BR946

March 1980

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Specification for Miniature Tractive Armature DC Neutral Time Delay Relay for Railway Signalling Purposes

Controlled Copy Number

British Railways Board

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Specification for Miniature Tractive Armature DC Neutral Time Delay Relay for Railway Signalling Purposes

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Amendments

Amd. No.	Date	Text Affected
1	Aug 1980	Clause 23 Appendix C
2	Jan 1981	Various Clauses & Appendices

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B.R. SPECIFICATION FOR MINIATURE RELAYS

FOR RAILWAY SIGNALLING PURPOSES

AMENDMENT NO. 2

APPENDIX A1

Withdraw the existing Appendix A1 dated September, 1981 and substitute the attached.

The maximum allowable overall (length) dimensions have been increased as follows:-

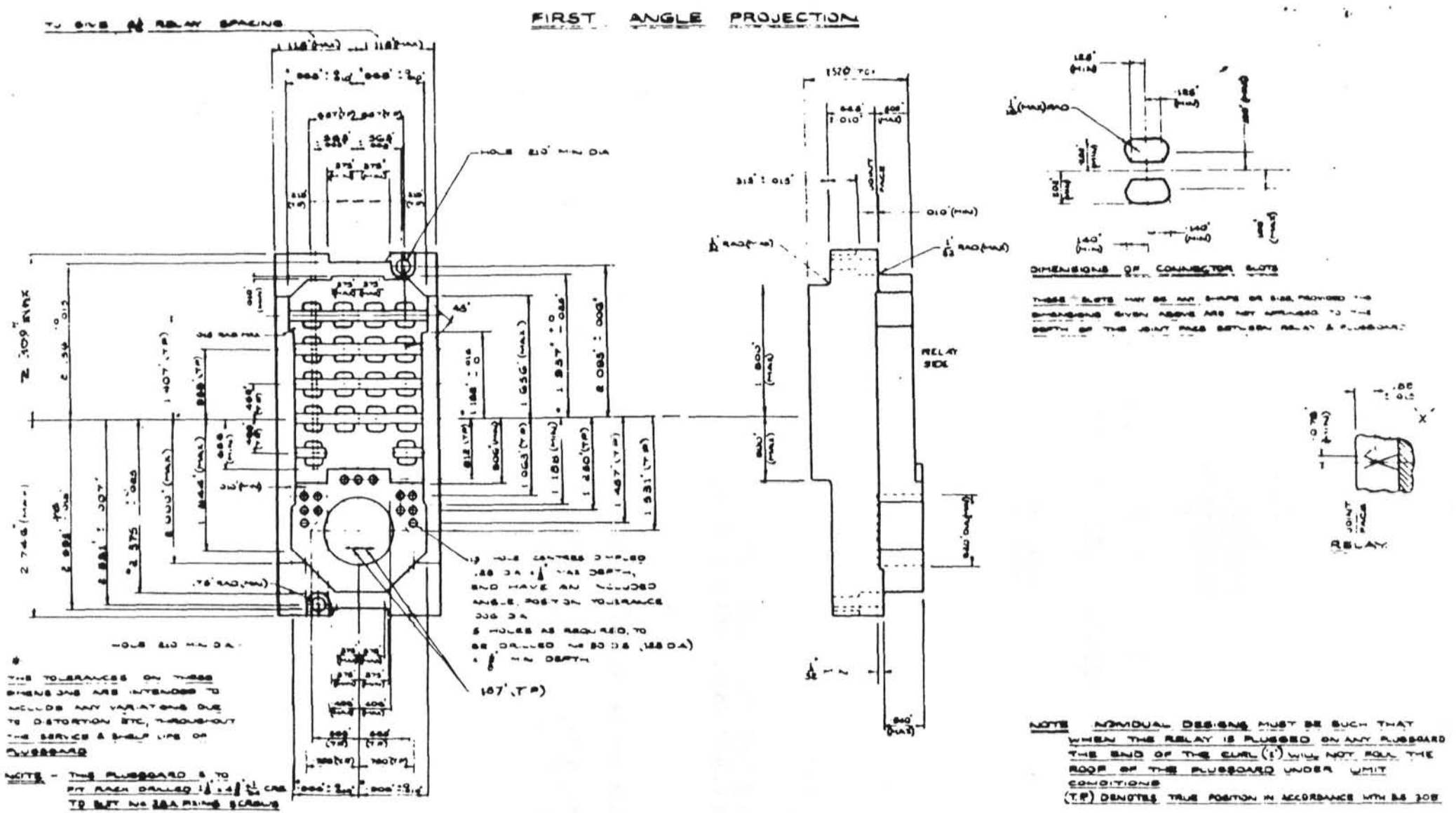
dimension 2.746" (Max.) was 2.708" (Max)
dimension 2.309" (Max.) was 2.271" (Max)

