GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

(RAILWAY BOARD)

INDIAN RAILWAY STANDARD Specification for D. C. NEUTRAL LINE RELAY (PROVED TYPE) FOR RAILWAY SIGNALLING (Tentative)

Serial No. S 46-74

0. FOREWORD

0.1 This specification is issued under the fixed Serial No. S 46, the final number indicates the year of original adoption as Standard, or in the case of revision, the year of last revision.

ADOPTED 1974

0.2 This specification is being issued in the series of specifications for different types of signalling relays proposed to be issued to cover the requirements of the Indian Railways. Specifications already issued or drawn out are :-

IRS : S 31-65	D. C. Polarised relay, 3 position.
IRS : S 53-73	Tractive Armature, Shelf type, D. C. Neutral Line Relay (non-proved type)
IRS : S 54-73	Tractive Armature, Shelf type, D. C. Neutral Track Relay, (non-proved type)

0.3 This specification requires reference to following Indian Railway Standard (IRS), Indian Standard (IS) and British Standard (BS) specifications which shall also be complied with to the extent applicable :

IRS : S 10	Mechanical Signalling and Interlocking Equipment.
IRS : S 23	Electrical Signalling and Interlocking Equipment.
IRS : S 34	Testing of Railway Signalling Relays (General).
IS: 1821	Dimensions for clearance holes for Metric bolts.
IS: 2112	Grades of silver and silver alloys.
BS : 407	Phosphor bronze, sheet, strip and foil.
BS : 790	Nickel Silver, sheet, strip and foil.
BS : 2026	Tolerances for mouldings in Thermo-setting materials.

0.4 In this specification, wherever any of the above mentioned, specifications is referred to by number only without mentioning the year of issue, the latest issue of that specification is implied.

0.5 This specification is intended chiefly to lay down the technical provisions and the provisions relating to supply of the equipment and so does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This specification relates to design and performance requirements for Direct Current Neutral Line Relays (Proved Type) with metal to metal contacts for use in Railway Signalling Circuits.

1.2 This relays covered by this specification may be used in all applications where in the system of circuit design, the opening of the front contacts of a relay is proved by the closing of a back contact (Proved Signalling Relays), provided, that their characteristics are suitable.

1.3 Relays covered by this specification are not meant for use in external circuits in 50 Hz, A.C. electrified sections.

1.4 These relays must not be used to break circuits in which the energy dissipated at the contact exceeds the limits given in Clause 10.6.

1.5 Relays to this specification shall be of such form or forms as to permit use of either normally one single winding or, if so approved by the purchaser, of electrically two separate windings or maximum 3 galvanically connected windings.

2. TERMINOLOGY

2.1 The terminology referred to in this specification is covered by the definitions given in IRS Specification Nos. S 23* and S34.**

2.2 The terms referred to in this specification but not covered by IRS specification Nos. S 23* and S 34** are defined below:

2.2.1 **Metal Contacts** - 'Metal' in the expression 'Metal to Metal contacts' is used as a general term covering the use of silver, silver cadmium oxide, tungsten, platinum or any other suitable Material to an approved specification.

2.2.2 **Front contact** - That contact which is made with arm contact when the relay is energised.

2.2.3 **Back Contact** - That contact which is made with arm contact when the relay is de-energised.

2.2.4 **Arm contact** - That contact which is movable part of the pair of contacts and is made with front contact when the relay is energised and with back contact when the relay is de-energised.

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*Electrical signalling and interlocking equipment

**Testing railway signalling relays (General)

2.2.5 **Dependent Contact** - The condition in which a movable arm contact connects to a front contact when the relay is energised and the same arm contact connects to a back contact when the relay is de-energised.

2.2.6 **Independent contact** - The condition in which the movable arm contact connects either to a front or to a back contact, but not to both.

2.2.7 **Operate** - That condition of the relay when all front contacts are just made.

2.2.8 **Full operate** - That condition of the relay when the armature has completed its maximum travel, i. e. up to the stop.

2.2.9 **Release** - That condition of the relay when all front contacts have just opened.

2.2.10 **Full Release** - That condition of the relay when the armature comes back up to the back stop when the relay is de-energised.

2.2.11 **Pick-up Value** - The value of the current or ampere-turns which is just sufficient to close all the front contacts of a relay under specified conditions.

2.2.12 **Drop-away (Release) Value** - The value of the current or ampere-turns at which all the front contacts of a relay just open under specified conditions.

2.2.13 **Full Operate Value** – The value of the current or ampere-turns sufficient to energise the relay to the "Full Operate" position.

2.2.14 **Ampere-Turns (AW)** - Value of measured current in ampere multiplied by the number of turns in the relay coil winding.

2.2.15 **Residual Gap**- The length of the air gap between the core/pole face centre and the nearest point on the armature when the armature is in the "full-operate" position.

3. GENERAL REQUIREMENTS

3.1 Design and Drawings

3.1.1 The relay shall meet the requirements of this specification for material, design, assembly and finish, etc., in entirety and also relevant requirements in other specifications.

3.1.2 Necessary technical particulars including drawings forming an essential part of an offer for relay to this specification may asked to be furnished for examination by the purchaser.

3.2 Mounting and Cover

3.2.1 The relay shall be so designed that it can be mounted within a relay group housing such that the relays are protected against dust and against moisture under service conditions when enclosed in such relay group housing. Alternative1y, the relay shall be provided with an individual transparent cover which protects the relay from dust and moisture under service conditions. In either case, the relay and its moving parts including contacts shall be clearly visible for inspection from outside.

3.2.2 Sealing arrangement shall be provided for the relay group housing in which the relays are enclosed or for individual cover for the relay where provided, so that there is no possibility of unauthorized interference with the contact arrangement and other moving parts. Locking arrangements may also be provided when required by the purchaser.

