BS EN 3312:2012
Incorporating corrigendum March 2012

BSI Standards Publication

Aerospace series — Titanium alloy Ti-6Al-4V — Annealed — Forgings De ≤ 150 mm

National foreword

This British Standard is the UK implementation of EN 3312:2012. It supersedes BS 3TA 13:2009, which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee ACE/61, Metallic materials for aerospace purposes, to Subcommittee ACE/61/-/49, Titanium and its Alloys for Aerospace Purposes.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Date	Text affected
31 March 2012	Implementation of CEN correction notice 2 February 2012: Table on page 6 amended

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 3312

February 2012

ICS 49.025.30

English Version

Aerospace series - Titanium alloy Ti-6Al-4V - Annealed - Forgings De ≤ 150 mm

Série aérospatiale - Alliage de titane Ti-6Al-4V - Recuit - Pièces forgées et matricées - De ≤ 150 mm

Luft- und Raumfahrt - Titanlegierung Ti-6Al-4V - Geglüht - Schmiedestücke - De ≤ 150 mm

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 3312:2012) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2012, and conflicting national standards shall be withdrawn at the latest by August 2012.

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Introduction

This European Standard is part of the series of EN metallic material standards for aerospace applications. The general organization of this series is described in EN 4258.

This European Standard has been prepared in accordance with EN 4500-4.

1 Scope

This European Standard specifies the requirements relating to: [1)]

Titanium alloy Ti-6Al-4V
Annealed
Forgings
$D_e \leq 150$ mm

for aerospace applications.

2 Normative references

The following referenced document, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2003-009, *Aerospace series — Test methods — Titanium and titanium alloys — Part 009: Determination of surface contamination*

EN 2032-2, *Aerospace series — Metallic materials — Part 2: Coding of metallurgical condition in delivery condition*

EN 2954-002, *Aerospace series — Macrostructure of titanium and titanium alloy wrought products — Part 002: Macrostructure of bar, section, forging stock and forgings*

EN 3114-002, *Aerospace series — Test method — Microstructure of ($\alpha + \beta$) titanium alloy wrought products — Part 002: Microstructure of bars, sections, forging stock and forgings*

EN 3310, *Aerospace series — Titanium alloy TI-P64001 (Ti-6Al-4V) — Not heat treated — Forging stock, for annealed forgings — De ≤ 360 mm* [2)]

EN 4050-4, *Aerospace series — Test method for metallic materials — Part 4: Acceptance criteria*

EN 4800-005, *Aerospace series — Titanium and titanium alloys — Technical specification — Part 005: Forging stock*

EN 4800-006, *Aerospace series — Titanium and titanium alloys — Technical specification — Part 006: Pre-production and production forgings*

1) Grade 2 according to EN 4800-005.

2 Published as ASD-STAN Prestandard at the date of publication of this standard (www.asd-stan.org).

1	Material designation		Titanium alloy Ti-6Al-4V									
2	Chemical composition %	Element	Al	V	O+2N	N	H	Fe	C	Y	Others	Ti
											Each / Total	
		min.	5,50	3,50	–	–	–	–	–	–	– / –	Base
		max.	6,75	4,50	0,25	0,03	0,012 5	0,30	0,08	0,005 0	0,10 / 0,40	
3	Method of melting		Grade 2 – see EN 4800-005.									
4.1	Form		Forgings									
4.2	Method of production		Forged from forging stock EN 3310									
4.3	Limit dimension(s)	mm	$D_e \leq 150$									
5	Technical specification		EN 4800-006									

6.1	Delivery condition	Annealed
	Heat treatment	690 °C ≤ θ ≤ 840 °C / t ≥ 30 min / AC or cool in inert atmosphere
6.2	Delivery condition code	U [a]
7	Use condition	Delivery condition
	Heat treatment	–

