

**Aerospace series - Heat resisting steel FE-PA2601
(X4NiCrTiMoV26-15) - $R_m \geq 900$ MPa - Bars for
forged bolts - $D \geq 25$ mm**

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(X4NiCrTiMoV26-15) - $R_m \geq 900$ MPa - Bars for forged
bolts - $D \geq 25$ mm

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 2399:2008 sisaldab Euroopa standardi EN 2399:2008 ingliskeelset teksti.</p> <p>Standard on kinnitatud Eesti Standardikeskuse 20.06.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 23.04.2008.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 2399:2008 consists of the English text of the European standard EN 2399:2008.</p> <p>This standard is ratified with the order of Estonian Centre for Standardisation dated 20.06.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.</p> <p>Date of Availability of the European standard text 23.04.2008.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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ICS 49.025.10

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English Version

**Aerospace series - Heat resisting steel FE-PA2601
(X4NiCrTiMoV26-15) - $R_m \geq 900$ MPa - Bars for forged bolts -
 $D \leq 25$ mm**

Série aérospatiale - Acier résistant à chaud FE-PA2601
(X4NiCrTiMoV26-15) - $R_m \geq 900$ MPa - Barres pour
boulonnerie matricée - $D \leq 25$ mm

Luft- und Raumfahrt - Hochwarmfester Stahl FE-PA2601
(X4NiCrTiMoV26-15) - $R_m \geq 900$ MPa - Stangen zum
Warmstauchen für Schrauben - $D \leq 25$ mm

This European Standard was approved by CEN on 29 February 2008.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Foreword

This document (EN 2399:2008) 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 October 2008, and conflicting national standards shall be withdrawn at the latest by October 2008.

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.

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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 4500-3.

1 Scope

This standard specifies the requirements relating to:

Heat resisting steel FE-PA2601 (X4NiCrTiMoV26-15)

$R_m \geq 900 \text{ MPa}$

Bars for forged bolts

$D \leq 25 \text{ mm}$

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 2002-16, *Aerospace series — Metallic materials — Test methods — Part 16: Non-destructive testing — Penetrant testing* ¹⁾

EN 2344, *Aerospace series — Round bars, machined in heat resisting alloys — Diameter $10 \text{ mm} \leq D \leq 180 \text{ mm}$ — Dimensions*

EN 2398, *Aerospace series — Heat resisting steel FE-PA2601 (X6NiCrTiMoV26-15) — $R_m \geq 900 \text{ MPa}$ — Bars for machined bolts — $D \leq 25 \text{ mm}$*

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 4500-3, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 3: Specific rules for heat resisting alloys* 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.

1	Material designation		Heat resisting steel FE-PA2601 (X4NiCrTiMoV26-15)													
2	Chemical composition %	Element	C	Si	Mn	P	S	Al	B ^a	Cr	Mo	Ni	Pb ^a	Ti	V	Fe
		min.	–	–	–	–	–	–	(30)	13,5	1,0	24,0	–	1,9	0,10	Base
		max.	0,08	1,0	2,0	0,020	0,015	0,35	(100)	16,0	1,5	27,0	(50)	2,3	0,50	
3	Method of melting		Consumable electrode remelted ^b													
4.1	Form		Bars for upset forging ^c													
4.2	Method of production		–													
4.3	Limit dimension(s)	mm	$D \leq 25$													
5	Technical specification		EN 4700-2													

6.1	Delivery condition		Softened, cold worked ^d and ground													
	Heat treatment		900 °C ± 10 °C / t = 1 h / air cool or faster cold worked ^d													
6.2	Delivery condition code		K													
7	Use condition		Softened, cold worked, ground, solution treated and precipitation treated													
	Heat treatment		Delivery condition + 980 °C ± 10 °C / t = 1 h / air cool or faster + 720 °C ± 10 °C / t ≥ 16 h / air cool													

Characteristics

8.1	Test sample(s)			See EN 4700-2	
8.2	Test piece(s)			See EN 4700-2	
8.3	Heat treatment			Delivery condition	Condition of use
9	Dimensions concerned	mm	$D \leq 25$		
10	Thickness of cladding on each face	%	—		
11	Direction of test piece			L	
12	Temperature	θ	°C	Room temperature	
13	Proof stress	R _{p0,2}	MPa	—	≥ 590
14	Strength	R _m	MPa	—	≥ 900
15	Elongation	A	%	—	≥ 13
16	Reduction of area	Z	%	—	≥ 20
17	Hardness			—	248 ≤ HB ≤ 341
18	Shear strength	R _c	MPa	—	
19	Bending	k	—	—	
20	Impact strength			—	
21	Temperature	θ	°C	—	650
22	Time		h	—	≥ 23
23	Stress	σ_a	MPa	—	—
24	Elongation	a	%	—	—
25	Rupture stress	σ_R	MPa	—	480 ^e
26	Elongation at rupture	A	%	—	≥ 4,5 for tr ≤ 48 h ≥ 2,5 for tr > 48 h
27	Notes (see line 98)			a, b, c, d, e	