3.2.3 The relay housing or cover shall be free from detrimental warping which may reduce clearance between the housing or cover and any moving part of the relay,

either from temperature or moisture changes or long term ageing or from release of locked-up stresses.

3.2.4 The clearance between the cover of relay or group of relays and the moving parts of the relay is shall not be less than 3mm.

3.2.5 The cover and base of the relay group housing or individual cover and base-plate of the relay shall be gasketted in such a manner as to protect the whole against dust, moisture and vermin.

3.3 Air Clearance Distance

3.3.1 An Air Clearance distance of minimum 1.8 mm. shall be provided between any exposed current carrying part and any other metallic part insulated therefrom. However, it is desirable that a clearance of not less than 3 mm wherever possible, is provided.

3.4 Surface Leakage Distance

3.4.1 A surface leakage distance of minimum 1.8 mm. shall be provided between any exposed metallic part carrying current and any other metallic part insulated therefrom. However, it is desirable that a surface leakage distance of not less than 3 mm wherever possible, is provided.

3.5 Other Requirements

3.5.1 These shall be as in Clause 4 of IRS Specification No. S 23* (except sub-clauses 4.4, 4.5 and 4.6).

3.5.2 All nuts and screws shall be securely locked and shall not loosen while in service due to vibration or other causes as normally met with in Railway usage.

3.5.3 Screw threads in parts fabricated of materials which do not lend themselves to successful tapping shall be formed in bushes made from suitable material and these bushes shall be properly moulded, embedded or otherwise securely fixed.

4. DIMENSIONS

4.1 the over-all dimensions of the relay (with maximum contact equipment) shall not exceed the following, unless otherwise approved by the purchaser:-

	Without cover	**With cover**	
Height	55 mm	75 mm	
	115 mm	135 mm	(For interlocking relays when mounted height-wise).
Width	42 mm	62 mm	
	85 mm	105 mm	(For interlocking relays when mounted width-wise).
Depth	120 mm	140 mm	

4.2 Limits and fits shall in general be as per sub-clauses 6.1 and 6.2 of IRS Specification No. S 23*, except where specified or required otherwise for proper functioning of the equipment.

4.3 Dimensions on which tolerances are not indicated shall be within the following limits, depending also on related dimensions for correct functioning, unless otherwise agreed upon by the purchaser :

a) Castings and sheet metal parts	..	± 0.50 mm
b) Insulating moulded parts	..	As per BS : 2026**.
c) Spacing of Machined holes	..	± 0.05 mm.
d) Angular Dimensions	..	± 1/2°
e) Linear Dimensions	..	± 0.5 mm.
f) Diameter of Drilled holes (Clearance holes).	..	As per IS: 1821 *** (Fine).

5. WORKMANSHIP

5.1 The standard of workmanship shall be as per Cl. 5 of IRS Spec. No. S 23*.

6. MATERIALS

6.1 Transparent material for relay cover or for use in front of relay group housing shall be permanently transparent, tough, self-extinguishing and non-hygroscopic and shall be unaffected by changes in temperature between -25°C and + 85°C.

6.2 Magnetic materials for Armature and Core etc., shall comply with clauses 10.1 and 10.3 of IRS Specification No. S 23*.

6.3 6.3 All insulating materials shall be tough and non-hygroscopic and shall be unaffected by changes in temperature between -25°C and +85°C. Insulating materials used as insulation for contacts and coil bobbin must be self-extinguishing and preferably so for other purposes also as far as possible.

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

"Two 6 mm. dia. electrodes shall be placed 3 mm. apart on a sample of the material, which is at a temperature of not more than 20°C. The sample then shall be transferred to a test chamber having a temperature of 55°C and a humidity of 95 per cent. The insulation resistance measured at a voltage of 500V D. C. between the electrodes shall not then fall below 1 megohm while the samples remain in the test chamber for a period of not less than 15 seconds."

6.4 Material used for impregnation or insulating the coil shall be chemically neutral and physic ally stable between temperature limits of -25°C and + 85°C.

6.5 Insulating material used for fillers in winding coils shall be chemically neutral.

6.6 Insulating sealing compound shall not melt, flake or crack between temperature limits of -25°C and +85°C.

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* Electrical Signalling arid Interlocking Equipment.

** Tolerances for mouldings in thermosetting materials.

*** Dimensions for clearance holes for metric bolts.

6.7 Material for electrical contact springs and contacts shall comply with clause 9 of IRS Specification No. S 23*. Contact springs shall be made either from phosphor bronze material to specification BS : 407**, Grade PB 102 (Extra hard or hard) or from Nickel Silver with minimum 18 per cent Nickel to Specification BS : 790***. The contacts shall be made either from fine silver of minimum 99.9 per cent purity to specification IS: 2112@ or from silver cadmium oxide material (having minimum 10 percent cadmium oxide) conforming to an approved specification acceptable to the purchaser.

6.8 Contact keeper, where provided, shall be of the same material as of contact spring, as far as possible.

6.9 Other materials employed in the construction of the relay shall allow them to function perfectly within a temperature range from -25°C to + 85°C and shall be in accordance with Specification for 'Materials' in the IRS Specification No. S 10$ or other appropriate approved standard specifications, as far as applicable.

6.10 No materials shall be used in the construction of the relay which are capable of supporting growth of mould or which are subject to deterioration by exposure to sunlight or which would cause alteration in performance during storage life or which are not capable of maintaining all their essential electrical and mechanical properties during service life of the relay.

7. PROTECTION AGAINST CORROSION

7.1 Protection against corrosion shall be provided as per Clause 13 of IRS Specification No. S23*.

7.2 Material used for Protection against corrosion shall neither melt nor flake under ordinary conditions between temperature limits of -25°C and +85°C.

