

BRITISH RAILWAYS AUTOMATIC WARNING SYSTEMSPECIFICATION NO. 37FOR NEW PATTERN ELECTRO INDUCTORS AND SUPPRESSOR INDUCTORSSTANDARD AND EXTRA STRENGTH

<u>CLAUSE</u>	<u>CONTENTS</u>	<u>PAGE</u>
1	Scope	2
2	General	2
3	Coil Potting/Impregnation	2
4	Flash Test and Insulation Resistance	3
5	Magnetic Performance Testing	3
6	Environmental Conditions	3
7	Surface Preparation and Finish	3

APPENDICES

A	Detail of Impregnation Test and Flash Test
B	Performance Requirements for Standard Electro Inductor
C	Performance Requirements for Extra Strength Electro Inductor
D	Performance Requirements for Standard Suppressor Inductor
E	Performance Requirement for Extra Strength Suppressor Inductor

Date: July 1981
Amended March 1982

1. SCOPE

- 1.1 This is a general specification for AWS electro inductors and suppressor inductors. The requirements specific to each inductor are contained in the Appendices.

This specification supersedes previous BRAWS specifications numbers 13, 26, 27, 28, 33 and 34.

2. GENERAL

- 2.1 For the purpose of this specification the Engineer shall be the Director of Signal and Telecommunications Engineering, British Railways Board, or his appointed representative.
- 2.2 The inductors must conform to the drawings listed in the Appendices. Any amendments or alterations to the drawings or this specification must be submitted in writing to and approved by the Engineer.
- 2.3 Type approval must be given for the inductor and method of potting by the Engineer before commencement of production.
- 2.4 Inspection, B.R.B. Category 'A' before despatch tests 3.2, 4.1 do not come under the course of normal inspection and will be treated independently.

3. COIL POTTING IMPREGNATION

- 3.1 The coil assembly shall be potted and impregnated in a suitable epoxy resin potting/impregnating system. There must be no adverse reactions between any of the materials used in the coil, or associated with its manufacture (i.e. release agents etc.), over the specified ambient temperature range and/or in the presence of moisture. Details of the resin system and other materials used shall be made available to the Engineer. The coil winding should be tight overall and must, as far as is permitted by the lay and tightness of the winding, be fully impregnated with the epoxy resin. The potting must be free of voids, small air bubbles are permitted as follows, maximum diameter 1 mm, not more than 10 randomly distributed per 1000 mm³. Repairs in the outer surface, where the winding has not been exposed, must be homogeneous. No other repairs are permitted. Not more than 1% of the surface of the potting may be repaired.
- 3.2 The test for impregnation is given in Appendix A. Subsequent to type approval the Engineer or BR Inspector shall be at liberty to select one coil out of each batch for a similar examination. If any one of these coils fail to pass the tests a further 5 may be selected for test. If any one of these 5 fail the whole batch will be rejected. The test to be carried out by the Contractor at his cost and on his premises or other agreed place. At least 3 days notice will be given by the Engineer of his intention to have a coil tested.

4. FLASH TEST AND INSULATION RESISTANCE

- 4.1 After impregnation the coil must withstand without breakdown 5kV d.c. for 5 seconds between the winding and any part of the surface of the coil assembly.
- 4.2 The flash test being applied as shown in Appendix A. Subsequent to type approval the same conditions as detailed in Clause 3.2 apply.
- 4.3 The insulation resistance of the inductor, measured between the terminal box terminals and any other part of the inductor, not less than 10 megohms at 1 kV d.c.

5. MAGNETIC PERFORMANCE TESTING

- 5.1 The magnetic performance requirements for each type of inductor are given in the relevant appendix.
- 5.2 Instrumentation for testing and material inspection should be a suitable flux meter and Hall effect probe. In particular a scalamp meter and search coil are not considered suitable for making measurements on the extra strength suppressor inductor and shall not be used.

6. ENVIRONMENTAL CONDITIONS

- 6.1 The inductors must conform to B.R. specification No. 967, Railway Signalling Apparatus Environmental Conditions, except where specifically excluded. The inductors are Category F in Specification 967. Latest issue of the specification to apply.

7. SURFACE PREPARATION AND FINISH

7.1 Aluminium Surfaces

After completion of machining, clean and degrease. Apply by spray, 1 coat of Two Pack Etch Primer to B.R. Specification 71 item 4, B.R. Cat. No. 28/63062 to all surfaces.

