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IS 1284 (1975): Wrought aluminium alloy bolt and screw stock for general engineering purposes [MTD 7: Light Metals and their Alloys]



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Indian Standard
SPECIFICATION FOR
WROUGHT ALUMINIUM ALLOY BOLT AND
SCREW STOCK (FOR GENERAL
ENGINEERING PURPOSES)
(*Second Revision*)

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INDIAN STANDARDS INSTITUTION
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Indian Standard

SPECIFICATION FOR WROUGHT ALUMINIUM ALLOY BOLT AND SCREW STOCK (FOR GENERAL ENGINEERING PURPOSES) (*Second Revision*)

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Indian Standard
SPECIFICATION FOR
WROUGHT ALUMINIUM ALLOY BOLT AND
SCREW STOCK (FOR GENERAL
ENGINEERING PURPOSES)
(*Second Revision*)

0. FOREWORD

0.1 This Indian Standard (Second 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 first issued in 1956 and subsequently revised in 1966. Further revision became necessary as a number of new alloys which have found wide applications in engineering industries were required to be included. Tables on requirements for mechanical properties were reviewed and modified wherever necessary. The main modifications which have been made in this revision are as follows:

- a) Four alloys 24534 (H14), 53000 (N5), 64423 and 65032 (H20) have been added.
- b) Heat-treatable alloy 65400 (HB19) which has a limited use has been excluded.
- c) Code designations given in IS : 6051-1970* have been adopted in this standard. However, the relevant old Indian Standard designations have also been included for ready reference.
- d) Metric units of System International d'Unites (SI) have been used. These have been adopted by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). It is expected that they will become the generally accepted metric units throughout the world. However, during the transition period, equivalent figures in kgf/mm^2 have also been given along with the SI units to facilitate smooth change over.

*Code for designation of aluminium and its alloys.

0.3 Some characteristics and typical uses of the alloys have been listed in Appendix A.

0.4 The major alloying elements have been printed in bold face in the chemical composition (*see* Table 1).

0.5 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 1473 : 1972 'Wrought aluminium and aluminium alloys, rivet, bolt and screw stock' issued by the British Standards Institution.

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 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.

1. SCOPE

1.1 This standard covers the requirements of wrought aluminium alloy, bolt and screw stock in various tempers.

2. TERMINOLOGY

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

2.1 Bolt Stock — Round bar or wire suitable for the manufacture of bolts.

2.2 Screw Stock — Round bar or wire suitable for the manufacture of screws by machining.

2.3 Heat Treatment Batch — A quantity of material of one alloy, of the nearly same dimensions and produced in the same way, solution-treated in one furnace load, or such material so solution-treated and subsequently precipitation-treated in one furnace load. More than one heat treatment batch may comprise a furnace load.

3. SUPPLY OF MATERIAL

3.1 General requirements for the supply of aluminium and aluminium alloy products shall conform to IS : 1387-1967†.

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

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

4. FREEDOM FROM DEFECTS

4.1 Bolt and screw stock shall be sound and free from harmful defects.

5. CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

5.1 The chemical composition and mechanical properties of bolt and screw stock shall comply with the requirements of Table 1 and Table 2 respectively.

5.1.1 The chemical analysis of the material shall be carried out in accordance with IS : 504-1963*.

5.1.2 Mechanical tests shall be carried out as specified in 8.

6. DIMENSIONS AND TOLERANCES

6.1 The diameters of bolt and screw stock and the tolerances permissible on them shall be as laid down in IS : 3577-1967†.

7. SELECTION OF TEST SAMPLES

7.0 The test samples shall be selected as specified in 7.1. Before the test samples are cut off, they shall be marked to identify them with the lot they represent.

7.1 Bolt and Screw Stock of Nonheat-Treatable Aluminium Alloys — Bolt and screw stock 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 from a coil or length selected.

7.2 Bolt and Screw Stock of Heat-Treatable Aluminium Alloys — Bolt and screw stock 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 from a coil or length selected from each lot. The test sample shall be tested in the W or WP condition as specified by the purchaser, except that for alloy 24534 (HB14) and 24345 (HB15) the head-forming test shall be made on the test sample not more than two hours after solution treatment. The test samples shall not be mechanically worked or further heat-treated before they are tested.

8. MECHANICAL TESTS

8.0 The following tests shall be made on the test pieces prepared from test samples selected as specified in 7.

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

†Diameters of wrought aluminium and aluminium alloys, rivet, bolt and screw stock.

