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IS 2067 (1975): Wrought aluminium wire for electrical purposes [MTD 7: Light Metals and their Alloys]



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**IS : 2067 - 1975**  
**(Reaffirmed 2003)**

*Indian Standard*  
**SPECIFICATION FOR WROUGHT ALUMINIUM  
WIRE FOR ELECTRICAL PURPOSES**  
*(First Revision)*

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**BUREAU OF INDIAN STANDARDS**  
**MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG**  
**NEW DELHI 110002**

# *Indian Standard*

## SPECIFICATION FOR WROUGHT ALUMINIUM WIRE FOR ELECTRICAL PURPOSES

### ( *First Revision* )

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*Indian Standard*  
**SPECIFICATION FOR WROUGHT ALUMINIUM  
WIRE FOR ELECTRICAL PURPOSES**  
*( First Revision )*

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 26 September 1975, after the draft finalized by the Light Metals and Their Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** This standard was earlier published in 1962. In this revision, which covers wires used for electrical conductors such as insulated cables and winding wires for rotating machinery and transformers, clauses on electrical resistivity and mechanical properties have been revised. This standard does not cover wires used as overhead conductors which are covered in IS : 398-1961\*. Three tempers are specified in this standard. Depending on the end use, a proper temper of wire should be used.

**0.3** In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from BS 2627 : 1970 'Wrought aluminium for electrical purposes, wire' issued by the British Standards Institution.

**0.4** 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 : 2-1960†. 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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**1. SCOPE**

**1.1** This standard covers the requirements of aluminium wire for electrical conductors, and specifies the chemical composition, mechanical properties, electrical resistivity, and other general requirements.

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\*Specification for hard-drawn stranded aluminium and steel-cored aluminium conductors for overhead power transmission purposes ( revised ).

†Rules for rounding off numerical values ( revised ).

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## **2. TERMINOLOGY**

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Diameter of Wire** — The diameter of wire shall be the mean of two measurements at right angles taken at the same cross section.

**2.2 Wire** — Solid circular section that has been reduced by cold-drawing to a diameter up to and including 9 mm.

## **3. SUPPLY OF MATERIAL**

**3.1** General requirements relating to the supply of material are laid down in IS : 1387-1967\*.

## **4. CHEMICAL COMPOSITION**

**4.1** The material when analysed in accordance with IS : 504-1963† shall conform to Grade 1 of IS : 4026-1969‡.

## **5. CONDITION**

**5.1** The material shall be supplied in one of the following conditions as specified by the purchaser and shall have the mechanical properties as specified under 8:

Annealed	( O )
Three-quarter hard	( H3 )
Hard	( H4 )

## **6. FREEDOM FROM DEFECTS**

**6.1** The wire shall be free from all types of harmful defects such as scratches, pits and ovality of cross section beyond specified limit, and it shall be clean of all greases and oils. The wire shall have a smooth finish.

## **7. ELECTRICAL RESISTIVITY**

**7.1** When determined in accordance with 12.4 the electrical resistivity of the wire shall not exceed the values given in Table 1.

**Note** — 'Resistivity' is used in place of 'conductivity'. The international value of volume resistivity of annealed copper at 20°C is 0.017 241 ohm.mm<sup>2</sup>/m which equals 100 percent conductivity. This term means that a copper wire 1 mm<sup>2</sup> in cross section and one metre in length would have a resistance of 0.017 241 ohm. Conductivity values and their equivalent resistivity values are given in Appendix A for ready reference.

\*General requirements for the supply of metallurgical materials ( *first revision* ).

†Methods of chemical analysis of aluminium and its alloys ( *revised* ).

‡Specification for aluminium ingots ( EC grade ) ( *first revision* ).



**TABLE 1 ELECTRICAL RESISTIVITY OF WIRE**  
( Clause 7.1 )

CONDITION (1)	RESISTIVITY AT 20°C, Max (2) Microhm cm
O	2·826 4
H3	2·845
H4	2·845

## 8. MECHANICAL PROPERTIES

**8.1** The mechanical properties obtained from the test pieces selected and tested in accordance with 11 and 12 respectively shall be as given in Table 2.

**TABLE 2 MECHANICAL PROPERTIES**

CONDITION (1)	TENSILE STRENGTH (2) N/mm <sup>2</sup> ( kgf/mm <sup>2</sup> )	MINIMUM ELONGATION OR WRAPPING TEST (3)
O	70 to 100 ( 7·0 to 10·0 )	15 percent minimum elongation on 250 mm ( all sizes )
H3	100 to 150 ( 10·0 to 15·0 )	To pass the wrapping test ( all sizes )
H4	150 to 165 ( 15·0 to 17·0 )	To pass the wrapping test ( all sizes )

## 9. JOINTS

**9.1** Joint in the wire shall only be permitted before final drawing. No joint shall be allowed on finished wire.

## 10. TOLERANCES

**10.1** The diameter of round wire determined by means of a suitable micrometer and by taking the mean of the two measurements at right angles, made at the same cross section of a sample, taken from any part of a coil, reel or drum shall be as ordered subject to a tolerance of  $\pm 1$  percent.

