

**Aerospace series - Steel X4CrNiMo16-5-1 (1.4418) - Air
melted - Hardened and tempered - Bar - $D_e \leq 200$ mm -
 $900 \text{ MPa} \leq R_m \leq 1\,050 \text{ MPa}$**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 4631:2013 sisaldab Euroopa standardi EN 4631:2013 ingliskeelset teksti.	This Estonian standard EVS-EN 4631:2013 consists of the English text of the European standard EN 4631:2013.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 27.02.2013.	Date of Availability of the European standard is 27.02.2013.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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English Version

**Aerospace series - Steel X4CrNiMo16-5-1 (1.4418) - Air melted
- Hardened and tempered - Bar - $De \leq 200$ mm - $900 \text{ MPa} \leq R_m$
 $\leq 1\,050 \text{ MPa}$**

Série aérospatiale - Acier X4CrNiMo16-5-1 (1.4418) -
Élaboré à l'air - Trempé et revenu - Barres - $De \leq 200$ mm -
 $900 \text{ MPa} \leq R_m \leq 1\,050 \text{ MPa}$

Luft- und Raumfahrt - Stahl X4CrNiMo16-5-1 (1.4418) -
Lufterschmolzen - Gehärtet- und angelassen - Stangen -
 $De \leq 200$ mm - $900 \text{ MPa} \leq R_m \leq 1\,050 \text{ MPa}$

This European Standard was approved by CEN on 24 August 2012.

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.

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

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Foreword

This document (EN 4631:2013) 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 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

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.

This document supersedes EN 4631:2007.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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.

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 4500-005.

1 Scope

This European Standard specifies the requirements relating to:

Steel X4CrNiMo16-5-1 (1.4418)
Air melted
Hardened and tempered
Bar
 $D_e \leq 200 \text{ mm}$
 $900 \text{ MPa} \leq R_m \leq 1\,050 \text{ MPa}$

for aerospace applications.

NOTE Other designation: Z 8 CND 17-04.
Only the chemical composition of this standard must be considered.

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 2950, *Aerospace series — Test method — Wrought heat resisting alloys — Semi-finished products and parts — Conditions for macrographic and micrographic examination — Atlas of structures and defects*

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

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

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

EN 4500-005, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 005: Specific rules for steels*

EN 4629, *Aerospace series — Steel FE-PM 3504 (X4CrNiMo16-5-1) — Air melted — Hardened and tempered — Forging stock — $D_e \leq 300 \text{ mm}$ ¹⁾*

EN 4700-002, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 002: Bar and section*

EN ISO 643, *Steels — Micrographic determination of the apparent grain size (ISO 643)*

AMS 2315, *Determination of delta ferrite content* ²⁾

1) Published as ASD-STAN Standard at the date of publication of this standard (www.asd-stan.org).

2) Published as SAE National (US) Society of Automotive Engineers (<http://www.sae.org/>).

1	Material designation		Steel X4CrNiMo16-5-1 (1.4418)									
2	Chemical composition %	Element	C	Si	Mn ^a	P ^b	S ^b	N	Cr	Mo	Ni	Fe
		min.	–	–	–	–	–	0,020	15,00	0,80	4,00	Base
		max.	0,06	0,70	1,50	0,030	0,005	–	17,00	1,50	6,00	
3	Method of melting		Air melted									
4.1	Form		Bar									
4.2	Method of production		–									
4.3	Limit dimension(s)	mm	$D_e \leq 200$									
5	Technical specification		EN 4700-002									

6.1	Delivery condition		Annealed					Hardened and tempered				
	Heat treatment		–					$1\,010\,^{\circ}\text{C} \leq \theta \leq 1\,060\,^{\circ}\text{C}$ / OQ or WQ ^c $+ 550\,^{\circ}\text{C} \leq \theta \leq 620\,^{\circ}\text{C}$				
6.2	Delivery condition code		A					U				
7	Use condition		Hardened and tempered					Delivery condition				
	Heat treatment		Delivery condition $+ 1\,010\,^{\circ}\text{C} \leq \theta \leq 1\,060\,^{\circ}\text{C}$ / OQ or WQ ^c $+ 550\,^{\circ}\text{C} \leq \theta \leq 620\,^{\circ}\text{C}$					–				

Characteristics

8.1	Test sample(s)			See EN 4700-002.		
8.2	Test piece(s)			See EN 4700-002.		
8.3	Heat treatment			Annealed	Use condition	
9	Dimensions concerned	mm		$D_e \leq 200$	$D_e \leq 75$	$75 < D_e \leq 200$
10	Thickness of cladding on each face	%		–	–	–
11	Direction of test piece			–	L	LT
12	Temperature	θ	°C	Ambient	Ambient	Ambient
13	Proof stress	$R_{p0.2}$	MPa	–	≥ 700	≥ 700
14	Strength	R_m	MPa	–	$900 \leq R_m \leq 1\,050$	$900 \leq R_m \leq 1\,050$
15	Elongation	A	%	–	≥ 16	≥ 12
16	Reduction of area	Z	%	–	–	–
17	Hardness			HBW ≤ 293	$269 \leq \text{HBW} \leq 331$	$269 \leq \text{HBW} \leq 331$
18	Shear strength	R_c	MPa	–	–	–
19	Bending	k	–	–	–	–
20	Impact strength	KV	J	–	$\geq 120\text{ J at }20\text{ °C}$ Notch direction T $\geq 70\text{ J at }-40\text{ °C}$ Notch direction T	$\geq 60\text{ J at }20\text{ °C}$ Notch direction L $\geq 35\text{ J at }-40\text{ °C}$ 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, b, c		