REVISED DRAFT

No.IRS:S23 Part I-88

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

(RAILWAY BOARD)

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INDIAN RAILWAY STANDARD SPECIFICATION FOR ELECTRICAL AND ELECTRONIC BASED SIGNALLING AND INTERLOCKING EQUIPMENT.

PART-I Terminology and General Requirements.

Serial No.S.23 (Part I)-88

REFRENCE COPY

0. FOREWORD

0.1 This specification is issued under the fixed serial No.S-23(Part I) followed by the year of original adoption as standard, or in the case of revision, the year of last revision.

ADOPTED 1963, REVISED 1988

0.2 This IRS:S23 originally adopted in the year 1963 for Electrical Signalling and Interlocking equipment, amended in 1966, 1971 and 1978 has now been split up into three parts given below to cater for Electrical and Electronic based signalling equipments in view of the diversification of the Electrical Signalling equipments and rapid adoption of Electronic based signalling equipments by Indian Railways.

1. Part I - Terminology and General requirements.

2. Part II - General requirements for Electrical Signalling and Interlocking equipments.

3. Part III - General requirements for Electronic based Signalling and Interlocking equipments.

This IRS-S-23 (Part I) deals with "Terminology and General requirements" for Electrical and Electronic based signalling and interlocking equipment for use on Indian Railways.

0.3 This specification requires reference to the following:

Indian Railway Standard specification (IRS):-
IRS.S.10 Specification for mechanical Signalling and Interlocking Equipment.

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Wherever in this specification, any specification is referred to by number only without mentioning the year of issue, the latest issue of that specification is implied, otherwise the particular issue referred to is meant.

This specification is intended chiefly to cover the technical provisions and provisions relating to the general requirements of the equipment and so does not include all the necessary provisions of a contract.

1. SCOPE

This specification covers the terminology and general requirements of electrical and electronic signalling and interlocking equipment for Railway signalling. It lays down general requirements for standard equipment and quality in manufacture for satisfactory performance under tropical conditions.

For detailed requirements of electrical and electronic based equipments, Part II and Part III of this specification respectively may be referred to.

2. DRAWINGS AND SPECIFICATIONS

The principal object of the drawings is to ensure that items of equipment developed to the design shall perform the required function and shall be of uniform standard with interchangeability of units or parts consistent with economy in cost.

The manufacturer shall ensure that the drafting is consistent with the spirit of the specification and any error noticed in the drawings during manufacture or otherwise shall be brought to the notice of the purchaser or his nominee.

The manufacturer shall not deviate from the drawings or specification without written approval of the purchaser or his nominee.

The manufacturer shall be responsible for ensuring that the provisions of this specification are complied with wherever applicable in addition to other relevant specifications specified on the drawings.

The drawings prepared for purposes of standardisation, leave scope for modifications in designs, materials, manufacturing and testing, provided the basic objectives of this specification are maintained.

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2.6 Any proposal for deviation from the drawings or specification by the manufacturer may be considered, provided such proposal results in an improvement in design, reduction in cost or ease in production consistent with good performance and safety of operation.

2.7 Proposals by the manufacturer for any alternative design or equipment of their own design may be considered either by trials of a prototype or by such data that may be required for proper consideration of the proposals.

2.8 The proposal envisaged in 2.7 above shall ensure that the strength, quality, interchangeability, function of the equipment and normal life are not impaired in any way and they comply either with the basic requirements of this specification or that of any other approved specification, acceptable to Purchaser or his nominee.

2.9 The manufacturer shall ensure that the equipment supplied by him conforms to the latest revision of the drawings and specifications to which such equipment is ordered on him, unless the Purchaser specifically mentions any particular revision to the drawing.

2.10 Information pertaining to alterations and amendments to IRS drawings and specifications is contained in Quarterly Notifications issued from time to time by the Research Designs & Standards Organization, Ministry of [illegible] Railways, Lucknow-226 011.

3. TERMINOLOGY

3.1 'RDSO/S DRAWINGS' mean those drawings which are initially prepared for consideration during the various stages of development of the design in consultation with Railways and manufacturers.

3.2 'Advance Drawings' mean the drawings for the design developed on the basis of the RDSO/S drawings and are circulated for manufacture of the equipment for use on railways.

3.3 'IRS/S Drawings' mean those drawings which have been finalised on the basis of the experience gained with the manufacture and actual extensive usage of the design to the Advance Drawings.

3.4 'Rated Voltage' means the voltage at which an electrical signalling equipment is intended to operate in the field. This may be sometimes termed as 'Normal Voltage'.

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'Minimum Working Voltage' shall mean the minimum voltage at which the particular electrical signalling equipment will function.

'Rated Current' shall mean the current that shall be obtained in the particular electrical signalling equipment when the Rated Voltage is applied to its terminals.

'Minimum Working Current' shall mean the current flowing through an electrical signalling equipment when the minimum working voltage is applied to its terminals.

'Air Clearance' shall mean the clearance provided through air between any exposed current carrying part and other metallic parts insulated therefrom.

'Surface Leakage Distance' shall mean the shortest distance along the surface between any exposed current carrying parts, and between any exposed current carrying part and other metallic parts insulated therefrom.

'Investigation Tests' are those tests which are carried out to determine that the materials used and methods of processing adopted are in conformity with the Purchaser's requirements.

'Routine Tests' are those tests which must be carried out on each individual equipment by the manufacturer.

'Type Tests' are those tests which are specified for a particular equipment in a distinctive manner.

'Performance Tests' are those tests which are required to prove satisfactory performance of an equipment under service conditions, and shall include such of those tests as are required to investigate problems in its installation and maintenance.

'Acceptance Tests' are those tests which are particularly specified by the purchaser to be carried out on the equipment at various stages or on completion and may be any or all the tests concerned with the equipment before he accepts the delivery.

'Environmental Tests' are those tests which are required to prove that the equipment functions satisfactorily and that the materials used in its manufacture are stable under specified environments and climatic conditions.

'Life Tests' are meant to prove that the equipment shall stand the stress and strain of service conditions for a particular period, under particular environments without any sign of disability.

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3.17 'Endurance Tests' are carried out to determine the maximum life of the equipment under actual service conditions.

3.18 'Manufacturing Tests' are those tests which are required to be carried out on the workshop floor at different stages in order to verify the quality and suitability of the complete product for the field operation.

3.19 'Contacts' are current carrying parts in an equipment which engage or disengage to make or break electrical circuits.

3.20 'Contact Spring' means a current carrying spring to which the contacts are fastened, if necessary.

3.21 'Rated Contact Capacity' means the current that the contacts are designed to carry for their Rated life.

3.22 'Contact Capacity maximum' means the current which the contact is capable of carrying or breaking in a non-inductive circuit without fusing.