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

8. MAGNETIC SYSTEM

8.1 The core and armature supports shall be so mounted that the position of the core with respect to the armature and to the fixed parts at the contacts shall be maintained constant throughout the service life of the relay.

8.2 The armature supports shall be so designed as to ensure a reliable operation of the armature. The movement of the contacts shall be controlled rigidly by the movement of the armature indirect control by other contact springs or by any other means being disallowed. The functioning of the contacts shall be controlled by gravity or combination of gravity and spring action provided that gravity alone must cause the front contacts to open if the spring action fails, when the relay is de-energised in the normal mounting position of the relay.

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* Electrical Signalling and Interlocking Equipment.
** Phosphor Bronze, sheet, strip and foil.
*** Nickel silver, sheet, strip and foil.
@ Grades of silver and silver alloys.
$ Mechanical Signalling and Interlocking Equipment.

8.3 The armature shall be positively located so as to prevent any displacement other than that required for a proper operation of the Contacts. End play of the armature when pushed or slided & from one end to the other end shall be not less than 0.1 mm. and not more than 0.4 mm.

8.4 The travel of the armature must be limited by means of stops which shall last for the whole service life of the relay, and which shall not cause any rebounding, with-holding or sticking of the armature. These stops must be made of an anti-residual, anti-corrosive material, and the gap between armature and core must not be affected either by distortion or by wear. With the armature in the picked up position, a minimum physical air gap of 0.3 mm (0.1 mm for special relays) shall be provided (at the centre of the portions of core and armature coming opposite each other) by a non-adjustable stop suitable dimensions.

8.5 In relays fitted with knife-edge bearings, the armature shall be held in its place in such a manner as to permit free movement throughout the normal stroke, but shall prevent its being displaced as a result of Type Tests carried out under Clause 15.2.

8.6 In relays fitted with pivot bearings, the armature pivots and bearings shall be cylindrical and the bearings shall be not less than 0.05 mm. nor more than 0.1 mm. larger in diameter than the pivots. The armature pivots and bearings shall be of dis-similar 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. The design shall be such that the breaking of a-pivot shall not allow any front contact to close irregularly.

9. ELECTRO-MAGNET COILS

9.1 Electro-magnet coils shall comply with the requirements as per Clause 9 of IRS Specification No. S23* (except sub-clauses 8.2, 8.6, 8.11 and 8.12).

9.2 When electrically separate windings; are provided, each shall be capable of fully operating the relay and the design shall be such that both windings could remain continuously energised simultaneously.

9.3 No conductor, of diameter smaller than 0.08 mm. (0.05 mm. for special relays) shall be used for coil windings, unless otherwise approved by the purchaser.

9.4 Coils shall be such that they shall be able to carry 125% of the rated current continuously and 150% of the rated current for four hours without injurious heating, at an ambient temperature of 20°C±2°C.

9.5 The coils shall have leads (preferably flexible) of suitable size, length and strength for connection to solder lugs/tags of the coil. The insu1atlon of the leads shall remain flexible under all service conditions. The solder lugs/tags of the coil shall be made out of brass sheet, silver plated or of same material (un-plated), as of contact spring.

9.6 Coil resistance shall not vary from the nominal value by more than ±15% for wires below 0.08 mm. diameter and ±10% for wires below 0.08 mm. dia and above, when measured at 20°C. This permissible variation in resistance shall have no adverse effect on the performance of the relay as per the specified operating requirements.

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* Electrical Signalling and Interlocking Equipment.

9.7 The nominal resistance of-the coil maybe specified by the Purchaser. Where it is not so specified, coil resistance shall be such that the coils comply with specified operating requirements, within a variation up to ±20% from the rated voltage.

9.8 Four contact prongs (solder lugs/coil tags) must always be provided, being marked R1, R2, R3 and R4. Coil of a single wound relay shall be connected to contact prongs marked R1 and R2 and the coil of the second winding, when provided, would be connected to contact prongs marked R3 and R4 ; the connections to be so made that the coils must assist with the like polarities on contact prongs marked R1 and R3.

9.9 The particulars of the coil in respect of Manufacturers Trade Mark, nominal resistance at 20°C, number of turns, size of wire and kind of wire insulation shall be exhibited on a label/tag of non-conducting material plainly and indelibly marked which shall be located at a conspicuous position and securely fixed, preferably below the first layer of the coil sheathing.

10. CONTACTS

10.1 Contact equipment

10.1.1 The relay shall be provided with one of the standard contact arrangement as shown below, except where specified differently by the Purchaser;

Number of Independent Contacts.

Front	..	2 3 4 6 5 4.
Back	..	2 3 2 2 3 4.

10.1.2 Contacts shall be ‘metal to metal’.

10.2 Contact Assemblies

10.2.1 Contact springs shall be formed in such a way that their main axes lie at not more than 45° from the direction of rolling of the strip and so that abrupt changes of dimensions, giving rise to high localised stresses do not occur.

10.2.2 The design shall be such that contact springs shall not be subjected to any twist about their longitudinal axis.

10.2.3 Contact elements shall not be out of centre with respect to, each other by more than 0.5 mm. (0.02").

10.2.4 Contact elements shall be firmly secured so that they will not shift or become loose during transport or service.

10.2.5 The materials used in affixing contact elements shall be such as not to cause corrosion.

10.2.6 All similar contacts, i.e either front or back, shall function approximately simultaneously when the relay is operated or released. The difference in the voltage between that at which the first and the last front or back contacts break shall as far as possible be within 5 % of the maximum full operate voltage. In the alternative the difference in the stroke between that at which the first and the last

front or back contacts break shall be within about 10% of the full stroke of the moving contacts/the contact pins.

10.2.7 If twin contact elements are employed, these shall be co-planar and shall make or break contact approximately simultaneously.

10.2.8 Contacts when enclosed inside the relay cover shall be readily visible from the front of the relay. Similarly, the relay contacts shall be visible from the front of the relay group housing.

10.2.9 Contact spring fingers shall be made of such material and so proportioned that they shall not stress beyond half of their elasticity limit. Movements of contact springs shall ensure self-aligning, self-cleaning and wiping action between the contacts.

10.2.10 Contact springs must be in positive contact with their backing springs, when provided.

10.2.11 As far as possible, the opening and closing of the contacts must not be accompanied by any rebound exceeding a duration of 10 milli-seconds and the contact elements shall establish steady contact conditions after this period when the relay is energised at rated voltage or is released.

10.2.12 When in the normal mounting position a relay must still function perfectly, i. e., a closed contact must not open and an open contact must not close on their own, whether the relays are energised at 20% in excess of rated voltage or they are not energised, when subjected to sinusoidal vibrations, in which the oscillations have an amplitude of 1 mm at a frequency between 5 and 50 c/s.

10.3 Contact Clearances

10.3.1 Minimum clearance between the back contact elements:

a) When the relay is in operate position (at the instant at which closure of front contacts occurs) :

0.5 mm for contacts in series	..	(1.1 mm desirable)
1.0 mm for single contacts	..	(1.3 mm desirable)

b) When the relay is in full operate position :

1.2 mm for contacts in series	..	(1.8 mm desirable)
2.0 mm for single contacts	..	(2.5 mm desirable)

10.3.2 Minimum clearance between the front contact elements shall be as under:

a) While dropping of the moving armature of the relay is taking place (at the instant at which closure of the back contacts occurs) :

0.5 mm for contacts in series	..	(1.1 mm desirable)
1.0 mm for single contacts	..	(1.3 mm desirable)

b) When the relay is in full release position :

1.2 mm for contacts in series	..	(1.8 mm desirable)
2.0 mm or single contacts	..	(2.5 mm desirable)

10.3.3 The values for contact clearances specified in sub-clauses 10.3.1 and 10.3.2 must not vary by more than 20 percent during the endurance test on the relay to clause 15.2.2 (d).

10.4 Contact Pressure

10.4.1 When the armature is in the full operate position, initial contact pressure for front contacts shall not be less than 15 gms. per contact element in the case of single contacts, and 10 gms. per contact point in the case of double contacts.

10.4.2 When the armature is in the full release position initial contact pressure for back contacts shall not be less than 15 gms. per contact element in 1he case of single contacts, and 10 gms. per contact point in the case of double contacts.

10.4.3 The loss in contact pressure throughout the endurance test on the relay to clause 15.2.2(d) (both for loaded and un-loaded contacts) shall not exceed 40% of the initial contact pressure.

10.5 Contact Resistance

10.5.1 For “metal to metal” contacts, initial clean contact resistance shall not exceed 0.05 ohm.

10.5.2 Increase in contact resistance throughout the endurance test on the relay to Cl. 15.2.2(d) shall not exceed 100% of the initial contact resistance; maximum value of contact resistance shall not, however, exceed 0.1 ohm.

10.5.3 Contact resistance shall be measured when the contact unit is carrying 100 ma. DC and then by measuring the voltage drop across the solder lugs/contact tags. Contact resistance shall be determined by taking at least 10 readings on each contact at approximately equal intervals throughout the endurance test on the relay to clause 15.2.2(d) ; the average of all readings shall be considered as the contact resistance. Contact resistance shall be measured for front contact with the armature in the full operate position and for back contact with the armature in full release position. Contact resistance shall be measured in both conditions for unloaded contacts as well as for contacts loaded as per contact loads specified in clause 10.6.

10.5.4 For contact element with two contacts in series, the permissible values of contact resistance may be considered to be twice of the values given in sub-clauses 10.5.1 and 10.5.2.

10.6 Contact Rating

10.6.1 Each front contact shall be capable of carrying a current of 3 amps. continuously and 5 amps. for 30 seconds with the relay in the full operate position. Each back contact shall be capable of carrying a current of 3 amps. continuously with the relay in the full release position. The contacts shall not become overheated and there shall be no injurious effect to the contacts.

10.6.2 During the endurance test on the relay to clause 15.2.2(d), each contact shall be capable of making and breaking a 12 Volt circuit having the resistive load with a switch-on surge of 5 amps., dropping to a maximum steady value of 2 amps. after a further 100 ms. (equivalent to normal circuit for a SL 17 Lamp).

10.6.3 During the endurance test on the relay to clause 15.2.2(d), each contact shall be capable of making and breaking the current in an unquenched circuit consisting of three parallel connected relays of a type covered by this specification.

10.6.4 Over a few operations, as shown below, each contact shall be capable of making and breaking the following resistive loads at a rate of 20 cycles per minute, without any spark-quenching arrangement: -

Contact loads		**No. of cycles (Make & Break)**
Volts	**Max. Amp.**	
60V DC	0.5 Amp.	1000
24 V DC	1.25 Am.	1000
12 V AC/DC	2.5 Amp. (for front contact)	1000
	1.25 Amps. (for back contact)	1000

10.7 **Contact Failure**

10.7.1 If a back contact remains accidentally closed (due to a failure/welding), none of the front contacts shall close even if, the, supply voltage is equal to 1.5 times the rated voltage.

10.7.2 Where a front contact remains closed due to faulty functioning, when the relay is de-energised, all the other front contacts must open, and none of the back contacts should close. However, in case of series contacts when both the contacts remain closed due to faulty conditions, the requirement that the other front contacts should open mayor may not be fulfilled. The entire return torque of the relay must be available to attempt the opening of the defective contact.

11. PLUGGING-IN ARRANGEMENT AND WIRING.

11.1 The Plugging-in devices for relays of the plug-in type and for relay groups must be constructed and identified in such a way that it is practically impossible .for any mistake in assembly or connection to take place.

