
Aeronavtika - Kemične prevleke za aluminij in aluminijeve zlitine na osnovi trivalentnega kroma

Aerospace series - Trivalent chromium based chemical conversion coatings for aluminium and aluminium alloys

Luft- und Raumfahrt - Chrom-(III)-basierte chemische Konversionsüberzüge für Aluminium und Aluminiumlegierungen

Série aérospatiale - Conversion chimique au chrome trivalent de l'aluminium et des alliages d'aluminium

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EUROPEAN STANDARD
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**Aerospace series - Trivalent chromium based chemical
conversion coatings for aluminium and aluminium alloys**

Série aérospatiale - Conversion chimique au chrome
trivalent de l'aluminium et des alliages d'aluminium

Luft- und Raumfahrt - Chrom-(III)-basierte chemische
Konversionsüberzüge für Aluminium und
Aluminiumlegierungen

This European Standard was approved by CEN on 14 May 2017.

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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

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European foreword

This document (EN 4729:2017) 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of an identical text or by endorsement, at the latest by March 2018, and conflicting national standards shall be withdrawn at the latest by March 2018.

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.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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1 Scope

This European Standard specifies trivalent chromium based chemical conversion coatings for aluminium and aluminium alloys. It covers the application by bath but also by touch-up. It doesn't give complete in-house process instructions; these shall be given in the manufacturers detailed process instructions.

2 Purpose of process

The aim of the trivalent chromium based chemical conversion coatings is to increase corrosion resistance, to improve the adhesion of paints and varnishes and to ensure electrical conductivity. Coatings are also suitable for the repair of mechanically damaged anodic coatings.

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 4707, *Aerospace series — Acid pickling of aluminum and aluminum alloy without hexavalent chromium* ¹⁾

EN 9100, *Quality Management Systems — Requirements for Aviation, Space and Defence Organizations*

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

EN ISO 2812-2, *Paints and varnishes — Determination of resistance to liquids — Part 2: Water immersion method*

EN ISO 3892, *Conversion coatings on metallic materials — Determination of coating mass per unit area — Gravimetric methods*

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

4 Terms and definitions

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

4.1

batch

unless otherwise specified, it comprises parts of the same type (shape, size, material), processed at the same time in the same bath

4.2

substrate

material upon which a coating is directly applied, in the case of a single or first coating, the substrate is the basis metal and for a subsequent coating, the intermediate coating is the substrate

1) Published as ASD-STAN Prestandard at the date of publication of this standard by AeroSpace and Defence industries Association of Europe - Standardization (ASD-STAN) (www.asd-stan.org)

4.3

pit

substrate corrosion defect at which the conversion coating is penetrated

Note 1 to entry: Typical characteristics of corrosion pits are:

- rounded or irregular or elongated geometry,
- comet tail or line or halo that emerges from the cavity,
- some corrosion by-products inside pits (on aluminium test samples the by-product may be granular, powdery or amorphous and white, grey or black in colour).

Note 2 to entry: To be considered a corrosion pit, a surface cavity must exhibit at least two of the above characteristics.

5 Applicability and limitations of the process

This standard applies whenever referenced.

Parts with features that may trap treatment solutions shall be subjected to additional rinsing operations to ensure removal of treatment solutions. Chemical conversion treatment shall not be applied if removal of treatment solution cannot be assured.

Chemical conversion coatings shall not be applied to parts before bonding or welding.

The maximum in service temperature of the chemical conversion coatings, is 100 °C.

6 Classification

6.1 Coating weight

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For trivalent chromium base conversion coating, the mass per unit area should be ranged from 0,2 g/m² to 0,9 g/m².

6.2 Materials

- Category 1: Aluminium alloy 1 000, 5 000 and 6 000 series,
- Category 2: Aluminium alloy 2 000 and 7 000 series,
- Category 3: Aluminium alloy castings.

For clad aluminium alloys, the clad is considered as the material.

7 Requirements

7.1 Process requirements

7.1.1 Information for the processor

- categories of materials;
- substrate standard reference and heat treatment;
- areas to be coated;
- specification for testing on parts and/or samples;
- criticality of parts.

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7.1.2 Condition of parts prior to processing

- welding, soldering/brazing, mechanical operations and heat treatments shall have been completed.
- the parts shall be free of oil, grease, marking inks and other surface contaminations;
- mechanically disturbed layer shall be removed either by mechanical or chemical processes;
- in case of re-treatment all residuals from the previous coating shall be completely removed.

Tooling

The tools and metal masking tooling must be protected against corrosion, and/or free of corrosion or any other damage which may be detrimental to the treatment during use. The part racks and tools must be designed and set up in such a manner as to:

- avoid any retention of air or treatment solution in the parts,
- facilitate neutralization and removal of solutions during rinsing operations,
- avoid during the treatment any accidental contact between the parts to be treated and the tank equipment, and between the different parts.

The parts shall be previously degreased prior to masking.

Component areas which must not be coated shall be masked with suitable material.

7.1.3 Pre-treatment

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The pre-treatment phase shall not result in critical deterioration of dimensions, surface finish and mechanical properties of parts.

For conversion coating applied by touch up process or following vapor deposited aluminium (IVD or PVD) a mechanical pre-treatment is allowed.

Cleaning

Surface preparation means any method able to completely eliminate all surface contaminations.

Pickling

It shall not cause pitting, intergranular corrosion or any alterations to the metallurgical characteristics or mechanical strength of the material.

Chemical conversion coating must be performed immediately after pickling (in accordance with aluminium and aluminium alloys pickling standard EN 4707).

Rinsing bath

See 7.1.4.

7.1.4 Rinsings

The parts shall be rinsed thoroughly, it is recommended that the final rinsing of each step of overall process has to be carried out in deionized water.

The supplied deionised water shall comply with the following requirements:

- pH value at 25 °C: 5.0 to 8.0
- total residue [mg/l]: ≤ 5
- conductivity [$\mu\text{S}/\text{cm}$]: ≤ 20

For touch-up application, rinsing is optional, according to product specification.

7.1.5 Treatment

The parts are immersed in a still or agitated bath or treated by spraying or by touch-up (RTU, gel, stick...). A commercial product may be used according to the manufacturer's instructions.

During the bath application process:

- distance between parts shall be adapted in order to avoid impacts.
- parts shall be fully immersed, in such a way that all air can escape.
- during emersion the bath fluid shall run off from all areas and cavities.
- tubes shall be placed in the bath in such a way that the bath fluid can rise in the bath, expelling all the air. If not, the bath fluid shall then be drawn in or pump through.
- the process shall be performed in such a way that parts do not dry between single process steps (pre-treatment, treatment, post-treatment).
- the parameters (temperature, time) shall be adapted to the material and its requirements in accordance with manufacturer instructions.

It is recommended to handle the parts after treatment and after each post-treatment step with gloves.

- a rinsing step shall be performed according 7.1.4.
- parts shall be stored under clean and dry conditions. Drying may be carried out with dry, oil-free air at ambient temperature or at max. 60 °C.

7.1.6 Post-treatment

Optional chemical treatment can be applied to improve corrosion resistance performance

In case of optional chemical treatments the drying shall not be applied.

A commercial product may be used according to the manufacturer's instructions.

See 7.1.5 for process recommendation.