**10.2** The difference between the maximum and minimum measurements, taken at the same cross section, shall not exceed 1 percent.

## 11. TEST SAMPLES

**11.1** The samples for the various tests such as tensile test, elongation and electrical resistivity as specified under 12 shall be selected as given in 11.1.1 and 11.1.2.

**11.1.1** The test samples shall be cut from a coil selected at random from a lot of coils of wires of same diameter produced under the same conditions and technique.

**11.1.2** The weight of each such lot shall not exceed the weights as given below. The test sample shall carry identification marks and shall not be annealed or mechanically worked except straightening for testing purposes:

<i>Wire Diameter</i>	<i>Maximum Weight of Lot</i>
0.5 mm up to and including 1.25 mm	250 kg
Above 1.25 mm	1 000 kg

The weight of lot for wire of standard diameter below 0.5 mm shall be as agreed to between the purchaser and the supplier.

## 12. TESTS

### 12.1 Tensile Test

**12.1.1** The breaking load of the test sample selected in 11.1.1 shall be determined by means of a tensile testing machine the accuracy of which may easily be checked and adjustments made, if necessary.

**12.1.2** When an automatic tensile testing machine is used, the load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not greater than 10 cm/min.

**12.1.3** When a hand-operated lever testing machine is used, 90 percent of the specified breaking load shall be applied quickly and the load shall then be increased steadily until the specimen breaks. The time taken to apply the last 10 percent of the load shall be approximately 15 seconds and the total time from the first application of load to fracture shall be approximately 20 seconds.

**12.2 Elongation Test** — The load shall be applied on straightened length of wire having an original gauge length of 250 mm. The elongation shall be measured on the gauge length after the fracture ends have been fitted together provided the fracture occurs between the gauge marks and not closer than 25 mm to either mark. If the fracture occurs outside these limits or the required elongation is not obtained, the test shall be discarded and a fresh sample tested. This test is applicable to annealed wires only.

**12.3 Wrapping Test** — The wire shall be wrapped round a wire of its own diameter to form a close helix of eight turns. Six turns shall then be unwrapped and again closely re-wrapped in the same direction as the first wrapping. The wire shall not break when tested thus.

**12.4 Electrical Resistivity** — The measurement of resistance shall be carried out to an accuracy of at least one in thousand. The length of sample selected for this test shall be sufficient to give the accuracy required and shall be suitable for the method of testing employed.

**12.4.1** Electrical resistivity shall be measured at room temperature as specified in IS : 3635-1966\* and corrected to 20°C.

### **13. RETESTS**

**13.1** If any test sample fails to comply with any of the test requirements for each such rejected coil, two samples from two different coils from the same lot shall be taken and one such sample shall be from the coil from which the original test sample was taken or otherwise the rejected coil shall be withdrawn by the suppliers. If both these test samples satisfy the test requirements the lot shall be deemed to comply with the requirements of this standard. If any of these two test samples fail to satisfy the requirements of this standard, the lot shall be rejected.

**13.2** All such rejected lots shall carry the identification marks and kept aside.

### **14. PACKING**

**14.1** The material shall be packed in coils.

**14.2** Coil size and weight shall be agreed upon by the supplier and the purchaser at the time of placing the order.

**14.3** Coils need be wrapped only when specified in the order. The quality and application of the wrapping material should be adequate to protect wire from damage incidental to normal handling and shipment.

### **15. MARKING**

**15.1** Each coil shall bear a tag showing the manufacturer's name or trademark, weight and tensile range of material. If additional information is required on the tags, it shall be arranged with the manufacturer at the time of purchase. The supplier shall furnish a certificate that the material supplied complies with the requirements of this specification.

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\*Methods of test for resistance of metallic electrical resistance materials.

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**15.2** The coil shall carry a distinguishing tag, wrapping or the like, to indicate if the coil is in two lengths and if the material contains any joints.

**15.3 BIS Certification Marking**

The product may also be marked with Standard Mark.

**15.3.1** The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

**APPENDIX A**

*( Clause 7.1 )*

**EQUIVALENT RESISTIVITY VALUES**

<b>MATERIAL</b>	<b>VOLUME CONDUCTIVITY, PERCENT</b>	<b>RESISTIVITY AT 20°C, microhm cm</b>	
<b>Copper</b>	100	1.724 1	
	{	60.6	2.845 0
61.0		2.826 4	
61.3		2.812 6	
<b>Aluminium</b>		61.4	2.808 0
61.5		2.803 5	
61.8		2.789 9	
62.0		2.780 9	

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**AMENDMENT NO. 1 OCTOBER 1993  
TO  
IS 2067 : 1975 SPECIFICATION FOR WROUGHT  
ALUMINIUM-WIRE FOR ELECTRICAL PURPOSES —  
SPECIFICATION**

*( First Revision )*

*( Clause 3.1, line 2 )* — Substitute 'IS 10259 : 1982 General conditions for delivery and inspection of aluminium and aluminium alloy products' for 'IS 1387 : 1967'.

*( Clause 4.1, line 2 )* — Substitute the words 'Grade 2 of IS 4026 : 1987' for 'Grade 1 of IS 4026 : 1969'.

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