GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

INDIAN RAILWAY STANDARD SPECIFICATION FOR SILVER IMPREGNATED GRAPHITE CONTACTS FOR RAILWAY SIGNALLING RELAYS

(TENTATIVE)

SERIAL NO. S67-85

0. FOREWORD

0.1 This specification is issued under the fixed serial No. S 67 the final number indicates the year of original adoption as standard or in the event of revision, the year of last revision.

ADOPTED 1985

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

IRS:S 34	-	Testing Railway Signalling Relays (General)
IRS:S 53	-	Tractive Armature, Shelf type DC Neutral Line Relay (Non-proved type) for Railway Signalling.
IRS:S 54	-	Tractive Armature, shelf type, Direct Current Neutral Track Relay (Non-proved type) for Railway Signalling.
IS:2	-	Rules for rounding off numerical values.
IS:5320	-	Fine silver ingots.
BS:1659	-	Tractive armature direct current neutral track and line relays for railway signalling.
BRS:930 series	-	Miniature relays plug-in type for Railway signalling purposes.

0.3 Whereas 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 the specification is implied; otherwise, the particular issue referred is meant.

0.4 This specification is chiefly intended to cover the technical provisions relating to the supply of materials and does not include all the necessary provisions of the contract.

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

1. SCOPE

1.1 This specification relates to the performance requirements of Silver Impregnated Graphite contacts for (a) Shelf Type Signalling Relays, conforming to specification, IRS:S 53, IRS:S 54 and BS:1659, (b) Miniature, plug-in type relays conforming to BRS:930 series specifications or other similar plug-in type relays of equivalent standards. (c) 'B' type relays of North Eastern Railway, Gorakhpur.

2. TERMINOLOGY

For the purposes of this standard specification, the following definition shall apply:-

2.1 Type Test

Tests carried out to prove conformity with the requirements of this specification. These are intended to prove the specific qualities and design.

2.2 Acceptance test

Tests carried out on samples selected from a lot for the purpose of acceptance of the lot.

2.3 Routine Test

Tests carried out to check the requirements which are likely to vary during production.

2.4 Lot

All the silver impregnated graphite contacts manufactured by the same firm during any one period using the same process and raw materials.

3. DIMENSIONS AND TOLERANCES

3.1 The contacts shall conform to the Shape/Size as shown in figures (Annexure – IA and IB – Figure 1 and 2) for reference only. However, the dimensions and tolerances shall conform to the drawings supplied by the purchaser, unless otherwise specified by the purchaser.

3.2 All tolerances shall be in accordance with the limits specified on the purchaser's drawings, or as agreed upon between the purchaser and the manufacturer. The manufacturer shall provide all 'GO' and 'NO GO' gauges to enable quick and accurate measurement of various dimensions.

4. WORKMANSHIP

4.1 The workmanship shall be of the best quality and shall be in accordance with the best current engineering practices.

4.2 The contacts shall be manufactured strictly in accordance with this specification and drawings supplied by the purchaser.

4.3 The contacts shall be manufactured from graphite block having characteristics specified in Cl. 5.

4.4 Only moulded grades of carbon shall be used. The use of extruded carbon is not permitted.

4.5 While machining contacts from the graphite block, the contacts should be cut axially i.e. in the direction of moulding pressure for obtaining uniform compressive strength. The working surface of the contact shall be perpendicular to the direction of moulding pressure.

4.6 The contacts shall be impregnated with silver salt / molten silver conforming to Cl. 6 under high vacuum.

4.7 In respect of contacts which are required to be soldered to the contact springs / contact holders, silver electroplating of thickness between 22 to 38 microns or as agreed upon between the purchaser and the manufacturer, shall be done at the back of the contact. Plating must not peel-off during or after the contact is soldered and it shall give a rigid bonded joint.

4.8 The working surface of contact shall be flat and parallel to the opposite surface. The flatness of this surface shall not deviate by more than 0.01 mm at any point on this surface.

5. GRAPHITE BLOCK

The contacts shall be machined out of best quality electro-graphite blocks of the type approved by the manufacturer of sig contacts and having the following characteristics.

5.1 The porosity and density of the graphite block shall be such that when impregnated with silver salt silver will produce uniformly distributed structures to comply with general requirements of silver impregnated graphite contacts as stipulated in Cl. 7.

5.2 The specific resistance of the block shall be such so as to give specific resistance of impregnated block as stipulated in Cl. 7.1.5.

5.3 The electro-graphite shall be of such purity that the contact shall not develop sticky, greasy, tarnished surface under service conditions.

6. IMPREGNATING MATERIALS

6.1 The silver salt/silver with which the electro-graphite blocks are impregnated shall be of high purity of Analytical Reagent for salt and fine grade 99.9% + purity of silver conforming to IS:5320.

7. GENERAL REQUIREMENTS OF SILVER IMPREGNATED GRAPHITE CONTACTS

7.1 Silver impregnated graphite contacts shall have the following characteristics:-

7.1.1 The contacts shall not fuse, or weld together with the silver metal contacts when tested as per Annexure III.

7.1.2 The contacts shall be free from defects such as cracks, seams, chipped off surfaces, inclusion of foreign materials, oxidized free surfaces and seams of carbon unimpregnated with silver, which would tend to increase the resistivity / contact resistance of contact material or which would interfere with the secure attachment of the contact with its mounting.

7.1.3 Distribution of silver throughout the volume of the contacts shall be uniform and free from defects seams, threads, globules of silver and on examination photomicrographs shall show uniform distribution of silver throughout the matrix of graphite.

