SLOVENSKI STANDARD
oSIST prEN 4842:2020

01-november-2020

Aeronavtika - Jeklo X5CrNiCu15-5 (WL 1.4545) - Pretaljeno s talilno elektrodo (ESR ali VAR) - Topilno žarjeno in izločevalno utrjeno (H1025) - Palice za obdelavo - a ali D ≤ 250 mm - 1070 MPa ≤ Rm ≤ 1200 MPa - Visoka stopnja kakovosti (pq)

Aerospace series - Steel X5CrNiCu15-5 (WL 1.4545) - Consumable electrode remelted (ESR or VAR) - Solution treated and precipitation treated (H1025) - Bars for machining - a or D ≤ 250 mm - 1 070 MPa ≤ Rm ≤ 1 200 MPa - Premium quality (pq)

Luft- und Raumfahrt - Stahl X5CrNiCu15-5 (WL 1.4545) - Mit selbstverzehrender Elektrode umgeschmolzen (ESR oder VAR) - lösungsgeglüht und ausgelagert (H1025) - Stangen zur spanenden Bearbeitung - a oder D ≤ 250 mm - 1 070 MPa ≤ Rm ≤ 1 200 MPa - Beste Güte (pq)

Série aérospatiale - Acier X5CrNiCu15-5 (WL 1.4545) - Refondu à l'électrode consommable (ESR ou VAR) - Mis en solution et vieilli (H1025) - Barres pour usinage - a ou D ≤ 250 mm - 1 070 MPa ≤ Rm ≤ 1 200 MPa - Première qualité (pq)

Ta slovenski standard je istoveten z: **prEN 4842**

ICS:

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

oSIST prEN 4842:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
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ICS

Will supersede EN 4842:2019

English Version

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ASD-STAN.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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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 (prEN 4842:2020) 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-STAN, prior to its presentation to CEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 4842:2019.

Introduction

This document is part of the series of 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 X5CrNiCu15-5 (WL 1.4545)

Consumable electrode remelted (ESR or VAR)

Solution treated and precipitation treated (H1025)

Bars for machining

a or $D \leq 250$ mm

1 070 MPa $\leq R_m \leq$ 1 200 MPa

Premium quality (pq)

for aerospace applications.

NOTE Other designation:

The ASD-STAN designation of this material is FE-PM1802.

Only the chemical composition of this document are to be 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 2043, *Aerospace series - Metallic materials - General requirements for semi-finished product qualification (excluding forgings and castings)*

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 3874, Aerospace series — Test methods for metallic materials — Constant amplitude force-controlled low cycle fatigue testing *1)*

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: Bar and section*

ISO 1143, *Metallic materials — Rotating bar bending fatigue testing*

AMS 2315, *Determination of Delta Ferrite Content*

ASTM E45, *Standard Test Methods for Determining the Inclusion Content of Steel 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.

Table 1 — Requirements for Steel X5CrNiCu15–5 (WL 1.4545)

1	Material designation		X5CrNiCu15–5 (WL 1.4545)										
2	Chemical composition %	Element	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	Nb + Ta	Fe
		min.	—	—	—	—	—	14,0	—	3,5	2,5	5 × C	Base
		max.	0,07	1,00	1,00	0,025	0,005	15,5	0,50	5,5	4,5	0,45	
3	Method of melting		Consumable electrode remelted (ESR or VAR)										
4.1	Form		Bars										
4.2	Method of production		—										
4.3	Limit dimension(s)	mm	a or $D \leq 250$										
5	Technical specification		See EN 4700-002.										

