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Inductor Divert Coil Specification

Inter Business / Departmental Interface Approvals of Procedure:

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2.		
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1. Introduction and Scope

This Specification outlines the Requirement for Inductor Divert Coils as Required for 5M2A and 10M5 Motor Coaches.

2. Drawings and Documentation

2.1 General Specification

 The Field shunt type SH116Z is used to weaken the field strength of the motors by diverting current from the main-field windings, thus obtain higher speeds for given armature current. The Diverter is displayed in Figure 1.

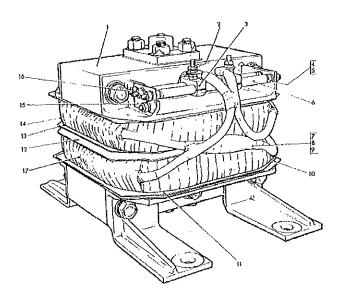


Figure 1

- 1 Core
- 2. Hex locknut
- 3. Terminal Clamp
- 4. Hex nut
- 5. Spring Washer
- 6. Insulated support rod
- 7. Hex Bolt
- 8. Spring washer

- 9. Hex nut
- 10. Insulating coll washer
- 11. Coil support washer
- 12. Coil Spacer
- 13. Coil Spring
- 14. Top Coil
- 15. Clamping Plate
- 16. Hex Boft

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17. Bottom Coll

Table 1: Inductive Diverter Properties

Number of coils per Inductive Divert	2
Turns per coil	140.5 in two layers
Type of bare conductor	Copper C101 grade (Superceded by BS1432)
Cross section of bare conductor	23.62 x 1,02mm
Type of winding	strap on the flat
Resistance Value of 2 Coils at 20 °C	0.22 ohm
Total Impedance at 50 hz	48 ohm
Overall Dimensions of Inductor Diverter (Length x	559 x 377 x 376 mm
Breadth x Width)	
Minimum 5000 V Meggar Ohm Reading	200Mohm

2.2 Coil Construction

As per Figure 1, Item 14 and 17. An inductive diverter consits of 2 identical coils seperated by a coil spacer. Each Coil consists of 2 layers. And each layer consists of 70.25 turns of copper bar (23.62 x 1.02mm). Individual Coil construction is depicted below.

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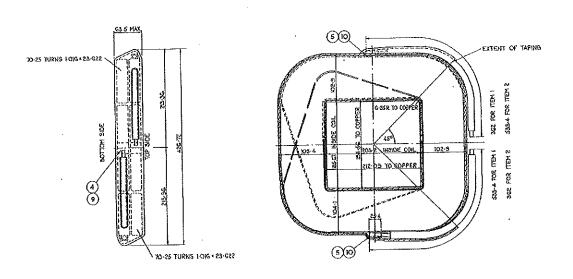


Figure 2: Side and Top View of an individual TOP/BOTTOM Coil

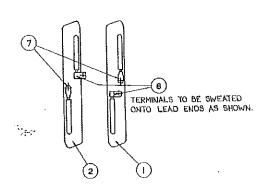


Figure 3: Connection of Top and Bottom Coil

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Table 2: Bill of Quantities for Coll

item	Name	Qauntity per assembly	Material	Specification	Length	Additional Notes
1	Top Coll (Figure 3)	1	-			
2	Bottom Coll (Figure	1	-			
	3)					
3	Coll Layers	4	Copper	Copper C101	±77.2 m	
				grade		
				(Superceded by		
				BS1432)		
4	Connector Strips	2	Copper	Copper C101	±0.127m Long	
				grade		
				(Superceded by		
				BS1432)		
5	Connectors (Bent to	4	Copper	Copper C101	Width-	
	suit)			grade	23.62mm	
				(Superceded by	Length-	
				BS1432)	80mm	
					Thickness-	
					1.02mm	
6	Tinned Flexible	1		25mm ²	1,826m long	3300V
	Cable					insulatted
•						Stranding,
						Rope
				1 1	·	stranded
7	Terminals	2	Copper	Copper C101	25mm	
					1.0mm	
8	Brazing Strips	2	Brazing Alloy	(.12 x 50.8) mm	±47.24mm	3000V
	J 1					applicable
9	Brazing strips	4	Brazing alloy	(.12x 50.8)mm	±25,4mm	3000V

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2.3 Coil Insulation Instruction

- Overall Insulation Resistance should remain above 200Mohm throughout a lifespan of 5 Years. Maximum Dimensions as shown in Figure 2.

