



SLOVENSKI STANDARD

SIST EN 4628:2023

01-marec-2023

Nadomešča:

SIST EN 4628:2014

**Aeronavtika - Jeklo X4CrNiMo16-5-1 (1.4418) - Taljeno - Utrjeno in mehko žarjeno -
Palice - De ≤ 200 mm - 1150 MPa ≤ Rm ≤ 1300 MPa**

Aerospace series - Steel X4CrNiMo16-5-1 (1.4418) - Air melted - Hardened and
tempered - Bars - De ≤ 200 mm - 1 150 MPa ≤ Rm ≤ 1 300 MPa

Luft- und Raumfahrt - Stahl X4CrNiMo16-5-1 (1.4418) - Lufterschmolzen - Gehärtet- und
angelassen - Stangen - De ≤ 200 mm - 1 150 MPa ≤ Rm ≤ 1 300 MPa

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

Ta slovenski standard je istoveten z: EN 4628:2022

ICS:

49.025.10	Jekla	Steels
77.140.60	Jeklene palice in drogovi	Steel bars and rods

SIST EN 4628:2023

en,fr,de

EUROPEAN STANDARD

EN 4628

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 49.025.10

Supersedes EN 4628:2013

English Version

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

This European Standard was approved by CEN on 22 August 2022.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 4628:2022) 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 document 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 2023, and conflicting national standards shall be withdrawn at the latest by June 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 4628:2013.

This document is a technical revision of EN 4628:2013.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this document: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

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EN 4628:2022 (E)

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.

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1 Scope

This document specifies the requirements relating to:

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

for aerospace applications.

NOTE Other common designations:

- AIR: Z 8 CND 17-04.
- Only the chemical composition according to this document is considered.

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 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*

EN 2951, *Aerospace series — Metallic materials — 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 4700-002, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 002: Bars and sections*

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

AMS 2315,¹⁾ *Determination of Delta Ferrite Content*

ASTM A604,¹⁾ *Standard Practice for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets*

ASTM E340,²⁾ *Standard Practice for Macroetching Metals and Alloys*

ASTM E381,²⁾ *Standard Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings*

¹⁾ Published by: SAE International (US), <https://www.sae.org/>.

²⁾ Published by: ASTM International (US), <https://www.astm.org/>.

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3 Terms and definitions

No terms and definitions are listed in this document.

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

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

4 Requirements

See Table 1.

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Table 1 — Requirements for steel X4CrNiMo16-5-1 (1.4418) — Bars

1	Material designation		Steel X4CrNiMo16-5-1 (1.4418)									
2	Chemical composition %	Element	C	Si	Mn	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		Bars									
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	$\theta \geq 830 \text{ }^\circ\text{C}$	$850 \text{ }^\circ\text{C} \leq \theta \leq 1\ 060 \text{ }^\circ\text{C/AC}$ $+ \theta \geq 250 \text{ }^\circ\text{C}$	$1\ 010 \text{ }^\circ\text{C} \leq \theta \leq 1\ 060 \text{ }^\circ\text{C/PQ}$, OQ or WQ ^c $+ 375 \text{ }^\circ\text{C} \leq \theta \leq 405 \text{ }^\circ\text{C}$ or $480 \text{ }^\circ\text{C} \leq \theta \leq 550 \text{ }^\circ\text{C}$
6.2	Delivery condition code	A		U
7	Use condition	Hardened + Tempered		Delivery condition
	Heat treatment	Delivery condition $+ 1\ 010 \text{ }^\circ\text{C} \leq \theta \leq 1\ 060 \text{ }^\circ\text{C/PQ}$, OQ or WQ ^c $+ 375 \text{ }^\circ\text{C} \leq \theta \leq 405 \text{ }^\circ\text{C}$ or $480 \text{ }^\circ\text{C} \leq \theta \leq 550 \text{ }^\circ\text{C}$		—

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	$D_e \leq 200$	$D_e \leq 75$ $D_e \leq 75$ $75 < D_e \leq 200$
10	Thickness of cladding on each face	%	—	—
11	Direction of test piece	—		L L LT
12	Temperature	θ	$^\circ\text{C}$	Ambient Ambient Ambient
13	Proof stress	$R_{p0.2}$	MPa	— ≥ 900 ≥ 900
14	Strength	R_m	MPa	— $1\ 150 \leq R_m \leq 1\ 300$ $1\ 150 \leq R_m \leq 1\ 300$
15	Elongation	A	%	— ≥ 14 ≥ 14 ≥ 8
16	Reduction of area	Z	%	— — —
17	Hardness	HBW		≤ 293 $341 \leq \text{HBW} \leq 401$ $341 \leq \text{HBW} \leq 401$
18	Shear strength	R_c	MPa	— — —
19	Bending	k	—	— — —
20	Impact strength ^a	KV	J	— $\geq 100 \text{ J at } 20 \text{ }^\circ\text{C}$ 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	θ	$^\circ\text{C}$	—
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		

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30	Microstructure	—	EN 4700-002
		1	See AMS 2315.
		7	The δ ferrite content shall not exceed 5 %, and austenite shall not exceed 10 %.
34	Grain size	—	EN 4700-002
		1	See EN ISO 643.
		7	$G \geq 5$ or finer
44	External imperfections Visual testing (VT)	—	EN 4700-002
50	Inclusion content	—	EN 4700-002
		1	See EN 2951.
		7	Category 2
51	Macrostructure (grain flow)	—	EN 4700-002
		1	See ASTM A604/ASTM E340/ASTM E381.
61	Internal imperfections Ultrasonic testing (UT)	—	EN 4700-002
		7	EN 4050-4, Class 2
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95	Marking inspection	—	EN 4700-002
96	Dimensional inspection	—	EN 4700-002
98	Notes	—	<p>a After agreement between manufacturer and purchaser, a more stringent impact strength should be required (e.g. ≥ 50 J at -40 °C direction L and ≥ 20 J at -40 °C direction T).</p> <p>b For specific welding applications (e.g. with high-power beam), and after agreement between manufacturer and purchaser, S + P should be equal or less than 0,023 %.</p> <p>c Air quenching may be used for $D_e \leq 20$ mm.</p>
99	Typical use	—	—