6.1	Delivery condition	Solution treated and precipitation treated
	Heat treatment	1 025 °C ≤ θ ≤ 1 050 °C/t ≥ 30 min/AC or faster + cool to θ ≤ 30 °C + 540 °C ≤ θ ≤ 570 °C/t ≥ 4 h/AC or faster
6.2	Delivery condition code	U
7	Use condition	Delivery condition
	Heat treatment	—

Characteristics

8.1	Test sample(s)			See EN 4700-002.	
8.2	Test piece(s)			See EN 4700-002.	
8.3	Heat treatment			Use condition	
9	Dimensions concerned		mm	a or $D \leq 250$	
10	Thickness of cladding on each face		%	—	
11	Direction of test piece			L	T (a or $D \geq 75$ mm)
12	T	Temperature	θ °C	Ambient	
13		Proof stress	$R_{p0,2}$ MPa	≥ 1 000	
14		Strength	R_m MPa	1 070 ≤ R_m ≤ 1 200	
15		Elongation	A %	≥ 11	≥ 7
16		Reduction of area	Z %	—	—
17	Hardness			321 ≤ HBW ≤ 375	
18	Shear strength		R_c MPa	—	
19	Bending		k –	—	

20	Impact strength	Notch direction		L-T		T-L	
		Temperature °C		+20	−30	+20	−30
		Energy	KV J	≥ 80	≥ 35	≥ 56	≥ 25

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)			—	

30	Microstructure	—	See EN 4700-002.		
		1	EN 2950		
		3	L-T Direction		
		7	Martensitic structure fine and homogeneous		
	Microstructure (Ferrite δ)	—	See EN 4700-002.		
		1	AMS 2315		
		2	1 (one) per cast		
		3	Corresponding to ingot top		
		7	The δ ferrite content shall not exceed 0,5 %		
34	Grain size	—	See EN 4700-002.		
		1	$G \geq 5$; occasional, $G \geq 3$ permitted		
44	External imperfections	—	See EN 4700-002.		
	(visual testing – VT)	1	Visual		
50	Inclusion content	—	See EN 4700-002.		
		1	ASTM E45 – Method D		
		7	Inclusion types	Thin	Heavy
			A (Sulphides)	≤ 1	≤ 0,5
			B (Aluminates)	≤ 1	≤ 0,5
			C (Silicates)	≤ 1	≤ 0,5
			D (Globular oxides)	≤ 1,5	≤ 1
			The maximum allowed series (thin and heavy) on 20 mm² (40 fields: 20 in longitudinal direction, 20 in transversal direction) for all type of inclusions is 20, so: Σ (A + B + C + D) ≤ 20		
51	Macrostructure	—	See EN 4700-002.		
		7	Class	Condition	Severity
			1	Freckles	A
			2	White spots	A
			3	Radial segregation	A
			4	Ring pattern	B
61	Internal imperfections	—	See EN 4700-002.		
	(ultrasonic testing – UT)	1	EN 4050-4		
		6	a or $D \leq 100$ mm may be tested either on the product or at an earlier stage of manufacturing.		
		7	10 < a or $D \leq 150$ mm Class 5	150 < a or $D \leq 250$ mm Class 3	
64	Surface condition roughness		a or $D \leq 100$ mm	100 < a or $D \leq 250$ mm	
			Smooth turned or better	Peeled or turned or better	
			$Ra \leq 1,6$ µm	$Ra \leq 3,2$ µm	
95	Marking inspection	—	See EN 4700-002.		
96	Dimensional inspection	—	See EN 4700-002.		
98	Notes	—	—		
99	Typical use	—	—		

100	—	Product qualification		—	See EN 2043.			
	30	Microstructure (for qualification)		—	X Ray			
				—	Austenite γ ≤ 20 %			
	40	Fracture toughness (K1c or Kq) (For qualification)	MPa	—	See EN 4700-002.			
				3	Tests shall be carried out when the section size permits ($D \geq 70$ mm or $a \geq 30$ mm)			
			√m	4	*T-L*	*L-T*		
				7	≥ 120			
	46	Fatigue (for qualification)		—	See EN 4700-002.			
				1	See EN 3874 or ISO 1143			
				7	σ max. (MPa)	Number of cycles	R	Kt	Direction
					600	≥ 10^{E5}	−1	1,035	*L*
					510	≥ $2{,}10^{E7}$			