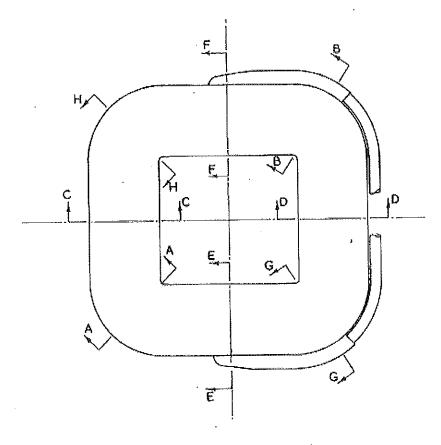


Figure 4: Primary Insulation section view

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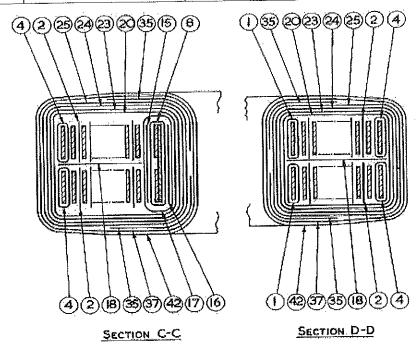


Figure 5: C & D Insulation Section view

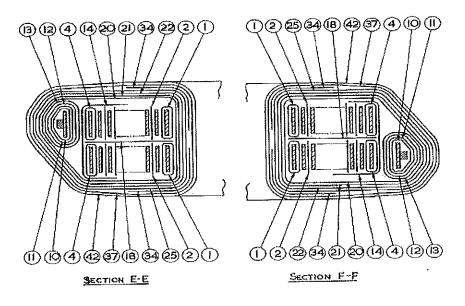


Figure 6: E & F Insulation Section View

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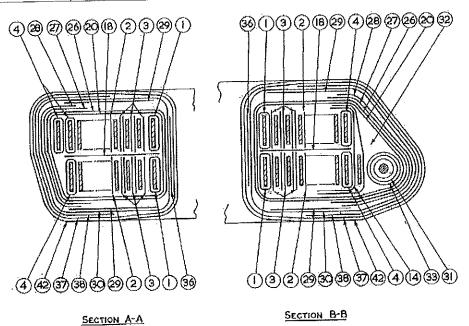