3.23 'Air gap'. The length of the gap between the core/pole face and the nearest point on the armature when the armature is in 'fully Released' position.

3.24 'Contact Pressure': It is the pressure in grams of the moving arm to the fixed arm in the centre of the contact elements and at right angle to the contact arm.

3.25 'Contact Resistance': The Electrical Resistance offered by the two contact surfaces.

3.26 'Contact Clearance': It is the minimum distance between two contact surfaces.

4. GENERAL REQUIREMENTS.

4.1 All electrical signalling equipment shall be fail safe.

4.2 All equipment shall be of substantial design, robust and capable of withstanding such handling as encountered in service, storage or transhipment under tropical climatic conditions.

4.3 The construction shall be such that no part or element shall get out of order or displaced due to vibration or other causes as may be met in railway usage.

4.4 All parts shall normally be easily accessible for maintenance.

4.5 Wherever specified sealing and/or locking arrangements shall be provided for each apparatus to avoid any unauthorised interference.

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4.6 With the exception of motor commutators, surface leakage distance of not less than 6mm shall be provided between any exposed current carrying part and other metallic parts insulated therefrom.

4.7 Unless otherwise specified an air clearance of not less than 12mm shall be provided between any exposed current carrying part and other metallic parts insulated therefrom.

4.8 The material for bearings and shafts, specially for sealed units, shall be resistive to corrosion.

4.9 The clearance between shaft and bearing and end play of shaft shall neither cause sticking tendency nor erratic behaviour of equipment in performance under specified climatic conditions.

4.10 All bearings unless otherwise specified shall be provided with oiling or greasing arrangements.

4.11 The oil or grease used shall be suitable for use between temperature limits of -25° $+100^{\circ}$C.

4.12 Oil or grease shall be neutral and free from such materials which might gum or corrode metals under all specified climatic conditions.

4.13 Gasket material shall be suitable for tropical climatic conditions. Gasketting shall be done in such a manner as to render the equipment dust proof and shall not work loose in service.

4.14 Painting, enamelling, galvanising and protection against rust where specified shall be in accordance with the provisions in IRS:S10 as far ass applicable.

5. WORKMANSHIP

5.1 The workmanship throughout shall be of best quality and shall be in accordance with the best current engineering practice.

5.2 All parts shall be manufactured strictly in accordance with the Drawings and or specifications as approved by the Purchaser or his nominee.

5.3 All parts shall be free from liability to distortion likely to affect their operation under severe service conditions, storage or transhipment.

5.4 All like parts shall be interchangeable.

5.5 The fittings of the parts during assembly shall be first class in all respect and shall not cause any obstruction to moving parts and no part shall show any sign of erratic behaviour in service.

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6. DIMENSIONS, LIMITS AND FITS

6.1 Dimensions, Limits and Fits shall be in accordance with clause 6 of IRS: S-10-1978.

7. PROTECTION AGAINST CORROSION

7.1 Unpainted metallic parts shall be adequately protected against corrosion with nickel or cadmium plating, or other suitable equivalent except where such protection may interfere with the proper function of that part.

7.2 Electro-plating or any other protective material wherever specified shall withstand the tropical climatic and severe service conditions.

7.3 Zinc or Cadmium shall not be used on current carrying parts.

7.4 All iron and steel parts of magnetic circuit shall be given an adequate coating with an approved paint or varnish after having first received suitable protective treatment.

7.5 Laminations for magnetic circuit which cannot be adequately rust proofed shall have their edges thoroughly cleaned and coated with an approved tropic proofing varnish.

7.6 Working surfaces shall be left bright and protected by a film of an approved preservative varnish.

8. INSPECTION AND TESTING

8.1 General

8.1.1 Testing facilities.

The manufacturer must have an organised system of manufacturing, tests for the equipment and materials and also a system of floor inspection to control the quality of the equipment in the factory while the equipment is being manufactured from stage to stage. Manufacturing Tests may include tests other than those specified by the Purchaser.

Inspection and test shall be carried out to ensure that all the requirements of this specification and those of IRS:S10 where applicable are complied with.

8.1.2 Semi finished materials.

The manufacturer shall ensure that finished or semi-finished materials received from other sources used for manufacture are in accordance with the approved current specification unless otherwise indicated and with details as on the drawings if any. These may be subjected to tests at any stage of manufacture to verify their correctness at a laboratory approved by the Purchaser or his nominee.

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8.1.3 Access to Inspection

Purchaser or his nominee shall have free access to the works of the manufacturer at all reasonable times and shall be given facilities by the manufacturer to inspect the manufacture of the equipment at any stage of manufacture. He may reject in whole or part any work or material that does not conform to the terms of this specification or any other specification or requirement applicable and may order the same to be removed, replaced or altered at the expense of the manufacturer. All gauges, templates and other fixtures considered necessary by the Inspecting officer for the inspection of the equipment must be supplied by the manufacturer free of cost.

8.1.4 Materials & Appliances for Inspection & Testing.

The manufacturer, when required, shall supply free of charge, the material required for tests, shall, at his own cost, furnish and prepare the necessary test pieces and supply labour and applicances for such testing as may be carried out in his premises in accordance with this specification. Failing the existince of facilities at his own works, for making the prescribed tests, the manufacturer shall bear the cost of carrying out the test in a laboratory, workshop or test house approved by the Purchaser.

8.1.5 Tests requiring long periods.

In case some of the tests require long testing periods, the purchaser may demand a warranty for working of the equipment for at least 3 years in the field without any deterioration in performance and materials used in the equipment.

8.1.6 Approval of sample by purchaser.

8.1.6.1 For drawings marked as "Advance" the contractor shall first prepare a sample for approval of the purchaser or his nominee. Bulk manufacture shall be undertaken only after the sample has been approved in writing by the purchaser or his nominee.

8.1.6.2 Before bulk manufacture is undertaken, the manufacturer shall also undertake to carry out such modifications as may be considered necessary by the purchaser in order to ensure the suitability of the product for the purpose it is required, without any claim of additional charges.

8.1.7 Test Results

The Inspecting Officer may, at his discretion, check test results obtained by the manufacturer at his works by independent tests at Government Test House or in a laboratory or workshop approved by the purchaser and should the material so tested be found to be unsatisfactory

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the cost of such tests will be borne by the manufacturer. Should the manufacturer's testing facilities be found in the Inspecting officer's opinion unreliable, he is empowered to cancel any tests already carried out with these facilities and have these tests carried out at the manufacturer's expense at the Government Test House or in a laboratory or workshop approved by the Purchaser or his nominee.

