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IS 7428 (1974): Aluminium alloy extruded bars, rods and sections (for aircraft purposes) (Alloy 24345) [MTD 7: Light Metals and their Alloys]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 7428 - 1974

Indian Standard
SPECIFICATION FOR
ALUMINIUM ALLOY EXTRUDED BARS, RODS
AND SECTIONS FOR AIRCRAFT PURPOSES
(ALLOY NO. 24345)

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INDIAN STANDARDS INSTITUTION
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Indian Standard

SPECIFICATION FOR ALUMINIUM ALLOY EXTRUDED BARS, RODS AND SECTIONS FOR AIRCRAFT PURPOSES (ALLOY NO. 24345)

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Indian Standard

SPECIFICATION FOR ALUMINIUM ALLOY EXTRUDED BARS, RODS AND SECTIONS FOR AIRCRAFT PURPOSES (ALLOY NO. 24345)

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 22 July 1974, 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 Extruded bars, rods and sections of aluminium-copper-magnesium-silicon-manganese alloy is used in the manufacture of different types of aircraft. Need was, therefore, felt to lay down requirements for such material supplied in different conditions.

0.3 During the preparation of this standard, assistance has been derived from the following standards :

BS L 102 : 1970 Bars and extruded sections Al-Cu-Mg-Si-Mn alloy (solution treated and aged at room temperature). British Standards Institution.

BS 3L 65 : 1970 Bars and extruded sections of Al-Cu-Mg-Si-Mn alloy (solution treated and precipitation treated). British Standards Institution.

GOST 4783 : 1968 Extruded aluminium and aluminium alloy rods. Gosudarstvennyj Komitet Standartov, Mer i Izmeritel'nyh Priborou SSSR (USSR).

IS : 3436-1966 Aluminium-clad aluminium alloy sheet, strip and coil for aircraft purposes. Indian Standards Institution.

0.4 This standard contains clause 6.1 (Note) which calls for agreement between the supplier and the purchaser.

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 : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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

1. SCOPE

1.1 This standard covers the requirements of the following two grades of aluminium-copper-magnesium-silicon-manganese alloy extruded bars, rods and sections :

Grade I — Extruded bars, rods and sections (for general applications)

Grade II — Extruded bars, rods and sections for highly stressed applications

2. INSPECTION AND TESTING PROCEDURE

2.1 This standard shall be used in conjunction with IS : 7429-1974*.

3. MATERIAL

3.1 The extruded bars, rods and sections shall be made from the alloy specified under 5.1.

4. MANUFACTURE AND FREEDOM FROM DEFECTS

4.1 If manufacture by multihole die is not acceptable, it should be stated on the order.

4.2 All extruded bars, rods and sections shall be free from harmful defects. Any extruded bar, rod or section should be rejected for faults in the manufacture, notwithstanding its conformity to chemical composition and mechanical properties.

5. CHEMICAL COMPOSITION

5.1 The chemical composition of each cast of the alloy No. 24345 used for bars, rods and sections, when analyzed in accordance with IS : 504-1963† shall be as given below :

<i>Element</i>	<i>Percent</i>
Copper	3.8-5.0
Magnesium	0.20-0.8
Silicon	0.50-1.2
Manganese	0.30-1.2
Iron, <i>Max</i>	0.7
‡Zinc, <i>Max</i>	0.2
‡Titanium and/or other grain refining elements, <i>Max</i>	0.2
‡Chromium, <i>Max</i>	0.10
Aluminium	Remainder

*Procedure for inspection and testing of aluminium and aluminium alloy extruded bars, rods and sections (for aircraft purposes).

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

‡Subject to the discretion of the Inspection Authority, determination of these elements need be made on a small proportion only of the samples analyzed.

5.1.1 For the making of alloy for extruded bars, rods and sections, aluminium complying with IS : 23-1965* and alloying constituents with or without approved scrap (at the discretion of the manufacturer) shall be used.

6. CONDITION

6.1 Extruded bars, rods and sections shall be supplied in one of the following conditions :

Condition	Grade I	Grade II
W	Solution treated, straightened and subsequently aged at room temperature but not control stretched	Solution treated, control stretched (1.5 to 2.5 per cent) and subsequently aged at room temperature
WP	Solution treated, straightened and subsequently precipitation treated but not control stretched	Solution treated, control stretched (1.5 to 2.5 per cent) and subsequently precipitation treated

NOTE — Any other condition may be agreed to between the supplier and the purchaser. The condition and the grade in which the material is to be supplied shall be stated by the purchaser in the order.

7. HEAT-TREATMENT

7.1 The bars, rods and sections shall be heat-treated as follows :

W Condition :

- Solution-treat by heating at a temperature of $505 \pm 5^\circ\text{C}$ and quench in water at a temperature not exceeding 40°C .
- Age at room temperature for not less than 5 days.

WP Condition :

- Solution-treat by heating at a temperature of $505 \pm 5^\circ\text{C}$ and quench in water at a temperature not exceeding 40°C .
- Precipitation-treat by heating for requisite period (*see Note*) at a temperature between 160 and 190°C .

NOTE — The following temperatures and duration have been found appropriate:

Temperature ($^\circ\text{C}$)	Duration (hours)
160	12-20
175	9-12
190	3-6

*Specification for primary (virgin) aluminium notched bars and ingots for remelting for aircraft purposes (*second revision*).

8. MECHANICAL PROPERTIES

8.1 Tensile Test — The mechanical properties obtained from test pieces selected, prepared and tested in accordance with IS : 7429-1974* shall not be less than the values given in Table 1 according to the conditions for both the grades.

TABLE 1 MECHANICAL PROPERTIES

CONDI- TION	DIAMETER OR MINOR SECTIONAL DIMENSION OF THE EXTRUDED BAR, ROD OR SECTION		0.2 PERCENT PROOF STRESS, Min		TENSILE STRENGTH, Min		ELONGATION ON GAUGE LENGTH, PERCENT, Min	
			N/mm ²	kgf/mm ²	N/mm ² kgf/mm ²		50 mm	5.65√S ₀
					(6)	(7)		
(1)	Over mm	Up to and Including mm	(4)	(5)	(6)	(7)	(8)	(9)
W	—	5	235	24.0	345	35.0	11	—
	5	10	235	24.0	375	38.0	11	—
	10	20	260	26.5	400	40.5	12	12
	20	75	270	27.5	410	41.5	—	14
	75	150	260	26.5	400	40.5	—	12
	150	200	230	23.5	370	37.5	—	8
WP	—	5	370	37.5	415	42.0	7	—
	5	10	385	39.0	435	44.0	7	—
	10	20	415	42.0	460	46.5	7	7
	20	75	445	45.0	490	50.0	—	7
	75	100	430	43.5	480	49.0	—	7
	100	150	420	42.5	465	47.0	—	7
	150	200	390	39.5	435	44.0	—	7

NOTE — 1 N/mm² = 1 MN/m² = 0.102 kgf/mm².

9. TOLERANCES ON DIMENSIONS

9.1 The tolerances on dimensions of the extruded bars, rods and sections shall be as given in IS : 7429-1974*.

10. IDENTIFICATION

10.1 Extruded bars, rods and sections approved by the Inspector shall be identified as detailed in IS : 7429-1974* ensuring full identification of the material.

*Procedure for inspection and testing of aluminium and aluminium alloy extruded bars, rods and sections (for aircraft purposes).

11. CERTIFICATION

11.1 All supplies shall be accompanied by certificates for freedom from defects, chemical composition, controlled stretching, if any and its percentage, heat-treatment mechanical properties as laid down in 4.2, 5.1, 6.1, 7.1 and 8.1, respectively, or as required by the Inspecting Authority.

11.2 The manufacturer shall, when required, supply free of charge a copy of the works analysis of the material. Works analysis is defined as routine analysis conducted by the manufacturer in order to control the quality of the material.

12. PROTECTION OF MATERIAL BEFORE DESPATCH

12.1 Unless the order states otherwise, the material shall be protected before despatch by an effective (but temporary) corrosion-preventive coating.

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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	Conversion
Force	newton	N	1 N = 1 kg·1 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
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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