11.2 Removable connectors, where provided, shall be suitable for both soldered and/or crimped connection.

11.3 The terminations may be provided in the form of contact prongs/solder lugs either forming part of the contact spring contact spring concerned or separate and suitable for termination of wiring by both soldered and crimped connection.

12. STORAGE LIFE

12.1 The relay shall be considered as having possible period of upto 2 years in reasonable storage conditions prior to being brought into use without verification or examination and without any adverse effect on its operating characteristics.

13. OPERATING CHARACTERISTICS

13.1 The relays shall be rated for operation on nominal supply voltages of either 24V DC or 60V DC, or as specified by the purchaser.

13.2 Relay coil shall be able to withstand a maximum thermal load of 4.5 watts when the coil space is fully used.

13.3 The maximum rated power consumption for each relay coil shall be 2.5 watts. Full operate power consumption shall, however, not exceed 1.25 watts.

13.4 The operating values shall be as follows (throughout the service life of the relay) when tested with the coil at temperature of 20°C:

	24 Volt Relay	**60 Volt Relay**	**Remarks**
Maximum voltage/current across windings for full operate.	19.2V/80.0ma	48.0V/32.0 ma	80% of nominal rated voltage/current.
Minimum voltage/ current across windings for release.	4.8V/20.0ma	12.0V/8.0ma	20% of nominal rated voltage/current.
Maximum ampere-turns (AW) for full operate.	…	335 (for single relay). 600 (for interlocking relay).	
Maximum ampere-turns (AW) for release.	…	15% of measured value of ampere-turns (AW) for full operate.	

13.5 During and on completion of the contact rating test (mechanical) on the relay (1 X 10^7 cycles), the increase in pick-up current must not exceed 10% of its initial value; the decrease in-drop-away current must not exceed 15% of its initial value; and the ratio between drop-away current and pick-up current must vary by no more than minus 20% in relation to its initial ratio.

13.6 The Pick-up value of current when measured in the reverse direction must not exceed 110% of the pick-up value of the current in the normal direction.

13.7 Operating times for the when energised at rated voltage, shall not exceed the following:-

a) Operating time (interval between energisation and closing of last front contact). 100 ms

b) Release time (interval between de-energisation and opening of the first front contact). 20 ms

14. DETERMINATION OF OPERATING VALUES

14.1 Measurement of drop-away, pick-up and full operate current :

14.1.1 After the relay has been neutralised, the relay shall be energised to four times the normal pick-up current applied in the normal working direction; the current shall then be gradually reduced and the value at which all front contacts open shall be recorded as the drop-away value for this direction. The current shall then be reduced to zero and then increased until the relay picks up and an front contacts are closed, and the value at which this occurs shall be recorded as the pick-up value. The current shall then be further increased until the armature is in the full operate position. This value shall be termed as full operate value of current.

14.2 **Measurement of reverse pick-up current**

14.2.1 The relay shall first be saturated to four times the normal pick-up current in the normal working direction and then current reduced to zero. The current shall again be increased gradually in the opposite direction, i. e., with polarity reversed and the value at which all the front contacts are closed shall be regarded a, reverse pick-up current.

14.3 **Measurement of operate time, release time and contact bounce time**

14.3.1 Timing tests for the front contacts shall be made at the rated current value. These measurements may be made by using a suitable electronic counter or an oscilloscope.

15. INSPECTION AND TESTING

15.1 **General**

15.1.1 Inspection and testing shall be carried out in accordance with Clause 11 of IRS Specification No. S 34-68* read with Clause 14.1 of IRS Specification No. S 23-63**.

15.1.2 Visual inspection shall be carried out in accordance with sub-clause 4.1.1 of IRS Specification No. S 34-68* read with Clause 14.2, as far as applicable, of IRS Specification No. S 23-63**.

15.1.3 Provisions contained in this Specification shall apply wherever, in any details, they differ from those in IRS Specification Nos. S 34-68* and S 23-63. ** as referred to in sub-clause 15.1.1 and 15.1.2.

15.1.4 Inspection and tests may be carried out, partly or wholly and in combination either at the place of manufacture or in Railway Laboratory or in National Laboratory or in any other approved laboratory or workshop wherever suitable facilities may exist, as desired by the purchaser or the Inspecting author

15.2 **Type Tests and Manufacturing Tests**

15.2.1 Type tests shall apply whenever a relay covered by specification is offered for the first time by a manufacturer. Further, these tests shall also apply whenever any change is made in the design, material or processes of manufacture for the relay vitally affecting the working of the relay. The decision of Inspecting Official shall be final in this regard.

15.2.2 Type Tests shall include Group ‘0’ to Group ‘VI’ tests, as laid down in clauses 4 to 10 of IRS Specification No. S:34-68, as far as applicable, and the following additional tests :-

i) **Temperature rise Test**:- As per Clause-15.2 of this specification (To be done on one relay after Group ‘0’ – Coil resistance test to Cl. 4.1.2 of IRS:S 34-68)*;

ii) **Vibration and Resonance effects test**:- To verify provision in Clause 10.2.12 of this specification (to be done on one relay after Group ‘0’ - Contact resistance test to Cl. 4.1.5 of IRS:S 34-68*);

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* Testing of Railway Signalling Relays (General).

** Electrical Signalling and Interlocking Equipment.

iii) **Bump Test**:- As per clause 18.3 of this specification (To be done on additional samples of 2 number relays/relay Group Housing).