This Appendix applies to all the Specifications listed below:-

930A, 931A, 932A, 933A, 934A, 936A, 938A, 939A, 940A, 941A, 942, 943, 946, 949, 960, 961, 963. 966 and 968.

November 1985

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COMMON APPENDIX FOR MINIATURE RELAY SPECIFICATIONS

PLUGBOARD DIMENSIONS.

APPENDIX 'A.1'

NOT TO SCALE.

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BRITISH RAILWAYS BOARD

SPECIFICATION NO. 946

FOR

MINIATURE TRACTIVE ARMATURE D.C. NEUTRAL TIME

DELAY RELAY FOR RAILWAY

SIGNALLING PURPOSES

FOREWORD

This specification supersedes all previous issues and is issued by:-

British Railways Board,
Director of S.&T. Engineering,
Materials Management Group,
ROOT 1103,
Rail House,
CREWE,
Cheshire. CW2 6EA

from whom further copies may be obtained

BT (STD) 0270-532494
BT (SID) 0270-532345 FAX
BR (ETD) 05-32494
BR (ETD) 05-32345 FAX

Technical queries shall be referred to:-

The Chief Signal & Telecommunications Engineer,
Melbury House,
Melbury Terrace,
LONDON.
NW1 6JU

Telephone : PO (STD) 01-262 3232 Ext. 5744
BR (ETD) 015 5744

1. REFERENCES

Reference in this specification is made to :-

British Railways specification :

831 - Connectors for BR miniature relays

872 - Flame retardant compound insulated cables for railway signalling,

930 - Miniature tractive armature d.c Neutral line relay plug-in type for railway signalling

944 - Supplement to specifications for all relays or equivalent items whose pin codes lie in the range 1 to 252, 566 to 1060 or 6001 to 6210

950 - Design of electronic equipment - general conditions to secure reliability.

British Standards :

57 - B.A. screws, bolts and nuts

442 - Terminals for railway signalling apparatus,

2757 Classification of insulating material for electrical machinery and apparatus for the basis of thermal stability in service

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Where this specification requires reference to BR specifications and British Standards, the latest issue shall apply, unless specially stated.

2. GENERAL

2.1 The relay is intended for applications where a time delay is required upon de-energisation which is in excess of that obtainable conveniently from a relay with a slugged iron circuit.

Such a devise is required to control the timing cycles for an automatic half barrier level crossing.

2.2 The relays must not be used to break circuits in which the energy dissipated at the contact exceeds the limit given in clause 17.1. In general, this means that equipment such as lever locks must be spark quenched.

3. SCOPE

3.1 The time shall be obtained from the discharge of an capacitor into a coil of a tractive armature relay conforming to specifications of the BR 930 series

3.2 The users attention is drawn to the fact that if this relay is used on a rectified a.c. supply, the busbar voltage of this supply could be raised by the smoothing effect of the capacitors used in the relay.

The extent of this effect will depend on the number of relays, to this specification, which are connected on one supply and the magnitude of the load connected to the same supply.

The consequence of this voltage enhancement must be considered in relation to other devices fed from the same power supply.

4. DEFINITIONS

4.1 For the purpose of this specification the following definitions shall apply: -

Relay	The complete unit including the capacitors and any other components.
Operate	That condition of the relay when all front contacts are just made.
Pull Operate	That condition of the relay when the armature has completed its maximum travel.
Release	That condition of the relay when all front contacts have opened.
Full Release	That condition which the relay assumes when de-energised.
Front Contact	A contact which is made when the relay is energised.
Back Contact	A contact which is made when the relay is de-energised.

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4.1	Contact Element	The contact piece which is attached to a contact spring.
	Contact Spring	The spring strip to the end of which the contact element is secured.
	Direct Current	Current from a battery or smoothed rectified a.c. with a ripple content not exceeding 1.25% r.m.s.