8.2 Visual Inspection.

8.2.1 General.

8.2.1.1 Visual inspection shall be carried out to ensure:

i) that the equipment is of sound construction and that reasonable precautions have been taken to prevent the ingress of foreign bodies;

ii) that adequate protection is provided for all components against possible damage due to laying the equipment on any face during maintenance;

iii) that the base of equipment rests squarely on the four corners while on flat surface;

iv) that general arrangement of assembly is in accordance with specified description and drawings;

v) that no part is damaged or cracked;

vi) that no metal fillings are present;

vii) that mating surfaces mate squarely;

viii) that parallel faces are in parallelism and true to the eye;

ix) that all nuts are tight and locking washers are turned up correctly;

x) that split pins are opened out;

xi) that dowel pins are provided wherever required;

xii) that there is no sticking tendency of the operating parts;

xiii) that adjustments have been correctly made, and

xiv) that working strokes are correct;

xv) that the surface finish is to the satisfaction of the Purchaser.

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9. REJECTION

Any materials which do not comply with the requirements of this specification may be rejected.

10. MARKING & IDENTIFICATION

10.1 Wherever possible an engraved name plate giving manufacturer's name, the IRS No.if any, serial No. and year of manufacture shall be attached on the outside of the apparatus in a conspicuous position.

10.2 When the size of the part permits, all metal parts shall have the letters IRS (where applicable) and the parts number shown on the drawing, stamped or cast thereon, in letters and figures of suitable size, Cast or malleable iron parts or Nylon, Phenolic and other moulded parts shall have, in addition to the above, manufacturer's name or initials of Trade mark moulded, stamped or, engraved thereon when the size of the part permits.

11. PACKING

11.1 Equipment shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

12. WARRANTY

12.1 The contractor shall warrant the material covered by this specification to be free from defects in design, material and workmanship under ordinary use and service, his obligation under this Warranty being limited to replace free of cost these parts which shall be found defective within one year after delivery to the purchaser. This warranty shall not apply to any apparatus which shall have been repaired or altered in any way by anyone other than the manufacturer thereof so as to affect, in contractor's judgement, its proper functioning or reliability, or which has been subjected to misuse, negligence or accident.

13. IMPORTANT NOTE

13.1 In the event of any requirement, information or specification applicable to any apparatus or equipment being omitted from this general specification, the manufacturer shall at once obtain from the purchaser or his nominee required information specification or drawing that may be necessary before proceeding with the manufacture.

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REVISED DRAFT

No.IRS:S.23(Part II)-88

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

(RAILWAY BOARD)

(SEAL)

INDIAN RAILWAY STANDARD SPECIFICATION FOR ELECTRICAL AND ELECTRONIC BASED SIGNALLING AND INTER LOCKING EQUIPMENTS

PART II GENERAL REQUIREMENTS FOR ELECTRICAL SIGNALLING AND INTERLOCKING EQUIPMENTS

(Tentative)
Serial No.S.23 (Part II)-88

0. FOREWORD

0.1 This specification is issued under the fixed serial No.S.23 the final number indicates the year of original adoption as standard or in the case of revision, the year of last revision.

0.2 This IRS-S23 originally adapted in the year 1963 and revised in 1966, 1971 and 1978 for "Electrical Signalling and interlocking equipment" has now been split up into three parts to cater for electrical and electronic based signalling equipments in view of the diversification of electrical signalling equipments and rapid adoption of electronic based signalling equipments by Indian Railways. This IRS-S23 (Part II) deals with the "General requirements for electrical signalling and interlocking equipments" for use on Indian Railways.

0.3 For the purpose of deciding whether a particular requirement of this specification is complied with the final value, observed or calculated expressing the result of the test, shall be rounded off in accordance with IS:2-1960. The number of significant places retained in the rounded off value should be the same as that of the specified value in this specification.

0.4 This specification requires reference to the following specifications:-

IRS:S10 - Specification for mechanical signalling and interlocking equipment - Indian Railway Standard.

IRS-S23 (Part I) Terminology and general requirements for electrical signalling and interlocking equipment- Indian Railway Standard.

IS:2 Rules for rounding off numerical values.

IS:9000 Basic environmental testing procedures for electronic and electrical items.

IS:7084 Bitumen based filling compounds for electrical purposes.

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BS:442 - Specification for Terminals for electrical apparatus for Railway signalling purposes - British Standard Specification.

0.5 Wherever in this specification, any of the above mentioned specification is referred to by number only without mentioning the year of issue, the latest issue of that specification is implied; otherwise the particular issue referred to is meant.

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

1. SCOPE

1.1 This specification applies to "Electrical signalling and interlocking equipment for railway signalling". It lays down general requirements for standard equipment for quality in manufacture to ensure satisfactory performance under all tropical climatic conditions.

2. DRAWINGS AND SPECIFICATIONS

2.1 Drawings and specifications shall be in accordance with sub-clause 2.1 to 2.10 of IRS-S23(Part-I).

3.TERMINOLOGY

3.1 Terminology shall be in accordance with IS:9000(Part-I) and sub-clause 3.1 to 3.26 of IRS:S23 (Part-I).

4.GENERAL REQUIREMENTS

4.1 General requirements of the equipment shall be in accordance with sub clause 4.1 to 4.14 of IRS:S23(Part-I).

5.WORKMANSHIP

5.1 Worksmanship of the equipment shall be in accordance with sub clause 5.1 to 5.5 of IRS:S.23(Part-I).

6.DIMENSIONS,LIMITS AND FITS

6.1 Dimensions, limits and fits shall be in accordance with sub clause 6.1 of IRS:S23(Part-I).

7. MATERIALS

7.1 Insulating material for mountings and other purposes shall be tough, self-extinguishing and non-hygroscopic and shall be unaffected by changes in temperature between -25°C and + 100°C.

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7.2 Transparent material shall be permanently transparent, tough, self extinguishing and non-hygroscopic and shall be unaffected by changes in temperature between -25°C and +100.°C.

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

7.4 The material used in impregnation or insulating the coils shall be chemically and physically stable between temperature limits of -25°C and +100°C .

7.5 The insulating and or sealing compound shall not melt, flake or crack between temperature limit of -25°C and +100°C.

7.6 Any other material used for manufacture of equipment shall conform to relevant IRS or IS specification as far as practicable.

8. ELECTRO MAGNETIC COILS

8.1 Coils shall comply with Rated and Minimum voltage, current and resistance etc, as specified for individual equipment.

8.2 Unless otherwise stated, resistance of the coil shall not vary from that specified by more than ± 5% at 20°C (See Annexure A).

8.3 All coils shall be replaceable without affecting magnetic or mechanical adjustment of the equipment as far as practicable.

8.4 Coils shall be layer wound on suitable insulated formers or bobbins.

8.5 Coils shall be wound with best quality insulated wire to an approved specification and treated so as not to be injuriously affected under specified climatic conditions.