7.1.4 The contact resistance between silver and silver impregnated graphite contacts when measured as per Annexure-IV shall not exceed 0.05 ohm when 100mA direct current is passed through the contacts, when a contact pressure of 28 grams is maintained between the contact and the spring.

7.1.5 The specific resistance when measured on a block of impregnated graphite (size cube of 3 cms) as per Annexure-II, shall not exceed 2×10^{-4} ohms-cms.

7.1.6 The compressive strength when measured on silver impregnated graphite contact shall not be less than 700 kg/cm^2.

7.1.7 The hardness when measured on representative silver impregnated graphite contacts shall not be less than 22 VPN.

7.1.8 The ash content of graphite shall not exceed 1.5% when measured as per Annexure-V.

7.1.9 The contacts shall contain 50% to 55% by weight of silver when determined as per Annexure-VI. The constituents shall be finally divided and evenly distributed throughout the contact. For this purpose, the contact element, excluding the silver plated portion only shall be taken into account.

7.1.10 Each individual contact shall be marked with manufacturer's identification marks, as approved by the purchaser at a suitable place, but not on the working surface.

8. FUNCTIONAL TEST

8.1. Shelf type line and track relays conforming to IRS:S 53, IRS:S 54 and BS:1659.

8.1.1 The contacts for shelf type line and track relays shall be subjected to endurance/life test as below, after being fitted on relays.

8.1.2 Low current breaking capacity :

The contacts shall be capable of breaking a current of 0.6 Ampere in a non-inductive DC circuit at 125 Volts, when operated minimum (one lakh) 1,00,000 times at the rate of 8 to 10 breaks per minute, when the relay is energized at 250% of the specified maximum pick up value in respect of track relays, and at 125% of the specified maximum pick-up current in respect of line relays.

8.1.3 High current breaking capacity:

The contacts shall be capable of breaking a non-inductive DC circuit load of 5 Amps at 50 volts when operated 100 times at the rate of 8 to 10 breaks per minute when the relay is energised at 250% of the specified maximum pickup value in respect of track relays, and at 125% of the specified maximum pick-up current in respect of line relays.

8.1.4 Inductive load breaking capacity:

The contacts shall be capable of making and breaking the current in an unquenched circuit consisting of three parallel connected shelf type line or one track relay as the case may be, when operated 100 times at a rate of 8 to 10 operations per minute, when the relay is energised at 250% of the maximum specified pick:-up value in respect of track relay, and 125% of the specified maximum pick up current in respect of line relays.

8.1.5 Endurance/Life Test:

The contacts shall be capable of withstanding endurance/life test for one lakh operations. The tests shall be carried out on two relays, one relay at room temperature and the other relay at 70°C±2°C. All the contacts of these relays shall be loaded and operated under conditions specified in clause 8.1.2 of this specification except one front contact of each relay which shall be loaded inductively as per clause 8.1.4. Contact resistance shall be measured initially as well as after every 10,000 operations up to completion of this test. During and on completion of the endurance test on these relays, the contact resistance shall not be more than 0.2 ohm and contact pressure shall not reduce below the minimum value specified in the relevant specification. The total number of observations, where contact resistance and pressure are not within the specified limits shall not exceed by more than 10% of the total number of observations provided the same are consistent.

8.2 Plug-in relays (BRS:930 series and 'B' type relays of N.E. Railway, Gorakhpur):

8.2.1 The contact for miniature plug-in type relays manufactured to BRS specification 930 series and for 'B' type relays of North Eastern Railway, Gorakhpur after being fitted on the relays shall 'be subjected to endurance/life tests as below.

8.2.2 Non-Inductive Current Breaking Capacity:

The contacts shall be capable of making and breaking a 12 Volts AC., 50 Hz circuit having a resistive load with a switch on-surge of 5 Ampere dropping to a maximum steady value of 2 Amps. After a further 110 ms (equivalent to a normal lamp circuit for a SL-17 lamp), when operated 10 lakh times at the rate of 8 to 10 operations per minute and the relay is energized at *20%* above rated voltage.

8.2.3 Inductive Load Breaking Capacity:

The contacts shall be capable of making and breaking the current in an unquenched circuit consisting of 3 parallel connected relays of the type under tests at the rate of 8 to 10 operations per minute for 10 lakh operations when the relay is energized at 20% above rated voltage.

8.2.4 Endurance/Life Test:

The contacts shall be capable of withstanding endurance/life test for 10 lakh operations. The tests shall be carried out on two relays, one relay at room temperature and the other relay at 70°C±2°C. All the contacts of these relays shall be loaded and operated under conditions specified in clause 8.2.2 of this specification except two front contacts of each relay which shall be loaded inductively as per clause 8.2.3. Contact resistance shall be measured initially as well as after every 1 lakh operations up to 4 lakhs and thereafter every 2 lakh operations up to completion of this test. During and on completion of the endurance test on these relays, the contact resistance shall not be more than 0.21 ohm (when measured at the external connections through the plug board) and contact pressure shall not reduce below the minimum value specified in the relevant specification. The total number of observations, where contact resistance and pressure are not within the specified limits shall not exceed by more than 10% of the total number of observations provided the same are consistent.

8.3 Continuous Current Rating - Front Contacts:

Each front contact of different types of relays as described in clauses 8.1 and 8.2 of this specification shall be capable of carrying 3 amperes continuously and 5 amperes for 30 seconds, without injurious heating when the relay is energised at 125 percent of the specified maximum pick-up current or as specified in the relevant specification.

