BRITISH STANDARD AEROSPACE SERIES

BS EN
2437:2002

Chromate conversion coatings (yellow) for aluminium and aluminium alloys

The European Standard EN 2437:2001 has the status of a British Standard

ICS 49.040

National foreword

This British Standard is the official English language version of EN 2437:2001.

The UK participation in its preparation was entrusted to Technical Committee ACE/44, Protective treatments and aircraft finishes, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

NORME EUROPÉENNE

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EN 2437

December 2001

ICS 49.040

English version

Aerospace series - Chromate conversion coatings (yellow) for aluminium and aluminium alloys

Série aérospatiale - Chromatation jaune de l'aluminium et des alliages d'aluminium

Luft- und Raumfahrt - Gelbchromatieren von Aluminium und Aluminiumlegierungen

This European Standard was approved by CEN on 2 May 2001.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 2437:2001 E

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of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

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

1 Scope

This standard specifies yellow chromate conversion coating of aluminium and aluminium alloys.

It shall be applicable wherever referenced.

2 Purpose of process

To increase corrosion resistance and to improve the adhesion of paints and varnishes.

Type B coatings are also suitable for the repair of mechanically damaged anodic coatings.

3 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 8081	Aerospace process - Chemical conversion coating for aluminium alloys - General purpose
ISO 9227	Corrosion tests in artificial atmospheres - Salt spray tests
EN 2000	Aerospace series - Quality assurance - EN aerospace products - Approval of the quality system of manufacturers
EN 2334	Aerospace series - Acid chromate pickling of aluminium and aluminium alloys [1)]
EN 3997	Aerospace series - Aluminium alloy AL-P2024- - T3 - Sheet and strip - 0,4 mm $\leq a \leq$ 6 mm [2)]

4 Definitions

For the purposes of this standard, the following definition applies:

batch
parts treated at the same time in the same bath.

5 Classification

5.1 Thickness

– Type A: Mass per unit area from 0,2 g/m^2 to 0,42 g/m^2 for slight corrosion protection, where low electrical resistance is required;

– Type B: Mass per unit area from > 0,42 g/m^2 to 1,2 g/m^2 for good corrosion protection, with or without painting.

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

5.2 Materials

– Category 1: Aluminium alloy with an Si-content ≤ 3,5 %;

– Category 2: Aluminium alloy with an Si-content > 3,5 %.

6 Information for the processor

– Designation, see 16.

– Areas not to be chromated.

7 Condition of parts prior to processing

Soldering, welding, mechanical operations and heat treatments (except for cold storage) shall be completed.

The parts to be chromate coated after assembly (e.g. by spot welding) shall be pickled prior to assembly.

Areas not to be chromate coated shall be suitably masked.

8 Pre-treatment

8.1 Cleaning

The cleaning method shall be chosen according to the degree of contamination of the materials to be treated.

In general, the most effective method is degreasing with solvents followed by cleaning in an alkaline solution (see annex A, A.2).

8.2 Rinsing

The parts shall be rinsed thoroughly, e.g. by immersion followed by spray washing. It is recommended that a further rinsing be carried out in deionised water with a maximum specific conductivity of 100 $\mu S \cdot cm^{-1}$.

8.3 Pickling

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

The dimensions and the surfaces roughness value indicated on the drawings shall be observed.

Pickling is normally carried out in a solution containing chromate. Other methods may be used (see annex A, A.4).

8.4 Rinsing

See 8.2.

9 Treatment

The parts are submerged in a still or agitated bath or treated by spraying or by brushpainting.

An exemple of the possible composition of the chromate solution is given in annex A, A.5. However, a commercial product is generally used according to the manufacturer's instructions.

10 Post-treatment

10.1 Rinsing

See 8.2.

The quality of the water shall not adversely affect the adhesion of paints or varnishes.

Rinsing in hot water at 50 °C to 60 °C helps the drying process though the parts shall not be submerged for longer than 1 min.

10.2 Drying

Drying may be carried out at ambient temperature using dry, oil-free compressed air or hot air, at max. 60 °C.

Alternative drying processes are permissible, provided that they do not have an adverse effect on the quality of the chromate coating and subsequent treatments.

10.3 Paints or varnishes

The primer or the varnish coat shall be applied as soon as possible (max. 48 h after chromate coating).

11 Removal of the chromate coating

Either by using a nitric acid solution (e.g. d = 1,4) at ambient temperature or a chromic acid solution (e.g. 40 g/l to 60 g/l) at 40 °C or mechanically by light abrasion.

Strong alkaline pickling shall be avoided.

12 Requirements

12.1 Appearance

The chromate coating shall be iridescent and range in colour from light yellow to dark yellow depending on the type of alloy. It shall be uniform and free from defects. Powdery coatings are not acceptable.

Differences in colour due to different surface textures are permissible.

12.2 Mass of coating

See 5.

12.3 Corrosion resistance

After testing, a maximum of five corroding points is permissible per test piece and the diameter of each point shall not exceed 0,8 mm.

The inspection shall not be carried out at less than 6 mm from:

- the test piece edges;
- the marking;
- the mounting points.

13 Inspection and test methods

13.1 Parts

Each batch shall be subjected to a visual inspection with the naked eye.

The number of parts to be tested per batch shall be agreed between the purchaser and processor.

For pipes, the inspection shall be carried out using either an endoscope, or a cross section at a position where the geometry is the least favorable.