TABLE 1 CHEMICAL COMPOSITION OF WROUGHT ALUMINIUM ALLOY BOLT AND SCREW STOCK (FOR GENERAL ENGINEERING PURPOSES)

(Clause 5.1)

(Composition limits are in percent maximum, unless shown as a range)

ALLOY DESIGNATION		COPPER	MAGNESIUM	SILICON	IRON	MANGANESE	ZINC	TITANIUM AND/OR OTHER GRAIN REFINING ELEMENTS	CHROMIUM	ALUMINIUM	REMARKS
New	Old										
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
24345	HB15	3·8-5·0	0·2-0·8	0·5-1·2	0·7	0·3-1·2	0·2	*0·3	*0·3	Remainder	—
24534	HB14	3·5-4·7	0·4-1·2	0·2-0·7	0·7	0·4-1·0	0·2	0·3	—	Remainder	—
53000	NB5	0·1	2·8-4·0	0·6	0·5	0·5	0·2	0·2	0·25	Remainder	Cr + Mn = 0·5
55000	NB6	0·1	4·5-5·5	0·6	0·5	0·5	0·2	0·2	0·25	Remainder	Cr + Mn = 0·5
64423	—	0·5-1·0	0·5-1·3	0·7-1·3	0·8	1·0	—	—	—	Remainder	—
64430	HB30	0·1	0·4-1·2	0·6-1·3	0·6	0·4-1·0	0·1	0·2	0·25	Remainder	—
65032	HB20	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	Remainder	Either Mn or Cr shall be present

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

*Titanium and/or other grain refining elements and/or chromium may be present at the option of the supplier provided the total content does not exceed 0·3 percent.

**TABLE 2 MECHANICAL PROPERTIES OF WROUGHT ALUMINIUM ALLOY, BOLT AND
SCREW STOCK (FOR GENERAL ENGINEERING PURPOSES)**

(Clause 5.1)

(Single figures indicate minimum value)

ALLOY DESIGNATION		*CONDITION OF TEST	DIAMETER		0.2 PERCENT PROOF STRESS	TENSILE STRENGTH
New	Old		Over	Up to and Including		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			mm	mm	N/mm ² (kgf/mm ²)	N/mm ² (kgf/mm ²)
24345	HB15	WP	—	12.5	345 (35.0)	430 (44.0)
24534	HB14	W	—	12.5	220 (22.5)	375 (38.0)
53000	NB5	H2	—	12.5	220 (22.5)	270-320 (27.5-32.5)
55000	NB6	H2	—	12.5	240 (24.5)	310-355 (31.5-36.0)
64423	—	WP	—	12.5	265 (27.0)	330 (33.5)
64430	HB30	WP	— 6.3	6.3 12.5	255 (26.0) 270 (27.5)	295 (30.0) 310 (31.5)
65032	HB20	WP	— 6.3	6.3 12.5	225 (23.0) 235 (24.0)	265 (27.0) 280 (28.5)

NOTE — N/mm² (newton per square millimetre) = 0.102/kgf/mm².

*For temper designation, refer to IS : 5052-1969 ' Temper designations of aluminium and its alloys '.

8.1 Tensile Test — The tensile test shall be carried out and the proof stress determined thereby in accordance with IS : 1816-1961*.

8.2 Head-Forming Test (Applicable Only to Bolt and Screw Stock 1·60 mm Diameter and Above) — For bolt and screw stock 1·60 to 6·50 mm diameter, a length of bolt and screw stock equal to the diameter shall be flattened cold in an axial direction until the diameter of the flattened part shall be equal to 1·8 times the original diameter.

9. RETESTS

9.1 Should any one of the test pieces first selected fail to conform to the mechanical tests, two further samples from the same lot shall be selected for testing, one of which shall be from the bolt and screw stock from which the original test sample was taken, unless that has been withdrawn by the supplier.

9.1.1 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.

9.2 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 the test piece from either of these additional samples fail, the lot represented by the test samples shall be liable to rejection.

10. MARKING

10.1 If required, bolt and screw stock may be suitably marked for identification, with the name of the manufacturer, grade and condition of the material. The supplier shall furnish a certificate that the material supplied complies with the requirements of this specification.

10.1.1 The material may also be marked with the ISI Certification Mark. The supplier's certification (*see 10.1*) shall be implied if the material is certified under 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.

*Method for tensile test for light metals and their alloys.

APPENDIX A

(Clause 0.3)

CHARACTERISTICS AND TYPICAL USES OF ALUMINIUM ALLOYS

ALLOY DESIGNATION		CHARACTERISTICS	AVAILABLE FORMS	TYPICAL USES
New	Old			
24345	HB15	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	Heavy duty forgings, structures where high mechanical properties are of utmost importance, aircraft application of clad sheets, extrusions and armaments
24534	HB14	A strong alloy that is aged naturally at room temperature after solution treatment and has fair ductility in this condition	Extrusion, Tube, Wire, Rolled Rod, and Forgings	Stressed parts in aircraft and other structures where high strength is of primary consideration
53000	NB5	Ductile in soft condition, but workhardens rapidly becoming extremely tough. Has high resistance to corrosive attack, especially in marine atmosphere	Sheet, Extrusion, Tube, Wire, and Rolled Rod	Shipbuilding; rivets, pressure vessels and other processing tanks; cryogenics, and welded structures
55000	NB6	-do-	Sheet, Plate, Wire, and Forgings	Shipbuilding and other applications demanding moderately high strength with good corrosion resistance; rivets, zippers, welding wire, etc

ALLOY DESIGNATION		CHARACTERISTICS	AVAILABLE FORMS	TYPICAL USES
New	Old			
64423	—	Stronger than 64430 (H30) and has superior machinability	Extrusions	Applications requiring good strength and machinability such as textile machinery components
64430	HB30	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	HB20	Medium-strength alloy similar to 64430	Sheet, Plate, Extrusion, Tube, Forgings, and Wire	Similar to 64430

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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