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EUROPEAN STANDARD

EN 4628

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2013

ICS 49.025.10

Supersedes EN 4628:2007

English Version

**Aerospace series - Steel X4CrNiMo16-5-1 (1.4418) - Air melted  
- Hardened and tempered - Bar -  $De \leq 200$  mm -  $1\ 150$  MPa  $\leq$   
 $R_m \leq 1\ 300$  MPa**

Série aérospatiale - Acier X4CrNiMo16-5-1 (1.4418) -  
Élaboré à l'air - Trempé et revenu - Barres -  $De \leq 200$  mm -  
 $1\ 150$  MPa  $\leq R_m \leq 1\ 300$  MPa

Luft- und Raumfahrt - Stahl X4CrNiMo16-5-1 (1.4418) -  
Lufterschmolzen - Gehärtet- und angelassen - Stangen -  
 $De \leq 200$  mm -  $1\ 150$  MPa  $\leq R_m \leq 1\ 300$  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.

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, 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 United Kingdom.



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

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## Foreword

This document (EN 4628:2013) 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 4628:2007.

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.

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**EN 4628:2013 (E)**

## **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.

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## 1 Scope

This European Standard specifies the requirements relating to:

Steel X4CrNiMo16-5-1 (1.4418)  
Air melted  
Hardened and tempered  
Bar  
 $D_e \leq 200$  mm  
 $1\ 150\ \text{MPa} \leq R_m \leq 1\ 300\ \text{MPa}$

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.

FprEN 2043, *Aerospace series — Metallic materials — General requirements for semi-finished product qualification (excluding forgings and castings)* <sup>1)</sup>

prEN 2951, *Aerospace series — Metallic materials — Test method — Micrographic determination of content of non-metallic inclusions* <sup>1)</sup>

EN 4050-4, *Aerospace series — Test method for metallic materials — Ultrasonic inspection of bars, plates, forging stock and forgings — Part 4: Acceptance criteria* <sup>2014</sup>

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

AMS 2315, *Determination of delta ferrite content* <sup>2)</sup>

1) Published as ASD-STAN Prestandard at the date of publication of this standard ([www.asd-stan.org](http://www.asd-stan.org)).

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

## EN 4628:2013 (E)

1	Material designation		Steel X4CrNiMo16-5-1 (1.4418)									
2	Chemical composition %	Element	C	Si	Mn <sup>a</sup>	P <sup>b</sup>	S <sup>b</sup>	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 (direct quenching on hot rolled products) + Tempered	Hardened + Tempered
	Heat treatment		$\theta \geq 830 \text{ }^\circ\text{C}$	$850 \text{ }^\circ\text{C} \leq \theta \leq 1\ 060 \text{ }^\circ\text{C} / \text{AC} + \theta \geq 250 \text{ }^\circ\text{C}$	$1\ 010 \text{ }^\circ\text{C} \leq \theta \leq 1\ 060 \text{ }^\circ\text{C} / \text{OQ}$ or WQ <sup>c</sup> $+ 375 \text{ }^\circ\text{C} \leq \theta \leq 405 \text{ }^\circ\text{C}^d$
6.2	Delivery condition code		A	U	
7	Use condition		Delivery condition		Delivery condition
	Heat treatment		Delivery condition $+ 1\ 010 \text{ }^\circ\text{C} \leq \theta \leq 1\ 060 \text{ }^\circ\text{C} / \text{OQ}$ or WQ <sup>c</sup> $+ 375 \text{ }^\circ\text{C} \leq \theta \leq 405 \text{ }^\circ\text{C}$		–

## Characteristics

8.1	Test sample(s)		See EN 4700-002.		See EN 4700-002.	
8.2	Test piece(s)		See EN 4700-002.		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	L   LT
12	Temperature	$\theta$	°C	Ambient		Ambient
13	Proof stress	$R_{p0,2}$	MPa	–		$\geq 900$
14	T Strength	$R_m$	MPa	–		$1\ 150 \leq R_m \leq 1\ 300$
15	Elongation	A	%	–		$\geq 14$   $\geq 8$
16	Reduction of area	Z	%	–		–
17	Hardness		HBW $\leq 293$		$341 \leq \text{HBW} \leq 401$	
18	Shear strength	$R_c$	MPa	–		–
19	Bending	k	–	–		–
20	Impact strength		–		$\geq 100 \text{ J at } 20 \text{ }^\circ\text{C}$ Notch direction T $\geq 60 \text{ J at } -30 \text{ }^\circ\text{C}$ Notch direction T (see line 98)	$\geq 100 \text{ J at } 20 \text{ }^\circ\text{C}$ Notch direction T $\geq 60 \text{ J at } -30 \text{ }^\circ\text{C}$ Notch direction T (see line 98)   $\geq 50 \text{ J at } 20 \text{ }^\circ\text{C}$ Notch direction L $\geq 20 \text{ J at } -30 \text{ }^\circ\text{C}$ Notch direction L (see line 98)
21	Temperature	$\theta$	°C	–		
22	Time		h	–		
23	Stress	$\sigma_a$	MPa	–		
24	Elongation	a	%	–		
25	Rupture stress	$\sigma_R$	MPa	–		
26	Elongation at rupture	A	%	–		
27	Notes (see line 98)		a, b, c, d			



30	Microstructure	–	EN 4700-002
		1	See AMS 2315.
		7	The $\delta$ ferrite content shall not exceed 5 %
34	Grain size	–	See EN 4700-002.
		7	G = 5 or finer
44	External defects (visual)	–	EN 4700-002
50	Cleanliness/inclusion content (micro cleanness)	–	EN 4700-002
		1	See EN 2951.
		7	Category 2
61	Internal defects	–	EN 4700-002
		1	See EN 4050-4.
		7	Class 4
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95	Marking inspection	–	EN 4700-002
96	Dimensional inspection	–	EN 4700-002
98	Notes	–	<p><sup>a</sup> Where a more stringent impact strength is required (e.g. <math>\geq 20</math> J at <math>-40</math> °C direction L and <math>\geq 50</math> J at <math>-40</math> °C direction T), the maximum Mn content may be increased to 2 % subject to agreement between the customer and the supplier.</p> <p><sup>b</sup> For specific welding applications (e.g. high power beam), and after agreement between manufacturer and purchaser, S+P should be equal or less than 0,023 %.</p> <p><sup>c</sup> Air quenching may be used for <math>D_e \leq 20</math> mm.</p> <p><sup>d</sup> The temperature range may be increased subject to agreement between the customer and the supplier.</p>
99	Typical use	–	–