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**Aeronavtika - Barve in laki - Dvokomponentni poliuretanski lak, ki se strdi pri temperaturi okolja - Zelo elastičen in odporen proti kemikalijam, za vojaško uporabo**

Aerospace series - Paints and varnishes - Two components cold curing polyurethane finish - High flexibility and chemical agent resistance for military application

Luft- und Raumfahrt - Anstrichstoffe - Zweikomponenten Polyurethan- Decklack, raumtemperaturhärtend - Hohe Elastizität und Beständigkeit gegen Chemikalien für militärische Anwendung

Série aérospatiale - Peinture et vernis - Peinture de finition polyuréthane à deux composants polymérisant à température ambiante - Haute flexibilité et résistance aux substances chimiques pour applications militaires

**Ta slovenski standard je istoveten z: EN 4689:2012**

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**ICS:**

49.040	Prevleke in z njimi povezani postopki, ki se uporabljajo v letalski in vesoljski industriji	Coatings and related processes used in aerospace industry
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**SIST EN 4689:2012**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 4689**

March 2012

ICS 49.040

English Version

**Aerospace series - Paints and varnishes - Two components cold curing polyurethane finish - High flexibility and chemical agent resistance for military application**

Série aérospatiale - Peinture et vernis - Peinture de finition polyuréthane à deux composants polymérisant à température ambiante - Haute flexibilité et résistance aux substances chimiques pour applications militaires

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This European Standard was approved by CEN on 21 January 2012.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
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## Foreword

This document (EN 4689:2012) 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 September 2012, and conflicting national standards shall be withdrawn at the latest by September 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## Introduction

The requirements concerning fibre reinforced composite substrates are established in Clause 7.

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## 1 Scope

This European Standard specifies the requirements for a two components flexible polyurethane top coat to be applied over EN 4687 and/or EN 4688 primers mainly for exterior aerospace applications.

The primer and the finish tested to this specification will be from the same manufacturer applied in accordance with (i.a.w.) their instruction / Table 1.

## 2 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 2101, *Aerospace series — Chromic acid anodizing of aluminium and wrought aluminium alloys*

EN 2334, *Aerospace series — Chromic-sulphuric acid pickle of aluminium and aluminium alloys*

EN 2437, *Aerospace series — Chromate conversion coatings (yellow) for aluminium and aluminium alloys*

EN 2436-006, *Aerospace series — Paints and varnishes — Corrosion resistant chromate-free two component cold curing epoxy primer — Part 006: High corrosion resistance for military application*

EN 3212, *Aerospace series — Paints and varnishes — Corrosion test by alternate immersion in a buffered sodium chloride solution*

EN 3837, *Aerospace series — Paints and varnishes — Nature and method for surface preparation of test pieces in aluminium alloys*<sup>1)</sup>

EN 3840, *Aerospace series — Paints and varnishes — Technical specification*  
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EN 3847, *Aerospace series — Paints and varnishes — Determination of sedimentation rating*<sup>1)</sup>

EN 4160, *Aerospace series — Non-metallic materials — Paints and varnishes — Test methods — Determination of the effect of thermal exposure*<sup>1)</sup>

EN 4687, *Aerospace series — Paints and varnishes — Chromate free non corrosion inhibiting two components cold curing primer for military application*

EN 4688, *Aerospace series — Paints and varnishes — Corrosion inhibiting two components cold curing primer for military application*

EN 6042, *Aerospace series — Organic compounds — Test method — Analysis by infrared spectroscopy*<sup>1)</sup>

EN ISO 1513, *Paints and varnishes — Examination and preparation of test samples*

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1) Published as ASD-STAN Prestandard at the date of publication of this standard ([www.asd-stan.org](http://www.asd-stan.org)).

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EN ISO 1518, *Paints and varnishes — Scratch test*

EN ISO 1519, *Paints and varnishes — Bend test (cylindrical mandrel)*

EN ISO 1520, *Paints and varnishes — Cupping test*

EN ISO 1524, *Paints, varnishes and printing inks — Determination of fineness of grind*

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

EN ISO 2431, *Paints and varnishes — Determination of flow time by use of flow cups*

EN ISO 2811-1, *Paints and varnishes — Determination of density — Part 1: Pycnometer method*

EN ISO 2811-2, *Paints and varnishes — Determination of density — Part 2: Immersed body (plummet) method*

EN ISO 2811-3, *Paints and varnishes — Determination of density — Part 3: Oscillation method*

EN ISO 2811-4, *Paints and varnishes — Determination of density — Part 4: Pressure cup method*

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

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

EN ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20°, 60° and 85°*

EN ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content*

EN ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

EN ISO 3678, *Paints and varnishes — Print-free test*

EN ISO 3679, *Determination of flash point — Rapid equilibrium closed cup method*

EN ISO 3680, *Determination of flash/no flash — Rapid equilibrium closed cup method*

EN ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

EN ISO 4628-8, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 8: Assessment of degree of delamination and corrosion around a scribe*

EN ISO 6270-1, *Paints and varnishes — Determination of resistance to humidity — Part 1: Continuous condensation*

EN ISO 9117-1, *Paints and varnishes — Drying tests — Part 1: Determination of through-dry state and through-dry time*

EN ISO 9117-3, *Paints and varnishes — Drying tests — Part 3: Surface-drying test using ballotini*

