



SLOVENSKI STANDARD
SIST EN 4642:2009

01-maj-2009

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https://standards.iteh.ai/catalog/standards/sist/c5a408b5-75df-426f-9d01-55079eb17275/sist-en-4642-2009

Ta slovenski standard je istoveten z: EN 4642:2009

ICS:

49.025.10 Jekla Steels

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EUROPEAN STANDARD

EN 4642

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2009

ICS 49.025.10

English Version

**Aerospace series - Steel FE-PM 3504 (X4CrNiMo16-5-1) - Air
melted - Hardened and tempered - Sheet and plate - $0,6 \text{ mm} \leq a$
 $\leq 50 \text{ mm}$ - $900 \text{ MPa} \leq R_m \leq 1\ 050 \text{ MPa}$**

Série aérospatiale - Acier FE-PM 3504 (X4CrNiMo16-5-1) -
Élaboré à l'air - Trempé et revenu - Tôles et plaques - $0,6$
 $\text{mm} \leq a \leq 50 \text{ mm}$ - $900 \text{ MPa} \leq R_m \leq 1\ 050 \text{ MPa}$

Luft- und Raumfahrt - Stahl FE-PM 3504 (X4CrNiMo16-5-1)
- Luftschnitzungen - Gehärtet- und angelassen - Bleche und
Platten - $0,6 \text{ mm} \leq a \leq 50 \text{ mm}$ - $900 \text{ MPa} \leq R_m \leq 1\ 050$
MPa

This European Standard was approved by CEN on 11 July 2008.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, 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 and United Kingdom.



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

This document (EN 4642:2009) 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 2009, and conflicting national standards shall be withdrawn at the latest by August 2009.

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, 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 and the United Kingdom.

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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 4500-5.

1 Scope

This standard specifies the requirements relating to:

Steel FE-PM 3504 (X4CrNiMo16-5-1)
Air melted
Hardened and tempered
Sheet and plate
 $0,6 \text{ mm} \leq a \leq 50 \text{ mm}$
 $900 \text{ MPa} \leq R_m \leq 1\,050 \text{ MPa}$

for aerospace applications.

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2 Normative references

[SIST EN 4642:2009](#)

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 2951, *Aerospace series — Metallic materials — Test method — Micrographic determination of content of non-metallic inclusions* ¹

EN 4050-4, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 4: Acceptance criteria* ¹

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

EN 4500-5, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 5: Specific rules for steels* ¹

EN 4700-1, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 1: Plate, sheet and strip* ¹

EN 4700-2, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 2: Bar and section* ¹

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

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1	Material designation	Steel FE-PM 3504 (X4CrNiMo16-5-1)										
2	Chemical composition %	Element	C	Si	Mn	P ^a	S ^a	N	Cr	Mo	Ni	Fe
		min.	–	–	–	–	–	0,02	15,00	0,80	4,00	Base
		max.	0,06	0,70	1,50	0,030	0,005	0,08	17,00	1,50	6,00	
3	Method of melting	Air melted + AOD or + VOD or equivalent process										
4.1	Form	Sheet and plate										
4.2	Method of production	Rolled										
4.3	Limit dimension(s)	mm	a ≤ 50 mm									
5	Technical specification	EN 4700-1										

6.1	Delivery condition	Softened					Hardened and tempered					
	Heat treatment	–					1 010 °C ≤ θ ≤ 1 060 °C AC or AQ or OQ + Tempered 580 °C ≤ θ ≤ 650 °C or Process according to manufacturer and purchaser agreement					
6.2	Delivery condition code	A					U					
7	Use condition	Hardened and tempered					Hardened and tempered					
	Heat treatment	Delivery condition + 1 010 °C ≤ θ ≤ 1 060 °C AC or AQ or OQ + Tempered 580 °C ≤ θ ≤ 650 °C or For tempering before process according to manufacturer and purchaser agreement					Delivery condition					

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Characteristics

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8.1	Test sample(s)	See EN 4700-1.											
8.2	Test piece(s)	See EN 4700-1.											
8.3	Heat treatment	Softened					Delivery condition						
9	Dimensions concerned	mm	a ≤ 50			0,6 ≤ a ≤ 3			3 < a ≤ 25		25 < a ≤ 50		
10	Thickness of cladding on each face	%	–			–			–		–		
11	Direction of test piece	–		L			L		L		LT		
12	Temperature	θ	°C		Ambient			Ambient		Ambient		Ambient	
13	Proof stress	R _{p0,2}	MPa		–			≥ 700		≥ 700		≥ 700	
14	T Strength	R _m	MPa		–			900 ≤ R _m ≤ 1 050		900 ≤ R _m ≤ 1 050		900 ≤ R _m ≤ 1 050	
15	Elongation	A	%		–			A 50 mm ≥ 8		A 5,65 √ So ≥ 16		A 5,65 √ So ≥ 16	
16	Reduction of area	Z	%		–			–		–		–	
17	Hardness	≤ 310 HV or ≤ 293 HB			280 ≤ HV ≤ 320			280 ≤ HV ≤ 320		280 ≤ HV ≤ 320		280 ≤ HV ≤ 320	
18	Shear strength	R _c	MPa		–			–		–		–	
19	Bending	k	–		–			K = 2; α = 180°; 2 for L; 2 for T		K = 2; α = 180°; 2 for L; 2 for T		–	
20	Impact strength	KV	J		–			–		≥ 120 J at 20 °C Notch direction T ≥ 70 J at – 40 °C Notch direction T with a ≥ 12 mm		≥ 120 J at 20 °C Notch direction T ≥ 70 J at – 40 °C Notch direction T	
			J		–			–		≥ 60 J at 20 °C Notch direction L ≥ 35 J at – 40 °C Notch direction L		–	
21	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 4700-1.
		7	The δ -ferrite content shall not exceed 5 %
34	Grain size	–	See EN 4700-1.
		7	$G \geq 5$ or finer
44	External defects	–	Criteria following to EN 4700-1
50	Cleanliness/inclusion content (micro-cleanness)	–	See EN 4700-1.
		7	EN 2951, category 2.
61	Internal defects	–	See EN 4700-1.
		7	EN 4050-4 class 3 on an intermediate rolling stage for $a < 12$ mm EN 4050-4 class 3 for $a \geq 12$ mm
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95	Marking inspection	–	See EN 4700-2.
96	Dimensional inspection	–	See EN 4700-2.
98	Notes	–	^a For specific welding applications (e.g. high power beam), and after agreement between manufacturer and purchaser, S+P should be inferior or equal to 0,023 %.
99	Typical use	–	–

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