5. DESIGN

5.1 The unit is required for mounting on a BR standard relay rack, therefore the size of the unit is to be arranged to occupy the space taken up by no more than 3 relays to BR specification no. 930 and to pick up the mounting centres of the same where necessary.

The preferred form of unit will be that enclosed in a miniature relay case as defined in BR specification no. 930 and shall incorporate a standard BR miniature relay plugboard.

Other units shall incorporate a baseplate in accordance with Appendix 'D' which will be used for mounting the relay on the relay rack.

5.2 The relay shall be designed to have minimum bulk and weight consistent with the prime necessity for safety and reliability, and its construction shall be such as to minimise accidental damage sustained during transit or installation.

5.3 The relay shall include a rigid baseplate which shall form part of the plug-socket inter-connection between the relay and its plugboard, or mounting baseplate whichever is relevant.

5.4 The relay shall be enclosed in a cover which shall be so constructed that the relay shall be clearly visible for inspection. A retaining device shall be provided for the cover such that the cover cannot be removed without breaking a seal.

5.5 There shall be a minimum clearance of 0.125 inch between the cover and any moving part of the relay. The material of the cover and construction of the relay shall be such that the application of a force of 30 lb. at any point on the surface of the cover of the assembled relay shall not result in its deflection to an extent sufficient to interfere with the operation of the relay. The material shall be of such resilience that after removal of this force it shall restore to its normal condition. The cover shall be free from detrimental warping which may reduce this clearance, either from temperature or moisture changes or long term ageing or release of locked up stresses.

5.6 The cover and baseplate of the relay when assembled shall be dustproof.

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5.7 Surface leakage distances shall not be less than 0.125 inch internal and 0.25 inch external. Parts enclosed when the relay is attached to its plugboard may be regarded as internal.

5.8 There shall be a minimum of 0.015 inch clearance between any moving part and any other part which might interfere with its correct operation and the design must be such that this clearance is maintained throughout the rated life of the relay.

5.9 If a relay case and plugboard as defined in BR specification no. 930 is used, the wiring shall be terminated on a connector to BR specification no. 831.

If a baseplate in accordance with appendix 'D' is used, the wiring shall be terminated on terminals to BS 442 though plain binding nuts in accordance with BS 57 are acceptable.

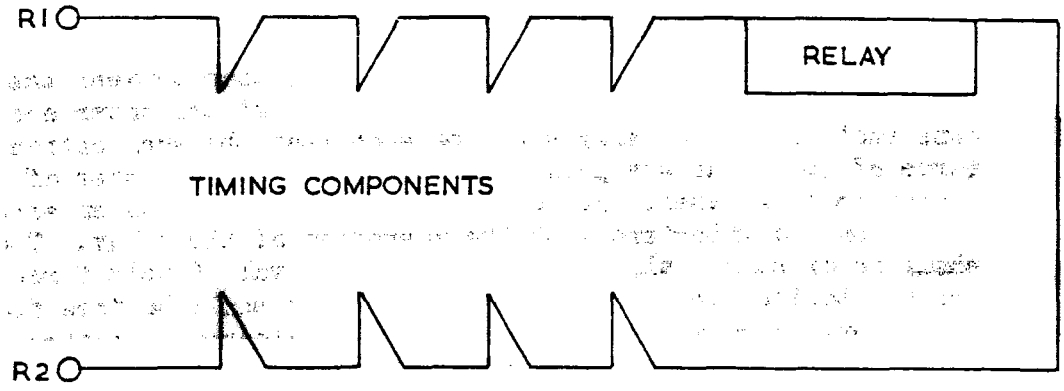
5.10 Wiring is to be carried out, such that no strain is applied to soldered connections, and is to use wire to BR specification no. 872, type 'MC', or wire of a type approved by the British Railways Board.

5.11 No component of weight greater than \ ounce shall be supported by its connections, and then only if the connections are axial with the device.

5.12 The capacitance of the delay circuit is to be provided by at least three separate capacitors so that a single disconnection of a capacitor shall not result in the complete loss of the time delay. The actual capacitance of any capacitor is to be not less than 50% of the actual capacitance of the largest value capacitor fitted in the unit.