8.6 Coils shall be such that they shall be able to carry 125 percent of the rated current continuously and 200 percent of the rated current for four hours without injurious heating at ambient temperature of 27°C ± 2°C.

8.7 Coils shall preferably be formed from one continuous length of conductor. Not more than one joint shall be permitted in one coil. The joint shall be properly soldered and efficiently covered by an insulating covering. Flux used shall be non-corrosive.

8.8 Coils shall be suitably protected from injury liable to be caused by vibration as may be encountered in service.

8.9 Coils shall be provided with means to avoid their rotation on the cores.

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7.2 Transparent material shall be permanently transparent, tough, self extinguishing and non-hygroscopic and shall be unaffected by changes in temperature between -25°C and +100°C.

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

7.4 The material used in impregnation or insulating the coils shall be chemically and physically stable between temperature limits of -25°C and +100°C.

7.5 The insulating and or sealing compound shall not melt, flake or crack between temperature limit of -25°C and +100°C.

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8.7 Coils shall preferably be formed from one continuous length of conductor. Not more than one joint shall be permitted in one coil. The joint shall be properly soldered and efficiently covered by an insulating covering. Flux used shall be non-corrosive.

8.8 Coils shall be suitably protected from injury liable to be caused by vibration as may be encountered in service.

8.9 Coils shall be provided with means to avoid their rotation on the cores.

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8.10 Unless otherwise specified all coils shall be impregnated in vacuum under pressure with insulating varnish or compound in accordance with the established practice.

11 Coils shall have flexible leads of suitable length and strength with insulated sleeves and eye lets for termination. Coils of one design shall be similar in all respects.

12 The particulars of the coil in respect of size of wire, number of turns and resistance at 20°C shall be exhibited on a label indelibly marked and securely fixed.

9. ELECTRICAL CONTACTS AND SPRINGS.

1 Electrical contacts and springs shall be made from one of the following materials conforming to relevant approved specifications.

9.1 Contact springs

i) Phosphor-bronze.
ii) Nickel silver.
iii) Beryllium Copper.
iv) Any other suitable material conforming to an approved specification acceptable to purchaser.

9.2 Contacts

i) Silver.
ii) Silver graphite.
iii) Nickel silver.
iv) Phosphor-bronze.
v) Platinum.
vi) Any other suitable material conforming to an approved specification acceptable to purchaser.

The purchaser shall specify the following data:-

i) Contact capacity (Rated and Maximum)

ii) Contact pressure.

iii) Contact Resistance.

iv) Keeper if required

a) Clearance between the keeper and the contact.
b) Pressure of the spring on the keeper.

v) Type of contacts.
vi) Environmental conditions under which a contact is required to work.

vii) Any other additional information, if required.

Endurance limit of the contact spring shall be as nigh as possible.

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9.4 The spring shall have suitable temper.

9.5 The spring shall be of uniform thickness.

9.6 The spring shall be free from scratches and uneven surfaces.

9.7 The spring shall be suitably electro-plated after fabrication unless specified to contrary.

9.8 The spring shall be heat-treated to remove all stresses produced during forming.

9.9 Contact keeper springs where provided shall be of same material as the spring as far as possible.

9.10 The contact element wherever required shall be either soldered, rivetted and soldered or force fitted and spun.

9.11 Soldering of the spring assembly shall be done by non-corrosive solder compound without injurious heating of the spring element.

9.12 Contact elements shall be firmly secured so that they will not become loose in service and the material used for this purpose shall be such as not to cause corrosion.

9.13 The contact assembly shall be fit to stand a number of operations at the specified rate. The reduction in contact pressure and increase in contact resistance shall be within the specified limits indicated in para 14.3.1.3.

*Note Purchaser will indicate whether the contacts are required to make and break a capacitive or an inductive circuit; whether there is high inrush current when closing the contacts; speed of make and break of contacts and whether any Arc quenching facilities are required.

10. MAGNETIC MATERIALS

10.1 General.

10.1.1 The magnetic iron shall be carefully formed and suitably heat-treated.

10.1.2 The magnetic iron shall be smooth finished and shall be protected against corrosion under tropical climatic conditions.

10.1.3 The working faces wherever required shall be smooth and the surfaces shall be free in all respects.

10.2 Permanent Magnets:

10.2.1 Material for permanent magnets shall have high coercivity and shall not deteriorate in strength by more than 3 percent after a period of 10 years in service.

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10.2.2 The magnet steel shall be non-ageing within limits prescribed in para 10.2.1 and unless otherwise specified the percentage change in the strength shall not exceed more than 2% after it has been subjected to a continuous temperature of 100°C for a period of 600 hours.

10.2.3 The steel for permanent magnets may be from any of the following types depending on requirements:-

i) Chromium steel.
ii) Tungsten steel.
iii) Cobalt steel.
iv) Any suitable magnetic material conforming with above requirements.

10.3 Electromagnets.

10.3.1 Cores and armatures of electromagnets shall be made of high permeability iron with low coercive force.

10.3.2 There shall be no effect or residual magnetism on the performance of the equipment during its life time.

10.3.3 The electromagnet iron may be in any of the following form:-

i) Bar of silicon steel.
ii) Best Yorkshire wrought iron.
iii) Swedish charcoal iron.
iv) Electrical steel sheets.
v) Any other electro magnetic materials approved by the purchaser or his nominee.

11. TERMINALS

Unless otherwise specified the terminals shall comply with the following requirements:-

11.1 Terminals shall be of NUT type and shall comply with BS:442.-

11.2 Terminals shall be placed not less than 20 mm apart between centres.

11.3 Terminals shall be mounted on insulated block.

11.4 Terminals shall be fastened in their support in such a way that they cannot turn or become loose in service.

11.5 Wherever required terminal heads shall be sealed with insulating sealing compound conforming to IS:7084 Bitumen basedfilling compounds for electrical purposes.

11.6 Terminals shall be so located that there shall be no possibility of nuts unscrewed to the point of removal coming into contact with other metallic parts.

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11.7 Terminals shall be so located as to be easily accessible and located near the cable entry.

12. WIRING

12.1 The wiring for the complete instrument shall be as per Purchaser's Drawing and shall be properly connected to respective terminals. The wiring shall include wiring of the coils, internal wiring as per circuit diagram and wiring between internal circuit and external terminals.

12.2 All wiring shall be terminated in eyelets adequately protected against corrosion. The crimped lugs and the soldering terminals should be protected with insulated PVC sleeves of different colour coats or alpha numerical as desired by the Purchaser.

12.3 It shall be ensured that the wiring in no way prevents proper functioning of all working parts.

12.4 A wire entrance of an adequate size, conveniently located for an easy access to terminals and coils so arranged as to protect wire from mechanical injury shall be provided on all equipments. Such entry shall be plugged or sealed for the purpose of transit.

