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भारतीय मानक

पिटवां अल्मुनियम और अल्मुनियम मिश्रधातुएँ – सामान्य इंजीनियरी प्रयोजनों के लिए तार – विशिष्टि

(तीसरा पुनरीक्षण)

Indian Standard

WROUGHT ALUMINIUM AND ALUMINIUM ALLOYS — WIRE FOR GENERAL ENGINEERING PURPOSES — SPECIFICATION

(Third Revision)

UDC 669·71-426-131

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

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Price Group 3

Light Metals and Their Alloys Sectional Committee, MTD 7

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Light Metals and Their Alloys Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1956 and subsequently revised in 1966 and 1977. In this revision the following modifications have been made:

a) A separate clause, giving all the referred standards, have been added.
b) The requirements of test certificate for each consignment have been added.
c) Old designations have been deleted.
d) 'MKS' units have been replaced by SI units.
e) Wrapping test has been introduced.
f) Clauses on chemical composition, chemical analysis and mechanical properties have been modified.

Some characteristics and typical uses of the alloys have been listed in Annex A, for guidance only.

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 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

WROUGHT ALUMINIUM AND ALUMINIUM ALLOYS — WIRE FOR GENERAL ENGINEERING PURPOSES — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the requirements for wrought aluminium and aluminium alloy wire for general engineering purposes.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
504 : 1963	Methods of chemical analysis of aluminium and its alloys (*revised*)
1755 : 1983	Method for wrapping test for metallic wire (*first revision*)
2525 : 1982	Dimension of wrought aluminium and aluminium alloy wire (*first revision*)
2658 : 1964	Method for tensile test for aluminium and aluminium alloy wire
5047 (Part 1) : 1986	Glossary of terms relating to aluminium and aluminium alloys: Part 1 Unwrought and wrought metals (*second revision*)
5052 : 1969	Temper designations of aluminium and its alloys
10259 : 1982	General condition for delivery and inspection of aluminium and aluminium alloy products
11035 : 1984	Methods for spectrographic analysis of wrought aluminium alloys

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions as given in IS 5047 (Part 1) : 1986 shall apply.

3.1 Wire

Solid circular section that has been reduced by cold drawing to a diameter up to and including 6 mm.

4 SUPPLY OF MATERIAL

General requirements for the supply of material shall conform to IS 10259 : 1982.

5 CONDITION OF DELIVERY

The material shall be supplied in the condition as specified by the purchaser in the condition laid down in Table 2. While specifying the condition, temper designations as laid down in IS 5052 : 1969 shall be followed.

6 FREEDOM FROM DEFECTS

Wires shall be sound and free from harmful defects.

7 DIMENSIONS AND TOLERANCES

The diameters of wire and the permissible tolerances shall be as given in IS 2525 : 1982.

8 CHEMICAL COMPOSITION

8.1 The chemical composition of wire shall conform to any one of the designations given in Table 1.

8.2 The chemical composition shall be determined by methods specified in IS 504 : 1963 or IS 11035 : 1984 or any other established instrumental/chemical method. In case of dispute, the procedure specified in IS 504 : 1963 shall be the referee method.

9 MECHANICAL PROPERTIES

9.1 The mechanical properties of the drawn wire shall comply with the requirements as given in Table 2.

Table 1 Chemical Composition

(*Clause* 8.1)

(Composition limits are in percent maximum unless shown otherwise)