7.2 Steel Surfaces (Top & Bottom Pole Plates & Core)

Descale top pole plate and fix in position. Remove any flux/weld residues from bottom pole plate/core. Clean and degrease. Apply, by spray, 1 coat of Primer for Aluminium to B.R. Specification 71, item 7, B.R. Cat. No. 28/6008 to all surfaces. After 16 hours apply, by spray, 1 coat of Green Anti-Corrosive Primer to B.R. Specification 71 Item 1, B.R. Cat. No. 28/150 to all surfaces.

After 16 hours apply, by spray, 1 coat of Black Finishing paint to B.R. Specification 71, item 39, B.R. Cat. No. 28/6048 to all surfaces.

7.3 Inductor

After final assembly clean and degrease exterior surfaces as necessary.

Apply by spray to all exterior surfaces, except underside of bottom pole plate:-

- 7.3.1 For standard Electro and Suppressor Inductors, 1 coat of Yellow Warning Colour Finishing Paint to BR Specification 71 item 31, B.R. Cat. No. 28/6023.
- 7.3.2 For extra strength Electro and Suppressor Inductors, 1 coat of Olive Drab Finishing Paint to B.R. Specification 71, item 36, B.R. Cat. No. 28/6018.

B.R.A.W.S. SPECIFICATION 371. COIL IMPREGNATION TEST

An impregnated and potted coil assembly to have two 3 mm diameter holes drilled longitudinally through the complete length of the coil and cheeks. The holes to be diametrically opposed midway between the inner and outer layers of the winding.

The coil assembly to be then fully immersed in a bath of suitably dyed penetrating oil under not less than 700 m bar vacuum below atmosphere for 12 hours and then put under a pressure of 2 bar above atmosphere. After removing from the bath and drying out, the coil assembly to be sawn in two longitudinally on an axis normal to the line of drilled holes and the surfaces ground or filed smooth.

No evidence of the dye must be perceptible in the six outer, inner, top or bottom layers of the winding.

2. FLASH TEST

The test coil assembly to be provided with two suitably insulated leads. The coil assembly must be fully immersed in water for 12 hours and then with the two leads joined together 5000 V d.c. to be applied between these leads and the water in the bath via an electrode in the water or the bath itself may be the electrode if the inside surface is uninsulated metal. The distance between the electrode and any one part of the coil assembly must not exceed 25 mm.

B.R.A.W.S. SPECIFICATION 37NEW PATTERN STANDARD ELECTRO INDUCTOR1. GENERAL

- 1.1 The inductors must conform to B.R. drawing No. ATC/T/893 and associated drawings, latest issue to apply.
- 1.2 The inductor has a double coil which can be connected in parallel for 12V operation or series for 24V operation.

2. PERFORMANCE

- 2.1 Coil loading shall be not more than 10 watts when energised at 12 V.d.c (coils in parallel) or 24 V d.c. (coils in series) at a nominal ambient temperature of 18°C .
- 2.2 Magnetic flux density measured in air 127 mm above the top surface of the inductor casing when energised at 0.65 A.d.c. (coils in parallel), or 0.36 A.d.c. (coils in series) shall not be less than 35 gauss over a rectangular area 155 mm x 100 mm, centred on the centre of the coil, see Fig. B.1, and must encompass the curves in Fig. B.2.

- 2.2.1 For the purpose of material inspection, after type approval; the inductors in a batch will be inspected either to an appropriate sampling plan or 100%. At least one inductor from each batch shall be tested with the coils connected in parallel and then in series. The magnetic field strength being assessed as follows (see Clause 5.2):-

the average of 4 measurements one from each corner of the rectangle of Clause 2.2 above, see Fig. B.1, must not be less than 35 gauss.

One inductor, selected at random, from each new batch manufactured must be tested and meet all the requirements detailed in Clause 2.2 above. If this inductor fails to meet the requirements a further 10% or 5 inductors whichever is the greater may be selected for test. If any one of this 10% or 5 inductors fail the whole batch will be rejected.

- 2.3 With the inductors energised from a constant voltage source (current varying with load) the inductors must meet the performance requirements of 2.1 and 2.2 above over the ambient temperature range -20°C to +60°C. The magnetic performance clause 2.2 must be maintained after 4 hours continuous energisation in the max ambient temperature +60°C.

3. TYPICAL WINDING DETAILS

- 3.1 Typical winding details, 2947 turns/coil of 0.90 mm diameter wire, nominal resistance at 18°C, each coil 29.5Ω, in parallel 14.75Ω, and in series 59Ω.