9. VISUAL INSPECTION UNDER MICROSCOPE/MAGNASCOPE

9.1 Visual inspection of all contacts in each lot shall be carried out by observing lot of contacts under microscope/magnascope having suitable magnification to check the distribution of Silver Graphite matrix and to ensure that the contacts are free from defects such as cracks, seams, chipped-off surfaces. Precipitated silver, etc.

10. INSPECTION AND TESTING

10.1 Inspection and testing may be carried out, partly or wholly or in combination either at the place of manufacture or any railway laboratory or rational laboratory or any other approved laboratory or workshop, where suitable facilities exist, as mutually agreed upon between the purchaser and the supplier, in consultation with the inspecting authority.

11. TYPE TEST

11.1 Type test on silver impregnated graphite contacts shall comprise of the following tests, in addition to functional tests as per clause 8 of this specification:

(a)	Visual inspection	Cl. 9
(b)	Dimensional check as per relevant drawing	Cl. 3
(c)	Specific resistance	Cl. 7.1.5
(d)	Contact resistance (initial and final)	Cl. 7.1.4 & Cl. 8
(e)	Photo micrograph examination to check the structure	Cl. 7.1.2 & Cl. 7.1.3. Examination must be conducted and photo-micrographs shall be taken on 2 contacts in each lot.
(f)	Hardness	Cl. 7.1.7
(g)	Compressive Strength	Cl. 7.1.6.
(h)	Chemical analysis	Cl. 7.1.8 & 7.1.9

Note 1:- Minimum 25 number of contact samples for contacts shown in the figures of Annexure-IB and minimum 50 for contacts shown in the figures of Annexure-IA shall be supplied by the manufacturer duly random sampled by the Inspecting Authority according to the sampling plan described in Cl. 13.1 of this specification for conducting tests as per Clauses 8 and 11.1 of this specification.

Note 2:- Tests from (e) to (h) shall be conducted on the same and in sequence as indicated above.

11.1.1 Adhesion and solderability tests:

These tests shall be conducted in the case of contacts with silver electroplating at the back.

(a) Adhesion Test:- The contact when soldered to the contact spring without a clip/contact holder, the contact shall not be dislodged by the normal pull applied with the grip of a thumb and first finger.

This test shall be conducted on a minimum of 5 contacts.

(b) Solderability Test:- The contact when held in position on the contact spring by means of a clip/contact holder and its lugs bent, soldered over the bent lugs end portion shall give a rigid bonded joint.
This test shall be conducted on a minimum of 5 contacts.

11.2 Type test on graphite block shall consist of:

(a) Quality of graphite block - Cl. 5

Note:- For the purpose of checking the quality of graphite block, the manufacturer shall supply three tests blocks of size cube of 3 cms, cut in the direction as stipulated in Cl. 4.5, along with technical data of the graphite block.

11.3 Type test certificate shall be normally valid for a period of 3 years, unless changes are made in the design, any basic material, or process of manufacture affecting the various parameters of the contacts.

12. ROUTINE TEST

12.1 The manufacturer shall carry out the following tests on each sample lot of contacts as follows:

(a)	Visual inspection	Cl. 9	Measured on 5% of qty. of each lot subject to a minimum of 50, whichever is greater.
(b)	Dimensional check as per relevant drawing	Cl. 3	
(c)	Contact resistance	Cl. 7.1.4	
(d)	Specific resistance	Cl. 7.1.5 (Measured on Min. two silver impregnated graphite blocks of size cube of 3 cms. Impregnated along with same lot.	
(e)	Photo micrograph examination to check the structure	Cl. 7.1.2 & Cl. 7.1.3. (This examination must be checked on min. 50 contacts of each lot and photomicrographs shall be taken on not less than 10 contacts in each lot).	
(f)	Hardness	Cl. 7.1.7 (Measured on min. of 50 contacts of each lot).	
(g)	Compressive Strength	Cl. 7.1.6 (Measured on min. of 50 contacts of each lot).	
(h)	Chemical analysis	Cl. 7.1.8 & 7.1.9 (Measured on min. of 50 contacts of each lot).	
(i)	Adhesion and solderability test	Cl. 11.1.1 (On min. of 10 contacts of each test).	

Note:- Tests from (e) to (h) shall be conducted on the same samples and in sequence as indicated above.

12.1.1 Before contacts covered by this specification are offered for inspection, the manufacturer shall carry out the above routine tests and shall keep complete record for such tests for each lot and for different types of contacts, and a copy of

the record shall be made available to the inspecting authority as recorded results will enable the testing authority as to check upon and confirm the performance, reliability and quality of the product.

12.1.2 In case the inspecting officer observe that as a result of tests carried out by him, the recorded test results are not reasonably accurate in respect of the lot of contacts, he may reject the complete lot, and at his discretion, call upon the manufacturer to have the contacts retested before further lots are offered for inspection.

13. ACCEPTANCE TESTS

13.1 The inspecting officer shall carry out the following acceptance tests, as per the sampling plan below:-

Samples shall be selected at random from 2 bottles or 1/3rd the number of bottles containing contacts, whichever is greater, as offered for inspection. The lot shall be secured and sealed before the random samples are tested for acceptance test.

