BS EN 3354:2013

BSI Standards Publication

Aerospace series — Titanium alloy Ti-6Al-4V — Annealed — Sheet for superplastic forming — a ≤ 6 mm

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National foreword

This British Standard is the UK implementation of EN 3354:2013.

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

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

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

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Luft- und Raumfahrt - Titanlegierung Ti-6Al-4V - Geglüht - Bleche für superplastisches Umformen - a ≤ 6 mm

This European Standard was approved by CEN on 23 December 2011.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 3354:2012) 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of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

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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 4500-004.

1 Scope

This European Standard specifies the requirements relating to:

Titanium alloy Ti-6Al-4V
Annealed
Sheet for superplastic forming
$a \leq 6$ mm

for aerospace applications.

2 Normative references

The following documents, 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 2002-8, *Aerospace series — Metallic materials — Test methods — Part 8: Micrographic determination of grain size* [1)]

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

EN 2338, *Aerospace series — Sheets, hot rolled in titanium and titanium alloys — Thickness 0,8 mm ≤ a ≤ 6 mm — Dimensions*

EN 3114-004, *Aerospace series — Test method — Microstructure of ($\alpha + \beta$) titanium alloy wrought products — Part 004: Microstructure of sheet for superplastic forming*

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

EN 4500-004, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 004: Specific rules for titanium and titanium alloys*

EN 4800-001, *Aerospace series — Titanium and titanium alloys — Technical specification — Part 001: Plate, sheet and strip*

ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

1) 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	N	O + 2N	H	Fe	C	Y	Others		Ti
												Each	Total	
		min.	5,50	3,50	–	–	–	–	–	–	–	–	–	Base
		max.	6,75	4,50	0,20	0,03	0,25	0,008 0	0,30	0,08	0,005 0	0,10	0,40	
3	Method of melting		See EN 4800-001.											
4.1	Form		Sheet											
4.2	Method of production		Rolled											
4.3	Limit dimension(s)	mm	$a \leq 6$											
5	Technical specification		EN 2338 - EN 4800-001											

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 4800-001.			
8.2	Test piece(s)			See EN 4800-001.			
8.3	Heat treatment			Use condition			
9	Dimensions concerned		mm	$a \leq 0,6$	$0,6 < a \leq 1,6$	$1,6 < a \leq 6$	
10	Thickness of cladding on each face		%	–	–	–	
11	Direction of test piece			L and LT	L and LT	L and LT	
12	T	Temperature	θ	°C	Ambient	Ambient	Ambient
13		Proof stress	$R_{p0,2}$	MPa	≥ 870	≥ 870	≥ 870
14		Strength	R_m	MPa	$925 \leq R_m \leq 1\,180$	$925 \leq R_m \leq 1\,180$	$925 \leq R_m \leq 1\,180$
15		Elongation	A	%	$A_{50\,mm} \geq 6$	$A_{50\,mm} \geq 8$	$A_{50\,mm} \geq 10$
16		Reduction of area	Z	%	–	–	–
17	Hardness				–		–
18	Shear strength		R_c	MPa	–		–
19	Bending		k	–	L: 4,5 ; α = 105 ° LT: 2,25 ; α = 105 °		L: 5 ; α = 105 ° LT: 2,25 ; α = 105 °
20	Impact strength				–		
21	C	Temperature	θ	°C	–		
22		Time		h	–		
23		Stress	σ_a	MPa	–		
24		Elongation	a	%	–		
25		Rupture stress	σ_R	MPa	–		
26		Elongation at rupture	A	%	–		
27	Notes (see line 98)				a		

30	Microstructure	–	See EN 4800-001.	
		1	EN 3114-004	
		3	L-ST and LT-ST section	
		5	θ = 930 °C ± 10 °C / t = 30 min / WQ	
		6	The microstructure shall show a two phase microstructure with primary $\alpha \geq 40$ %	
		7	Acceptable microstructure	Unacceptable microstructure
			4L1B to 4L7B	4L8B to 4L12B
			No grain boundary α, blocky α, α stringers or β fleck.	
34	Grain size	–	See EN 4800-001.	
		1	EN 2002-8	
		3	L-ST and LT-ST section	
		5	θ = 930 °C ± 10 °C / t = 30 min / AC	
		7	G ≥ 10	
44	External defects	–	See EN 4800-001.	
61	Internal defects	–	See EN 4800-001.	
63	Superplastic forming capability	–	To be agreed between manufacturer and purchaser	
64	Surface condition roughness	–	See EN 4800-001.	
		1	ISO 4288	
		2	Each sheet, "capability clause" applies	
		7	$R_a \leq 0{,}6$ µm	
74	Surface contamination	–	See EN 4800-001.	
95	Marking inspection	–	See EN 4800-001.	
96	Dimensional inspection	–	See EN 4800-001.	
98	Notes	–	[a] According to EN 2032-2.	
99	Typical use	–	–	

100	–	Product qualification	–	See EN 4800-001.
				Qualification programme to be agreed between manufacturer and purchaser.

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