# SLOVENSKI STANDARD
# SIST EN 4825:2021

**01-julij-2021**

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**Aeronavtika - Jeklo X12CrNiMoV12-3 (1.4938) - Taljeno na zraku in pretaljeno s taljivo elektrodo - Utrjeno in mehko žarjeno - Palice - De ≤ 150 mm - 900 MPa ≤ Rm ≤ 1 100 MPa**

Aerospace series - Steel X12CrNiMoV12-3 (1.4938) - Air melted and consumable electrode remelted - Hardened and tempered - Bars - De ≤ 150 mm - 900 MPa ≤ Rm ≤ 1 100 MPa

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Luft- und Raumfahrt - Stahl X12CrNiMoV12-3 (1.4938) - Lufterschmolzen und mit selbstverzehrender Elektrode umgeschmolzen - Gehärtet- und angelassen - Stangen - De ≤ 150 mm - 900 MPa ≤ Rm ≤ 1 100 MPa

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Série aérospatiale - Acier X12CrNiMoV12-3 (1.4938) - Élaboré à l'air et refondu à l'électrode consommable - Trempé et revenu - Barres - De ≤ 150 mm - 900 MPa ≤ Rm ≤ 1 100 MPa

**Ta slovenski standard je istoveten z:** **EN 4825:2021**

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**ICS:**

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

**SIST EN 4825:2021** **en,fr,de**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 4825

May 2021

ICS 49.025.10

English Version

# Aerospace series - Steel X12CrNiMoV12-3 (1.4938) - Air melted and consumable electrode remelted - Hardened and tempered - Bars - De ≤ 150 mm - 900 MPa ≤ Rm ≤ 1 100 MPa

Série aérospatiale - Acier X12CrNiMoV12-3 (1.4938) - Élaboré à l'air et refondu à l'électrode consommable - Trempé et revenu - Barres - De ≤ 150 mm - 900 MPa ≤ Rm ≤ 1 100 MPa

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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## European foreword

This document (EN 4825:2021) 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 November 2021, and conflicting national standards shall be withdrawn at the latest by November 2021.

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.

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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.

This document allows to be in compliance with the requirements of the grade of WL 1.4939 and 1.4933 if the steel maker aims C 0,008-0,13 % max. and Si ≤ 0,35 %.

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# 1 Scope

This document specifies the requirements relating to:

Steel X12CrNiMoV12-3 (1.4938)
Air melted and consumable electrode remelted
Hardened and tempered
Bars
$D_e \leq 150$ mm
900 MPa $\leq R_m \leq$ 1 100 MPa

for aerospace applications.

# 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 2043, *Aerospace series — Metallic materials — General requirements for semi-finished product qualification (excluding forgings and castings)*

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

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

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EN 4700-002, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 002: Bar and section* [1]

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# 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 document by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), http://www.asd-stan.org/.

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## Table 1 — Requirements for steel X12CrNiMoV12-3 (1.4938) — Bars

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Material designation | | Steel X12CrNiMoV12-3 (1.4938) | | | | | | | | | | |
| 2 | Chemical composition % | Element | C | Si | Mn | P | S | Cr | Mo | Ni | V | N | Fe |
| | | min. | 0,08 | — | 0,50 | — | — | 11,0 | 1,50 | 2,00 | 0,25 | 0,020 | Base |
| | | max. | 0,15 | 0,50 | 0,90 | 0,025 | 0,015 | 12,5 | 2,00 | 3,00 | 0,40 | 0,040 | |
| 3 | Method of melting | | Air melted and consumable electrode remelted | | | | | | | | | | |
| 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 | | | | | | | | | | |

| | | | |
|---|---|---|---|
| 6.1 | Delivery condition | Softened | Hardened and tempered |
| | Heat treatment | — | 1 020 °C ≤ $\theta$ ≤ 1 050 °C [a]/PQ, OQ or AC + $\theta$ ≥ 640 °C |
| 6.2 | Delivery condition code | *A* | *U* |
| 7 | Use condition | Hardened and tempered | Delivery condition |
| | Heat treatment | Delivery condition 1 020 °C ≤ $\theta$ ≤ 1 050 °C [a]/PQ, OQ or AC + $\theta$ ≥ 640 °C | — |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Characteristics | | |
| 8.1 | Test sample(s) | | | See EN 4700-002. | | |
| 8.2 | Test piece(s) | | | See EN 4700-002. | | |
| 8.3 | Heat treatment | | | Softened | Hardened and tempered | |
| 9 | Dimensions concerned | | mm | | $D_e \leq 150$ | |
| 10 | Thickness of cladding on each face | | % | | | |
| 11 | Direction of test piece | | | — | *L* or *T* [b] | |
| 12 | T | Temperature | $\theta$ | °C | Ambient | |
| 13 | T | Proof stress | $R_{p0,2}$ | MPa | — | ≥ 750 |
| 14 | T | Strength | $R_m$ | MPa | — | $900 \leq R_m \leq 1\,100$ |
| 15 | T | Elongation | *A* | % | — | ≥ 14 [c] |
| 16 | T | Reduction of area | *Z* | % | — | ≥ 40 |
| 17 | Hardness [d] | | HB | | ≤ 311 | 269 ≤ HB ≤ 331 |
| 18 | Shear strength | | $R_c$ | MPa | — | — — |
| 19 | Bending | | *k* | — | — | — — |
| 20 | Impact strength [a] | | *KV* | J | — | ≥ 30 J at 20 °C; Notch direction *T* |
| 21 | C | Temperature | $\theta$ | °C | — | |
| 22 | C | Time | | h | — | |
| 23 | C | Stress | $\sigma_a$ | MPa | — | |
| 24 | C | Elongation | *a* | % | — | |
| 25 | C | Rupture stress | $\sigma_R$ | MPa | — | |
| 26 | C | Elongation at rupture | *A* | % | — | |
| 27 | Notes (see line 98) | | | | a, b, c, d | |

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| | | | |
|---|---|---|---|
| 34 | Grain size | — | See EN 4700-002. |
| | | 7 | $G \geq 5$; some 3 permitted |
| 44 | External imperfections (visual testing-VT) | — | See EN 4700-002. |
| | | 1 | Visual |
| 50 | Inclusion content | — | See EN 4700-002. |
| | | 7 | EN 2951, Category 3 |
| 61 | Internal imperfections (ultrasonic testing-UT) | — | EN 4700-006 |
| | | 7 | EN 4050-4, Class 4 |
| | | | |
| 95 | Marking inspection | — | See EN 4700-002. |
| 96 | Dimensional inspection | — | See EN 4700-002. |
| 98 | Notes | — | a For optimum corrosion resistance 990°C ≤ θ ≤ 1030 °C is recommended.<br>b 75 mm ≤ $D_e$ ≤ 150 mm may be tested in $L$ or $T$ direction.<br>c $A \geq 10$ % if material is cold worked.<br>d An over range hardness is not considered as a rejection reason. |
| 99 | Typical use | — | For several applications. |

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| | | | | |
|---|---|---|---|---|
| 100 | — | Product qualification | — | See EN 2043. |
| | | | | Qualification programme to be agreed between manufacturer and purchaser. |

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