Designation	Aluminium	Copper	Magnesium	Silicon	Iron	Manganese	Zinc	Titanium[1)]	Chromium	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
19000	99·0 *Min*	0·1	—	0·5	0·6	0·1	—	—	—	Ti[1)] + V = 0·07 Total impurities = 1·00
19500	99·5 *Min*	0·05	—	0·3	0·4	0·05	—	—	—	Ti[1)] + V = 0·07 Total impurities = 0·50
24345	Remainder	**3·8-5·0**	**0·2-0·8**	**0·5-1·2**	0·7	**0·5-1·2**	0·2	0·3	0·3	Ti[1)] + Cr = 0·3
31000	Remainder	0·1	0·1	0·6	0·7	**0·8-1·5**	0·2	0·2	0·2	Ti[1)] + Cr = 0·2
43000	Remainder	0·1	0·2	**4·5-6·0**	0·6	0·5	0·2	—	—	
46000	Remainder	0·1	0·2	**10·0-13·0**	0·6	0·5	0·2	—	—	
52000	Remainder	0·1	**1·7-2·6**	0·6	0·5	0·5	0·2	0·2	0·25	Cr + Mn = 0·5
53000	Remainder	0·1	**2·8-4·0**	0·6	0·5	0·5	0·2	0·2	0·25	Cr + Mn = 0·5
55000	Remainder	0·1	**4·5-5·5**	0·6	0·7	0·5	0·2	0·2	0·25	Cr + Mn = 0·5
55380	Remainder	0·1	**5·0-5·5**	—	—	**0·6-1·0**	0·2	**0·05-0·20** (Ti-only)	**0·05-0·20**	Si + Fe = 0·40
63400	Remainder	0·1	**0·4-0·9**	**0·3-0·7**	0·6	0·3	0·2	0·2	0·1	
64430	Remainder	0·1	**0·4-1·2**	**0·6-1·3**	0·6	**0·4-1·0**	0·1	0·2	0·25	
65032	Remainder	**0·15-0·4**	**0·7-1·2**	**0·4-0·8**	0·7	**0·2-0·8**	0·2	0·2	**0·15-0·35**	Either Mn or Cr shall be present

NOTES

1 It is the responsibility of the supplier to ensure that any element not specially limited is not present in any amount such as is generally accepted as having an adverse effect on the product. If the purchaser's requirements necessitate limits for any element not specified these should be agreed to between the supplier and the purchaser.

2 Major alloying elements have been printed in bold face type.

[1)] Including other grain refining elements, if any.

9.2 The tensile test shall be carried out in accordance with IS 2658 : 1964 on the test samples selected as per the procedure specified in **10.**

9.3 Wrapping Test

The wrapping test shall be carried out in accordance with IS 1755 : 1983.

9.3.1 The test sample of the wire in the condition as supplied, when wrapped around a wire of its own diameter to form a close helix of eight turns and then totally unwrapped, shall not break or show any crack.

10 SELECTION OF TEST SAMPLES

10.0 Before the test samples are cut off, they shall be marked to identify them with the lot or heat-treatment batch they represent. The test sample shall be taken from the wire as supplied, and shall not be annealed or mechanically worked (except for straightening) before they are tested.

10.1 Wire of Aluminium and Non-heat-Treatable Aluminium Alloys

Wire of the same diameter, of the same grade and manufactured under similar conditions, shall be grouped into lots weighing up to 250 kg and one test sample shall be cut off from a coil or length selected from each lot.

10.2 Wire of Heat-Treatable Aluminium Alloys

10.2.0 One test sample shall be cut from a coil selected from each heat-treatment batch.

10.2.1 For material supplied in the 'O' condition, the test sample shall be tested on the O, W or WP condition as specified by the purchaser. The test samples, after heat-treatment, shall not be mechanically worked (except for straightening) before being tested.

Table 2 Mechanical Properties

(*Clauses* 5 *and* 9.1)

Designation	Condition	Tensile Strength, MPa	
		Min	*Max*
(1)	(2)	(3)	(4)
19000	M	—	—
	O	—	100
	H4	140	—
19500	M	—	—
	O	—	95
	H4	135	—
24345	W	380	—
	WP	425	—
31000	M	—	—
	O	—	125
	H4	170	—
43000	M	—	—
46000	M	—	—
52000	M	—	—
	O	165	215
	H4	260	—
53000	M	—	—
55000	M	—	—
	O	245	310
	H2	310	355
	H4	380	—
55380	M	—	—
63400	W	140	—
	WP	180	—
	WD	280	—
64430	W	200	—
	WP	295	—
	WDP	355	—
65032	WDP	355	—

10.2.1.1 Material in the 'O' condition, when heat-treated, may be expected to develop properties of the order of 15 MPa less than the specified properties for the W and WP condition as appropriate.

10.2.2 For the material supplied in the W condition, the test samples shall be tested in the condition as supplied unless the purchaser has specified that he requires the test samples to be tested in the WP condition.

10.2.3 For material supplied in WP, WD or WDP condition, the test samples shall be tested in the condition as supplied.

11 RETESTS

11.1 Should any one of the test pieces first selected fail to conform to the mechanical test two further samples from the same lot shall be selected for testing, one of which shall be from the coil or length from which the original test sample was taken, unless that coil or length has been withdrawn by the supplier.

11.1.1 For heat-treatable alloys the supplier shall have the right, if he so desires, to reheat-treat the material before two further samples are selected.

11.2 Should the test pieces from both these additional samples conform to the values prescribed, the lot represented by the test samples shall be deemed to comply with the requirements of mechanical properties. Should a test piece from either of these additional samples fail, the lot represented by the test samples shall be liable to rejection.

12 MARKING

12.1 Wires shall be suitably marked with the following details:

a) Indication of source of manufacture,
b) Designation and condition of the material, and
c) Lot number.

12.2 Wires may also be marked with the Standard Mark.

13 TEST CERTIFICATE

The manufacturer/supplier shall supply test certificate along with each consignment giving information like designation and condition of material and lot number with corresponding chemical composition and mechanical test results.

ANNEX A

(*Foreword*)

CHARACTERISTICS AND TYPICAL USES OF ALLOYS

Designation	*Characteristics*	*Available Forms*	*Typical Uses*
(1)	(2)	(3)	(4)
19000	Commercially pure aluminium, very ductile in annealed or extruded condition, excellent resistant to corrosion	Sheet, plate, extruded tube, wire, forgings	Panelling and moulding equipment for food, chemical and brewing industries, architectural and builders hardwares, fasteners, welding wires and electrical appliances, rivet wires, spray gun wires
19500	High purity aluminium, more resistant to corrosion than other grades	Sheet, plate, extrusion, tube, wire, rolled, rod and forgings	Food, chemical, brewing and processing equipments, marine fittings, pressed and anodized utility items, jewellery, rivet for aircraft purpose, filler rods for inert gas arc welding
24345	Combines high strength with fair ductility in the solution treated condition when forming can be done and parts subsequently aged	Sheet, plate extrusion tube, wire and forgings	Structures where high mechanical properties are of utmost importance, screw machine products, fasteners and rivets for aircraft purposes
31000	Stronger and harder than 19000 but has good workability, weldability and corrosion resistance	Sheet, plate, extrusion, wire tube, rolled rods and forgings	General purposes alloy for moderate strength applications, pressure vessels, builders hardware, vehicle panelling, rivet wires, fasteners, filler rods for inert gas arc welding
43000	Easily formed and blends itself well to welding, brazing and soldering	Wire and rolled rod	Filler wires for brazing and soldering, welding rods, spray gun wires
46000	Easily formed and blends itself well to welding, brazing and soldering	Wire and rolled rod	Filler wires for brazing, welding rods, spray gun wires
52000	Ductile in soft condition, but work hardens rapidly becoming extremely tough. Has high resistance to corrosion in marine atmosphere	Sheet, plate extrusion tube, wire and forgings	Panelling and structures, rivet wires, zippers, grills, fasteners, filler rods for inert gas arc welding
53000	Ductile in soft condition, but work hardens rapidly becoming extremely tough. Has high resistance to corrosion in marine atmosphere	Sheet, plate, extrusion tube, wire and forgings	Shipbuilding, rivets, pressure vessels, welding rods, zippers, screen wires, grills, fasteners

Designation (1)	*Characteristics* (2)	*Available Forms* (3)	*Typical Uses* (4)
55000	Ductile in soft condition, but work hardens rapidly becoming extremely tough. Has high resistance to corrosion in marine atmosphere	Sheet, plate, extrusion tube, wire and forgings	Shipbuilding and other applications demanding moderately high strength with good corrosion resistance rivets, zippers, welding wires, screen wires, grills, fasteners
55380	High strength and excellent corrosion resistance in marine atmosphere, excellent weldability	Wire and rolled rods	Filler wires for welding rivets, screen wires
63400	Suitable for intricate extruded sections of medium strength, forms well in W condition, highly resistant to corrosion	Extrusion, wire, tube rolled rod and forgings	Architectural uses and other similar applications where surface finish is important and medium strength would suffice. Builders hardware
64430	A medium-strength alloy with good mechanical properties, corrosion resistance and weldability	Sheet, plate, extrusion, tube, wire and forgings	Structural applications of all kinds, such as road and rail transport vehicles, bridges, cranes, roof trusses, rivets, etc. Cargo containers, milk containers, deep drawn containers and flooring
65032	Medium strength alloy with good mechanical properties and corrosion resistance	Extrusion, wire, tube forgings and rolled	Structural applications of all kinds, rivets, builders hardwares and fastener rods

Standard Mark

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 Standard 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 BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

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Revision of Indian Standards

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