Figure 7: A & B insulation section view

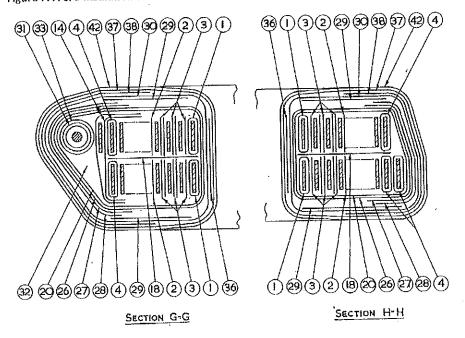


Figure 8: G & H insulation section View

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Table 3: Winding process

Item	Name	Length /	Material/Spec	Description/Size	Size	Remarks
		Qauntity				
		per				
		assembly				
1	First turn during	12 metres	Glass Tape	0,13 x 25mm		1 layer with ½ lap
	winding					
2	Insulate	305	Nomex Type	0.1x 26mm		2 layers
	between turns	metres	410			
	when winding	1				
3	Reinforce First	24	Nomex Type	0.1 x 26mm	76mm	
	four turns at		410		long	
	each corner		}			
4	Tape last turn	23 metres	Glass Tape	0.1 x 19mm		1 layer ¼,lap
	during winding					
5	Tie Up end	3m	Cotton tape	0.18 x 25mm		lf Reqd
	turns when					
	winding	Access				
6	Tie up sections	10m	Cotton Tape	0,18 x 25 mm		If Reqd
	after winding					
7	Tie up Coll	5m	Cotton Tape	0,18 x 25mm		If Reqd
	when Joining					
8	Tape inside	1m	Kapton /	0.07 x 9.5mm		
	joints and		polyimide			
	connections		tape			
9	Tape recess on	4m	Glass tape	0.23 x 25mm		
	cable					
10	Insulate tail	2	Phlogoplite -	- Sheet 0.23 mm	95 x 95	
	strap and Joint		grade Mica	thick	mm	
			sheet			

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11	Insulate tail	2	Phlogoplite -	Sheet 0.23mm	64x 381	
	strap and joint		grade Mica	thick	mm	
			sheet			
12	Tape tail strap	6m	Mica Tape	0,14 x 25mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	3 layers ½ lap
	and cable joint					
13	Tape tail strap	8m	Glass Tape	0,23 x 25mm		1 layer ⅓ lap
	and cable joint					
14	Seperate tail	2	Nomex Type	Sheet 0.23 mm	152 x	
	strap from coil		410	thick	508 mm	
15	Protect Inside	2	Nomex Type	Sheet 0.23 mm	29 x	
	joint from coil		410	thick	127 mm	
16	Insulate inside	2	Nomex Type	Sheet 0,23mm	76 x	
	joint		410	thick	102mm	
17	Tape inside joint	6m	-1st layer	-0.07 x 9.5mm	<u> </u>	2 layer ½ lap
			Kapton Tape	*		1 layer ½ lap
		3m	-2nd Layer	-0.14 x 25mm	1	
			Mica Tape		\	1 layer ½ lap
		3m	-3rd Layer	0.23 x 25mm		,
			Glass Tape			
18	Washers	2	Nomex or	Sheet 0.76 thick	382x	Cut to template
	between		Nomex mica		400mm	
	sections	<u> </u>		1		
20	Tape coil	28m	Mica Tape	0.14 x 25mm		
27	Reinforce	4	Nornex	Sheet 0.20 thick	191 x	
	corners(outside)			- Land	204mm	***
29	Reinforce	8	Nomex	Sheet 0.3 thick	137 x	Cut to template
	corners (Top		Į.		156mm	
	and Bottom)					
30	Bind Items	23m	Glass Tape	0.13 x 25mm		Staggered/Skeleto
	27,28,29					tape
31	Jacket on cables	2		Sheet 0.15 mm	137	Cut to template
				thick	156mm	44.6

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32	Pack around cables	As reqd	non setting and jointing compound			
33	Tape Jacket to cable	7m	Mica tape	0.14 x 25mm		1 layer 1/2 lap
36	Inside corner protection	4	Nomex	Sheet 0.76mm thick	25 x 44mm	
40	Apply stripping tape	28m	Glass Tape	0.18 x 38 mm		Temporary/ Skeleton Tape
41	Treat coil	VPI Proce better.Folk	ss using EPOX owed by a baking		M IMPREC	GNATING RESIN or
42	Tape coil	+- 25 m +-20 m	- 1st Mica Tape layer - 2nd Glass	0.14 x 25mm 0.13 x 25 mm		1 ½ lap
43	Treat Coil	}	Tape layer ess using EPO) owed by a baking		M IMPRE	GNATING RESIN OI

Please Note:

Where applicable only the following High Quality materials are to be utilised or equivalent.