13.2 Test pieces

The quality of the chromate coating shall be checked regularly and at least once every three months on at least three test pieces:

- in aluminium alloy EN 3997 unplated;
- dimensions: 75 mm × 250 mm × 0,8 mm to 1 mm.

13.2.1 Mass per unit area

See ISO 8081.

13.2.2 Corrosion resistance

Chromate coated test pieces shall be:

- aged for at least 24 h at ambient temperature;
- exposed to a continuous salt spray test according to ISO 9227 at an angle of inclination of 6° to the perpendicular line:
  - thickness type A: 72 h;
  - thickness type B: 168 h;
- rinsed in cold, running water, to remove sodium chloride residues;
- air dried.

Inspection shall be made visually.

13.3 Baths

The solution shall be checked daily, prior to use, for liquid level, cleanness and temperature.

Chemical analyses shall be carried out on the constitution of the bath and at regular intervals during operation. A fresh preparation is required if corrections remain ineffective.

14 Quality assurance

14.1 Approval of the processor

See EN 2000.

14.2 Process approval

The processor shall carry out:

- chromate coating on a series of pre-production parts made up of the first batch of the parts;
- tests specified in this standard, unless otherwise agreed between the purchaser and processor.

When the test results have been accepted as satisfactory by the purchaser, he shall give his written approval to start production.

The procedure shall not be changed without previous agreement from the purchaser.

14.3 Acceptance

The frequency and nature of the inspection of parts and test pieces shall be defined in the definition documents or determined by agreement between the purchaser and processor.

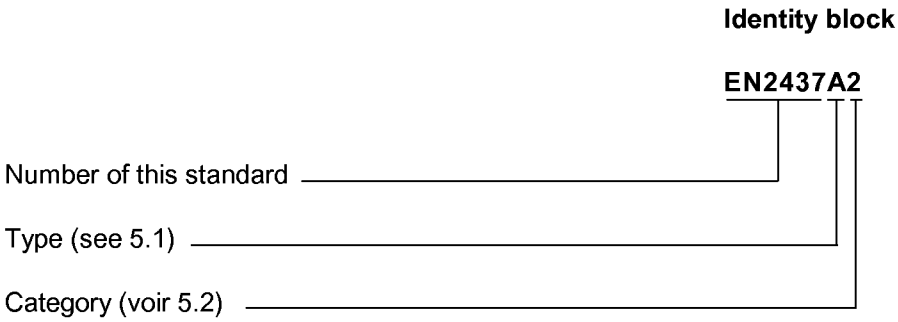
The parts showing defects on visual inspection shall be removed. Faulty areas can only be touched up with the purchaser's agreement.

15 Health, safety and environmental aspects

Locally applicable regulations and laws shall be observed.

16 Designation

EXAMPLE:



Annex A
(normative)

Recommendations for surface preparation

A.1 Scope

This annex describes solvents and bath preparation as well as processes for cleaning, pickling and yellow chromate conversion coating of aluminium and aluminium alloys.

All processes providing results which are at least equivalent to the one described may also be applied.

A.2 Degreasing

A.2.1 In organic solvents

This process comprises hot or cold degreasing at liquid or vapour state with authorized products.

A.2.2 Alkaline cleaning

This process may be used either alone or in addition to degreasing with solvents. Inhibitors shall be added to the degreasing baths in order to prevent the metal surfaces from being attacked. They can be used in a hot or cold state and with or without electric current.

A.3 Cleaning by abrasive blasting

A.3.1 Coarse cleaning

This type of cleaning is achieved by means of blasting with a grain size > 100 μm, with or without water.

This process is not applicable to thin parts or parts with low surface roughness.

A.3.2 Fine cleaning

This type of cleaning is achieved by blasting with a grain size < 100 μm, with or without water.

After cleaning remove any blasting medium still adhering to the parts and decontaminate the parts by suitable pickling.

A.4 Pickling

A.4.1 Acid pickling

A.4.1.1 Acid chromate pickling for class 1 materials

See EN 2334

A.4.1.2 Other acid pickling media for materials of classes 1 and 2

Commercial or other products, e.g. those containing fluorides, may be used.

A.4.2 Alkaline pickling for class 1 materials

This process, based on sodium hydroxide shall not be used for parts with close tolerances or for parts fastened by rivets or spot welding. Moreover, it increases surface roughness.

The degreased metal is immersed in the following solution:

- Sodium hydroxide : 26 g to 50 g;
- Sodium heptonate or gluconate : 0,75 g to 1,0 g;
- Temperature : 40 °C to 65 °C.

The reaction is very strong and normally an immersion time of 15 s to 1 min is sufficient.

The rate of removal by the alkaline bath is 0,6 μm/min to 1,5 μm/min.

A.4.3 De-smutting

The film remaining after akaline pickling and some acid-pickling processes shall be removed by immersion in a solution of 30 % to 50 % by volume of nitric acid (d = 1,4) at ambient temprature.

A.5 Chromate coating

The following preparation may be used as the bath solution:

- $Na_2Cr_2O_7 \cdot 2H_2O$: 7,5 g/l;
- NaF : 1 g/l;
- $K_3 [Fe (CN)_6]$: 5 g/l;
- HNO_3 : 1,15 g/l;
- Water : maximum specific conductivity 100 $\mu S \cdot cm^{-1}$;
- pH : 1,2 to 2,2;
- Solution temperature : 15 °C to 55 °C;
- Treatment time : 5 s to 8 min.

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389 Chiswick High Road
London
W4 4AL