Characteristics

8.1	Test sample(s)			See EN 4800-006.		
8.2	Test piece(s)			See EN 4800-006.		
8.3	Heat treatment			Use condition		
9	Dimensions concerned		mm	$D_e \leq 150$		
10	Thickness of cladding on each face		%	–		
11	Direction of test piece			L	LT	ST
12	T	Temperature	θ °C	Ambient		
13	T	Proof stress	$R_{p0,2}$ MPa	≥ 830	≥ 830	≥ 830
14	T	Strength	R_m MPa	900 ≤ R_m ≤ 1 160	900 ≤ R_m ≤ 1 160	900 ≤ R_m ≤ 1 160
15	T	Elongation	A %	≥ 10	≥ 8	≥ 6
16	T	Reduction of area	Z %	≥ 25	≥ 20	≥ 15
17	Hardness			–		
18	Shear strength	R_c	MPa	–		
19	Bending	k	–	–		
20	Impact strength			–		
21	C	Temperature	θ °C	–		
22	C	Time	h	–		
23	C	Stress	σ_a MPa	–		
24	C	Elongation	a %	–		
25	C	Rupture stress	σ_R MPa	–		
26	C	Elongation at rupture	A %	–		
27	Notes (see line 98)			a		

30	Microstructure	–	See EN 4800-006.			
		1	See EN 3114-002.			
		7	D_e mm	Acceptable microstructure	Not acceptable microstructure	
			$D_e \leq 25$	From 2 T 1 to 2 T 6 Occasionally 2 T 8	2 T 7 and 2 T 9 From 2 T 10 to 2 T 15	
				From 2 L 1 to 2 L 4	From 2 L 5 to 2 L 15	
				2 T 100, 2 T 102	2T 101 From 2 T 103 to 2 T 117	
				2 A 1, 2 A 2	–	
				–	From 2 T 200 to 2 T 201	
			$25 < D_e < 150$	From 2 T 1 to 2 T 7 Occasionally 2 T 8 to 2 T 12	From 2 T 13 to 2 T 15	
				From 2 L 1 to 2 L 6, 2 L 8, 2 L 10 Occasionally 2 L 7, 2 L 9, 2 L 12	2 L 11 From 2 L 13 to 2 L 15	
				2 T 100, 2 T 102 Occasionally 2 T 103, 2 T 109 to 2 T 111	2 T 101 From 2 T 104 to 2 T 108 From 2 T 112 to 2 T 117	
				From 2 T 108 to 2 T 110, if number of defects less than 5 per cm^2 of the sampling section	From 2 T 108 to 2 T 110, if number of defects less than 5 per cm^2 of the sampling section	
				–	From 2 T 111 to 2 T 117	
				2 A 1	–	
				–	From 2 T 200 to 2 T 201	
44	External defects	–	See EN 4800-006.			
		1	Visual examination			
51	Macrostructure	–	See EN 4800-006.			
		1	EN 2954-002			
		7	D_e mm	Maximum acceptable macrostructure	Not acceptable macrostructure	Macrostructure submitted for approval
			$50 < D_e < 110$	2 MA 3	2 MA 80 to 2 MA 84 and 2 MA 100	2 MA 40 to 2 MA 42 and 2 MA 60 to 2 MA 62
61	Internal defects	–	See EN 4800-006.			
		1	EN 4050-4			
		7	Class 3			
74	Surface contamination	–	See EN 4800-006.			
		1	EN 2003-009			
		2	Pre-production part unless otherwise specified			
		3	See inspection schedule			
82	Batch uniformity (Material verification)	–	See EN 4800-006.			
95	Marking inspection	–	–			
96	Dimensional inspection	–	–			
98	Notes	–	[a] According to EN 2032-2.			
99	Typical use	–	–			

100	–	Product qualification	–	See EN 4800-006.
				Qualification programme to be agreed between manufacturer and purchaser.

Bibliography

EN 4258, *Aerospace series — Metallic materials — General organization of standardization — Links between types of EN standards and their use*

EN 4500-4, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 4: Specific rules for titanium and titanium alloys* [2)]

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BSI Group Headquarters

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