(a) Visual Inspection (Cl. 9):- On minimum of 10 and maximum of 50 contacts out of the sample random sampled by the Inspecting Officer.
(b) Dimensional Accuracy (Cl. 3):- Contacts will be inspected with the help of 'GO' and 'NO GO' gauges to be supplied by the manufacturer, subject to a minimum of 25 and maximum of 50 contacts out of the samples selected at random by the inspecting officer.
(c) Contact Resistance Test (Cl. 7.1.4):- On minimum of 25 and maximum of 50 shall be subjected to contact resistance test.
(d) Hardness Test (Cl. 7.1.7):- On minimum of 5 numbers and the maximum of 10 numbers.
(e) Compressive Strength (Cl. 7.1.6):- On minimum of 5 numbers and the maximum of 10 numbers.
(f) Chemical Composition Test (Cl. 7.1.8 & 7.1.9):- On minimum of 8 numbers and the maximum of 12 numbers for contacts shown in the figures of Annexure-IB and twice this quantity for contacts shown in the figures of Annexure-IA.
(g) Adhesion and Solderability Test (Cl. 11.1.1).
(h) Water soluble impurity test:- On maximum of 10 numbers as per Annexure 'Vll'.

Note:- Tests from (d) to (f) shall be conducted on the same samples and in sequence as indicated above.

14. REJECTION:

14.1 Any contact which does not comply with, in the opinion of the inspecting authority or the purchaser or his nominees, the requirements of this specification and any other specification stipulated in the order, may be rejected.

14.2 The manufacturer shall be responsible, at this entire cost, to rectify the defects or to replace the defective materials, where materials already inspected at manufacturer's place or any other place as agreed upon between the manufacturer

and purchaser and accepted, are subsequently on receipt of the consignee, found to be defective in respect of such of the characteristics of which tests were not made or made by the inspecting authority only on a percentage of accepted lot.

15. MARKING AND IDENTIFICATION

15.1 The following information shall be provided in a conspicuous place on a label fixed on every bottle and wrappers:-

(a) Manufacturer's name.
(b) Year and month of manufacture.
(c) Lot No.
(d) Type of contact.
(e) Quantity
(f) Handing instructions
(g) Type of solder to be used in respect of contacts required to be soldered to contact holder.

15.2 The package box containing bottles of contacts 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 con signer
(c) Requisition number and package number
(d) Purchaser's order reference and date
(e) Direction arrow for guidance during handing
(f) The package shall also be marked with the word “FRAGILE”.

16. STORAGE

16.1 The vital parameters of the contacts as stipulated in various clauses of this specification shall not be affected in reasonable storage conditions for minimum 5 years prior to being brought into use or used in relays without verification or examination.

17. PACKING

17.1 The contacts shall be so packed as to permit convenient handling and to protect against loss or damage and against ingress of moisture during transit and storage.

17.2 They shall be packed securely in glass bottles suitably wrapped with packing paper to avoid any damage during transit. The bottles shall be properly identified and sealed.

17.3 The quantity of contacts to be packed in each glass bottle shall be as agreed to by the manufacturer and purchaser.

17.4 The sterilized cotton shall be used in the bottles for packing purposes and it shall not come in direct touch with the contacts.

17.5 The lid of the bottle shall be of tinned sheet and of screwed type.

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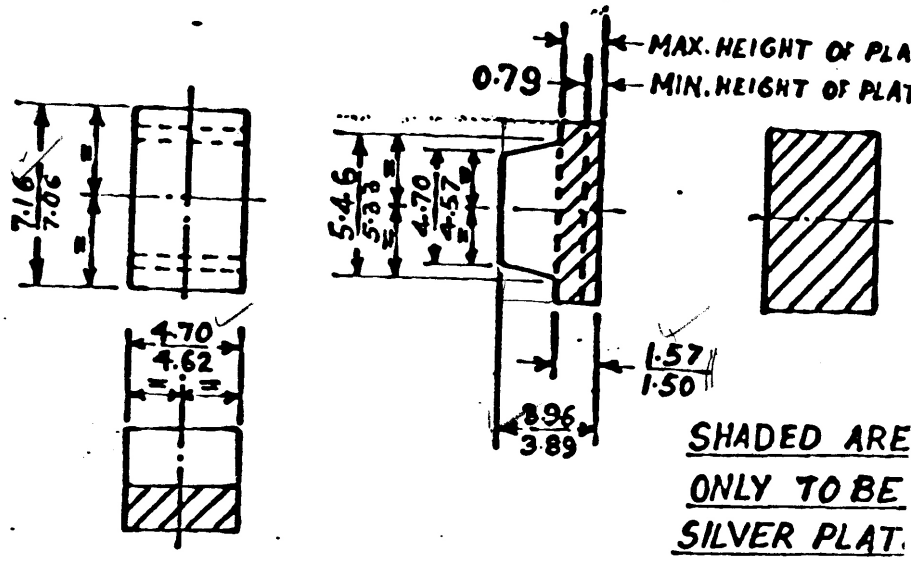
FOR

PLUG-IN TYPE RELAYS TO BRS: SPECIFICATION

[CLAUSE 3.1]



1. ALL DIMENSIONS ARE IN MILLIMETRES.

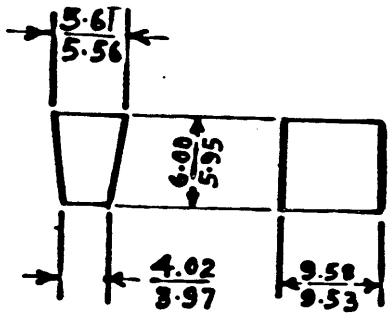
SILVER IMPREGNATED GRAPHITE CONTACT -

FOR

PLUG-IN TYPE RELAYS OF SIGNAL WORKSHO

GORAKHPUR CANTT

[CLAUSE 3.1]



