SLOVENSKI STANDARD
SIST EN 2516:2020

01-marec-2020

Nadomešča:
SIST EN 2516:2001

Aeronavtika - Pasiviranje korozijsko odpornih jekel in dekontaminacija nikljevih zlitin

Aerospace series - Passivation of corrosion resisting steels and decontamination of nickel base alloys

Luft- und Raumfahrt - Passivieren von korrosionsbeständigen Stählen und Dekontaminierung von Nickellegierungen

Série aérospatiale - Passivation des aciers résistants à la corrosion et décontamination des alliages base nickel

Ta slovenski standard je istoveten z: **EN 2516:2020**

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

SIST EN 2516:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 2516

January 2020

ICS 49.040

Supersedes EN 2516:1997

English Version

Aerospace series - Passivation of corrosion resisting steels and decontamination of nickel base alloys

Série aérospatiale - Passivation des aciers résistants à la corrosion et décontamination des alliages base nickel

Luft- und Raumfahrt - Passivieren von korrosionsbeständigen Stählen und Dekontaminierung von Nickellegierungen

This European Standard was approved by CEN on 11 November 2019.

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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 2516:2020) 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 document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2020, and conflicting national standards shall be withdrawn at the latest by July 2020.

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1 Scope

This standard specifies several chemical methods of passivation for corrosion resisting steels (austenitic, ferritic, martensitic and precipitation hardenable) and of decontamination for nickel or cobalt base alloys.

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

3 Terms and definitions

No terms and definitions are listed in this document.

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

- ISO Online browsing platform: available at http://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

4 Purpose of process

To improve the corrosion resistance characteristics of a part after such treatments as machining, forming, tumbling and shot peening by removing foreign metal contamination due to these operations.

Passivation shall not be used on castings, welded or brazed parts, carburized or nitrided surfaces nor on parts with mating surfaces when entrapment of acids may occur.

5 Applicability and limitations of the process

This specification is applicable for the following corrosion resisting alloys:

- austenitic steels;
- austenitic ferritic steels;
- martensitic chromium steels;
- ferritic steels;
- austenitic precipitation hardenable steels;
- martensitic precipitation hardenable steels;
- heat resisting nickel or cobalt base alloys.

This specification is not applicable for:

- unalloyed or low-alloyed carbon steel;

- powder metallurgy alloys;
- surface modified steel i.e. with case-hardened, carburized or nitrided surfaces;
- soldered or brazed alloys;
- items containing joints and cavities where it is not possible to mask prior to passivation or to ensure complete removal of the passivation solution.

6 Information for the processor

- Designation, refer to Clause 13;
- reference of the material standard and its metallurgical condition;
- process schedule, if necessary ;
- areas to be masked.

7 Condition of the parts prior to processing

Fabrication of the parts shall have been completed before treatment.

8 Pre-treatments

All parts shall be submitted to a surface preparation process. The surface preparation process may include mechanical and/or chemical and/or electrochemical methods, singly or in combination. Necessary sub steps (e.g. cleaning, degreasing, descaling, abrasive blasting, activation, pickling, rinsing, drying, masking) depend on the degree of contamination. Although descaling or other steps may be necessary before passivation can be effective, these steps shall be indicated in the process instructions.

The composition of appropriate surface preparation chemicals may depend on the grade of the corrosion resisting steel to be treated. Alloying elements, contaminations and mechanical processing may influence the sensitivity of the corrosion resisting steels and nickel or cobalt base alloys.

The result of the surface preparation treatment shall demonstrate a reproducible process and surface condition. Particularly, the resulting conditioned parts shall be substantially free of contaminants and other undesired organic and metallic residues from storage, transport and fabrication processes (e.g. oil, grease, forming compounds, lubricants, coolants, cutting fluids, rust, scale, foreign metal or other contaminations).

The surface preparation shall not induce pitting corrosion or intergranular corrosion. It shall only be used on corrosion resisting alloys not susceptible to pitting or sensitive to intergranular corrosion by the pickling solution which is most frequently an aqueous solution of nitric and hydrofluoric acids. The concentration can be adjusted within very wide limits by varying the proportions of the ingredients and by adjusting operating temperatures.

