BRITISH STANDARD

BS EN
3972:2006

Aerospace series — Steel FE-PL1507 (40CrMoV12) — Consumable electrode remelted — Hardened and tempered — Bar for machining — De ⩽ 50 mm — 1 250 MPa ⩽ Rm ⩽ 1 400 MPa

The European Standard EN 3972:2006 has the status of a British Standard

ICS 49.025.10

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National foreword

This British Standard was published by BSI. It is the UK implementation of EN 3972:2006.

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A list of organizations represented on ACE/61/-/15 can be obtained on request to its secretary.

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English Version

Aerospace series - Steel FE-PL1507 (40CrMoV12) - Consumable electrode remelted - Hardened and tempered - Bar for machining - De ≤ 50 mm - 1 250 MPa ≤ Rm ≤ 1 400 MPa

Série aérospatiale - Acier FE-PL1507 (40CrMoV12) - Refondu à l'électrode consommable - Trempé et revenu - Barres pour usinage - De ≤ 50 mm - 1 250 MPa ≤ Rm ≤ 1 400 MPa

Luft- und Raumfahrt - Stahl FE-PL1507 (40CrMoV12) - Mit selbstverzehrender Elektrode umgeschmolzen - Gehärtet und angelassen - Stangen zur spanenden Bearbeitung - De ≤ 50 mm - 1 250 MPa ≤ Rm ≤ 1 400 MPa

This European Standard was approved by CEN on 18 October 2006.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Foreword

This document (EN 3972:2006) 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of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.

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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 4500-5.

1 Scope

This standard specifies the requirements relating to:

Steel FE-PL1507 (40CrMoV12)
Consumable electrode remelted
Hardened and tempered
Bar for machining
$D_e \leq 50$ mm
1 250 MPa $\leq R_m \leq$ 1 400 MPa

for aerospace applications.

2 Normative references

The following referenced documents are indispensable for the application 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).* [1)]

EN 4258, *Aerospace series — Metallic materials — General organization of standardization — Links between types of EN standards and their use.*

EN 4500-5, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 5: Specific rules for steels.* [1)]

EN 4700-2, *Aerospace series — Steel and heat resisting alloys — Wrought products — Technical specification — Part 2: Bar and section.* [1)]

1) Published as ASD Prestandard at the date of publication of this standard.

1	Material designation		Steel FE-PL1507 (40CrMoV12)										
2	Chemical composition %	Element	C	Si	Mn	P [a]	S	Cr	Mo	Ni	Sn [a]	V	Fe
		min.	0,35	0,10	0,40	–	–	3,00	0,80	–	–	0,15	Base
		max.	0,43	0,35	0,70	0,015	0,010	3,50	1,10	0,30	0,025	0,25	
3	Method of melting		Consumable electrode remelted										
4.1	Form		Bar for machining										
4.2	Method of production		–										
4.3	Limit dimension(s)	mm	$D_e \leq 50$ [b]										
5	Technical specification		EN 4700-2										

6.1	Delivery condition	Annealed [b]	Hardened and tempered
	Heat treatment	–	910 °C ≤ θ ≤ 950 °C / t ≥ 1 h / OQ + θ ≥ 600 °C / t ≥ 1 h / OQ or AC
6.2	Delivery condition code	A	U
7	Use condition	Hardened and tempered [c]	Delivery condition
	Heat treatment	Delivery condition + 910 °C ≤ θ ≤ 950 °C / t ≥ 1 h / OQ + θ ≥ 600 °C / t ≥ 1 h / OQ or AC	–

Characteristics

8.1	Test sample(s)				See EN 4700-2.	See EN 4700-2.	D = 16 mm Cut from bar delivered in the annealed condition
8.2	Test piece(s)				See EN 4700-2.	See EN 4700-2.	Heat treated before machining
8.3	Heat treatment				Annealed	Hardened and tempered	See line 29.
9	Dimensions concerned			mm	a or $D \leq 100$	$D_e \leq 50$	a or $D \leq 100$
10	Thickness of cladding on each face			%	–	–	–
11	Direction of test piece				L	L	L
12	T	Temperature	θ	°C	Ambient	Ambient	Ambient
13	T	Proof stress	$R_{p0,2}$	MPa	–	≥ 1 030	≥ 1 030
14	T	Strength	R_m	MPa	–	1 250 ≤ R_m ≤ 1 400	1 250 ≤ R_m ≤ 1 400
15	T	Elongation	A	%	–	≥ 10	≥ 10
16	T	Reduction of area	Z	%	–	≥ 35	≥ 35
17	Hardness				≤ 277 HB	375 ≤ HB ≤ 401	375 ≤ HB ≤ 401
18	Shear strength		R_c	MPa	–	–	–
19	Bending		k	–	–	–	–
20	Impact strength				–	KV ≥ 25 J ; Notch direction T [d, e]	KV ≥ 25 J ; Notch direction T [d, e]
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, d, e		

29	Reference heat treatment	–	Hardened and tempered 910 °C ≤ θ ≤ 950 °C / t ≥ 30 min / OQ + temper θ ≥ 600 °C / t ≥ 1 h / OQ or AC [f]	
34	Grain size	–	See EN 4700-2.	
		5	Use condition	
		7	G ≥ 7	
44	External defects	–	See EN 4700-2.	
50	Cleanliness/Inclusion content (micro-cleanness)	–	See EN 4700-2.	
		7	Category 3	
51	Macrostructure	–	See EN 4700-2.	
		5	Delivery condition	
		7	Class 1	Freckles: severity A
			Class 2	White spots: severity A
			Class 3	Radial segregation: severity A
			Class 4	Ring pattern: severity B
59	Decarburization	–	See EN 4700-2.	
61	Internal defects	–	See EN 4700-2.	
		7	Class 4	
95	Marking inspection	–	See EN 4700-2.	
96	Dimensional inspection	–	See EN 4700-2.	
98	Notes	–	[a] P + Sn ≤ 0,025 [b] Material with a a or D > 50 mm may be delivered in the annealed condition. [c] Only to be heat treated when D_e ≤ 50 mm [d] Value after blank nitriding: 500 °C ± 10 °C / t = 24 h. The "capability clause" applies. [e] IZOD is optional test and shall achieve 20ft.lbf minimum. [f] Actual heat treatment temperature and time shall be reported on the inspection and test report.	
99	Typical use	–	Low alloy general purpose steel; suitable for nitriding.	

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

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