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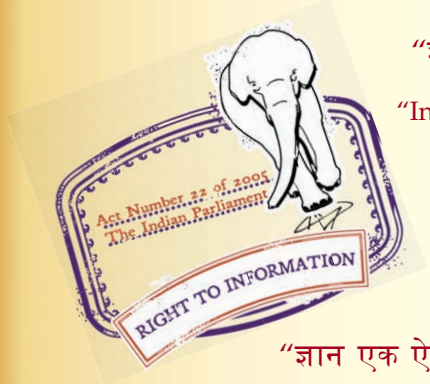

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"Knowledge is such a treasure which cannot be stolen"

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IS : 9926 - 1981
(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR FUSE-WIRE USED IN REWIRABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS

UDC 621·316·923

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price ~~Rs 5·00~~ G/L

March 1982

Indian Standard

SPECIFICATION FOR FUSE-WIRE USED IN REWIRABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS

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Indian Standard

SPECIFICATION FOR FUSE-WIRE USED IN REWIRABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 September 1981, after the draft finalized by the Low Voltage Switchgear and Controlgear Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard has been formulated to assist manufacturers regarding the optimum quality of rewirable fuse-wires intended for rewirable fuses and to ensure the proper selection of their sizes in use with carriers and bases for the desired protection of the circuit.

0.3 IS : 2086-1963* covers the requirements and methods of tests applicable for carriers and bases used in rewirable type electric fuses up to 650 volts. Dimensions of the carriers and bases are also covered in a separate Indian Standard, namely, IS : 8724-1978†. Fuse-wires manufactured in compliance with this standard are intended for use with carriers and bases conforming to the standards mentioned above.

0.4 This standard is intended to cover only the essential requirements and methods of tests for fuse-wires. At present, only the requirements relating to ETP copper (tinned) fuse-wires are covered. Fuse-wires of other materials in use shall also be permissible, though standardization of parameters relating to these are under consideration.

0.5 In the preparation of this standard assistance has been taken from I.T.D. Specification No. S/QH 112 'Standard specification for fuse-wire element', issued by the Indian Posts and Telegraphs Department.

0.6 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, 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 standard.

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*Carriers and bases used in rewirable type electric fuses up to 650 volts (*revised*).

†Dimensions for rewirable fuses.

‡Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the requirements of fuse-wires used in rewirable type electric fuses up to 650 V.

NOTE — This standard presently covers fuse-wires of ETP copper (tinned) only. Fuse-wires of other materials are under consideration.

1.2 Fuse-wires covered by this standard are intended for use in rewirable fuses conforming to IS : 2086-1963*.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions in addition to those given in IS : 1885 (Part XVII)-1978† and IS : 2086-1963* shall apply.

2.1 Fuse — A device that, by fusion of one or more of its specially designed and proportioned components, open the circuit in which it is inserted when the current through it exceeds a given value for a sufficient time. The fuse comprises all parts that form the complete device.

2.2 Fuse-Wire in Rewirable Fuse — That part of a rewirable fuse which is designed to melt and thus open the circuit.

2.3 Rated Current (Assigned to a Fuse-Wire) — A current used in the designation of a fuse-wire, namely, the current that the fuse-wire will carry continuously without deterioration.

3. MATERIAL

3.1 The fuse-wire shall be of electrolytic tough pitched (ETP) copper (tinned) conforming to IS : 8130-1976‡ (*see* Note under **1.1**).

3.2 The physical constants of the fuse-wire material are given below:

Characteristics	*ETP Copper*
Resistivity at 20°C	0·017 241 ohm mm^2/m
Density at 20°C	8·89 g/cm^3
Constant mass temperature coefficient of resistance at 20°C	0·003 93/°C
Coefficient of linear expansion	17×10^{-6}/°C

NOTE — The data provided here is for information only.

*Carriers and bases used in rewirable type electric fuses up to 650 volts (*revised*).
†Electrotechnical vocabulary : Part XVII Switchgear and controlgear (*revised*).
‡Conductors for insulated electric cables and flexible cords.

3.3 Finish

3.3.1 The fuse-wires shall be circular and shall have a uniform cross-section and free from pits, draw marks or any other harmful surface defects.

3.3.2 The tin coating layer shall be uniform, smooth, continuous and firmly adherent to the base copper material (*see* **7.4**).

3.4 Diameter and Maximum Allowable Resistance of Fuse-Wires

3.4.1 The diameter and maximum allowable resistance of the fuse-wire corresponding to their rated currents shall be as given in Table 1.

