



**SLOVENSKI STANDARD**  
**SIST EN 3312:2012**

**01-julij-2012**

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**Aeronavtika - Titanova zlitina Ti-6Al-4V - Kaljena - Kovani izdelki De ≤ 150 mm**

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

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

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

**STANDARD PREVIEW**  
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**Ta slovenski standard je istoveten z: EN 3312:2012**  
<https://standards.iteh.ai/catalog/standards/sist/d1a5ab9d-c0d6-42dd-bcb7-154a8bd4673f/sist-en-3312-2012>

**ICS:**

49.025.30 Titan Titanium

**SIST EN 3312:2012 en,fr,de**

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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  $De \leq 150$  mm**

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

Luft- und Raumfahrt - Titanlegierung Ti-6Al-4V - Geglüht -  
Schmiedestücke -  $De \leq 150$  mm

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

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

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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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 3312:2012 (E)**

## **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.

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## 1 Scope

This European Standard specifies the requirements relating to: <sup>1)</sup>

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 —  $D_e \leq 360$  mm <sup>2)</sup>*

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*

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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](http://www.asd-stan.org)).

## EN 3312:2012 (E)

1	Material designation		Titanium alloy Ti-6Al-4V										
2	Chemical composition %	Element	Al	V	O+2N	N	H	Fe	C	Y	Others		Ti
		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		$690\text{ °C} \leq \theta \leq 840\text{ °C} / t \geq 30\text{ min} / \text{AC}$ or cool in inert atmosphere									
6.2	Delivery condition code		U <sup>a</sup>									
7	Use condition		Delivery condition									
	Heat treatment		–									

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Characteristics  
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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	A.1.1.1.1	Thickness of cladding on each face	A.1.1	A.1.1.1.3 –								
A.1.1.1.5	Direction of test piece		A.1.1.1.6	L	A.1.1.1.7	LT	A.1.1.1.8	ST				
A.1.1.1.11	A.1.1.1.11	Temperature	A.1.1	A.1.1.1.14	Ambient							
A.1.1.2	A.	Proof stress	R <sub>p0,2</sub>	MPa	≥ 830		≥ 830		≥ 830			
14	A.	Strength	R <sub>m</sub>	MPa	900 ≤ R <sub>m</sub> ≤ 1 160		900 ≤ R <sub>m</sub> ≤ 1 160		900 ≤ R <sub>m</sub> ≤ 1 160			
15		Elongation	A	%	≥ 10		≥ 8		≥ 6			
16		Reduction of area	Z	%	≥ 25		≥ 20		≥ 15			
17	Hardness		–									
18	Shear strength	R <sub>c</sub>	MPa	–								
19	Bending	k	–	–								
20	Impact strength		–									
21	Temperature	θ	°C	–								
22	Time		h	–								
23	Stress	σ <sub>a</sub>	MPa	–								
24	Elongation	a	%	–								
25	Rupture stress	σ <sub>R</sub>	MPa	–								
26	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	2 T 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	<b>A.1.1.1.16</b> 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 <sup>2</sup> of the sampling section	From 2 T 108 to 2 T 110, if number of defects less than 5 per cm <sup>2</sup> 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. 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
61	Internal defects	–	See EN 4800-006.			
74	Surface contamination	1	EN 4050-4			
		7	Class 3			
		–	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	–	<sup>a</sup> According to EN 2032-2.			
99	Typical use	–	–			