



SLOVENSKI STANDARD

SIST EN 2289:2001

01-januar-2001

Aerospace series - Rod bodies in aluminium alloy for flight controls - Technical specification

Aerospace series - Rod bodies in aluminium alloy for flight controls - Technical specification

Luft- und Raumfahrt - Rohrkörper aus Aluminiumlegierung für Flugsteuerungen - Technische Lieferbedingungen

Série aérospatiale - Corps de bielle en alliage d'aluminium pour commandes de vol - Spécification technique

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Ta slovenski standard je istoveten z: EN 2289:1996

ICS:

49.025.20	Aluminij	Aluminium
49.035	Sestavni deli za letalsko in vesoljsko gradnjo	Components for aerospace construction

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en

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EUROPEAN STANDARD

EN 2289

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 1996

ICS 49.040.30

Descriptors: aircraft, industry, aircraft control, rod body, specification

English version

**Aerospace series - Rod bodies in aluminium alloy
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This European Standard was approved by CEN on 1995-12-27. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries 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 AECMA, 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 January 1997, and conflicting national standards shall be withdrawn at the latest by January 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

..... 1996
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY



1 Scope

This standard specifies the required characteristics, inspection and test methods, qualification and acceptance conditions for flight control rod bodies in aluminium alloy.

It is applicable whenever referenced.

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 2409	Paints and varnishes - Cross cut tests
ISO 5855-1	Aerospace - MJ threads - Part 1 : General requirements
ISO 5855-2	Aerospace - MJ threads - Part 2 : Limit dimensions for bolts and nuts
ISO 9227	Corrosion tests in artificial atmospheres - Salt spray tests
EN 2002-7	Aerospace series - Test methods for metallic materials - Part 7 : Hardness test ¹⁾
EN 2002-16	Aerospace series - Test methods for metallic materials - Part 16 : Dye penetrant testing ²⁾
EN 2004-1	Aerospace series - Test methods for aluminium and aluminium alloy products - Part 1 : Determination of electrical conductivity of wrought aluminium alloys
EN 2435-01	Aerospace series - Paints and varnishes - Corrosion resistant chromated two component cold curing primer - Part 01: Minimum requirements ¹⁾
EN 2510	Aluminium alloy 2024-T42 - Drawn tubes for structural applications - Aerospace series ³⁾
EN 3042	Aerospace series - Quality assurance - EN aerospace products - Qualification procedure
ASTM E 112 : 1984	Standard methods for determining average grain size ⁴⁾

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

2) In preparation at the date of publication of the present standard.

3) Published as AECMA Standard at the date of publication of this standard.

4) Published by : American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103

3 Definitions

For the purposes of this standard, the following definitions apply :

3.1 Surface discontinuities

3.1.1 Crack

Break in the materials which may extend in all directions and be intercrystalline or transcrystalline in character

3.1.2 Score, scratch

Open surface defect

3.1.3 Lap

Surface defect where particles of metal or sharp edges are folded over and then rolled or forged into the surface

3.1.4 Seam

Unwelded fold which appears as an open defect in the material

3.1.5 Inclusions

Non-metallic particles originating from the material manufacturing process. These particles may be isolated or arranged in strings.

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3.2 Production batch

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Batch consisting of rod bodies bearing the same identity block, manufactured in the same manufacturing cycle from the same batch of semi-finished products

3.3 Artificial batch

A batch of max. 120 rod bodies which shall satisfy the following conditions :

- the same diameter D ;
- the same wall thickness a ;
- the same thread ($d \times$ pitch);
- manufactured in the same manufacturing cycle from the same batch of semi-finished products.

It may consist of several production batches.

4 Required characteristics, inspections and test methods

See table 1.

