BRITISH STANDARD

BS EN
3999:2007

Aerospace series — Aluminium alloy AL-P2024-T351 — Sheet and strip with improved chemical milling capability 1,6 mm ≤ a ≤ 6 mm

The European Standard EN 3999:2007 has the status of a British Standard

ICS 49.025.20; 77.150.10

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 3999:2007.

The UK participation in its preparation was entrusted by Technical Committee ACE/61, Metallic materials for aerospace purposes, to Panel ACE/61/-/24, Light alloys.

A list of organizations represented on this committee 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.

Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Aerospace series - Aluminium alloy AL-P2024-T351 - Sheet and strip with improved chemical milling capability 1,6 mm ≤ a ≤ 6 mm

Série aérospatiale - Alliage d'aluminium AL-P2024-T351 - Tôles et bandes avec aptitude améliorée à l'usinage chimique 1,6 mm ≤ a ≤ 6 mm

Luft- und Raumfahrt - Aluminiumlegierung AL-P2024-T351 - Bleche und Bänder mit besserer Eignung zum chemischen Fräsen 1,6 mm ≤ a ≤ 6 mm

This European Standard was approved by CEN on 12 June 2006.

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

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Contents

Foreword

This document (EN 3999:2007) has been prepared by the AeroSpace and Defense 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of an identical text or by endorsement, at the latest by February 2008, and conflicting national standards shall be withdrawn at the latest by February 2008.

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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 4500-2.

1 Scope

This standard specifies the requirements relating to:

Aluminium alloy AL-P2024-T351 — Sheet and strip with improved chemical milling capability 1,6 mm $\leq a \leq$ 6 mm for aerospace application.

This material is manufactured to a minimum residual stress requirement for chemical milling 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 4258, *Aerospace series — Metallic materials — General organization of standardization — Links between types of EN standards and their use*

EN 4400-2, *Aerospace series — Aluminium and aluminium alloy wrought products — Technical specification — Part 2: Sheet and strip* [1)]

EN 4500-2, *Aerospace series — Metallic materials — Rules for drafting and presentation of material standards — Part 2: Specific rules for aluminium, aluminium alloys and magnesium alloys* [1)]

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

1	Material designation		Aluminium alloy AL-P2024-										
2	Chemical composition %	Element	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Others		Al
											Each	Total	
		min.	—	—	3,8	0,30	1,2	—	—	—	—	—	Base
		max.	0,50	0,50	4,9	0,9	1,8	0,10	0,25	0,15	0,05	0,15	
3	Method of melting		—										
4.1	Form		Sheet and strip										
4.2	Method of production		Rolled										
4.3	Limit dimension(s)	mm	$1,6 \leq a \leq 6$										
5	Technical specification		EN 4400-2										

6.1	Delivery condition	T351
	Heat treatment	490 °C ≤ θ ≤ 500 °C / WQ θ ≤ 40 °C + 0,5 % ≤ controlled stretched ≤ 3 % + θ = ambient / t ≥ 5 d
6.2	Delivery condition code	U
7	Use condition	T351
	Heat treatment	Delivery condition

Characteristics

8.1	Test sample(s)			See EN 4400-2.
8.2	Test piece(s)			See EN 4400-2.
8.3	Heat treatment			Use condition
9	Dimensions concerned		mm	$1,6 \leq a \leq 6$
10	Thickness of cladding on each face		%	—
11	Direction of test piece			LT
12	T	Temperature	θ °C	Ambient
13		Proof stress	$R_{p0,2}$ MPa	≥ 290
14		Strength	R_m MPa	≥ 445
15		Elongation	A %	$A_{50\,mm} \geq 14$
16		Reduction of area	Z %	—
17	Hardness			—
18	Shear strength		R_c MPa	—
19	Bending		k –	—
20	Impact strength			—
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)			—

38	Intergranular corrosion	—	See EN 4400-2.			
		7	Dimensions (mm)		$0,6 \leq a \leq 3,2$	$3,2 < a \leq 6$
			Maximum depth of penetration (μm)		≤ 150	≤ 200
44	External defects	—	See EN 4400-2.			
65	Chemical millability	—	See EN 4400-2.			
		7	Measurement of residual stress: h ≤ 4 mm			
82	Batch uniformity	—	See EN 4400-2.			
		7	Electrical conductivity	γ	MS/m	17,5 (Typical value)
		or				
		7	Hardness	HB	125 (Typical value)	
					δ ≤ 16 per product	Δ ≤ 24 per batch
95	Marking inspection	—	See EN 4400-2			
96	Dimensional inspection	—	See EN 4400-2			
98	Notes	—	—			
99	Typical use	—	For parts manufactured by chemically milling through the thickness, necessitating control of residual stress			

100	—	Product qualification	—	See EN 4400-2 Qualification programme to be agreed between manufacturer and purchaser

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