The de-embrittlement treatment shall be applied on steel parts according to Table 1.

Remaining contamination or damage shall lead to rejection or rework of the components.

Table 1 — De-embrittlement in case of acid pickling

Substrate	Temperature [a b c] °C	Minimum duration [a] h
Corrosion resisting steels with *UTS* ≥ 1 100 MPa	from 190 to 230	1
Other materials	Not required	

[a] Other conditions may be used subject to agreement between the processor and the purchaser.

[b] The temperature of the de-embrittlement shall be adapted to the material ageing temperature and to the pre-treatment applied to the parts (shot-peening, etc.).

[c] Attention, some classes of furnace exceed the required maximum temperature, the class of furnace shall be taken into account.

9 Treatment

9.1 Process approval

The chemical composition of the bath shall be chosen according to Table 2.

Table 2 — Bath type

Type		Chemical composition			Temperature °C	Time min
		Nitric acid HNO_3 ml/l	Sodium dichromate $Na_2Cr_2O_7, 2H_2O$ g/l	Citric acid $C_6H_8O_7$ g/l [b]		
C1	A)	from 200 to 250	—	—	from 50 to 55	from 20 to 40
	B)				from 20 to 30	from 30 to 60
C2		from 200 to 500	—		from 20 to 30	from 30 to 60
C3 [a]	A)	from 200 to 250	from 20 to 30		from 50 to 55	from 2 to 3 [c]
	B)		from 40 to 60	—	from 60 to 70	from 30 to 40
C4 [a]	A)	from 200 to 250	from 20 to 30		from 50 to 55	from 20 to 40
	B)		from 40 to 60		from 60 to 70	from 30 to 40
C5		from 200 to 250	—	—	from 20 to 30	from 30 to 60
C6		from 250 to 450			from 20 to 30	≥ 30
C7		from 200 to 250			from 50 to 60	≥ 20
C8		from 450 to 550			from 50 to 55	≥ 30
C9		from 450 to 550			from 20 to 30	from 20 to 35
C10		—	—	from 40 to 100	from 60 to 70	≥ 4
C11					from 50 to 60	≥ 10
C12					from 20 to 50	≥ 20
C13 [b]		from 120 ml/l to 180 ml/l + $CuSO_4 5H_2O$ (copper sulfate) from 40 g/l to 100 g/l	—	—	from 55 to 65	≥ 20

[a] Use A) then B) after intermediate rinsing with clean water.

[b] With additional wetting agents and inhibitors as applicable.

[c] Apply anodic voltage from 3 V to 5 V.

NOTE Nitric acid concentration shown is by volume of 42° Baume (density: 1,4, nitric acid).

In addition to the bath parameters, the performance of passivation is strongly dependent on:

- method of production (forged, casted, rolled, etc.);
- heat treatment condition;
- surface preparation;
- rinsing quality.

The bath type shall be adapted to material to be treated. Table A.1 summarizes a list of recommended bath type for each type of treated materials. Examples of materials are listed in Table A.3.

10 Required characteristics and inspections

10.1 Parts

10.1.1 Visual testing

When subjected to visual testing, the surfaces shall be clean and free from corrosion, pitting or other form of surface attack due to the treatment.

A slight discoloration is allowed.

10.1.2 Absence of iron contamination

Surfaces of type parts or test specimens shall not show any iron contamination indicated by:

- red rust after a salt spray test according to EN ISO 9227 NSS (Neutral Salt Spray) for 2 h min.;
- copper color after copper sulfate test.

Copper sulfate test is not recommended on:

- martensitic stainless steels;
- ferritic stainless steels with less than 16 % of chromium.

Copper sulfate test can be done on:

- austenitic stainless steels;
- precipitation hardened stainless steels;
- ferritic stainless steels with a minimum of 16 % of chromium.

Copper sulfate test description:

Parts shall be swabbed with or immersed in a test solution containing 8 grams of copper sulfate ($CuSO_4 \cdot 5H_2O$) and from 2 ml to 3 ml of sulfuric acid (H_2SO_4, sp. gr. 1,84) in 500 ml of demineralized water, keeping the surface wet for not less than 6 min. Rinse and dry the surface without disturbing any deposits. A deposit indicates the presence of unacceptable free iron.