BS 2TA 50:2009

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AEROSPACE SERIES

Specification for forging stock of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 000–1 200 MPa) (Limiting ruling section over 100 mm up to and including 150 mm)

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Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 4, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 30 November 2009. It was prepared by Panel ACE/61/-/49, *Titanium and its alloys*, under the authority of Technical Committee ACE/61, *Metallic materials for aerospace purposes*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS TA 50:1973, which is withdrawn.

Information about this document

This is a full revision of BS TA 50, and introduces the following principal changes:

a) requirements stated in tabular format in accordance with EN 4500-1 and EN 4500-4;

b) chemical composition amended to add requirements for "other" elements;

c) melting method details deleted and replaced by reference to Section 1 of BS TA 100.

Hazard warnings

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This standard specifies requirements for titanium-aluminium-molybdenum-tin-silicon alloy forging stock with a tensile strength of 1 000 to 1 200 MPa.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS TA 100, *Procedure for inspection, testing and acceptance of wrought titanium and titanium alloys*

3 Technical requirements

Material to this standard shall conform to Table 1.

NOTE The format and symbols used in Table 1 are derived from EN 4500-1 and EN 4500-4.

Table 1 **Technical requirements for titanium-aluminium-molybdenum-tin-silicon forging stock**

1	**Material designation**			**BS TA 50**												
2	**Chemical composition %**	Element		Al	Mo	Sn	Si	Fe	O_2	N_2	H_2	O_2 + 2x N_2	Others		Ti	
													Each	Total		
		Min.		3.0	3.0	1.5	0.3	—	—	—	—	—	—	—	Base	
		Max.		5.0	5.0	2.5	0.7	0.2	0.25	0.03	0.012 5	0.27	0.1	0.4		
3	**Method of melting**			See Section 1 of BS TA 100												
4.1	**Form**			Forging stock [1)]												
4.2	**Method of production**			—												
4.3	**Limit dimension(s)**		mm	100 < a or D ⩽ 150												
5	**Technical specification**			Sections 1 and 3 of BS TA 100												

6.1	**Delivery condition**	As-forged, hot rolled or extruded [2)] + centreless ground or machined
	Heat treatment	—
6.2	**Delivery condition code**	U
7	**Use condition**	Delivery condition
	Heat treatment	—

					Characteristics	
8.1	**Test sample(s)**			See Section 3 of BS TA 100		
8.2	**Test piece(s)**			See Section 3 of BS TA 100		
8.3	**Heat treatment**			Reference (see line 29)		
9	**Dimensions concerned**		mm	100 < a or D ⩽ 150 [3)]	12.5 mm thick slice prepared by machining or forging [3)]	
10	**Thickness of cladding on each face**		%	—		
11	**Direction of test piece**			L	L or T	
12	**T**	**Temperature**	θ °C	Ambient	Ambient	
13		**Proof stress**	$R_{p0.2}$ MPa	⩾ 870	⩾ 960	
14		**Strength**	R_m MPa	1 000 ⩽ R_m ⩽ 1 200	1 100 ⩽ R_m ⩽ 1 280	
15		**Elongation**	A %	⩾ 9	⩾ 9	
16		**Reduction of area**	Z %	⩾ 20	⩾ 20	
17	**Hardness**			—		
18	**Shear strength**		R_c MPa	—		
19	**Bending**		κ —	—		
20	**Impact strength**			—		
21	**C**	**Temperature**	θ °C	400 °C		
22		**Time**	h	100		
23		**Stress**	σ_a MPa	465		
24		**Elongation**	a %	⩽ 0.10 (total plastic strain) [4)]		
25		**Rupture stress**	σ_R MPa	—		
26		**Elongation at rupture**	A %	—		
27	**Notes** (see line 98)			1), 2), 3), 4)		

Table 1 **Technical requirements for titanium-aluminium-molybdenum-tin-silicon forging stock** *(continued)*

29	**Reference heat treatment**	—	Solution treated + precipitation treated: θ = 900 °C ±10 °C / t = 1 h per 25 mm (⩾ 20 min) / AC + θ = 500 °C ±5 °C / t = 24 h / AC
44	**External defects**	—	See Section 3 of BS TA 100
74	**Surface contamination**	—	See Section 3 of BS TA 100
95	**Marking**	—	See Section 3 of BS TA 100
96	**Dimensional inspection**	—	See Section 3 of BS TA 100
98	**Notes**	—	1) British Standards covering other forms of material of similar composition are:

R_m (MPa)	min.	1 100	1 050	1 050	1 050	1 000
	max.	1 280	1 220	1 220	1 200	1 200
Limiting ruling section (lrs) (mm)		lrs ⩽ 25	25 < lrs ⩽ 100	lrs ⩽ 100	lrs ⩽ 100	100 < lrs ⩽ 150
Form		British Standard				
Bar and section for machining		BS TA 45	BS TA 46	—	—	BS TA 49
Forging stock		—	—	BS TA 47	—	—
Forgings		—	—	—	BS TA 48	BS TA 51

2) At the discretion of the manufacturer the material may be stress relieved (600 °C ⩽ θ ⩽ 700 °C / t ⩽ 3 h).

3) At heat treatment stage.

4) When specified on the drawing, order or inspection schedule.

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS TA 45, *Specification for bar and section of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 100–1 280 MPa) (Limiting ruling section 25 mm)*

BS TA 46, *Specification for bar and section for machining of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 050–1 220 MPa) (Limiting ruling section over 25 mm up to and including 100 mm)*

BS TA 47, *Specification for forging stock of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 050–1 220 MPa) (Limiting ruling section 100 mm)*

BS TA 48, *Specification of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 050–1 220 MPa) (Limiting ruling section 100 mm)*

BS TA 49, *Specification for bar and section for machining of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 000–1 200 MPa) (Limiting ruling section over 100 mm up to and including 150 mm)*

BS TA 51, *Specification for forgings of titanium-aluminium-molybdenum-tin-silicon alloy (Tensile strength 1 000–1 200 MPa) (Limiting ruling section over 100 mm up to and including 150 mm)*

EN 4500-1, *Metallic materials – Rules for the drafting and presentation of material standards – Part 1: General rules* [1)]

EN 4500-4, *Metallic materials – Rules for the drafting and presentation of material standards – Part 4: Specific rules for titanium and titanium alloys* [1)]

[1)] Published as ASD-STAN Prestandard at the date of publication of this standard.

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