BRITISH STANDARD

BS EN
3971:2006

Aerospace series — Steel FE-PL1507 (40CrMoV12) — Consumable electrode remelted — Annealed — Forging stock — a or D ⩽ 350 mm

The European Standard EN 3971:2006 has the status of a British Standard

ICS 49.025.10

BSI
British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 3971:2006.

The UK participation in its preparation was entrusted by Technical Committee ACE/61, Metallic materials for aerospace purposes, to Panel ACE/61/-/15, Steels.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Aerospace series - Steel FE-PL1507 (40CrMoV12) - Consumable electrode remelted - Annealed - Forging stock - a or D ≤ 350 mm

Série aérospatiale - Acier FE-PL1507 (40CrMoV12) - Refondu à l'électrode consommable - Recuit - Produits destinés à la forge - a ou D ≤ 350 mm

Luft- und Raumfahrt - Stahl FE-PL1507 (40CrMoV12) - Mit selbstverzehrender Elektrode umgeschmolzen - Geglüht - Schmiedevormaterial - a oder D ≤ 350 mm

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

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

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Foreword

This document (EN 3971:2006) 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of an identical text or by endorsement, at the latest by June 2007, and conflicting national standards shall be withdrawn at the latest by June 2007.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
Annealed
Forging stock
a or $D \leq 350$ mm

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 2002-8, *Aerospace series — Metallic materials — Test methods — Part 8: Micrographic determination of grain size.* [1)]

EN 2003-7, *Aerospace series — Steel — Test methods — Part 7: Macrographic test.* [1)]

EN 2043, *Aerospace series — Metallic materials — General requirements for semi-finished product qualification (excluding forgings and castings).* [1)]

EN 2157-2, *Aerospace series — Steel — Forging stock and forgings — Technical specification — Part 2: Forging stock.*

EN 2957, *Aerospace series — Method of preparation of forged samples.* [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)]

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		Forging stock										
4.2	Method of production		–										
4.3	Limit dimension(s)	mm	*a* or $D \leq 350$										
5	Technical specification		EN 2157-2										

6.1	Delivery condition	Annealed
	Heat treatment	–
6.2	Delivery condition code	U
7	Use condition	Delivery condition
	Heat treatment	–

Characteristics

8.1	Test sample(s)				See EN 2157-2.	Reforged sample in accordance with EN 2957 or cut from forging stock
8.2	Test piece(s)				See EN 2157-2.	Heat treated before machining with $D_e \leq 50$ mm
8.3	Heat treatment				Delivery condition	See line 29.
9	Dimensions concerned			mm	*a* or $D \leq 350$	*a* or $D \leq 350$
10	Thickness of cladding on each face			%	–	–
11	Direction of test piece				–	L or LT
12	T	Temperature	θ	°C	–	Ambient
13	T	Proof stress	$R_{p0,2}$	MPa	–	≥ 1 030
14	T	Strength	R_m	MPa	–	$1\,250 \leq R_m \leq 1\,400$
15	T	Elongation	A	%	–	≥ 10
16	T	Reduction of area	Z	%	–	≥ 45
17	Hardness				≤ 277 HB	375 ≤ HB ≤ 401
18	Shear strength		R_c	MPa	–	–
19	Bending		k	–	–	–
20	Impact strength				–	KV ≥ 25 J ; Notch direction T [b, c]
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	

29	Reference heat treatment	–	Hardened and tempered 910 °C ≤ θ ≤ 950 °C / t ≥ 1 h / OQ + temper θ ≥ 600 °C / t ≥ 1 h / OQ or AC [d]	
34	Grain size	1	EN 2002-8	
		2	The "capability clause" applies	
		3	A transverse slice selected at a convenient stage of manufacture from a location corresponding to the top of the ingot.	
		4	Reforged sample in accordance with EN 2957	
		5	See line 29.	
		7	G ≥ 7	
44	External defects	–	See EN 2157-2.	
50	Cleanliness/inclusion content	–	See EN 2157-2.	
	(micro-cleanness)	7	Category 3	
51	Macrostructure	1	EN 2003-7	
		2	1 per ingot	
		3	A transverse slice selected at a convenient stage of manufacture from a location corresponding to the top of the ingot.	
		5	Non heat treated	
		7	Class 1	Freckles: severity A
			Class 2	White spots: severity A
			Class 3	Radial segregation: severity A
			Class 4	Ring pattern: severity B
61	Internal defects	–	See EN 2157-2.	
		7	*a* or *D* (mm)	Class
			≤ 250	4
			> 250	3
95	Marking inspection	–	See EN 2157-2.	
96	Dimensional inspection	–	See EN 2157-2.	
98	Notes	–	[a] P + Sn ≤ 0,025 [b] Value after blank nitriding: 500 °C ± 10 °C / t = 24 h. The "capability clause" applies. [c] IZOD is optional test and shall achieve 20 ft.lbf minimum. [d] 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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