1. ALL DIMENSIONS ARE IN MILLIMETRES.

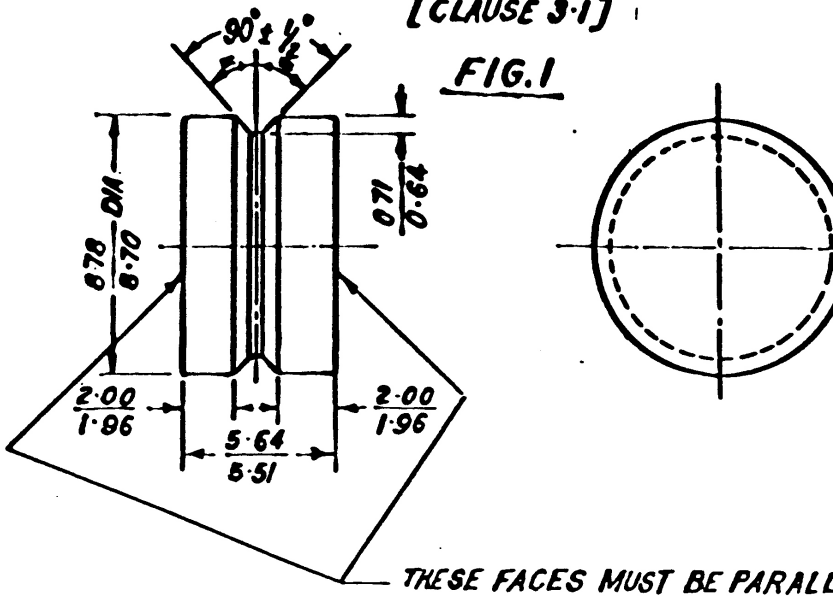
ANNEXURE -

Annexure-IA

SILVER IMPREGNATED GRAPHITE CONTACT FOR SHELF TYPE RELAYS TO IRS:S 53 & S 54 SPECN

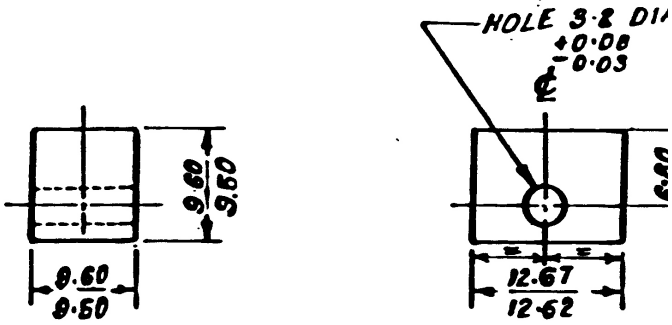
[CLAUSE 3·1]

FIG. 1



1. ALL DIMENSIONS ARE IN MILLIMETRES.

FIG. 2

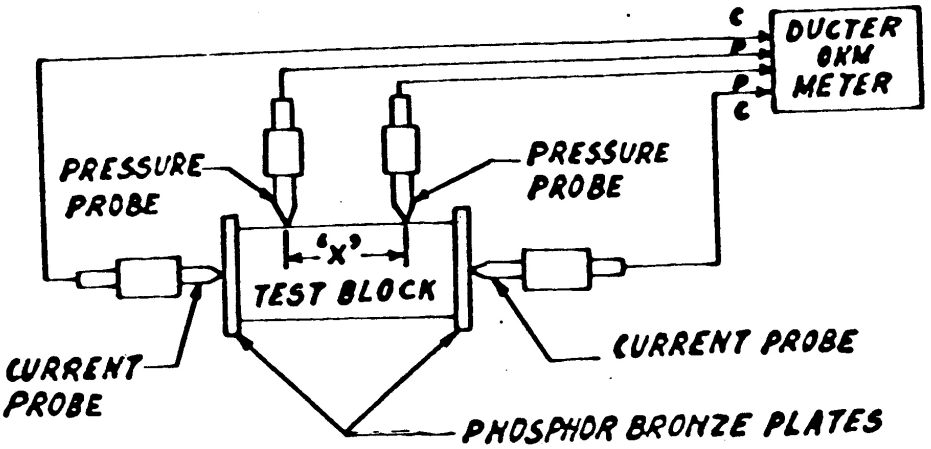


1-B

1. ALL DIMENSIONS ARE IN MILLIMETRES.

ANNEXURE -

MEASUREMENT OF SPECIFIC RESISTANCE OF SILVER IMPREGNATED GRAPHITE BLOCK (CLAUSE 7.1.5)



4. TEST BLOCK SIZE IS CUBE OF 3 Cms.
3. THREE READINGS EACH FOR SPECIFIC RESISTANCE SHALL BE TAKEN IN EACH OF THE THREE AXES OF GRAPHITE BLOCK, AND THE AVERAGE SPECIFIC RESISTANCE SHALL BE CALCULATED.
2. SPECIFIC RESISTANCE SHALL BE CALCULATED FROM THE FORMULA:

