

BS 2TA 48:2009



BSI British Standards

AEROSPACE SERIES

**Specification for forgings
of titanium-aluminium-
molybdenum-tin-silicon
alloy (Tensile strength
1 050–1 200 MPa) (Limiting
ruling section 100 mm)**

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Committee reference ACE/61

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Date	Text affected
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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This British Standard supersedes BS TA 48:1973, which is withdrawn.

Information about this document

This is a full revision of BS TA 48, and introduces the following principal changes:

- a) requirements are stated in tabular format in accordance with EN 4500-1 and EN 4500-4;
- b) chemical composition have been amended to add requirements for "other" elements;
- c) melting method details have been 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 forgings with a tensile strength of 1 050 MPa 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 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 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 alloy forgings

1	Material designation			BS TA 48										
2	Chemical composition %	Element	Al	Mo	Sn	Si	Fe	O ₂	N ₂	H ₂	O ₂ + 2xN ₂	Others		Ti
												Each	Total	
		Min.	3.0	3.0	1.5	0.3	—	—	—	—	—	—	—	—
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			Forgings ¹⁾										
4.2	Method of production			Manufactured from forging stock conforming to BS TA 47										
4.3	Limit dimension(s)	mm	a or D ≤ 100											
5	Technical specification			Sections 1 and 4 of BS TA 100										
6.1	Delivery condition			Solution treated + precipitation treated + descaled and pickled										
	Heat treatment			$\theta = (900 \pm 10) ^\circ\text{C} / t = 1 \text{ h per } 25 \text{ mm } (\geq 20 \text{ min}) / \text{AC} + \theta = (500 \pm 5) ^\circ\text{C} / t = 24 \text{ h} / \text{AC}$										
6.2	Delivery condition code			U										
7	Use condition			Delivery condition										
	Heat treatment			—										
Characteristics														
8.1	Test sample(s)			See Section 4 of BS TA 100										
8.2	Test piece(s)			See Section 4 of BS TA 100										
8.3	Heat treatment			Use condition										
9	Dimensions concerned	mm	a or D ≤ 100											
10	Thickness of cladding on each face	%	—											
11	Direction of test piece			L										
12	Temperature	θ	°C	Ambient										
13	Proof stress	R _{p0.2}	MPa	≥ 920										
14	T	Strength	R _m	MPa	1 050 ≤ R _m ≤ 1 200 ²⁾									
15		Elongation	A	%	≥ 9									
16		Reduction of area	Z	%	≥ 20									
17		Hardness			—									
18	Shear strength	R _c	MPa	—										
19	Bending	κ	—	—										
20	Impact strength			—										
21	Temperature	θ	°C	—										
22	Time			h	—									
23	Stress	σ _a	MPa	—										
24	C	Elongation	a	%	—									
25		Rupture stress	σ _R	MPa	—									
26		Elongation at rupture	A	%	—									
27	Notes (see line 98)			1), 2)										

Table 1 Technical requirements for titanium-aluminium-molybdenum-tin-silicon alloy forgings (continued)

44	External defects	—	See Section 4 of BS TA 100																																												
74	Surface contamination	—	See Section 4 of BS TA 100																																												
95	Marking	—	See Section 4 of BS TA 100																																												
96	Dimensional inspection	—	See Section 4 of BS TA 100																																												
98	Notes	—	¹⁾ British Standards covering other forms of material of similar composition are: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2">R_m (MPa)</td> <td>min.</td> <td>1 100</td> <td>1 050</td> <td>1 050</td> <td>1 000</td> </tr> <tr> <td>max.</td> <td>1 280</td> <td>1 220</td> <td>1 220</td> <td>1 200</td> </tr> <tr> <td colspan="2">Limiting ruling section (lrs) (mm)</td> <td>lrs ≤ 25</td> <td>25 < lrs ≤ 100</td> <td>lrs ≤ 100</td> <td>100 < lrs ≤ 150</td> </tr> <tr> <td colspan="2">Form</td> <td colspan="4" style="text-align: center;">British Standard</td> </tr> <tr> <td colspan="2">Bar and section for machining</td> <td>BS TA 45</td> <td>BS TA 46</td> <td>—</td> <td>BS TA 49</td> </tr> <tr> <td colspan="2">Forging stock</td> <td>—</td> <td>—</td> <td>BS TA 47</td> <td>BS TA 50</td> </tr> <tr> <td colspan="2">Forgings</td> <td>—</td> <td>—</td> <td>—</td> <td>BS TA 51</td> </tr> </table>				R _m (MPa)	min.	1 100	1 050	1 050	1 000	max.	1 280	1 220	1 220	1 200	Limiting ruling section (lrs) (mm)		lrs ≤ 25	25 < 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	BS TA 50	Forgings		—	—	—	BS TA 51
R _m (MPa)	min.	1 100	1 050	1 050	1 000																																										
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Forgings		—	—	—	BS TA 51																																										
			²⁾ By agreement between the manufacturer and the purchaser, the maximum value may be increased to 1 220 MPa for sections of 25 mm or less.																																												

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 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 50, *Specification for forging stock of titanium-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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BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Tel +44 (0)20 8996 9001

Fax +44 (0)20 8996 7001

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