BS EN 4720:2014

BSI Standards Publication

Aerospace series — Steel X4CrNiMo16-5-1 (1.4418) — Air melted and electroslag remelted (ESR) — Hardened and tempered — Bar — De ≤ 200 mm — 1 150 MPa ≤ Rm ≤ 1 300 MPa

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National foreword

This British Standard is the UK implementation of EN 4720:2014.

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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English Version

Aerospace series - Steel X4CrNiMo16-5-1 (1.4418) - Air melted and electroslag remelted (ESR) - Hardened and tempered - Bar - 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

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

This European Standard was approved by CEN on 4 January 2014.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Foreword

This document (EN 4720:2014) 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of an identical text or by endorsement, at the latest by April 2015 and conflicting national standards shall be withdrawn at the latest by April 2015.

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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.

1 Scope

This European Standard specifies the requirements relating to:

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

for aerospace applications.

NOTE Other common designation:
AIR: Z 8 CND 17-04.

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.

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

EN 2951, *Aerospace series — Metallic materials — Test method — Micrographic determination of content of non-metallic inclusions* [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 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* [2)]

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

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

1	Material designation		Steel X4CrNiMo16-5-1 (1.4418)									
2	Chemical composition %	Element	C	Si	Mn [a]	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 and electroslag remelted (ESR)									
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	$\theta \geq 830$ °C	850 °C $\leq \theta \leq$ 1 060 °C / AC Tempered $\theta \geq 250$ °C	1 010 °C $\leq \theta \leq$ 1 060 °C / OQ or WQ [c] + Tempered 375 °C $\leq \theta \leq$ 405 °C
6.2	Delivery condition code	A	U	
7	Use condition	Hardened and tempered	Delivery condition	
	Heat treatment	Delivery condition + 1 010 °C $\leq \theta \leq$ 1 060 °C / OQ or WQ [c] + 375 °C $\leq \theta \leq$ 405 °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	T	Temperature	θ °C	Ambient	Ambient	Ambient		
13	T	Proof stress	$R_{p0,2}$ MPa	–	≥ 900	≥ 900		
14	T	Strength	R_m MPa	–	1 150 $\leq R_m \leq$ 1 300	1 150 $\leq R_m \leq$ 1 300		
15	T	Elongation	A %	–	≥ 14	≥ 14	≥ 8	
16	T	Reduction of area	Z %	–	–	–	–	
17	Hardness			HBW ≤ 293	350 ≤ HBW ≤ 401	350 ≤ HBW ≤ 401		
18	Shear strength		R_c MPa	–	–	–		
19	Bending		k –	–	–	–		
20	Impact strength		KV J	–	≥ 100 J at 20 °C Notch direction T ≥ 60 J at – 30 °C Notch direction T (see line 98)	≥ 100 J at 20 °C Notch direction T ≥ 60 J at – 30 °C Notch direction T (see line 98)	≥ 50 J at 20 °C Notch direction L ≥ 20 J at – 30 °C Notch direction L (see line 98)	
21	C	Temperature	θ °C	–				
22	C	Time	h	–				
23	C	Stress	σ_a MPa	–				
24	C	Elongation	a %	–				
25	C	Rupture stress	σ_R MPa	–				
26	C	Elongation at rupture	A %	–				
27	Notes (see line 98)			a, b, c				

30	Microstructure	–	EN 4700-002
		1	See AMS 2315.
		7	The δ ferrite content shall not exceed 5 %
34	Grain size	–	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 4
61	Internal defects	–	EN 4700-002
		1	See EN 4050-2.
		7	Class 5
95	Marking inspection	–	EN 4700-002
96	Dimensional inspection	–	EN 4700-002
98	Notes	–	[a] Where a more stringent impact strength is required (e.g. ≥ 20 J at − 40 °C direction L and ≥ 50 J at − 40 °C direction T), the maximum Mn content may be increased to 2 % subject to agreement between the customer and the supplier. [b] 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 %. [c] Air quenching may be used for $D_e \leq 20$ mm.
99	Typical use	–	–

100	–	Product qualification	–	EN 2043
				Qualification programme to be agreed between manufacturer and purchaser.

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