Material	Specification or Equivalent materials
Mica Tape	Electrical Insulation tape
	High absorbent mica tape paper based uncalcined
	muscovite reinforced on one side with glass cloth
	COMPLIES TO IEC 371-2
	THICKNESS NOMINAL :0.14MM;
	WIDTH 25MM
	Product Name: 366.88 SAMICAPOR OR EQUIVALENT
Glass Tape	E22 Electrical Grade glass yarn
Oldas Fapa	Class H
	THICKNESS NOMINAL :0.13MM ; 0.18MM;0.23MM

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	WIDTH 25MM Specification BS 3779 (1985)				
Nomex	Type 410 or equivalent				
Resin	EPOXYLITE TSA 220FM IMPREGNATING RESIN or equivalent				
Non-setting and jointing Compound	-Temperature range from -50°C to 250°C -Pressure range of 0 – 35Bar				
	- easy to break and clean				
	-Non setting				
	-Non hardening				
	-Thermal resistance				
	-Vibration resistance				
	-used of contraction of joints				
	Product name: Henley Insulating Compound or Equivalent				

Coil Winding procedure Disclaimer:

Due to the fact that it is not possible to check final coils for consistency with the above winding process. This is is only a guideline to how Coils are wound within PRASA technical department.

Coils are however required to carry a guarantee of 5 years whereby insulation is gauranteed to not breakdown or lower below a value of 200 Mohm .

2.3 Quality Control Documents

Each coll To be supplied with Qaulity Control Documentation with all relevant details as stated below or a better inhouse process:

		QA Surname and Initials:		
	Job Number:			
No.	DESCRIPTION	SPECIFICATION	QA Remarks	
1	Verification of conductor sizing and grade	-Copper C101 grade -Conductor		

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		<u> </u>
		Width 23.62 mm
		-Conductor
		Thickness
		1,02mm
		as per procedure
2	Wind/Form the coil	in table 3
		III (able 3
3	Specify Winding Tension	
	Inspect terminals:	-No Cracks
		-Uniform Weld
4		-No inclusions
		Pre and Post VPI
		Inspection incl.
	VPI process	Resistance
5		,Impedance and
		Insulation
		Resistance
		-0,11 Ohm ± 5 %
6	Resistance Test per Coil	
7	Impedance of Coil at 50 HZ	2 coils @ 48 Ohm
		5000V for 1
8	Meggar Test	minute
		Min 200 Mohm
9		
	Mechanical Inspection 9.1 Using Small hammer ,tap bands to see if they	
	are tight	
	9.2 Inspect band for cracks	Not wider than 0.5mm
	9.3 Inspect bands for cracks longer than pole	
	pitch	
	9.4 No gaps between sleeves	
	9.5 no gaps between turns	
	9.6 Dimensional Tolerances of completed Coil after VPI	Thickness: ±31.75mm

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		2	Outside : ±426.72 by 126.72mm inside Coll dimension;				

3. Packaging and transportation

The following to be complied with:

- -Coil to be supplied in boxes with appropriate protective material to prevent any damage during transit
- -Colls which are damaged or contains missing items on arrival will be at the liability of the contractor and will need to be replaced accordingly.

± 203.2 mm by 185.67mm

All items to be delivered to Salt River Metrorail Goods Receiving Terminal at Rolling Stock, Cape Town.

4. Markings

-Coil Identity number as below to be stencilled on each supplied coil.

ID-5M/10M- (Sequence of supplied COILS) – (Manufacture date -yyyymmdd) Eg. ID-5M/10M-001-20190821

Stencilling to be done in such a way which does not compromise the coll or insulation.

5. Final Inspection and Acceptance

Coils will first be subjected through an internal Quality Check before being accepted.

An NCR (Non-Conformance Report) process will be initiated should a coil not meet the requirements

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6. Guarantee

Should Coils fall pre-maturely inside the warranty period of 5 years, A Joint investigation between PRASA and tenderer will be held to ascertain the cause of failure. Should inferior Colls supplied be the cause of failure, Tenderer will be held accountable for all damages and replacement of parts or complete Inductor Divert units should it be warranted. And should re-occurring faults occur. The decision will be left with PRASA Maintenance Engineering Manager with regard to the termination and/or penalties of the contract.