12.5 The wiring shall be protected against lubricants.

12.6 Wire shall be vulcanised rubber insulated or p.v.c insulated to approved specification unless particularly specified otherwise. The gauge of wire shall be specified by the Purchaser.

12.7 Wiring diagram, where required shall be securely attached to the inner face of the cover of the equipment and protected from the effects of lubricant and moisture.

13. PROTECTION AGAINST CORROSION

13.1 Protection against corrosion shall be as per clause 7.1 7.2, 7.3, 7.4, 7.5 and 7.6 of IRS:S23(Part-I).

14. INSPECTION AND TESTING.

14.1 General.

14.1.1 Testing facilities:

The manufacturer must have an organised system of manufacturing tests for the equipment and materials and also system of floor inspection to control the quality of the equipment in the factory while the equipment is being manufactured from stage to stage. Manufacturing tests may include tests other than those specified by the purchaser.

14.1.2 Semi finished materials.

The manufacturer shall ensure that finished or semi-finished material received from other sources used for manufacture are in accordance with the approved current specification

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unless otherwise indicated and with the details as on the drawings, if any. These may be subjected to tests at any stage of manufacture to verify their correctness at a laboratory approved by the Purchaser or his nominee.

14.1.3Access to inspection.

Purchaser or his nominee shall have free access to the works of the manufacturer at all reasonable times and shall be given facilities by the manufacturer to inspect the manufacture of the equipment at any stage of manufacture. He may reject in whole or part any work or material that does not conform to the terms of this specification or any other specification or requirement applicable and may order the same to be removed, replaced or altered at the expense of the manufacturer. All gauges, templates and other fixtures considered necessary by the Inspecting officer for the inspection of the equipment must be supplied by the manufacturer free of cost.

14.1.4 Materials & Appliances for Inspection and Testing.

The manufacturer, when required, shall supply free of charge, the material required for test, and shall, at his own cost, furnish and prepare the necessary test pieces and supply labour and appliances for such testing as may be carried out in his premises in accordance with this specification. Failing the existence of facilities at his own works, for making the prescribed tests, the manufacturer shall bear the cost of carrying out the tests in an approved laboratory, workshop or test house, as approved by the Purchaser or his nominee.

14.1.5 Tests requiring long periods.

In case some of the tests require long testing periods, the purchaser may demand a warranty for working of the equipment for at least 3 years in the field without any deterioration in performance and materials used in the equipment.

14.1.6 Approval of sample by purchaser.

14.1.6.1 For drawings marked as 'Advance' the contractor shall first prepare a sample for approval of the Purchaser or his nominee. Bulk manufacture shall be undertaken only after the sample has been approved in writing by the Purchaser or his nominee.

14.1.6.2 Before bulk manufacture is undertaken the manufacturer shall also undertake to carry out such modifications as may be considered necessary by the Purchaser in order to ensure the suitability of the product for the purpose it is required without any claim of additional charges.

14.1.7 Test Results:

The Inspecting officer may, at his discretion check test results obtained by the manufacturer at his works by independent tests at Government Test House or in a laboratory or workshop approved by the purchaser, and should the material so tested be found to be unsatisfactory, the cost of such

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tests will be borne by the manufacturer. Should the manufacturer's testing facilities be found in the Inspecting Officer's opinion unreliable, he is empowered to cancel any tests already carried out with these facilities and have these tests carried out at the manufacturer's expense at the Government Test House or in a laboratory or workshop approved by the purchaser, or his nominee.

14.2 Visual inspection.

14.2.1 General:

14.2.1.1 Visual inspection shall be carried out to ensure:

i) that the equipment is of sound construction and that reasonable precautions have been taken to prevent the ingress of foreign bodies.

ii) that adequate protection is provided for all components against possible damage due to laying the equipment on any face during maintenance.

iii) that the base of equipment rests squarely on the four corners while on flat surface.

iv) that general arrangement of assembly is in accordance with specified description and drawings.

v) that no part is damaged or cracked.

vi) that no metal fillings are present;

vii) that mating surfaces mate squarely;

viii) that parallel faces are in parallelism and true to the eyes.

ix) that all nuts are tight and locking washers are turned up correctly;

x) that the split pins are opened out.

xi) that dowel pins are provided wherever required

xii) that there is no sticking tendency of the operating parts.

xiii) that adjustments have been correctly made and

xiv) that working strokes are correct.

14.2.1.2 Surface finish may be inspected by comparison with pre-arranged standards.

14.2.2 Springs.

Visual inspection of contact springs shall be made to ensure:-

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i) that they are finished smooth and electro pl·t·j properly.

ii) that they are free from scratches.

iii) that they are of uniform thickness.

iv) that they are securely fixed.

v) that their alignment is correct.

vi) that make and break position of each contact is correct, and

vii) that specified pressure and lifts are correct.

14.2.3 Coils:

Visual inspection of coils shall be made to ensure

i) that coils have been correctly processed.

ii) that coils are satisfactory with respect to their size, position and length of leads.

iii) that the gauge or wire is correct;

iv) that the covering of wire is correct.

v) that the polarity of coils is correct.

vi) that inter layer insulation where required has been provided.

vii) that the leading ends of coils are provided with eyelets and are properly insulated.

viii) that suitable means have been provided to secure the coils against vibrations.

ix) that coils on laminated cores are not likely to be cut by laminations.

x) that leads are not stiff.

xi) that leads are not likely to foul the operating parts and

xii) that particulars of the coils in respect of size of wire, number of turns, resistance etc, have been clearly exhibited and indelibly marked and securely fixed.

4.2.4 Joints and soldering;

Visual inspection of joints and soldering shall be ade to ensure:-

i) that joints are properly made

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ii) that solder is feathered out making small dihedral angle.

iii) that soldered surface is bright and smooth;

iv) that there are few or no pin holes;

v) that there are no corners.

vi) that surplus solder is removed, and

vii) that there are no signs of corrosion.

14.2.5 Insulating materials:

14.2.5.1 Mouldings:

Visual inspection of mouldings shall be made to ensure

i) that the mouldings are free from surface imperfections, cracks, blisters and gas pockets, and show a uniform texture free from visible porosity.

ii) that there are no flash marks which would interfere with the behaviour of the moulding in use.

iii) that inserts are correctly positioned and

iv) that the material skin of the moulding is unbroken and bright.