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



EN ISO 9514, *Paints and varnishes — Determination of the pot life of multicomponent coating systems — Preparation and conditioning of samples and guidelines for testing*

EN ISO 11507, *Paints and varnishes — Exposure of coatings to artificial weathering — Exposure to fluorescent UV lamps and water*

EN ISO 11890-1, *Paints and varnishes — Determination of volatile organic compound (VOC) content — Part 1: Difference method*

EN ISO 11909, *Binders for paints and varnishes — Polyisocyanate resins — General methods of test*

ISO 7724-1, *Paints and varnishes — Colorimetry — Part 1: Principles*

ISO 7724-2, *Paints and varnishes — Colorimetry — Part 2: Colour measurement*

ISO 7724-3, *Paints and varnishes — Colorimetry — Part 3: Calculation of colour differences*

MIL-PRF-5606H, *Performance specification: Hydraulic fluid, petroleum base; aircraft, missile, and ordnance. (NATO H-515) <sup>2)</sup>*

MIL-PRF-6081D, *Performance specification: Lubricating oil, jet engine. (NATO O-133) <sup>2)</sup>*

MIL-PRF-23699F, *Performance specification: Lubricating oil, aircraft turbine engine, synthetic base, NATO code number O-156 <sup>2)</sup>*

MIL-DTL-83133G, *Detail specification: Turbine fuel, aviation, kerosene type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37) <sup>2)</sup>*

AMS 1526B, *Cleaner for aircraft exterior surfaces water-miscible, pressure-spraying type <sup>3)</sup>*

AMS 1527B, *Cleaner for aircraft exterior surfaces water-miscible, foam-on, pressure-spraying <sup>3)</sup>*

AMS 1533A, *Cleaner for exterior aircraft surfaces gel-type, solvent-base <sup>3)</sup>*

DEF STAN 68-10, *Corrosion Preventive, Water Displacing NATO Code: C-634 Joint Service Designation: PX-24*

STANAG 4477, *Specification for Paints and Paint Systems, Resistant to Chemical Agents and Decontaminants, for the Protection of Aerospace Military Equipment <sup>4)</sup>*

BS 1595-1:1986, *Propan-2-ol (isopropyl alcohol) for industrial use — Part 1: Specification for propan-2-ol (isopropyl alcohol).*

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2) Published by: DoD National (US) MIL. Department of Defense <http://www.defenselink.mil/>

3) Published by: SAE National (US) Society of Automotive Engineers <http://www.sae.org/>.

4) Published by: NATO EU MIL. - National (US) Mil. North Atlantic Treaty Organization <http://www.nato.int/docu/standar d.htm>.

**EN 4689:2012 (E)****3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 3840 apply.

**4 Surface pretreatments**

In accordance with EN 3837, the surface pretreatments applicable to aluminium alloy test panels are the following:

EN 3837 — Procedure A : Sulfochromic pickling in accordance with EN 2334;

EN 3837 — Procedure B : Chromate acid anodizing in accordance with EN 2101;

EN 3837 — Procedure C : Chromate conversion coating in accordance with EN 2437.

**5 Classification**

The top coat is classified according to the following types:

TYPE I: Standard solvent content ( $\leq 680$  g/l);

TYPE II: Low volatile organic content ( $\leq 420$  g/l);

TYPE III: Waterborne ( $\leq 350$  g/l).

**6 Batch release and qualification testing****6.1 General**

The general requirements for qualification and batch release testing shall be in accordance with EN 3840. A minimum of three batches shall be tested for qualification purposes.

**6.2 Qualification tests**

For product qualification, all tests defined in this standard, in the Tables 2 to 10, shall be performed.

The test work to be undertaken for product qualification shall be in accordance with this specification.

In addition, the requirements for qualification of coatings in specific colours/gloss levels, shall be as defined in EN 3840.

**6.3 Batch release testing**

The Manufacturer shall give evidence on the Test Report or the Certificate of Conformance that all the tests marked with the symbol \* in this specification shall be performed for batch acceptance tests.

**6.4 Compatibility of waterborne paints to solvent borne paints**

The waterborne top coat type III according to this specification shall be compatible to all primers qualified to EN 4687 and EN 4688. All tests to demonstrate the compatibility is defined in Tables 8 to 10 shall be performed.

Table 1 — General requirements

	Material description	Two components cold curing polyurethane top coat
	Formulation	Base: hydroxyl functional polyester or acrylic resins Activator: a polyisocyanate activator solution Thinner: if required
	Preparation	These components shall be mixed in simple whole number proportions, by volume or weight, in accordance with the manufacturers's instructions.
	Technical specification	EN 3840
	Marking	EN 3840
	Storage stability	EN 3840
	Application and use	Dry film thickness of $(50 \pm 5) \mu\text{m}$ (with primer SP-J-513-A-0013 or SP-J-513-A-0016 $(25 \pm 5) \mu\text{m}$ will be $65 \mu\text{m}$ to $85 \mu\text{m}$ )
	Drying conditions	$(23 \pm 2) ^\circ\text{C}$ / $(50 \pm 5) \% \text{RH}$ for 7 (seven) days before testing. Finish is applied to the primer (EN 4687 or EN 2436-006) following drying up the primer for 4 (four) hours to 6 (six) hours as specified.
	Quality assurance	EN 3840
	Designation	Flexible polyurethane top coat
	Packaging	EN 3840
	Health and safety	EN 3840

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