



# SLOVENSKI STANDARD

## SIST EN 10222-1:1998

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### Jekleni izkovki za tlačne posode - 1. del: Splošne zahteve za prosto kovane izkovke

Steel forgings for pressure purposes - Part 1: General requirements for open die forgings

Schmiedestücke aus Stahl für Druckbehälter - Teil 1: Allgemeine Anforderungen an Freiformschmiedestücke

Pieces forgées en acier pour appareils à pression - Partie 1: Prescriptions générales concernant les pièces obtenues par forgeage libre

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#### ICS:

77.140.30	Jekla za uporabo pod tlakom	Steels for pressure purposes
77.140.85	Železni in jekleni kovani izdelki	Iron and steel forgings

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EUROPEAN STANDARD

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NORME EUROPÉENNE

EUROPÄISCHE NORM

January 1998

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Descriptors: iron and steel products, forgings, steels, pressure equipment, designation, manufacturing, surface condition, grades: quality, chemical composition, mechanical properties, sampling, tests, inspection, marking

English version

## Steel forgings for pressure purposes - Part 1 : General requirements for open die forgings

Pièces forgées en acier pour appareils à pression - Partie 1: Prescriptions générales concernant les pièces obtenues par forgeage libre

Schmiedestücke aus Stahl für Druckbehälter - Teil 1 : Allgemeine Anforderungen an Freiformschmiedestücke

This European Standard was approved by CEN on 26 October 1997.

CEN members are bound to comply with the CEN/CENELEC 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 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 the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 28 "Steel forgings", the secretariat of which is held by BSI.

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 July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

The titles of the other Parts of this European Standard are:

Part 2 : Ferritic and martensitic steels with specified elevated temperature properties.

Part 3 : Nickel steels with specified low temperature properties.

Part 4 : Weldable fine grain steels with high proof strength.

Part 5 : Martensitic, austenitic and austenitic-ferritic stainless steels.

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.

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## 1 Scope

This Part of this European Standard specifies the general technical delivery conditions for open die steel forgings, ring rolled products and forged bars for pressure purposes.

General information on technical delivery conditions is given in EN 10021.

## 2 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.

- EN 287-1 Approval testing of welders. Fusion welding. Part 1 : Steels
- EN 288 Specification and qualification of welding procedure for fusion welding  
Part 1: General rules  
Part 2: Welding procedure specification for arc welding of metallic materials  
Part 3: Welding procedure tests for arc welding of steels
- EN 10 002-1 Metallic materials - Tensile testing - Method of test (at ambient temperature)
- EN 10 002-5 Metallic materials - Tensile test - Method of test at elevated temperatures
- EN 10 020 Definition and classification of grades of steel
- EN 10 021 General technical delivery requirements for iron and steel products
- EN 10 027 Designation system for steel  
Part 1 : Steel names, principal symbols  
Part 2 : Steel numbers
- EN 10 045-1 Metallic materials - Charpy impact test - Test method  
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- EN 10 052 Vocabulary of heat treatment terms for ferrous products
- EN 10 079 Definition of steel products
- EN 10 204 Metallic products - Inspection documents

prEN 10228	Non-destructive testing of steel forgings. Part 1. Magnetic particle inspection. Part 2. Penetrant testing. Part 3. Ultrasonic testing of ferritic or martensitic steel forgings. Part 4. Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings.
EURONORM 168	Iron and Steel products - Inspection documents - Contents
ENV 22605-1	Steel products for pressure purposes - Derivation and verification of elevated temperature properties - Part 1: Yield or proof stress of carbon and low alloy steel products
ENV 22605-2	Steel products for pressure purposes - Derivation and verification of elevated temperature properties - Part 2: Proof stress of austenitic steel products
EN ISO 377	Steel and steel products - Location of samples and test pieces for mechanical testing.
prEN ISO 3651	Determination of resistance to intergranular corrosion stainless steels Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in media containing sulfuric acid
CR10260	ECISS Information Circular 10. Designation systems for steel : Additional symbols for steel names
CR 10261	ECISS Information Circular 11 - Iron and steel - Review of available methods of chemical analysis

### 3 Definitions

#### 3.1 General

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For the purposes of this Part of this European Standard the following definitions apply in addition to the definitions in EN 10 020, EN 10 021, EN 10 052, EN 10 079 and EN ISO 377.

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**3.2 batch:** Forgings of similar dimensions from the same cast, made by the same forging procedure and from the same heat treatment charge.

## 4 Classification and designation

### 4.1 Classification

The steels in this European Standard are classified as follows:

Part 2: Non-alloy quality steels 1.0352, 1.0426 and 1.0436 -

Alloy special steels - remaining steels.

Part 3: Alloy special steels

Part 4: Non alloy quality steels - 1.0477, 1.0478, 1.0565 and 1.0571 - Alloy special steels - 1.8932 and 1.8936.

Part 5: Alloy special steels.