14.2.5.2 Insulating Boards:

Visual inspection of insulating boards shall be made to ensure:

i) that material is uniformly and smoothly finished and shall be free from twisting, splitting and warping;

ii) that the ends are trimmed at right angles to the length and the fibre sheets are supplied trimmed with square edges unless otherwise specified and are reasonably free from internal fractures.

iii) that drilled and tapped holes machined surfaces do not show any sign of splitting cracking, chipping or raggedness and

iv) that sheets are flat and free from cracks flaws and other imperfections.

14.2.5.3 Insulating compound and varnishes:

It shall be visually inspected and ensured that the insulating compound and varnish used for impregnation is finished uniformly and is such that it shall not drip, flow, become tacky, crack or flake.

14.2.6 Magnets.

Visual inspection of magnets shall be made to ensure:

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i) that end clamps are squarely fixed;

ii) that assembly is made with necessary fits when required;

iii) that cores of magnets are rigid and

iv) that the machined surfaces are true.

14.2.7 Sealing and locking.

It shall be checked that the instrument is provided with sealing and/or locking arrangements as required.

14.2.8 Painting and lacquering:

Visual inspection shall be made to ensure:

i) that painting is as specified and does not affect the working parts, and

ii) that lacquering does not affect the working parts.

14.2.9 Wiring and terminals:

Visual inspection of wiring and terminals shall be made to ensure:

i) that the terminals or lugs are sufficiently clear so as to preclude the possibility of accidental contact with body or terminals.

ii) that necessary sealing compound has been applied, and

iii) that wiring diagram wherever required are supplied and securely fixed inside the cover.

14.2.10 Electroplating:

Visual inspection of electroplating shall be made to ensure:

i) that material protected against corrosion do not show any sign of peeling off of the protective coating, and

ii) that electroplating is free from blisters, pits, unplated areas, cloudy patches, cracks and stains.

14.2.11 Bearings:

Visual inspection of bearing shall be made to ensure

i) that bearings are properly aligned,

ii) that bearings are not tapering, and

iii) that the bearings are neither tight nor exceedingly slack and do not run hot.

14.2.12 End Play and clearance:

Visual inspection for end play and clearance shall be made to ensure:

i) that side play is correctly provided as to protect against jamming or erratic working, and

ii) that moving parts are free and clearances are adequate as not to cause any sticking undue rubbing and erratic behaviour of equipment in performance.

14.2.13 Stop and Stop pins:

Visual inspection for stops and stop pins shall be made to ensure:

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i) that stops are correctly provided.

ii) that necessary gaps and clearances are provided, and

iii) that non adjustable safety stop pins and adjustable stop screws are correct.

14.2.14 Greasing and oiling.

Visual inspection for greasing and oiling shall be made to ensure;

i) that greasing and oiling arrangements are correct, and

ii) that right quality of grease or oil has been used.

14.2.15 Gears:-

Visual inspection shall be made to ensure

i) that gears do not show any tight spot when manually operated;

ii) that there is no unusual backlash in the gearing arrangement, and

iii) that profiles are correct and properly finished.

14.2.16 Gaskets and Covers:

Visual inspection shall be made to ensure:

i) that gaskets and covers are correctly fitted, and

ii) that hasps fit correctly and ends of eye bolts are rivetted wherever required.

14.2.17 Marking & Labelling:

It shall be ensured that marking and labelling are in accordance with purchaser's requirements and specifications and correspond with the equipment.

14.2.18 Packing & Transhipment:

It shall be ensured:

i) that necessary precautions have been taken to avoid damage of moving parts in transit.

ii) that packing is of a size to permit convenient handling and is fit to withstand shock, dropping or bumping during transhipment and storage, and

iii) that contents are suitably protected against ingress or moisture.

14.3 Laboratory Test:

14.3.1 General:

Tests for following shall be carried out according to the approved specification in the laboratory in addition to the tests as required in the relevant specification for each raw material.

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14.3.1.1 Insulating materials, mouldings and Boards etc, should be

i) stable and function efficiently between the temperature limits of -25°C and +100°C

ii) self extinguishing non hygroscopic and unaffected by humidity.

iii) physically stable and chemically neutral and stable, and

iv) free from ageing effects.

4.3.1.2 Electromagnetic Coils shall be

i) properly impregnated, and

ii) unaffected by the tropical climatic conditions.

.3.1.3 The electrical contacts and springs:

The contacts shall be tested for 100,000 operations operated at the rate of ten makes and breaks per minute in a non-inductive circuit carrying the rated contact current and on completion of test:

i) the loss in contact pressure shall not exceed 2% 10% of the initial contact pressure, and

ii) the increase in contact resistance shall not exceed 100% of the initial contact resistance but in any case not more than 0.06 ohm at the end of 100,000 operations. The resistance of the contacts shall be measured when passing a current of 100 milliamperes through the contacts.

.1.4 That electroplating shall withstand the tropical climatic conditions.

.1.5 That the electromagnetic materials are not likely to be affected by ageing.

1.6 That the permanent magnets are of right strength and free from ageing effects.

2 Routine Tests:

Unless otherwise specified the following tests shall be applied to all wound coils and assemblies:

2.1 Applied High Voltage Test:

The Insulation of the assembled equipment shall withstand for one minute test voltage of 2000 volts r.m.s applied between all parts of electric circuits and other metallic parts insulated therefrom. The test voltage in case of electronic components and their assemblies shall be 500 volts r.m.s. The test voltage in case of Bell contacts for SALR shall be 1000 volts r.m.s.

. . . . . 15/-

ii) The test voltage in 14.3.2.1(i) shall be alternating of approximately sine wave form and of any frequency between 50 and 100 cycles per second.

14.3.2.2 Insulation Resistance Test.

i) This test shall be made immediately after the applied high voltage test specified in clause 14.3.2.1 and at a potential of not less than 500 volts DC.

ii) The insulation resistance shall be measured between individual insulated circuits and earth. The minimum value for each individual insulated circuit shall be as per not less than 10 megohms in any case specification

14.3.2.3 The test specified in sub clause 14.3.2.1 and 14.3.2.2 above shall be made on the assembled equipment at the manufacturer's works immediately before acceptance or despatch. The minimum insulation resistance specified in sub-clause 14.3.2.2(ii) shall hold good at an ambient temperature of 27°C and 37°C at 98% relative humidity.

14.3.2.4 Coil Resistance test: (*) → Table for IR - temp - RH

The resistance of the coil shall be tested by any standard method and it shall be corrected according to the standard temperature correction chart for comparison purpose with the specified resistance at 20°C.

14.3.2.5 Coil short circuit test:

On application of twice the normal voltage at suitable frequency to the terminals for one minute, it shall not show any excessive flow of current through the apparatus or any sign of heating, indicating short circuit within the equipment while working on alternating current.

14.3.3 Type tests.

All type tests must be carried out in accordance with approved specification as specified by the Purchaser.