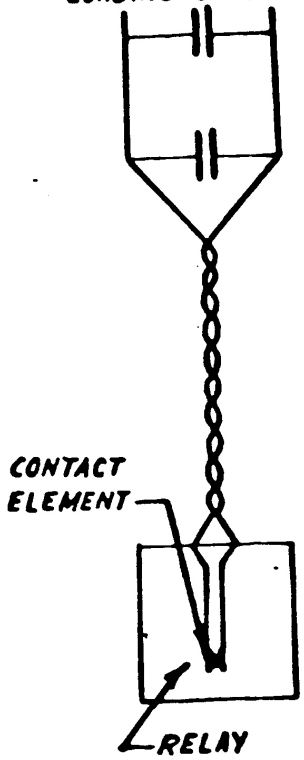
$$\text{SPECIFIC RESISTANCE (IN OHM-Cm.)} = \frac{\text{METER READING (IN OHM)} \times \text{CROSS SECTION AREA (IN SQ. Cm.)}}{\text{'X' DISTANCE IN Cm.}}$$

1. DISTANCE 'X' SHALL BE APPROXIMATELY 2 Cm.

ANNEXURE-II

GRAPHITE CONTACT (CLAUSE 7.1.1)

THIS TEST SHALL BE CARRIED OUT BY MEANS OF A DISCHARGE OF THE CAPACITOR. THE TWO ELEMENTS CONSTITUTING THE CONTACT SHALL BE CONNECTED WITH THE PLATES OF A BANK OF CAPACITORS OF THE VALUE OF 200 μF ACCORDING TO THE SKETCH SHOWN BELOW:-



CHARACTERISTICS OF THE CAPACITOR

(a) COMPOSITION: TWO ELEMENTS IN PARALLEL OF 100 μF ±5% EACH (ON DRY PAPER)
(b) OPERATING VOLTAGE: 600 V, DIRECT CURRENT
(c) INSULATION AT 500V AT +20°C : 100 MEG. OHMS
(d) RESISTANCE OF THE CONNECTIONS BETWEEN WINDINGS & TERMINALS: 100 MICRO-OHMS
(e) SELF-INDUCTANCE: FRACTION OF MICRO-HENRY