These Type tests shall apply, as far as applicable, and read with relevant requirements of this specification, together with modifications/clarifications given below in reference to provisions in Specification IRS :S34-68*

a) Group '0' tests to clauses 4.1.1 to 4.1.4 and 4.2 shall be done on all sample relays meant for Type test while tests to clauses 4.1.5 to 4.1.10 & 4.1.12 shall be done on two relays meant for Gr. '0' tests. Non-weldability test to clause 4.1.11 shall not apply. Contact rating test (Mechanical) to clause 4.1.12 shall be done for 1 X 10^7 cycles of operation, at a rate between 20 to 60 cycles per minute, without loading the contacts and under condition of over-excitation of relay at 20% above the rated voltage.

b) Operating characteristics to clause 4.1.4 shall include measurements for pick-up current/voltage, full operate current/voltage, Drop-away current/voltage, reverse pick-up current/voltage, operate time, release time and bounce time. Measurements for operate time, release time and bounce time may however be done only on two relays meant for Group '0' test.

c) Tests to verify physical parameters viz., contact follow, end play of armature, residual gap, clearance between pivot and bearing, clearance between relay cover/Group Housing and moving parts, surface leakage distance, air clearance distance and overall dimensions, etc., as. applicable, may also be made on relays meant for Group '0' tests.

d) Group III-Endurance test shall be carried out as per Cl. 7.1 and 7.2, 7.4.3 and 7.5 for 2X10^6 cycles of operation at a rate between 20 to 60 cycles per minute. This test shall be done on one relay at room temperature and on second relay at $60^oC \pm 2°C$, loading all the contacts of both relays with contact loads specified in clause 10.6 of this specification and under condition of over-excitation of relay at 20 percent above the rated voltage. During this test, contact resistance shall be measured at an interval of near about 2 x 10^5 cycles of operation.

e) At the end of Group 'V'-Salt Mist Test, the following parameters of Group '0' tests shall be checked/measured :-

   i) Visual Inspection.
   ii) Operating Characteristics (as per sub-clause(b) above).
   iii) Contact Resistance.

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* Testing of Railway Signalling Relays (General).

15.2.3 Manufacturing Tests shall include all relevant Laboratory Tests and Investigation Tests as laid down in clauses 14.3 and 14.4, respectively of IRS Specification No. S 23*, as far as applicable.

15.2.4 The Relay Coil/s shall be tested for 'Temperature Rise'. After the coil/s has/have been energised continuously for a sufficient length of time for the temperature to reach a stable value, the temperature measured at any point of the winding/s shall not exceed the maximum permissible for the class of insulation in accordance with the relevant standard specifications. This test shall be carried out at an ambient temperature of 60^{o}C and with the relay energised at 20 percent above its rated voltage.

15.2.5 Normally sample of 12 number relays would be required as per the IRS Specification No. S 34-68** for carrying out the complete range of Type Tests as mentioned in clause 15.2.2 or this specification. These tests shall take about 3-4 months to complete from commencement.

15.3 **Acceptance Tests**:

15.3.1 These tests will apply as laid down in clause 11.5 or IRS Specification No. S 34** to a percentage of the lot to be inspected and would include Routine Tests to be carried out on each individual relay as per clause 11.4 of IRS Specification No. S 34**, and clause 15.3.2 of this Specification. The Routine Tests have to be carried out on each individual relay by the 'Manufacturer' and ensured for compliance of the specification requirements before the relay is offered for inspection.

15.3.2 A test shall be conducted on the contact springs of each individual relay to ensure that no current flows during the transit of the relay armature when all back contacts (connected in parallel) are connected in series with all front contacts (connected in parallel) and a voltage of 500 volts DC is applied. The relay shall be energised at its operate voltage. The device to be used in making this test shall have a response time of not more than 250 micro-seconds and shall give a positive indication in the event of current passing for that period.

16. REJECTION

16.1 Any of the materials, which do not comply with the requirements of this specification and any other specification stipulated in the order, in the opinion of the Inspecting authority or the purchaser or his nominee, may be rejected.

16.2 Any supplies of materials, covered by this specification may, in case of urgency of requirements, be inspected and accepted on provisional basis, pending carrying out or completion of type tests of long term duration, e. g. Endurance test, Damp, heat (long term) test and Normal storage test. In such cases, the manufacturer shall guarantee the materials against defects and shall be responsible, at his entire cost, to rectify the defects or to replace the defective materials accepted provisionally even when put in use, as may be desired by the Purchaser, in case the above mentioned tests of long term duration, on completion, are found to have been not complied with.

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* Testing of Railway Signalling Relays (General).
** Electrical Signalling and Interlocking Equipment.

16.3 The manufacturer shall be responsible, at his entire cost, to rectify the defects or to replace the defective materials where materials, already inspected at manufacturer's place and accepted, are, subsequently on receipt by the consignee, found to be defective in respect of such of the characteristics for which tests were not made or made by the Inspecting authority only on a percentage of accepted lot.

17. MARKING AND IDENTIFICATION

17.1 A name plate shall be provided in a conspicuous position giving the following information:

a) Manufacturer's name or code.
b) Year and month of manufacture.
c) Serial number of relay.
d) Type of relay with specification reference and rated voltage.
e) Contact arrangement.
f) Identification/Signature of Tester with date of test.

17.2 The package/box containing relays and meant for transport to the consignee shall be plainly marked on the outside with the following particulars :

a) Name and address of consignee.
b) Name and address of consigner.
c) Requisition number and package number.
d) Purchaser’s order reference and date.
e) Direction arrow for guidance during handling.
f) The package shall also be marked with the word “FRAGILE”.

18. PACKING

18.l Thc relays/relay groups in Group Housings shall be so packed as to permit convenient handling and to protect against loss or damage and against ingress and moisture during transit and storage.

18.2. The relays/relay groups in Group Housings shall be packed securely and all necessary precautions shall be taken to avoid jolting and damage to moving parts and components during transit.

