



# SLOVENSKI STANDARD

## SIST EN 2103-3:2001

01-januar-2001

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**Aerospace series - Steel, nickel base and cobalt base alloy remelting stock and castings - Technical specifications - Part 3: Pre-production and production castings**

Aerospace series - Steel, nickel base and cobalt base alloy remelting stock and castings  
- Technical specifications - Part 3: Pre-production and production castings

Luft- und Raumfahrt - Vormaterial und Gußstücke aus Stahl, Nickel- und Kobaltlegierungen - Technische Lieferbedingungen - Teil 3: Ausfallmuster und Seriengußstücke

Série aérospatiale - Produits pour refusion et pièces moulées en acier et alliages base nickel et base cobalt - Spécification technique - Partie 3: Pièces types et pièces de série

**Ta slovenski standard je istoveten z: EN 2103-3:1991**

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**ICS:**

49.025.10	Jekla	Steels
49.025.99	Drugi materiali	Other materials

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EUROPEAN STANDARD  
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**EN 2103**

Part 3

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**English version**

**Aerospace series**  
**Steel, nickel base and cobalt**  
**base alloy remelting stock and castings**  
**- Technical specification -**  
**Part 3 - Pre-production and production castings**

**Série aérospatiale**  
**Produits pour refusion**  
**et pièces moulées en acier**  
**et alliages base nickel et base cobalt**  
**- Spécification technique -**  
**Partie 3 - Pièces types et pièces de série**

**Luft- und Raumfahrt**  
**Vormaterial und Gußstücke**  
**aus Stahl, Nickel- und Kobaltlegierungen**  
**Technische Lieferbedingungen -**  
**Teil 3 - Ausfallmuster und Seriengußstücke**

This European Standard was accepted by CEN on 1990-06-28. CEN members are bound to comply with the requirements of CEN Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Central Secretariat or to any CEN member.

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 CEN Central Secretariat has the same status as the official versions.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat : Rue de Stassart, 36, B-1050 Bruxelles

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FOREWORD

## SIST EN 2103-3:2001

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).  
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After inquiries and votes carried out in accordance with the rules of this Association, this Standard has successively received the approval of the National Associations and the Official Services of the member countries of AECMA, prior to its presentation to CEN.

According to the Common CEN/CENELEC Rules, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

ALTERNATIVE SYSTEMS OF UNITS  
 TROUVEZ LE SYSTÈME ALTERNATIF  
 di sistema di unità alternative  
 AVAILABLE

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SYMBOLIC SYSTEM OF UNITS

## 1 Scope and field of application

The present standard specifies the particular requirements for castings in steel, nickel base or cobalt base alloys produced from material complying with EN 2103-2.

This standard shall be used in conjunction with EN 2103-1.

This standard also applies to pre-production castings intended for the qualification of the method of manufacture and inspection.

## 2 References

- EN 2002-1 Aerospace series - Test methods for metallic materials - Part 1 - Tensile testing at ambient temperature <sup>1)</sup>
- EN 2002-2 Aerospace series - Test methods for metallic materials - Part 2 - Tensile testing at elevated temperature <sup>1)</sup>
- EN 2002-5 Aerospace series - Test methods for metallic materials - Part 5 - Uninterrupted creep and rupture testing <sup>2)</sup>
- EN 2002-7 Aerospace series - Test methods for metallic materials - Part 7 - Hardness test <sup>1)</sup>
- EN 2002-16 Aerospace series - Test methods for metallic materials - Part 16 - Dye penetrant testing <sup>2)</sup>
- EN 2002-21 Aerospace series - Test methods for metallic materials - Part 21 - Radiographic testing of cast components <sup>1)</sup>
- EN 2003-5 Aerospace series - Test methods for steel products - Part 5 - Charpy impact test (V notch) <sup>1)</sup>
- EN 2003-11 Aerospace series - Test methods for austenitic stainless steel - Part 11 - Determination of resistance to intergranular corrosion by the Huey method <sup>1)</sup>
- EN 2078 Aerospace series - Manufacturing schedule - Inspection schedule and inspection report - General definitions <sup>3)</sup>
- EN 2103-1 Aerospace series - Steel, nickel base and cobalt base alloy remelting stock and castings - Technical specification - Part 1 - General requirements
- EN 2103-2 Aerospace series - Steel, nickel base and cobalt base alloy remelting stock and castings - Technical specification - Part 2 - Remelting stock
- EN 2857 Aerospace series - Test methods for paramagnetic materials - Magnetic particle inspection <sup>2)</sup>

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1) Published as AECMA pre-standard at the date of publication of this standard.

2) In preparation at the date of publication of this standard.

3) Published as AECMA standard at the date of publication of this standard.

### 3 Recommendation for casting development

It is strongly recommended that the technical representative of the manufacturer be given the opportunity to examine the casting drawing at the initial stages of design and to advise on the optimum design which will facilitate consistent production of acceptable castings.

The dimensional tolerances of the castings shall be as agreed between the purchaser and manufacturer and indicated on the drawing or the inspection schedule.