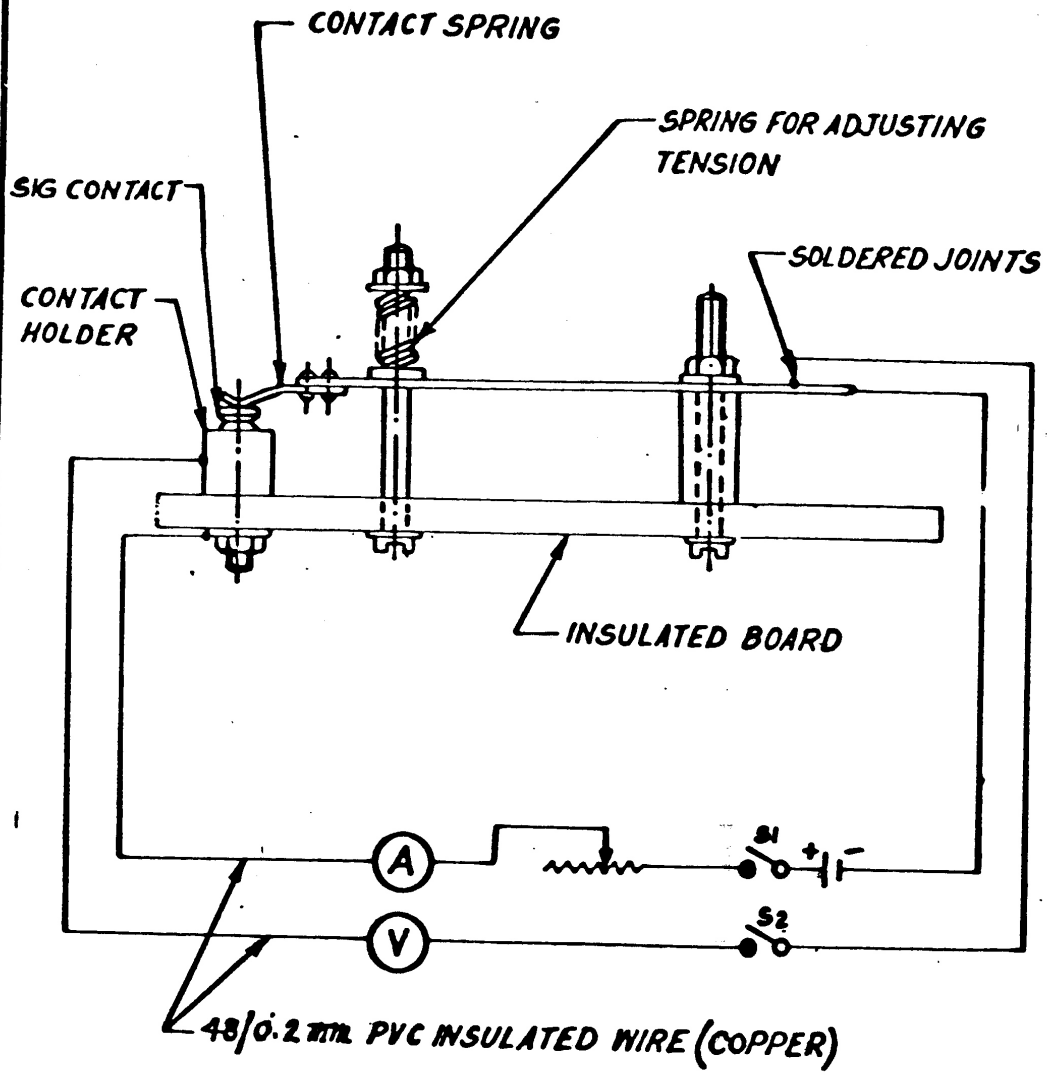
CHARACTERISTICS OF THE CONNECTIONS

(a) CONNECTIONS FOR THE PARALLEL ARRANGEMENT OF THE CAPACITORS CLIPS OF HEAVY SECTION (AT LEAST 25 mm^2).
(b) CONNECTION BETWEEN CAPACITORS AND RELAYS-TWO TWISTED CONDUCTORS EACH HAVING A LENGTH OF 60 Cm AND A SECTION OF 4 mm^2 TERMINATED AT EACH END BY A CONNECTION CORD FOR THE BRANCHES OF THE CAPACITORS AND THE RELAY TERMINALS.

THE BANK OF CAPACITORS SHALL BE CHARGED AT THE INDICATED DIRECT CURRENT INTENSITY AND THEN DISCHARGED INTO THE TWO CONTACT ELEMENTS WITH THE CONTACT IN MAKE POSITION TOGETHER BY ENERGISING THE RELAY AT THE WORKING CURRENT. THE RELAY CURRENT SHALL THEN BE INCREASED TO FOUR TIMES THE SPECIFIED MAXIMUM PICK-UP VALUE AND THEN DECREASED UNTILL THE FRONT CONTACTS OPEN. THIS CURRENT SHALL BE MEASURED AND COMPARED WITH THE DROP-AWAY. THIS TEST SHALL BE REPEATED 10 CONSECUTIVE TIMES. THE FIRST TEST SERIES SHALL BE CARRIED OUT WITH A CAPACITOR ENERGY OF 5 Ws AND THEN AT ENERGIES OF 10, 20, 40 Ws ETC. ACCORDING TO A GEOMETRICAL SERIES.

ANNEXURE-III

MEASUREMENT OF CONTACT RESISTANCE OF SILVER IMPREGNATED GRAPHITE CONTACT (CLAUSE 7.1.4)



A = 0–300 mA D.C. AMMETER
V = 0–25 mV D.C. VOLTMETER
(1 SMALLEST DIV = 0.5 mV)

ANNEXURE - IV

ANNEXURE-V

A. Determination of ash content of electro-graphite used in Silver Impregnated Graphite contacts (Cl. 7.1.8)

1. Take a clean and dry porcelain boat and weight it accurately in a chemical balance of very high accuracy.
   Let this weight by W1.
2. Reduce the sample of contacts to a fine powder.
3. Take about 1 gm of this powder in the porcelain.
   Let this weight by W2.
4. Place this porcelain boat in a furnace maintained at 900°C for about 2 hours and measure the weight of the porcelain boat when cool. Repeat this until a constant weight of this boat is obtained.

   Let this weight be W3.
   Results:
   (i) Weight of sample taken = W2-Wl
   (ii) Weight of resultant ash = W3-Wl

$$\text{Percentage of Ash Content} = \frac{W3-Wl}{W2-Wl} \times 100$$

B. Determination of carbon content in silver impregnated graphite contacts.

1. Take a clean and dry porcelain boat and weight it accurately in a chemical balance of very high accuracy.
   Let this weight by W1.
2. Reduce the sample of contacts to a fine powder.
3. Take about 5 grams of this powder in the porcelain boat and weight it accurately. Let this weight by W2.
   Weight of sample taken = W2- WI
4. Transfer this powder in 400 cc Pyrex beaker and through the spout add 40 cc of HNO_3-6N.
5. Initially heat the beaker slowly and then allow to boil until all the silver is dissolved and Nitric vapours are evolved.
6. Take a clean filter paper in a funnel and dry them for half an hour in an oven at 110°C. Weight it accurately.
   Let this weight be W3.
7. Pour the contents of the beaker in the funnel to filter out the solution.
8. Rinse the residual in the funnel with hot water until all traces of silver nitrate formed are removed.
9. The filtered liquid from the funnel must be collected carefully and kept inside for the determination of silver content as per Annexure-VI.
10. Dry the funnel with paper and filtrate and heat it in an oven at 110°C for about 3 hours till constant weight is obtained.
11. Weigh the funnel with paper and filtrate accurately.
    Let this weight be W4.
    Results:
    (i) Weight of sample taken = W2-Wl
    (ii) Weight of resultant ash = W4-W3

$$\text{Percentage of Carbon Content} = \frac{W4-W3}{W2-W1} \times 100$$

ANNEXURE-VI

DETERMINATION OF SILVER CONTENT IN SILVER IMPREGNATED GRAPHITE CONTACTS

1. Transfer the filtered liquid obtained in Step 9 of Annexure-V-B to a measuring jar and add distilled water to make up 250 cc of this solution.
2. Take 100 cc of this with a pipette and pour it into a 400 cc shallow beaker.
3. Evaporate the contents of the shallow beaker to a dry residue by warming.
4. Dissolve this residue with 4 CC ofHNO_3 - 6N and add distilled water to make up 200 cc of this solution and boil it.
5. Add 20 cc of HCL - 2N into this boiling solution and continue to stir for one hour so that a clear liquid is obtained.
6. Take a clean filter paper in a funnel and dry them for half an hour in an oven 110°C.
   Weigh it accurately.
   Let this weight be W5.
7. After cooling the solution, filter the same through the filter paper in a funnel.
8. Wash the filtrate in a funnel with HN03-N/I00 thoroughly until all traces of Cl^- ions have been washed away. Then a finish washing with cold water shall be done.
9. Finally wash the filtrate about 10 times, using 7 to 8 cc of pure acetone each time.
10. Dry the funnel with filtrate in an electric oven at 110°C for 40 minutes.
11. Cool the funnel with filtrate in a dessicator for one hour.
12. Weight the funnel with paper and filtrate of silver chloride accurately.
    Let this weight be W6.