18.3. The relay or relay group in Group Housing with its packing of shall be fit to withstand the Bump test to clause 14.4.5 of IRS Specification No. S 23-63*.

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* Electrical Signalling and Interlocking Equipment.

19. WARRANTY

19.1 The manufacturer shall warrant the products covered by this specification to be free from defects in the material and workmanship observed under ordinary use and service, his obligation under this Warranty being limited to quality of materials and manufacturing at the point of production. He shall agree to replace any part or parts that become defective within two years after delivery to the purchaser. This Warranty shall not apply to any equipment which shall have been repaired or altered in any way by anyone other than the manufacturer thereof, so as to affect, its proper functioning or reliability or which bas been subjected to misuse, negligence or accident.

20. INFORMATION TO BE SUPPLIED BY THE PURCHASER.

20.1 The following information shall be supplied by the Purchaser with the tender enquiry for the type of relays covered by this Specification:

20.1.1 Whether Locking arrangement is required (Clause 3.2.2).
20.1.2 Contact arrangement required, i. e., number of contacts, front and back, and independent/dependent (Clause 10.1.1).
20.1.3 Rated voltage for the relay (Clause 13.1).

21. INFORMATION TO BE SUPPLIED BY THE TENDERER

21.1 Whenever relays covered by this specification are offered by a tenderer either for the first time or to a modified design anyway different from his earlier supplies, necessary technical details including the following information shall be supplied with the tender:

21.1.1 Number of winding & in the relay separate and galvanically connected (Clause 1.5).
21.1.2 List of drawings forming an essential part of the tender and furnished therewith (Clause 3.1.2).
21.1.3 Enclosure provided for relay whether individual cover or relay group housing; the maximum number of relays that can be mounted in relay group housing where, provided as such (Clause 3.2.1).
21.1.4 Overall dimensions of the relay or group housing (Clause 4.1).
21.1.5 Materials test results and other relevant specification details of the materials used in the fabrication of the following relay components, if so desired by the purchaser (Clause 6) :

a) Electromechanical parts i.e., armature, core and yoke, etc.
b) Insulating parts, i.e., coil bobbin, contact blocks, etc.
c) Metal contacts.
d) Contact Springs.

21.2 Deviation statements giving complete details of deviations, if any, from the requirements in this specification, shall be furnished by the Tenderer with the

tender for relays covered by this Specification. In cases where specification is being fully complied with, a 'nil deviation' statement shall also be submitted.

22. IMPORTANT NOTE

22.1 Any clarification or additional information relating to the equipment covered by this specification, shall be obtained from the Purchaser or his Nominee.

****

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Government of India - Ministry of Railways
Research Designs & Standards Organisation
LUCKNOW – 226011

No. STS/E/Relays/Genl. Misc. Vol. XII

25th July 2017

मुख्य संकेत एवं दूरसंचार अभियन्ता, मुख्य संकेत एवं दूरसंचार अभियन्ता (निर्माण), मुख्य संकेत एवं दूरसंचार अभियन्ता (प्रॉजेक्ट)	**Chief Signal & Telecom Engineer, Chief Signal & Telecom Engineer (Const.), Chief Signal & Telecom Engineer (Project)**
मध्य रेलवे, मुम्बई सी.एस.टी. – 400 001	Central Rly, Mumbai CST – 400 001
पश्चिम रेलवे, चर्च गेट, मुम्बई – 400 020	Western Rly, Churchgate, Mumbai – 400 020
पूर्व रेलवे, फेयरली प्लेस, कोलकाता – 700 001	Eastern Rly, Fairlie Place, Kolkata – 700 001
दक्षिण पूर्व रेलवे, गार्डन रीच, कोलकाता – 700 043	South Eastern Rly., Garden Reach, Kolkata – 43
उत्तर रेलवे, बड़ौदा हाउस, नई दिल्ली – 110 001	Northern Rly., Baroda House, New Delhi – 01
पूर्वोत्तर रेलवे, गोरखपुर – 273 012	Northeastern Rly., Gorakhpur – 273 012
पूर्वोत्तर सीमान्त रेलवे, मालीगांव, गुवाहाटी – 780 011	North Frontier Rly., Maligaon, Guwahati – 011
दक्षिण रेलवे, पार्क टाउन, चेन्नई – 600 003	Southern Rly., Park Town, Chennai – 600 003
दक्षिण मध्य रेलवे, सिकन्दराबाद – 500 371	South Central Rly, Rail Nilayam, Secunderabad– 71
पूर्व मध्य रेलवे, हाजीपुर – 841 101	East Central Railway, Hazipur - 841 101
उत्तर पश्चिम रेलवे, जयपुर – 302 006	North Western Railway, Jaipur – 302 006
पूर्व तटीय रेलवे, ग्राउन्ड तल, उत्तरी ब्लाक, समन्त विहार, भुवनेश्वर – 17	East Coast Railway, Rail Vihar, Ground floor, North Block, Samant Vihar, Bhubaneswar – 17
उत्तर मध्य रेलवे, गंगा काम्पलेक्स, सूबेदारगंज, इलाहाबाद	North Central Railway, Ganga Complex, Subedarganj, Allahabad.
दक्षिण पश्चिम रेलवे, मुख्य कार्यालय, क्लब रोड, केशवपुर, हुबली – 580 023	South Western Railway, Main Office, Club Road, Keshavpur, Hubli – 23
पश्चिम मध्य रेलवे, द्वितीय तल, डी.आर.एम. ऑफिस, जबलपुर – 482 001	West Central Railway, IInd Floor, DRM Office, Jabalpur – 482 001
दक्षिण पूर्व मध्य रेलवे, आर0ई0 ऑफिस कॉम्पलेक्स, बिलासपुर – 495 004	South East Central Railway, R. E. Office Complex, Bilaspur – 495 004
मेट्रो रेलवे, 33/1, जवाहर लाल नेहरू रोड, कोलकाता – 700 071	Metro Railway, 33/1, Jawaharlal Nehru Road, Kolkata – 700071
कोर , नवाब युसुफ रोड, सिविल लाइन्स, इलाहाबाद – 211 001	CORE, Nawab Yusuf Road, Civil Lines, Allahabad –211 001
निदेशक/इरिसेट, तारनाका रोड, लालागुडा, पी. ओ. सिकन्दराबाद – 17	Director/IRISET, Tarnaka Road Lallaguda, P.O. Secunderabad –17

Sub: Amendment No. 1 to the Specification No. IRS : S - 46/74 for D.C. Neutral Line Relay (Proved type) for Railway Signalling.