5.13 Any adjusting resistor used for the fine setting of the time delay must be arranged to shunt energy away from the relay by parallel connection. Series connection is not acceptable because of its effect in increasing the susceptibility of the time delay to voltage variations. In no circumstances shall the time delay as specified in clause 22.2 be increased by more than *20%* should the adjustable resistor become disconnected.

5.14 The circuit shall be arranged as under, so that a disconnection of the wiring will cause the relay to release.



5.15 Series/shunt voltage regulating circuits are not acceptable because of the risk of enhanced time delays in the event of an open circuit in the shunt path or of a short circuit in the series path.

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6. DESIGN - RELAY CASE & PLUGBOARD AS DEFINED IN BR SPECIFICATION NO. 930 ONLY

6.1 A retaining clip as indicated in appendix 'B2' shall be provided to hold the relay securely in its plugboard without the possibility of the electrical connections becoming disconnected.

6.2 The male portion of each inter-connection shall make a positive sliding contact with the female portion.

7. DIMENSIONS - RELAY CASE & PLUGBOARD AS DEFINED IN BR SPECIFICATION NO. 930 ONLY

7.1 The dimensions of the relay and plugboard shall be in accordance with appendices 'A1', 'A2' and 'B1'.

7.2 The retaining clip is to be in accordance with appendix 'B2'. The handle of the relay shall be such that with the relay in position on its plugboard the total force exerted by the clip on the handle shall be not less than 20 lbs and shall not exceed 50 lbs.

7.3 Relays with the same coding must be interchangeable.

8. DIMENSIONS - NON PREFERRED UNITS

8.1 The dimensions of the relay baseplate shall be in accordance with appendix 'D'.

8.2 Relays with the same coding must be interchangeable.

9. MATERIALS

9.1 All materials used in the construction of the relay shall comply with the appropriate British Standard unless otherwise stated.

9.2 No materials shall be used in the construction of the relay which would cause alteration in performance during storage life, except as provided for in clause 20.1, or which are not capable of maintaining all their essential electrical and mechanical properties during rated service life.

9.3 All non-metallic materials used in the relay shall be non-hygroscopic, self extinguishing, free from detrimental warping, deformation, or embrittlement and, when transparent, permanently so, over the external temperature range -40°C to +60°C when the relay is continuously energised at 20% above rated voltage.

9.4 All insulating materials in contact with current carrying parts of the relay shall comply with the following tests:-

Two 1/4 inch diameter electrodes shall be placed 1/8 inch apart on a sample of the material, which is at a temperature of not more than 20°C. The sample shall then be transferred to a test chamber having a temperature of 30°C and a humidity of 85%. The insulation resistance measured at a voltage of 500 V d.c. between electrodes shall not then fall below 1 MΩ while the sample remains in the test chamber for a period of not less than 15 seconds.

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9.5 Ho materials shall be used in construction of the relay which are capable of supporting growth of mould, or which are subject to deterioration by exposure of sunlight.

9.6 All parts both separately and in combination shall either be resistant to corrosion or be so treated as to resist corrosion. Dissimilar metals used in contact with each other shall be so chosen or protected as to minimise the effect of electro-chemical action.

9.7 All materials used in the construction of the relay or for the impregnation of coils etc., shall be chemically and physically inert over the temperature range specified in clause 9.3.

9.8 All soldered joints in conductors shall be made with soft solder. Non-corrosive flux shall be used in making all soldered joints and after completion of the soldering operation, any excess flux shall be removed.

9.9 All screwed fastenings shall be securely locked to prevent movement in service. Mechanical means which do not abrade the surface and produce loose pieces of material shall be used to secure all pins, nuts, screws, etc. against working loose.

9.10 Screw threads in parts fabricated of materials which do not lend themselves to successful tapping shall be formed in metal bushes.

9.11 Silver or silver plated materials must not be used in combination with insulating materials susceptible to silver migration.

10. CAPACITORS

10.1 High quality capacitors of a type approved by the Chief Signal *St* Telecommunications Engineer, British Railways Board shall be used and shall be selected on assembly in order that the requirements regarding numbers of capacitors and the range of adjustment possible by means of the adjusting resistor, referred to, are satisfied.

10.2 The supplier shall give a recommended procedure for ensuring that the capacitors remain in working order in storage in order that the relay may be available for immediate use when it is required.