Results:

(i) Weight of sample taken = W2-W1 (Annexure-V-B, Step 3)
(ii) Weight of silver chloride formed = W6-W5

$$\text{Percentage of Silver Content} = 188.15 \times \frac{W6-W5}{W2-W1}$$

ANNEXURE-'VII'

Determination of water-soluble impurity in silver impregnated graphite contact.

1. Weight of empty water glass (W_1)
2. Weight of water glass + Powder (W_2)
3. Weight of powder (W_2-W_1)
4. Weight of beaker (W_3)
5. Weight of beaker with impurity after drying (W_4)
6. Weight of impurity (W_4-W_3)
7. Percentage of water soluble impurity $\left[\frac{W_4 - W_3}{W_2 - W_1} \times 100 \right]$

AMENDMENT NO. 1 DATED 9-10-1997
TO
IRS:S 67-85 (TENTATIVE)
INDIAN RAILWAY STANDARD SPECIFICATION
FOR
SILVER IMPREGNATED GRAPHITE CONTACTS
FOR RAILWAY SIGNALLING RELAYS

ANNEXURE-V:

A – Determination of ash content of electro-graphite used in Silver Impregnated Graphite contacts (Cl. 7.1.8)

Existing Para 2 – Reduce the sample of contacts to a fine powder.
Amended Para 2 – Reduce the sample of electro-graphite to a fine powder.

Amendment No. 2 of January 2001 to
Indian Railways Standard Specification for Silver Impregnated Graphite Contacts for Railway Signalling Relays (Tentative)
Serial No. S 67-85

S.No.	Clause No.	Amendment
1.	4.7	Substitute existing clause by amended clause as under:- The thickness of silver plating shall be 50-60 microns.
2.	5.4 (New Clause)	New clause is added as under:- Unless otherwise approved by RDSO, base graphite grade 2020 shall only be used.
3.	5.5. (New Clause)	New clause is added as under:- Compressive strength of base graphite shall not be less than 800 kg/cm^2.
4.	7.1.9	Substitute existing clause by amended clause as under:- The contacts shall contain silver 50-60% for shelf type relays and 53-60% for plug-in type relays by weight when determined as per Annexure-VI. The constituents shall be finally divided and evenly distributed through out the contact. For this purpose the contact element, excluding the silver plated portion shall be taken into account.
5.	7.1.12 (New Clause)	New clause is added as under:- The water-soluble impurities in the finished contact shall be determined as outlined in the Annexure-VII. It shall not exceed 0.25%.
6.	7.1.13 (New Clause)	New clause is added as under:- 3-stage cleaning of SIG contact shall be done to remove water-soluble impurities after electroplating. **First Stage:-** Contacts shall be cleaned in ultrasonic bath using triple distilled water at 90-100^oC. This shall be repeated 5 times for 10 minutes duration each. Every time the water shall be changed. **Second Stage:-** Contacts shall be washed with water vapour of triple distilled water for a period of 15 minutes. **Third Stage:-** Contacts shall be dried in hot air for 30 minutes. The number of contacts in each stage shall be commensurated with the size of the apparatus for cleaning/drying of the contacts.
7.	11.1(i), 12.1(j) & 13.1(h) (New Clauses)	New clause is added as under:- Water-soluble impurities test .....Cl. 7.1.12.
8.	Annexure-VII (New)	Add new Annexure-VII For determination of water soluble impurities in SIG contacts.

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सत्यमेव जयते

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. 3 to the Specification No. IRS : S - 67/85 for Silver Impregnated Graphite Contacts for Railway Signalling Relays.

***

In compliance to Vigilance Cell/RDSO's letter No. 13/Vig/Policy dt.26.07.16 & 08.09.16, Amendment No. 3 to the Specification No. IRS: S-67/85 for Silver Impregnated Graphite Contacts for Railway Signalling Relays is hereby issued with the approval of competent authority for information & implementation please.

DA: Copy of Amendment No. 3 to the Specification No. IRS : S - 67/85.

(V. K. Agarwal)
Jt. Director/Signal
for Director General/Signal
28/07/17

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. Advance Technology Contacts, C-12, Wazirpur Industrial Area, Delhi – 110 052	
2. M/s. Ultra Carbon Industries, 17, Taratalla Road, Kolkata – 700 088.	
3. M/s. Pure Carbon Pvt. Ltd., I-5/20, Budge Budge Trunk Road, Chakmir(S), Mahestalla, 24, Parganas (SOUTH), West Bengal	
4. M/s. Relays SIG CONTACTS, G-14, Sector 6, Noida – 201 301 (UP)	

DA: Copy of Amendment No. 3 to the
Specification No. IRS : S - 67/85

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

Amendment No. 3

To

RDSO Specification No. IRS : S - 67/85

For

Silver Impregnated Graphite Contacts for Railway Signalling Relays

Following new clause is added to the Specification No. IRS : S - 67/85 for Silver Impregnated Graphite Contacts for Railway Signalling Relays.

Clause No. 18

"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. 3