SLOVENSKI STANDARD
SIST EN 4473:2025

01-februar-2025

Aeronavtika - Organski premazi, pigmentirani z aluminijem, za vezne elemente - Tehnična specifikacija

Aerospace series - Aluminium pigmented organic coatings for fasteners - Technical specification

Luft und Raumfahrt - Aluminium pigmenttete organische Beschichtungen für Verbindungselemente - Technische Lieferbedingungen

Série aérospatiale - Revêtements alumino-organiques pour éléments de fixation - Spécification technique

Ta slovenski standard je istoveten z: **EN 4473:2024**

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49.025.20	Aluminij	Aluminium
49.030.01	Vezni elementi na splošno	Fasteners in general
49.040	Prevleke in z njimi povezani postopki, ki se uporabljajo v letalski in vesoljski industriji	Coatings and related processes used in aerospace industry

SIST EN 4473:2025 **en,fr,de**

EUROPEAN STANDARD
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Aerospace series - Aluminium pigmented organic coatings for fasteners - Technical specification

Série aérospatiale - Revêtements alumino-organiques pour éléments de fixation - Spécification technique

Luft- und Raumfahrt - Aluminiumpigmentierte organische Beschichtungen für Verbindungselemente - Technische Lieferbedingungen

This European Standard was approved by CEN on 30 September 2024.

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This European Standard exists 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 4473:2024) has been prepared by ASD STAN.

After enquiries and votes carried out in accordance with the rules of this Association, this document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, 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 May 2025, and conflicting national standards shall be withdrawn at the latest by May 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 4473:2010.

This document includes the following significant technical changes with respect to EN 4473:2010:

— editorial revision to comply with the updated layout in use;

— clarification of test requirements, e.g. coating adhesion on fasteners, measurement of coating thickness.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document specifies the performance requirements for aluminium pigmented organic coatings to be applied on titanium, titanium alloys, nickel or cobalt based alloys and corrosion resistant steels.

This specification does not cover electrical bonding and lightning strike applications of these coatings. Additional qualification tests will be agreed with the OEM upon qualification.

NOTE These coatings are not recommended for use on non-corrosion resistant steel fasteners.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2101, *Aerospace series — chromic acid anodizing of aluminium and wrought aluminium alloys*

EN 4474, *Aerospace series — Aluminium pigmented coatings — Coating methods*

EN 4827, *Aerospace series — Hexavalent chromium free anodizing of aluminium and aluminium alloys*

EN 6117,[1] *Aerospace series — Specification for lubrication of fasteners with cetyl alcohol*

EN ISO 2812-1, *Paints and varnishes — Determination of resistance to liquids — Part 1: Immersion in liquids other than water (ISO 2812-1)*

EN ISO 2409, *Paints and varnishes — Cross-cut test (ISO 2409)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

ASTM B117,[2] *Standard Practice for Operating Salt Spray (Fog) Apparatus*

MIL-PRF-8625,[3] *Anodic Coatings for Aluminum and Aluminum alloy*

NASM 1312-5,[4] *Fastener Test Methods, Method 5: Stress Durability*

NASM 1312-12,[4] *Fastener Test Methods, Method 12: Thickness of Metallic Coatings*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

[1] Published as ASD-STAN prEN at the date of publication of this document, available at: https://www.asd-stan.org/.

[2] Published by American Society for Testing and Materials (ASTM International), available at: https://www.astm.org/.

[3] Published by Department of Defense (DoD), available at: https://assist.dla.mil/online/start/.

[4] Published by Aerospace Industries Association (AIA), available at: https://www.aia aerospace.org/.

3.1
production lot
parts subjected to the same aluminium pigmented coating application at the same time under the same condition

3.2
product
commercial chemical solution that constitutes the aluminium pigmented coating

3.3
blister
local convexity caused by a sub-surface inclusion of gas or liquid

3.4
nodule
localized build-up or unmixed solid particles

3.5
pit
void, hole in the surface

EXAMPLE Pits can be caused, for example, by corrosion.

3.6
porosity
fine holes or pores within the coating

3.7
functional surface
surface in contact with mating structure and threaded portion

EXAMPLE

— pins, bolts, lockbolts, screws: under head bearing surface, shank, lead-in radius and thread surface, if applicable;

— nuts, threaded collars: bearing surfaces, thread surface;

— spherical washers: bearing surfaces;

— swaged collars: all surfaces.

3.8
generic part
family of similar fasteners

EXAMPLE

— pins, bolts, screws and lockbolts;

— nuts and threaded collars;

— swaged collars;

— solid rivets;

— blind bolts;

— bushes;

— washers.

4 Technical requirements

4.1 General

This document covers organic resin coatings pigmented with aluminium powder. Aluminium pigmented coatings provide:

— friction reduction in threads and interference fit assemblies;

— galvanic corrosion protection between fasteners and the structure in which the fasteners are installed;

— protection against aggressive chemicals used in operations and maintenance.

TR 4676 provides a list of commercial aluminium pigmented coating products widely used in the aerospace industry. This list is non-exhaustive and the use of different products may vary for each OEM and their specific applications.

4.2 Classification

Aluminium pigmented coatings are classified according to the following types:

Type I: Aluminium pigmented coatings containing hexavalent chromium, for use with cetyl alcohol.

Type II: Hexavalent chromium free aluminium pigmented coatings, for use with cetyl alcohol.

Type III: Aluminium pigmented coatings containing hexavalent chromium, for use without lubricant.

Type IV: Hexavalent chromium free aluminium pigmented coatings, for use without lubricant.

If no dedicated type is specified in the drawing, type II or IV shall be used depending on the need for lubrication (to be confirmed with the OEM).

4.3 Product composition and application

The manufacturing method and product composition are defined by the product manufacturer. The product manufacturer must notify its users of any changes.

The product shall not contain lead or graphite. Types II and IV shall not contain hexavalent chromium.

Unless otherwise specified, product application shall be carried out in accordance with EN 4474.

4.4 Coating performance

a) Qualification of a new coating product.

   Qualification tests as per Table A.1 shall be performed for each combination of coating product and material type (e.g. titanium alloys, corrosion resistant steels, Ni and Co-based alloys), unless otherwise agreed with the mandated body.

b) Qualification of fasteners or other parts coated with a qualified coating product.

Unless otherwise specified, qualification tests shall be performed as per Annex A, Table A.1.

All the tests required by this paragraph shall be carried out on coated fasteners, unless otherwise agreed with the mandated body.

c) Lot release of qualified fasteners or other parts coated with a qualified coating product.

Each lot of coated fasteners (or other parts) manufactured shall be subject to the acceptance tests and sampling devised in EN 4474 by the supplier before delivery. The results of these tests shall be given on the acceptance report for each lot of coated fasteners (or other parts).

Annex A
(normative)

Performance requirements

The performance requirements for aluminium pigmented organic coatings for fasteners shall be according to Table A.1.

Table A.1 — Performance requirements for coatings

Characteristic	Inspection	Acceptance criteria (all test parts shall conform)	Required	Quantity of test parts
A1.1 Appearance	Visual examination	The coating shall be smooth, uniform colour, and shall be free of pinholes, porosity, blisters, nodules, pits, or other imperfections.	a), b)	10
A1.2 Thickness	Determination of coating thickness shall be made by any of the methods specified in NASM 1312-12. In case of conflict, the micrographic examination shall be chosen.	Parts with external functional surfaces only: The coating thickness shall be between 5 µm and 13 µm on all functional surfaces as defined in 3.7. Parts with external and internal functional surfaces: The coating thickness shall be between 5 µm and 20 µm on all functional surfaces as defined in 3.7.	a), b)	10