10.3 The maximum permitted in-rush current to the capacitors is 1A.

10.4 The capacitors shall be derated to comply with BR specification no. 950.

11. MOUNTING FOR UNITS WITH CASE AND PLUGBOARD TO B.R. SPECIFICATION NO. 930

11.1 The plugboard shall be so designed that when the connector is inserted all live metallic parts are shrouded against accidental contact even when the relay is removed.

11.2 The spring tags on the relay shall be so constructed that in the event of the relay being plugged into a plugboard having maximum tolerances, they shall afterwards make effective contact if the relay is later plugged into a plugboard having minimum tolerances.

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11.3 A registration device shall be provided to prevent an incorrectly coded relay being plugged into a particular plugboard. That portion of the registration device carried on the relay shall be incapable of alteration without breaking a seal and shall be adequately protected against accidental breakage liable to permit the relay to be plugged into the wrong plugboard. The schedule of codes is shown in BR specification no. 944.

11.4 The code pins on the relay must not extend beyond the joint face and may be up to 1/16 inch short of this.

11.5 The electrode potential of the material forming that part of the plugboard connector which makes contact with the spring tags of the relay shall lie between the values of - 0.55 V and + 0.10 V, as measured against a saturated calomel electrode in sea water at 25°C.

12. MOUNTING FOR UNITS WITH BASEPLATES AS PER APPENDIX 'D'

12.1 A registration device shall be provided to prevent an incorrectly coded relay being mounted on the relay rack. That portion of the registration device carried on the baseplate shall be incapable of alteration without breaking a seal and shall be adequately protected. The code arrangement is shown in appendix 'D'.

12.2 The coding holes shall be a minimum of 5/8 inch deep.

13. LIFE

13.1 The rated life of the relay shall be taken as 10 cycles under specified conditions of operations where one cycle consists of an operation followed by a release.

The rate of operation shall be taken as 250 cycles daily.

13.2 The relay shall be considered as having a possible period of up to 3 years in reasonable storage conditions prior to being brought into use without any adverse effect on its rated life.

14. MAGNETIC CIRCUIT

14.1 All parts forming the magnetic circuit of the relay, i.e. armature, yoke and core, shall be of suitable quality magnetic materials so as to ensure consistent performance.

14.2 A non-adjustable residual stop of non-magnetic material shall be provided which shall be so designed that the relay continues to operate within the specified values throughout its rated life.

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15. ARMATURE SUPPORTS

15.1 The armature shall be positively located so as to prevent any displacement other than that required for the proper operation of the contacts.

15.2 The armature shall be held in place in a manner which permits free movement throughout the normal stroke. There shall be no displacement of the armature as a result of the tests carried out under clause 24.1.

15.3 In relays fitted with pivot bearings the armature pivots and bearings shall be of dissimilar materials possessing high resistance to corrosion under service conditions, shall fit rigidly in their supports, and be suitably secured and so constructed that they cannot restrict the desired motion of the armature.

15.4 In relays fitted with pivot bearings the armature pivots and bearings shall be cylindrical, and the bearings shall be not less than 0.002 inch or more than 0.004 inch larger in diameter than the pivots. The end play of the armature shall be not less than 0.01 inch and not more than 0.02 inch.

15.5 The design must be such that the breaking of a pivot shall not allow the front contact to close irregularly.

16. COILS

16.1 Each coil winding shall be formed preferably from one continuous length of conductor. If joints are necessary between coil conductors, these shall be securely soldered and efficiently insulated.

16.2 No conductor of a smaller diameter than 0.1 ram shall be used for coil windings.

16.3 Coil resistance shall not vary from the nominal value by more than ± 10% measured at 20°C.

16.4 Coil impregnation is not mandatory, but if carried out, attention is drawn to clause 9.7.

16.5 The coil shall be so fixed as to prevent movement with respect to its core.

17. CONTACTS

17.1 Contact ratings shall be as follows:-

All contacts shall be capable of carrying 3 A continuously, front contacts being considered with the relay in the full operate position, without injurious effect to the contact.

Over the rated life of the relay each contact shall be capable of making and breaking a 12 V circuit having a resistive load with a switch-on surge of 5 A dropping to a maximum steady current of 2 A after 100 ms.

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