TABLE 1 DIAMETER AND MAXIMUM ALLOWABLE RESISTANCE OF FUSE-WIRES

(*Clauses* 3.4.1, 4.1, 7.2.1 *and* 7.3.1)

Rated Current of Fuse-Wire	Nominal Diameter	Tolerance ± *t*	Permissible Resistance in Ohms per Metre at 20°C	
			Max	*Min*
(1)	(2)	(3)	(4)	(5)
A	mm	mm		
6	0·20	0·003	0·564 4	0·525 0
10	0·35	0·004	0·183 4	0·173 0
16	0·50	0·005	0·089 8	0·084 8
20	0·63	0·006	0·056 6	0·053 5
25	0·75	0·008	0·040 0	0·037 6
32	0·85	0·009	0·031 1	0·029 3
40	1·25	0·011	0·014 3	0·013 6
63	1·50	0·015	0·009 9	0·009 4
80	1·80	0·018	0·006 9	0·006 5
100	2·00	0·020	0·005 6	0·005 3

4. ELECTRICAL PROPERTIES

4.1 The material used for making the fuse-wires shall conform to the properties given in **3.2**. The finished wire shall have a resistance within the limits stipulated in col 4 and 5 of Table 1 (*see* **7.3**).

5. PACKAGING

5.1 The wires shall preferably be supplied in spools weighing 10 g or 50 g. The spools shall be so packed that the fuse-wires are adequately protected against damage in ordinary handling and transit.

6. MARKING

6.1 Each package containing spools of fuse-wires shall be clearly marked with the following information:

a) Manufacturer's name or trade-mark;

b) The material of the fuse-wire, that is, copper;

c) The rated current; and

d) Length and weight of each spool.

6.1.1 The fuse-wires element may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control, which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. TESTS

7.0 The following shall constitute the list of tests to be done on the fuse-wires. These shall constitute type tests. For the purposes of acceptance tests, tests mentioned in (a), (b) and (c) below shall be done:

a) Visual examination (**7.1**),

b) Dimensional check (**7.2**),

c) Resistance test (**7.3**), and

d) Persulphate test (**7.4**).

A recommended sampling plan for the purposes of acceptance is given in Appendix A.

7.1 Visual Examination

7.1.1 A few samples selected at random shall be visually examined for compliance with **3.3**, **5** and **6**.

7.2 Dimensional Check

7.2.1 The diameter of the fuse-wire shall be checked for compliance with the values given in col 2 and 3 of Table 1 (*see also* Note under **7.3.2**). The diameter shall be within the tolerance mentioned therein.

7.3 Resistance Test

7.3.1 The measurement of resistance shall be carried out to an accuracy required by the values against which they are checked. The length of the samples shall be sufficient to give the required accuracy. The values measured shall conform to those given in Table 1.

7.3.2 The dc resistance of the fuse-wire shall be measured at room-temperature and corrected to 20°C by means of the appropriate correction factors (*see* Table 10 of IS : 8130-1976*).

NOTE — For fuse-wires of diameter over 0·85 mm, for acceptance test purposes, it is sufficient if check is made, by measurement of diameter only.

7.4 Persulphate Test for Tinned Copper Wire

7.4.1 The tests shall be done according to the method given in Appendix A of IS : 8130-1976*. The length of the test specimen shall be 500 mm for wires of all diameters. The weight of copper dissolved shall not exceed the permissible limits given in Table 2.

TABLE 2 PERMISSIBLE MASS OF COPPER DISSOLVED IN PERSULPHATE TEST

DIAMETER OF FUSE-WIRE	PERMISSIBLE MASS OF COPPER DISSOLVED (*Max*)
(1)	(2)
mm	g/m²
0·20 up to and including 0·50	5
0·63 up to and including 2·00	3

APPENDIX A

(*Clause* 7.0)

SAMPLING PLAN FOR ACCEPTANCE TESTS AND CRITERIA FOR CONFORMITY

A-1. LOT

A-1.1 In any consignment, all the spools of fuse-wire of the same ratings and manufactured under similar conditions of production submitted for the inspection at one time shall constitute a lot.

*Conductors for insulated electric cables and flexible cords.

A-1.2 From each lot, a certain number of samples given in col 2 of Table 3 shall be selected at random and subjected to acceptance tests. Any spool that fails to satisfy the requirement of either of the acceptance tests shall be considered as defective.

A-1.2.1 The fuse-wire shall be selected at random from the lot. For this purpose reference may be made to IS : 4905-1968*.

TABLE 3 SCALE OF SAMPLING

(*Clauses* A-1.2 *and* A-2.1)

Lot Size	First Stage	Second Stage				
N	n	n	$2n$	C_1	C_2	C_3
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Up to 150	5	5	10	0	2	2
151 to 500	8	8	16	0	2	2
501 to 1 000	13	13	26	0	2	2
100 1 to 3 000	20	20	40	0	3	4
300 1 and above	32	32	64	1	4	5

n = number of spools.

A-2. CRITERIA FOR CONFORMITY

A-2.1 Each of the samples selected in the first stage in accordance with col 2 of Table 3 shall be tested for acceptance. If the number of defectives is less than or equal to C_1, the lot shall be considered as conforming to this standard. If the number of defectives is equal to or greater than C_2, the lot shall be considered as not conforming to this standard. If the number of defectives in the first stage sample is between C_1 and C_2, a second set of samples shall be taken as in col 3 of Table 3, and tested. If the number of defectives in the two samples combined is less than C_3, the lot shall be considered as conforming to the requirements of the standard, otherwise the lot shall be rejected.

*Methods for random sampling.