14.3.3.1 The manufacturer shall submit to the purchaser or his nominee two prototype samples of the equipment and supply labour and appliance for their testing, if required, free of cost for type approval.

14.3.3.2 A type approval certificate (as per proforma enclosed in Annexure-1) may be issued to the manufacturer if the sample / all the prescribed tests necessary for type approval. Type approval certificate shall normally be valid for three years from the date of issue. The type approval certificate once issued shall not be valid if a change in the design, construction materials used or manufacturing process is made subsequently unless this change has the approval of the purchaser or his nee.

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14.3.3.3 If agreed to by the purchaser or his nominee, the manufacturer can furnish the test certificate from an approved test laboratory, giving the results of chemical analysis and other tests carried out on the equipment and/or components/ material to prove their conformity to the requirements of this specification.

14.3.4 Performance test.

14.3.4.1 The equipment shall work correctly for the purpose intended and shall show no sign of jamming any where or erratic behaviour under all possible simulated conditions environmentsvisualised as being met with in actual service conditions.

14.3.4.2 The equipment shall respond correctly with the rated current under the conditions referred to in para 14.3.4.1

14.3.4.3 Tests may also be carried out on actual installations to make sure that the equipment shall correctly perform the required function.

14.4 Investigation Tests.

14.4.1 General.

Investigation tests shall be carried out to examine the suitability of materials and methods of processing in fabrication and investigate other requirements, the apparatus may have to comply according to environmental conditions and shall be carried out on the first sample. It may also be performed on samples subsequently made, or if required by the purchaser, on the sample drawn out at random from the assembly line.

14.4.2 Life Test.

14.4.2.1 The equipment shall be operated for a number of times as specified by the purchaser at specified rate continuously and no part of it shall show any sign of erratic behaviour and shall pass the initial performance test.

14.4.2.2 The above test shall be made under different environmental conditions as specified in clause 14.4.4

14.4.3 Endurance Test:

14.4.3.1 The equipment shall be operated for the maximum number of times at specified rate continuously till the equipment or parts thereof begin to show signs of erratic behaviour and fail to pass the performance test.

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14.4.3.2 The above test shall be made under all different environmental conditions in the same manner as the life test and thereby show the factor of safety available for the equipment between its maximum tested useful life and its service life expectancy.

14.4.4 Environmental Tests.

14.4.4.1 Climatic Tests

The following tests shall be carried out in accordance with the standard sequence and procedure given in IS:9000 and the severity of the tests shall be as follows unless otherwise specified or agreed upon:

Test	Degree of Severity
i) Cold	$-25^{\circ} \pm 3^{\circ}C$
ii) Dry heat	$+100^{\circ} \pm 2^{\circ}C$
iii) Damp heat (Steady state)	$40^{\circ} \pm 2^{\circ}C$ RH 93 $^{+2}_{-3}$% Duration 56 days.
iv) Damp Heat (Cyclic)	Upper temperature $55^{\circ} \pm 2^{\circ}C$ RH 95 ± 3% 6 cycles (12 + 12 hrs) of 24 hrs each.
v) Storage	Duration: 12 months.
vi) Mould growth	Duration: 28 days.
vii) Salt atmosphere	Duration: 4 days
viii) Dust	Duration: 1 or 4 hours

14.4.4.2 Fine Mist Test:

Wherever required by the purchaser, the fine mist test shall be carried out as follows:-

i) The equipment shall be sprayed with cold tap water simultaneously on all its external surfaces.

ii) The spray shall be in the form of a fine mist such as would be reproduced by a spray gun.

iii) The duration of this test shall be one hour and the equipment shall be brought into operation for the later half of this period.

iv) At the conclusion of the test period, the equipment shall be visually examined for the moisture penetration and performance test shall be carried out.

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14.4.4.3 Driving Rain Test

Wherever required by the purchaser, driving rain test shall be carried out as follows:

The equipment shall be subjected to water sprayed on all external surfaces from shower heads to simulate the effect of driving rain as per IS:9000. Performance test shall be carried out during this test.

14.4.5 Bump Test:

Wherever required by the purchaser Bump Test shall be carried out as follows:

a) The equipment shall be mounted on the bump table on its normal shock or anti-vibration mounts in the normal operational attitude. When no such mounts are used, the equipment shall be mounted on the bump table in the same manner and attitude as when used in service.

b) The equipment shall be subjected to not less than 4000 bumps at a fixed rate of between two and four bumps per second with a free drop of at least twenty five millimeters (25 mm).

c) The test shall be followed by a visual inspection and performance test.

14.5 Acceptance Test.

Purchaser shall specify those tests which are required to be carried out on a sample from each lot and on each equipment before accepting the delivery.

15. Rejection.

Any of the materials which do not comply with the requirements of this specification may be rejected.

16. Marking and Identification:

16.1 Wherever possible an engraved name plate giving manufacturer's name, the IRS No. if any and serial No. and year of manufacture shall be attached on the outside of the apparatus in a conspicuous position

16.2 When the size of the part permits all metal parts shall have the letters IRS (where applicable) and the part number shown on the drawing stamped or cast thereon, in letters and figures of suitable size.

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Cast or malleable iron parts of Nylon phenolic and other moulded parts shall have in addition to the above, manufacturer's name or initial of trade mark moulded stamped or engraved thereon when the size of the part permits.

17. Packing

17.1 Equipment shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

18. Warranty

18.1 The contractor shall warrant the material covered by this specification to be free from defects in design material and workmanship under ordinary use and service, his obligation under this warranty being limited to replace free of cost, those parts which shall be found defective within one year after delivery to the purchaser. This warranty shall not apply to any apparatus which shall have been repaired or altered in any way by any one other than the manufacturer thereof, so as to affect in the contractor's judgement, its proper functioning or reliability, or which has been subjected to misuse negligence or accident.

19. Important Notes:

19.1 In the event of any requirement, information or specification, applicable to any part of the equipment being omitted from this specification, the manufacturer shall at once obtain from the purchaser, or his nominee, the required information, specification or drawing that may be necessary before proceeding further with the manufacture of the equipment.