### 4 Pre-production castings

#### 4.1 General

4.1.1 The following requirements shall be specified on the order, drawing and/or inspection schedule in addition to those specified in EN 2103-1 :

- number of castings to be examined
- who shall perform the examination
- heat treatment condition
- type and frequency of inspection and testing necessary to evaluate and qualify the manufacturing process (dimensions, mechanical and metallurgical properties, etc.).

4.1.2 The inspection and testing of pre-production castings shall be carried out and recorded to allow the definition of the optimum techniques to be used for production castings.

4.1.3 The inspection and tests carried out on pre-production castings shall include those which will be carried out on production castings.

#### 4.2 Inspection report

In addition to the information required by EN 2078, the inspection and test report on the pre-production castings shall provide all technical information to allow evaluation of the quality of these parts, e.g., radiographs, results of dimensional measurements, etc.

#### 4.3 Acceptance of pre-production castings

When all inspection and test results relative to pre-production castings have been reported and accepted as satisfactory, the purchaser shall give his written agreement for series production.

The inspection schedule and if required, the manufacturing schedule shall be formally agreed between the manufacturer and purchaser.

### 5 Manufacture of production castings

5.1 At the start of production (particularly at the start of series production), the manufacturing schedule may be completed to allow the manufacturer to guarantee the reproducibility of the product with more certainty.

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All information, no matter how minor, shall be recorded in the manufacturing schedule.

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5.2 When a manufacturing schedule has been agreed, no change in the manufacturing method shall be made without the written approval of the purchaser.

When such changes are necessary in the case of, for example :

- a) alterations of pattern, mould material or position of runners and risers,
- b) alterations of the casting process,
- c) alterations of the heat treatment process,

the purchaser shall decide if new pre-production castings shall be manufactured and tested.

The manufacturing schedule and the inspection schedule shall be modified accordingly.

5.3 Any change of the casting requiring a revised drawing may require at the purchaser's or manufacturer's request :

- the manufacture of new pre-production castings, or
- modification of the manufacturing schedule and/or the inspection schedule.

**5.4** Manufacturing schedules and inspection schedules, which are modified during production shall be subjected to the same approval process as the original documents.

## **5.5 Manufacture**

Castings shall be poured from a melt, consisting of :

- 1) remelting stock complying with the requirements of EN 2103-2 plus, if necessary, pure metals and added elements, or
- 2) remelting stock complying with the requirements of EN 2103-2 plus a defined and constant percentage of approved scrap, pure metals and added elements, or
- 3) remelting stock, approved scrap, pure metals and added elements. Their proportion per melt is at the option of the manufacturer.

Unless otherwise specified on the order or manufacturing schedule, the following manufacturing method shall be used :

- for castings in steel : method 2)
- for castings in nickel or cobalt base alloys : method 1).

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**5.6** Correction of distortion shall be carried out only by agreement between the manufacturer and the purchaser. The manufacturer shall be responsible for specifying the conditions under which such correction is to be carried out, subject to any provisions made by the purchaser. The method agreed shall be incorporated in the manufacturing schedule.

If after correction of distortion a further heat treatment is required, the castings shall be re-tested in accordance with the requirements of the material standard. Finally, the castings shall be resubmitted to penetrant or magnetic flaw detection (see clause 6.3).

## **6 Inspection and testing of production castings**

Inspection and testing shall be carried out on production castings under the same conditions as applied to pre-production castings.

### **6.1 Dimensions and tolerances**

The dimensions specially indicated by the purchaser shall be checked on every casting.

For other dimensions the frequency of examination adopted by the manufacturer shall be sufficient to permit him to certify compliance with the requirements.



## 6.2 Chemical composition

In addition to EN 2103-1, the manufacturer shall perform sufficient analyses throughout a prolonged casting cycle to ensure that the composition of all the castings will conform to the requirements of the material standard.

For small multiple melts produced in accordance with method 1) and 2) (see 5.5) the frequency of analysis may be reduced by agreement with the purchaser and stated in the inspection schedule.

## 6.3 External defects

**6.3.1** Castings shall be suitably fettled, dressed, cleaned and if appropriate, etched and passivated, to enable inspection to be carried out in a satisfactory manner.

**6.3.2** Each casting shall be examined for surface defects by visual inspection and penetrant flaw detection in accordance with EN 2002-16 or magnetic particle examination in accordance with EN 2857 after all specified heat treatment and pressure tests are completed.

Castings shall be free from cracks and cracklike indications. If appropriate, the acceptance level for other indications of possible defect shall be detailed on the inspection schedule.

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**6.3.3** Surface defects may be removed by local dressing provided the castings are subsequently within the dimensional tolerances. Dressing shall be followed by flaw detection in accordance with EN 2002-16.

## 6.4 Internal defects

Castings shall be radiographically examined in accordance with EN 2002-21. Unless otherwise specified on the drawing or inspection schedule, the technique and frequency to be used, shall be as indicated in table 4 or 5, quality level 2.

The inspection schedule shall include a sheet detailing the requirements for radiographic examination.

**6.4.1** Acceptance criteria for radiographic examination of steel castings, except heat resisting steel, with wall thicknesses equal to or less than 25 mm are given in table 1. The standard of acceptance shall conform to grade B, unless alternative general or localised levels are agreed and defined on the drawing or in the inspection schedule.