Table 1

Sub-clause	Characteristics	Requirements	Inspection and test methods	Q 1)	A 2)									
4.1	Materials	In accordance with the product standards or design documentation	Chemical analysis or certificate of conformity issued by semi-finished products manufacturer	X	X									
4.1.1	Uniformity of the production batch material after the heat treatment	Electrical conductivity : ≤ 18,5 MS/m or Hardness : 120 HB min. or 96 HRF min. NOTE : Values for EN 2510	EN 2004-1 EN 2002-7 Measure in the unswaged areas of the rod body as follows : <table border="1" data-bbox="859 801 1273 936"> <thead> <tr> <th>Tube wall thickness</th> <th>Load</th> <th>Ball diameter</th> </tr> </thead> <tbody> <tr> <td>≤ 1,2 mm</td> <td>306 N</td> <td>2,5 mm</td> </tr> <tr> <td>> 1,2 mm</td> <td>612 N</td> <td>2,5 mm</td> </tr> </tbody> </table>	Tube wall thickness	Load	Ball diameter	≤ 1,2 mm	306 N	2,5 mm	> 1,2 mm	612 N	2,5 mm	X X	X X
Tube wall thickness	Load	Ball diameter												
≤ 1,2 mm	306 N	2,5 mm												
> 1,2 mm	612 N	2,5 mm												
4.1.2	Material grain size	≤ 5	ASTM E 112	X										
4.2	Surface treatment	In accordance with the product standards or design documentation. SIST EN 2289:2001	Visual examination inside and outside rod body	X	X									
4.2.1	Primer	Thickness and adhesion in accordance with EN 2435-01	Cut the rod body longitudinally and check the internal and external surfaces. ISO 2409	X	X									
4.2.2	Corrosion resistance	No corrosion	ISO 9227 Cut the rod body longitudinally. Examine the surfaces visually. Remove the inserts (if fitted) and check the mating surfaces.	X										
4.3	Dimensions, tolerances and mass	In accordance with the product standards or design documentation	Suitable measuring instruments	X	X									
4.4	Surface roughness	In accordance with the product standards or design documentation	Suitable measuring instruments	X	X									
4.5	Marking	In accordance with the product standards or design documentation	Visual examination	X	X									

(continued)

Table 1 (continued)

Sub-clause	Characteristics	Requirements	Inspection and test methods	Q 1)	A 2)
4.6	External surface appearance	Prior to surface treatment, no discontinuities	Visual examination to EN 2002-16. If a surface discontinuity is revealed in the swaged area, it may be removed by abrading the surface lightly to a depth of less than 10 % of the thickness of the rod body. If this does not completely remove the surface discontinuity the rod body shall be rejected.	X	X
4.7	Internal surface appearance	<p>On a longitudinal section, no discontinuity except in the threaded area (see figure 2)</p> <p>On three transverse sections Sections A and B</p> <ul style="list-style-type: none"> - no more than two cracks with a max. depth of 150 µm or - laps of any number permitted providing that the depth does not exceed 0,4 mm or 10 % of the thickness <p>Section C: No discontinuities are permitted.</p>	<p>The rod body shall be cut at one end longitudinally and at the other end transversely, see figure 1.</p> <p>Visual examination with a magnification of 100 times</p>	X	X
4.8	Resistance of threaded inserts to rotation	No rotation when torque values from table 2 are applied	The testing device to hold the rod body stationary is left to the manufacturer's option. Visual examination	X	X
4.9	Yield load	No permanent elongation under the loads given in the product standards or design documentation	Fit the rod body with special end fittings in heat treated steel which can be clamped in the jaws of a tensile testing machine. The end fittings shall be engaged no more than 1,5 times the thread diameter into the rod body. Apply the load progressively up to the yield load and maintain it for at least 3 s. Visual examination	X	X

(continued)

Table 1 (continued)

Sub-clause	Characteristics	Requirements	Inspection and test methods	Q 1)	A 2)
4.10	Ultimate load	No failure under the loads given in the product standards or design documentation	See 4.9.	X	X
4.11	Buckling strength	No increase in radial runout under the loads taken from the curves given in the product standards or design documentation	Use rod bodies which are as close as possible to the maximum tolerance of the radial runout given in the product standards or design documentation. Fit the rod bodies with rod ends with self-aligning bearings. The pins attaching these ends to the testing machine shall be parallel. Fit the end fittings in accordance with 4.9. Apply the load progressively up to 1,25 times the value given in the product standards or design documentation, maintain it for 3 s, then release. Check.	X	
4.12	Fatigue strength under stress	See 4.12.1 and 4.12.2.	Apply a fluctuating tensile force F , at a frequency of 30 Hz, varying from $0,1 F$ to F , such that : $F = \tau \times S$ where : F is the tensile force, in newtons; τ is the stress, in megapascals; and $S = \pi a (D - a)$ where : S is the cross sectional area of the central cylindrical portion of the rod body, in square millimetres; D is the nominal tube diameter, in millimetres; a is the nominal tube wall thickness, in millimetres	X	
4.12.1	High load fatigue test	$\tau = 210$ MPa No failure shall be permitted over the first 60 000 cycles. The test shall be continued up to failure or 100 000 cycles. The average number of cycles achieved shall be ≥ 80 000.	Special end fittings, see 4.9. See 4.12.	X	

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