***

In compliance to Vigilance Cell/RDSO's letter No. 13/Vig/Policy dt.26.07.16 & 08.09.16, Amendment No. 1 to the Specification No. IRS: S- 46/74 for D.C. Neutral Line Relay (Proved type) for Railway Signalling is hereby issued with the approval of competent authority for information & implementation please.

DA: Copy of Amendment No. 1 to the Specification No. IRS : S - 46/74.

(V. K. Agarwal)
Jt. Director/Signal
for Director General/Signal

25/07/17

Copy to :-

कार्यकारी निदेशक / गुणवत्ता आश्वासन /अ0अ0मा0सं0, लखनऊ	Executive Director/QA/S&T/RDSO/Lucknow
निदेशक / गुणवत्ता आश्वासन / सिगनल एवं दूरसंचार, / अ0अ0मा0सं0, निकट इरकॉट बिल्डिंग, शंकर मार्केट के पीछे, शिवाजी ब्रिज, नई दिल्ली – 110 001	Director/QA./S&T/RDSO, 1st Floor, Near IRCOT Building, Behind Shanker Market, Shivaji Bridge, New Delhi – 110 001
निदेशक / गुणवत्ता आश्वासन / संकेत एवं दूरसंचार, / अ0अ0मा0सं0, प्रथम तल, न्यू एनेक्सी बिल्डिंग, चर्चगेट, पश्चिम रेलवे, मुम्बई – 400 020	Director/QA./S&T/RDSO, 1st Floor, New Annexe Building., Western Railway, Churchgate, Mumbai – 400 020
निदेशक / गुणवत्ता आश्वासन / सिगनल एवं दूरसंचार, / अ0अ0मा0सं0, भूतल, डी0आर0एम0 ऑफिस, बंगलोर – 560 023	Director/QA./S&T/RDSO, Ground Floor, DRM Office, Bangalore – 560 023
निदेशक /गुणवत्ता आश्वासन / सिगनल एवं दूरसंचार, / अ0अ0मा0सं0, चौथी मंजिल, 17 एन.एस. रोड, वैस्ट विंग, फेयरली प्लेस, कोलकाता – 700 001	Director/QA./S&T/RDSO, 4th Floor, 17 N.S. Road, West Wing, Fairlie Place, Kolkata – 700 001
निदेशक /गुणवत्ता आश्वासन / सिगनल एवं दूरसंचार, / अ0अ0मा0सं0, हसनपुरा रोड, जयपुर – 302 006	Director/QA/S&T/RDSO,Hasanpura Road, In Front of Railway Hospital, JAIPUR – 302 006

1. M/s. Siemens Ltd., 130, Pandurang Budhkar Marg, Worli, Mumbai-18
2. M/s. Integra Engineering India Ltd., P.O. No. 55, Chandrapura Village, Tal. : Halol, Distt. Panchmahals – 389 350 (Gujarat)
3. M/s. AEW Technology LLP, 32/J, Sahitya Parishad Street, Ground Floor, Kolkata – 700 006
4. M/s Crompton Greaves Ltd., Signalling Relay Unit,11-B, Industrial Area No. 1, Pithampur, Disstt. Dhar – 454775
5. M/s. Eldyne Electro Systems Pvt. Ltd., EP-14/1, Praffula Kanan (Off. VIP Road), Krishanpur, Kolkata – 700 059
6. The Chief Workshop Manager, Signal Workshop, Southern Railway, Podanur – 641 023
7. M/s. Instrumentation Ltd., Signalling Division, Kota – 324 005. (RAJASTHAN)
8. M/s. Cosine Comm. & Electronics (P) Ltd., Plot No. 150, C&F, IDA Phase-II, Cherlapally, Hyderabad-51
9. M/s. Orient Relay & Equipments, 69/1/7, Diamond Harbour Road, Kolkata – 700 038
10. M/s. Hytronics Enterprises, 24-B, Electronics Complex, Kushaiguda, Hyderabad – 500 762.
11. M/s. Ultra Electronic Pvt. Ltd., 32B, Ganesh Chandra Avenue, Ground Floor, Kolkata – 700 013.
12. M/s. Westinghouse Saxby Farmer Ltd., 17, Convent Road, Entally, Kolkata – 700 014.
13. The Chief Workshop Manager, Signal Workshop, N.E. Railway, Gorakhpur – 273 008
14. M/s. Demson & Co., A-16, SIDCO Industrial Estate, Villivakkam, Chennai – 600 049.

DA: Copy of Amendment No. 1 to the
Specification No. IRS : S - 46/74.

(V. K. Agarwal)
Jt. Director/Signal
for Director General/Signal
25/07/17

Amendment No. 1

To

RDSO Specification No. IRS : S - 46/74

For

D.C. Neutral Line Relay (Proved type) for Railway Signalling

Following new clause is added to the Specification No. IRS: S-46/74 for D.C. Neutral Line Relay (Proved type) for Railway Signalling.

Clause No. 23

"All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-7.1-11 dated 19.07.2016 (titled "Vendor Changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways".

End of Amendment No. 1