



BSI Standards Publication

**Aerospace series — Steel
X5CrNoMoCuNb14-5 (1.4594) —
 $930 \text{ MPa} \leq R_m \leq 1\,080 \text{ MPa}$ — Bars**

National foreword

This British Standard is the UK implementation of EN 2502:2019.

The UK participation in its preparation was entrusted to Technical Committee ACE/61/-/15, Steels for Aerospace Purposes.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2019

ISBN 978 0 539 02513 2

ICS 49.025.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2019.

Amendments/corrigenda issued since publication

Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 2502

December 2019

ICS 49.025.10

English Version

**Aerospace series - Steel X5CrNoMoCuNb14-5 (1.4594) -
930 MPa ≤ Rm ≤ 1 080 MPa - Bars**

Série aérospatiale - Acier X5CrNoMoCuNb14-5
(1.4594) - 930 MPa ≤ Rm ≤ 1 080 MPa - Barres

Luft- und Raumfahrt - Stahl Acier X5CrNoMoCuNb14-5
(1.4594) - 930 MPa ≤ Rm ≤ 1 080 MPa - Stangen - De ≤
150 mm

This European Standard was approved by CEN on 4 February 2019.

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Contents	Page
European foreword.....	3
Introduction.....	4
1 Scope	5
2 Normative references	5
3 Terms and definitions.....	5
4 Requirements	5
Bibliography	8

European foreword

This document (EN 2502:2019) 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 document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2020, and conflicting national standards shall be withdrawn at the latest by June 2020.

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Introduction

This document 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 document has been prepared in accordance with EN 4500-005.

1 Scope

This document specifies the requirements relating to:

Steel X5CrNiMoCuNb14-5 (1.4594)
 $930 \text{ MPa} \leq R_m \leq 1\,080 \text{ MPa}$
Bars
 $D_e \leq 150 \text{ mm}$

for aerospace applications.

ASD-STAN designation: FE-PM66.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2034, *Round steel bars drawn and/or descaled — Dimensions — Tolerance h 11 — Aerospace series*

EN 2035, *Round steel bars — Drawn — Dimensions — Tolerance h 9 — Aerospace series*¹⁾

EN 2036, *Round steel bars — Ground — Dimensions — Tolerance h 8 — Aerospace series*

EN 2037, *Hexagonal steel bars — Drawn — Dimensions — Tolerances h 11 and h 12 — Aerospace series*

EN 2038, *Hexagonal steel bars — Drawn — Dimensions — Tolerance h 9 — Aerospace series*¹⁾

EN 2039, *Rectangular steel bars — Drawn — Dimensions — Tolerances h 11/h 12 — Aerospace series*¹⁾

EN 2040, *Rectangular steel bars — Rolled — Dimensions — Tolerance js 16 — Aerospace series*

EN 2041, *Square steel bars — Drawn — Dimensions — Tolerances h 11/h 12 — Aerospace series*¹⁾

EN 2042, *Square steel bars — Rolled — Dimensions — Tolerance js 16 — Aerospace series*¹⁾

EN 4700-002, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 002: Bars and sections*¹⁾

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Requirements

See Table 1.

¹⁾ Published as ASD-STAN Standard at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN), <http://www.asd-stan.org/>

Table 1 — Requirements for steel X5CrNoMoCuNb14-5 (1.4594)

1	Material designation		Steel X5CrNoMoCuNb14-5 (1.4594)									
2	Chemical composition %	Element	C	Si	Mn	P	S	Cr	Mo	Ni	Nb	Cu
		min.	–	–	–	–	–	13,2	1,2	5,0	0,10	1,2
		max.	0,07	0,60	1,00	0,035	0,025	14,7	2,0	5,8	0,40	2,0
3	Method of melting		Air melted									
4.1	Form		Bars									
4.2	Method of production		–									
4.3	Limit dimension(s)	mm	$D_e \leq 150$									
5	Technical specification		EN 4700-002									
	Dimensional standards		EN 2034 to EN 2042									

6.1	Delivery condition		Solution annealed, primary hardened and precipitation hardened									
	Heat treatment		$1\,000\,^{\circ}\text{C} \leq \theta \leq 1050\,^{\circ}\text{C}/t \geq 30\,\text{min}/\text{Air quenched}^{\text{a}}$ $+ 740\,^{\circ}\text{C} \leq \theta \leq 760\,^{\circ}\text{C}/t = 2\,\text{h}/\text{Air cool}^{\text{a}}$ $+ 530\,^{\circ}\text{C} \leq \theta \leq 550\,^{\circ}\text{C}/t = 2\,\text{h}/\text{Air cool}$									
6.2	Delivery condition code		–									
7	Use condition		Solution annealed, primary hardened and precipitation hardened									
	Heat treatment		Delivery condition									

Characteristics

8.1	Test sample(s)			-	Bar: $D = 16\text{ mm}$	
8.2	Test piece(s)			-	Reference (see line 29) ^b	
8.3	Heat treatment			Use condition	-	
9	Dimensions concerned		mm	≤ 150		
10	Thickness of cladding on each face		%	-		
11	Direction of test piece			L		
12	T	Temperature	θ	°C	Ambient	
13		Proof stress	$R_{p0,2}$	MPa*	≥ 780	≥ 1 030
14		Strength	R_m	MPa*	$930 \leq R_m \leq 1\,080$	$1\,270 \leq R_m \leq 1\,470$
15		Elongation	A	%	≥ 15	≥ 10
16		Reduction of area	Z	%	-	-
17	Hardness			$277 \leq \text{HB} \leq 341$	$375 \leq \text{HB} \leq 429$	
18	Shear strength		R_c	MPa*	-	-
19	Bending		k	-	-	-
20	Impact strength (J)			≥ 40	≥ 15	
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, b		

29	Reference heat treatment	–	Solution annealed and precipitation hardened (950 ± 10) °C/t = 30 min/Air cool ^a (450 ± 10) °C/t = 2 h/Air cool ^a
95	Marking inspection	–	–
96	Dimensional inspection	–	–
98	Notes	–	* 1 MPa = 1 N/mm ² . a Cool to $\theta \leq 30$ °C. b Optional test.
99	Typical use	–	Precipitation hardening stainless steel.
100	–	Product qualification	–
			Qualification programme to be agreed between manufacturer and purchaser.

Bibliography

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*

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BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK