-110-115-120-125Vac 50Hz	Output 1, 2= 105-110-115-120-125-140 Vac	SSI Isolating Transformer dual independent outputs for Points Modules

VA Rating	Rated Primary Voltage	Voltage Secondary	Remarks
200	120V, 120V	6V, 24V, 2V, 2V	
			Centre-tapped Electrolysis Drainage Bond Chokes 30A/leg. ee Appendix D for technical requirements. Drawing for the enclosure for this unit appear in Appendix E
300	120V	2V, 4V, 8V, 2V	Track feed
300	120V	240V	Fitted with 2 x double GPO
500	240V	120V	
500	120V - 120V	11V, 4V, 8V, 2V	Lighting
1000	90V - 125V	140V - 120V	* Step up/down
3000	90V - 125V	140V- 120V	* Step up/down
1500	240V	120V	
3000	240V	120V	
1000	110V- 125V	110V - 125V	* Step up/down
500	110V - 125V	110V - 125V	* Step up/down
250	110V - 125V	110V - 125V	* Step up/down
1500	110V - 125V	110V - 125V	* Step up/down

* Step up/down transformers shall be mounted in sheet metal cases with grommetted cable entries of 25mm. Two cable entries each for primary and secondary are required. Terminals on the primary and secondary winding shall be provided for each tapping. All terminals shall be shrouded. Each transformer shall have a Copper earth shield.

Appendix C - Requirements for Centre-tapped Electrolysis Bond Chokes

ELECTRICAL REQUIREMENTS

In addition to the common requirements laid down in this Specification (as applicable to Centre-tapped electrolysis bond choke), the following are additional requirements:

- a) The choke shall have a continuous rating of 30 amps D.C. per leg at an ambient temperature of 60°C.
- b) The choke shall be non-resonated and must be air cooled.
- c) The impedance/resistance of one leg shall not vary by more than 1% from the impedance/resistance of the other leg.
- d) The A.C. impedance at 0.5 volts 50Hz shall not be less than 15 ohm per leg.
- e) The DC resistance shall not be greater than 20 milliohm per leg.
- f) The A.C. impedance should not decrease by more than 10% with an out of balance current in one half of the winding exceeding that in the other half by the margin of 12% of the full continuous current.

Full technical information of the choke's electrical characteristics should be supplied by the tenderer. This should include curves of AC voltage v/s impedance out of balance, and impedance v/s frequency (to 3kHz).

MECHANICAL REQUIREMENTS

- a) The unit should be mounted in a stainless steel enclosure, or equivalent in accordance with drawing SPS 23 01-14. Where the enclosure offered differs from the drawing then full details should be supplied by the Tenderer.
- b) All terminals shall be accessible from the front with the hinged lid open.
- c) Three 20mm, grommetted holes are to be provided in the bottom of the enclosure to allow for cable entry to the choke.
- d) Terminals to be 6mm brass threaded.
- e) The overall dimensions of the choke, including enclosure, are to be provided by the Tenderer, if it is different to the drawing.
- f) The choke is to be mounted for easy removal from the enclosure.
- g) The choke is to be mounted to the enclosure at the rear of the unit.
- h) Traffolyte or similar Nameplate to show connection details.

Appendix- D - Drawings

Drawing No	Description
SC 09 10 01 00-1	Transformer 120V/240V, 300VA with 2 x 2 GPO
SC 09 10 01 00-2	Transformer - Signal Lighting for GEC colour light signal (SL 35 Lamp)
SC 09 10 01 00-3	Transformer 240/120V 500VA 1.5KVA 3KVA
SC 09 10 01 00-4	Signal Lighting Transformer-general details
SC 09 10 01 00-5	Transformer, Signal Lighting 30VA 120V/(8V-12V)x0.5V for Westinghouse Signal Head
SC 09 10 01 00-6	Signal Lighting Transformer, Tunnel type
SC 09 10 01 00-7	Signal Lighting Transformer, 5VA 120V/12V AC
SC 09 10 01 00-8	Track Transformer 200/300VA outline & circuit diagram
SC 09 10 01 00-9	Transformer (Store 57)-case & terminal layout
SC 09 10 01 00-10	Transformer (Store 62)- case & terminal layout
SC 09 10 01 00-11	Transformer (Store 64)- case & terminal layout
SC 09 10 01 00-12	Track Transformer (Store 51)- case & terminal layout
SC 09 10 01 00-13	Wiring Diagrams for SSI Isolation Transformers
SC 09 10 01 00-14	Electrolysis Choke and stainless steel enclosure