Annex 'A'

MULTIPLIER CONSTANTS AND RECIPROCALS OF CONSTANTS FOR ANNEALED HIGH CONDUCTIVITY COPPER AND 3/4H OR H ALUMINIUM

(CLAUSES 8.2)

Temperature °C	Copper		Aluminium.	
	Multiplier constant.	Reciprocal of constant.	Multiplier constant	Reciprocal of constant
1.	2.	3.	4.	5.
10	1.0409	0.9607	1.0417	0.9600
10.5	1.0388	0.9627	1.0395	0.9626
11	1.0367	0.9646	1.0373	0.9640
11.5	1.0346	0.9666	1.0352	0.9660
12	1.0325	0.9686	1.0331	0.9680
12.5	1.0304	0.9705	1.0309	0.9700
13	1.0283	0.9725	1.0288	0.9720
13.5	1.0262	0.9745	1.0267	0.9740
14	1.0241	0.9764	1.0246	0.9760
14.5	1.0221	0.9784	1.0225	0.9780
15	1.0200	0.9804	1.0204	0.9800
15.5	1.0180	0.9823	1.0183	0.9820
16	1.0160	0.9843	1.0163	0.9840
16.5	1.0139	0.9862	1.0142	0.9860
17	1.0119	0.9882	1.0121	0.9880
17.5	1.0099	0.9902	1.0101	0.9900
18	1.0079	0.9921	1.0081	0.9920
18.5	1.0059	0.9941	1.0060	0.9940
19	1.0039	0.9961	1.0040	0.9960
19.5	1.0020	0.9980	1.0020	0.9980
20	1.0000	1.0000	1.0000	1.0000
20.5	0.9980	1.0020	0.9980	1.0020
21	0.9961	1.0039	0.9960	1.0040
21.5	0.9941	1.0059	0.9940	1.0060
22	0.9922	1.0079	0.9921	1.0080
22.5	0.9903	1.0098	0.9901	1.0100
23	0.9883	1.0118	0.9881	1.0120
23.5	0.9864	1.0138	0.9862	1.0140
24	0.9845	1.0157	0.9843	1.0160
24.5	0.9826	1.0177	0.9823	1.0180
25	0.9807	1.0197	0.9804	1.0200
25.5	0.9788	1.0216	0.9785	1.0220
26	0.9770	1.0236	0.9766	1.0240
26.5	0.9751	1.0255	0.9747	1.0260
27	0.9732	1.0275	0.9728	1.0280
27.5	0.9714	1.0295	0.9709	1.0300
28	0.9695	1.0314	0.9690	1.0320
28.5	0.9677	1.0334	0.9671	1.0340
29	0.9658	1.0354	0.9653	1.0360
29.5	0.9640	1.0373	0.9634	1.0380
30	0.9622	1.0393	0.9615	1.0400
30.5	0.9604	1.0413	0.9597	1.0420
31	0.9568	1.0432	0.9579	1.0440
31.5	0.9568	1.0452	0.9560	1.0460
32	0.9550	1.0472	0.9542	1.0480
32.5	0.9532	1.0491	0.9524	1.0500
33	0.9414	1.0511	0.9506	1.0520

.....21/-

1	2	3	4	5
34	0.9478	1.0550	0.9470	1.0560
34.5	0.9461	1.0570	0.9452	1.0580
35	0.9443	1.0589	0.9434	1.0600
35.5	0.9426	1.0609	0.9416	1.0620
36	0.9408	1.0629	0.9399	1.0640
36.5	0.9391	1.0648	0.9381	1.0660
37	0.9374	1.0668	0.9363	1.0680
37.5	0.9357	1.0688	0.9346	1.0700
38	0.9339	1.0707	0.9328	1.0720
38.5	0.9322	1.0727	0.9311	1.0740
39	0.9305	1.0747	0.9294	1.0760
39.5	0.9288	1.0766	0.9276	1.0780
40	0.9271	1.0786	0.9259	1.0800
42	0.9204	1.0865	0.9191	1.0880
44	0.9138	1.0943	0.9124	1.0960
46	0.9073	1.1022	0.9058	1.1040
48	0.9009	1.1100	0.8993	1.1120
50	0.8945	1.1179	0.8929	1.1200
55	0.8791	1.1376	0.8772	1.1400
60	0.8642	1.1572	0.8621	1.1600
65	0.8497	1.1758	0.8475	1.1800
70	0.8358	1.1965	0.8333	1.2000
75	0.8222	1.2162	0.8197	1.2200
80	0.8092	1.2358	0.8035	1.2400

Note:1 Given the resistance of a wire at T°C, the resistance at 20°C is calculated by multiplying the resistance at T°Cby the multiplier constant given in the above table. Conversely, given the resistance at 20°C the corresponding resistance at T°C is calculated by multiplying the resistance at 20°C by the reciprocal of constant for T°C, also given in the above table.

Note. 2 The temperature coefficient of resistance of copper varies slightly from sample to sample according to its exact conductivity. The figures given above are based on the international standard coefficient of 0.00393 per degree C at 20°C. The error using this table for copper within the range of conductivity 99 to 101 percent shall not exceed 0.06 per cent upto 30°C.

Similarly, the figures given above for aluminium are based on a temperature coefficient of resistance of 0.004 per degree 30°C.

The constants and reciprocals have also been found of value for other purposes such as the calculation of voltage drop on heated conductors and for these purposes only, values have been given at five degre intervals from 50°C to 70°C. It should be realised however, that their use may lead to errors upto 0.2 percent at the upper end of the range.

Contd.../-

Annexure-I
(Sub clause 14.3.3.2)

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH DESIGNS AND STANDARDS ORGANIZATION
Manak Nagar, Lucknow-226011

Serial No. _____

Name of Firm/Manufacturer _____

_____

Name of Equipment/Material _____

_____

Specification No. _____

Relaxation, (if any) _____

Date of submission of Test sample _____

Date of Approval of Test sample _____

Period of Validity _____

Signature of Approving
Officer with Seal

Date _____

केवल कार्यालय प्रयोग हेतु
FOR OFFICIAL USE ON

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Telephone : 91-522-2465761
Mobile : 09794863336
Rly. : 032-42666,
E-mail : dsig8rdso@ gmail.com

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

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

Date : 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 23/88 for Electrical & Electronic Based Signalling and Interlocking Equipment.

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In compliance to Vigilance Cell/RDSO's letter No. 13/Vig/Policy dtd. 26.07.16 & 08.09.16, Amendment No. 1 to the Specification No. IRS:S 23/88 for Electrical & Electronic based Signalling and Interlocking Equipment 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 - 23/88.

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

Copy to :- (Addresses given overleaf)

कार्यकारी निदेशक/गुणवत्ता आश्वासन /अ0अ0मा0सं0, लखनऊ	Executive Director/QA/S&T/RDSO/Lucknow
निदेशक / गुणवत्ता आश्वासन/सिगनल एवं दूरसंचार,/ अ0अ0मा0सं0, निकट इरकॉट, शंकर मार्केट के पीछे, 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 Bldg., 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-389350, Distt. Panchmahals (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 - 23/88.

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

Amendment No. 1

To

Specification No. IRS : S - 23/88

For

Electrical & Electronic based Signalling and Interlocking Equipment

Following new clause is added to the Specification No. IRS : S - 23/88 for Electrical & Electronic Based Signalling and Interlocking Equipment.

Clause No. 20

"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