BS EN 3120:2012

BSI Standards Publication

Aerospace series — Titanium alloy TI-P64003 — Cold worked and stress relieved — Seamless tube for pressure systems — 4 mm ≤ D ≤ 51 mm — 690 MPa ≤ Rm ≤ 1 030 MPa

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National foreword

This British Standard is the UK implementation of EN 3120:2012.

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.

ISBN 978 0 580 59077 1

ICS 49.025.30

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 February 2012.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 3120

February 2012

ICS 49.025.30

English Version

Aerospace series - Titanium alloy TI-P64003 - Cold worked and stress relieved - Seamless tube for pressure systems - 4 mm ≤ D ≤ 51 mm - 690 MPa ≤ Rm ≤ 1 030 MPa

Série aérospatiale - Alliage de titane TI-P64003 - Étiré à froid et détensionné - Tube hydraulique sans soudure pour applications sous pression - 4 mm ≤ D ≤ 51 mm - 690 MPa ≤ Rm ≤ 1 030 MPa

Luft- und Raumfahrt - Titanlegierung TI-P64003 - Kaltverformt und spannungsarm geglüht - Nahtlose Innendruckrohre - 4 mm ≤ D ≤ 51 mm - 690 MPa ≤ Rm ≤ 1 030 MPa

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 3120:2012: E

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Foreword

This document (EN 3120:2012) 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of an identical text or by endorsement, at the latest by August 2012, and conflicting national standards shall be withdrawn at the latest by August 2012.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 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 standard has been prepared in accordance with EN 4500-4.

1 Scope

This European Standard specifies the requirements relating to:

Titanium alloy TI-P64003
Cold worked and stress relieved
Seamless tube for pressure systems
4 mm ≤ D ≤ 51 mm
690 MPa ≤ R_m ≤ 1 030 MPa

for aerospace applications.

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.

EN 2043, *Aerospace series — Metallic materials — General requirements for semi-finished product qualification (excluding forgings and castings).* [1)]

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*.

EN 4800-003, *Aerospace series — Titanium and titanium alloys — Technical specification — Part 3: Tube.*

ISO 4288:1996, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture.*

ISO 6772:1988, *Aerospace — Fluid systems — Impulse testing of hydraulic hose, tubing and fitting assemblies.*

SAE AS4076, *Contractile strain ratio testing of titanium hydraulic tubing*. [2)]

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

2) Published by: Department of Defense (DOD), the Pentagon, Washington, DC 20301, USA.

1	Material designation		Titanium alloy TI-P64003									
2	Chemical composition %	Element	Al	V	O_2	N_2	H_2	Fe	C	Others [a]		Ti
										Each	Total	
		min.	2,5	2,0	–	–	–	–	–	–	–	Base
		max.	3,5	3,0	0,120	0,020	0,0150	0,30	0,05	0,10	0,40	
3	Method of melting		See EN 4800-3.									
4.1	Form		Seamless tube									
4.2	Method of production		–									
4.3	Limit dimension(s)	mm	$4 \leq D \leq 51$									
5	Technical specification		EN 4800-003									

6.1	Delivery condition	Cold worked and stress relieved
	Heat treatment	380 °C ± 10 °C / t ≥ 30 min / AC or inert atmosphere
6.2	Delivery condition code	U
7	Use condition	Delivery condition
	Heat treatment	–

Characteristics

8.1	Test sample(s)			See EN 4800-003.		
8.2	Test piece(s)			See EN 4800-003.		
8.3	Heat treatment			Use condition		
9	Dimensions concerned		mm	$4 \leq D \leq 7$	$7 < D \leq 12$	$12 < D \leq 51$
10	Thickness of cladding on each face		%	–	–	–
11	Direction of test piece			L	L	L
12	T	Temperature	θ °C	Ambient	Ambient	Ambient
13		Proof stress	$R_{p0,2}$ MPa	≥ 650	≥ 730	≥ 730
14		Strength	R_m MPa	$690 \leq R_m \leq 920$	$870 \leq R_m \leq 1\,030$	$870 \leq R_m \leq 1\,030$
15		Elongation	A %	$A_{50\,mm} \geq 14$	$A_{50\,mm} \geq 14$	$A_{50\,mm} \geq 16$
16		Reduction of area	Z %	–	–	–
17	Hardness			–		
18	Shear strength		R_c MPa	–		
19	Bending		k –	–		
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 4800-003.	
		7	The microstructure shall consist of an elongated globular, wrought, alpha and beta structure. Evidence of Widmannstätten structure is not acceptable.	
33	Flattening of tubes	–	See EN 4800-003.	
		6	*D*/*a*	Z
			≤ 10	8 *a*
			10 < *D*/*a* ≤ 16	12 *a*
			16 < *D*/*a* ≤ 30	15 *a*
			30 < *D*/*a* ≤ 50	17 *a*
34	Grain size	–	See EN 4800-003.	
		3	Transverse	
		7	G ≥ 8	
37	Bending of tubes [b]	–	See EN 4800-003.	
		2	Two samples per batch	
		6	$\alpha = 180°$; r = 2,5 *D*	
		7	No visible defects	
44	External defects	–	See EN 4800-003.	
55	Deformation under pressure of tubes (Hydraulic distention test)	–	See EN 4800-003.	
		6	P = 0,95 $R_{p0,2}$	
61	Internal defects (Ultrasonics)	–	See EN 4800-003.	
		7	Nominal wall thickness (mm)	Class
			a ≤ 1,14	5
			1,14 < *a* ≤ 1,52	4
			1,52 < *a* ≤ 2,03	3
			2,03 < *a* ≤ 2,54	2
64	Surface condition roughness	–	See EN 4800-003.	
		1	ISO 4288	
		2	One per batch	
		7	$R_a \leq 0,8$ µm for external surface $R_a \leq 0,8$ µm for internal surface $R_t \leq 8,0$ µm for internal surface	
67	Contractile strain ratio (C.S.R.) [b] [c]	–	See EN 4800-003	
		1	SAE AS4076	
		2	2 per batch	
		7	1.5 ≤ CSR ≤ 2.5	
74	Surface contamination	–	See EN 4800-003.	
75	Internal pressure test of tubes	–	See EN 4800-003.	
		1	On straight tubes, straight tube length = 300 mm. Two per size batch for qualification and lot. One per size and lot. Pressure value formula: $P = 0,95 = R_{p0,95} = (D_N^2 - d^2 \ / \ D_N^2 + d^2)$ where D_N = Tube outside diameter. d = Tube inside diameter.	
	Impulse fatigue test of tubes [b] [c]	–	See EN 4800-003.	
		1	See ISO 6772.	
		4	On ± 90° bens tube at a bending radius of 3 *D*	
95	Marking inspection	–	See EN 4800-003.	
96	Dimensional inspection	–	See EN 4800-003.	
98	Notes	–	[a] Determination not required for routine acceptance [b] 2 additional bend tests required if 2,5 < CSR ≤ 2,8 [c] 2 pressure impulse fatigue tests per batch required only if 1,3 ≤ CSR < 1,5	
99	Typical use	–	Pressure systems	

100	–	Product qualification	–	See EN 2043.
				Qualification programme to be agreed between manufacturer and purchaser.

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