### 4.2 Designation

The steels in Parts 2 to 5 of this European Standard are designated in accordance with the requirements of EN 10 027: Parts 1 and 2 and CR 10260.

## 5 Information to be supplied by the purchaser

### 5.1 Mandatory information

The purchaser shall select the steel type, the shape and dimensions of the forging taking the intended use into account.

The purchaser shall provide in the purchase order all the information necessary for describing the forging and its characteristics and details concerning delivery including the following :

- I. the quantity of forgings required;
- II. the forging dimensions, or the drawing number(s) containing the dimensions, tolerances and surface finish, to which the forgings shall conform;
- III. the steel designation of the material of which the forgings are made (see clause 4);
- IV. whether the purchaser needs to be informed of the forging procedure (see 7.2);
- V. whether production and testing of the forgings is to be witnessed by the purchaser's representative, and if so, the particular stages in production and testing at which the purchaser's representative may require to be present (see clause 15);
- VI. any required options (see 5.2 and annex A);
- VII. whether additional sample material is required for welding tests, the dimensions and location of such test pieces being agreed with the manufacturer;
- VIII. the type of inspection document in accordance with EN 10 204.



## 5.2 Options

A number of options are available and these are detailed in annex A. Where any of the options given are specified at the time of the order, the forgings shall conform to the requirements of any such option, in addition to the mandatory requirements of this Part of this European Standard.

If the purchaser does not specify any options at the time of enquiry and order, the manufacturer shall supply in accordance with the basic specification.

## 6 Manufacture of the steel

### 6.1 Steelmaking process

The steel shall be produced by an electric process or one of the basic oxygen processes (see option A.1).

### 6.2 Deoxidation

The steel shall be fully killed.

## 7 Manufacture of the product

### 7.1 Hot working

The choice of hot working process shall be at the discretion of the manufacturer (see option A.2).

### 7.2 Forging reduction

The forging shall receive a sufficient forging reduction to completely consolidate the forging and remove the cast structure (see A.3).

### 7.3 Heat treatment

The forgings shall be heat treated as specified in the relevant Part of EN 10222, unless otherwise agreed at the time of enquiry and order.

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## 7.4 Weldability

The steels in this European Standard are generally regarded as being weldable. Welding shall be carried out in accordance with EN 287 and EN 288.

## 8 Surface condition and soundness

### 8.1 General

The forgings shall be sound and free from defects that preclude their intended use (see also A.4, A.5, A.6 and A.7).

### 8.2 Removal of surface defects

#### 8.2.1 *Conformity to 8.1*

Before the forgings are despatched or presented for acceptance, surface defects shall be removed in order to conform to 8.1.

#### 8.2.2 *Chipping and/or grinding*

Surface defects shall be removed by chipping and/or grinding providing the residual thickness meets the minimum tolerance and that the resulting depression does not undercut the rest of the surface. If the thickness is to be reduced to below the minimum tolerance, repair shall only be carried out following agreement with the purchaser.

#### 8.2.3 *Chipping and/or grinding and resurfacing by welding*

If resurfacing by welding is agreed by the purchaser, prior to the repair being carried out, larger surface defects shall be removed by chipping and/or grinding followed by resurfacing by welding and levelling the weld. Any welding operations carried out shall be in accordance with EN 287-1 and EN 288-1, EN 288-2 and EN 288-3.

### 8.3 Dimensions, shape, tolerances and nominal mass

The dimensions and shape of the product shall conform to the tolerances stated in the order.

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Any calculation of the nominal mass of the product shall be based on the following density values :

- |  |                         |
|--|-------------------------|
| – non alloy quality and alloy special steels in Parts 2, 3 and 4 | 7,85 kg/dm <sup>3</sup> |
| – martenstic stainless steels                                    | 7,7 kg/dm <sup>3</sup>  |

– austenitic stainless CrNi steels	7,9 kg/dm <sup>3</sup>
– austenitic stainless CrNi Mo steels	8,0 kg/dm <sup>3</sup>
– austenitic ferritic stainless steels	7,8 kg/dm <sup>3</sup>
– X8Ni9	7,89 kg/dm <sup>3</sup>

#### 8.4 Compatibility with non-destructive testing

The agreed requirements for surface finish shall be compatible with the requirements for non-destructive testing.

### 9 Chemical composition

#### 9.1 Cast analysis

The chemical composition of the steel, determined by cast analysis, shall conform to the requirements specified in the relevant Part of EN 10222.

Elements not listed in the composition tables in the other Parts of EN 10222 shall not be intentionally added without the agreement of the purchaser except for finishing the cast (see options A.8 and A.9).

#### 9.2 Product analysis (optional requirement)

The results of a product analysis on samples taken and prepared in accordance with clause 12 shall not deviate from the specified limits for the cast analysis by more than the values given in the table of permissible deviations of product analysis in the relevant Parts of EN 10222 (see A.10 to A.12).

NOTE 1: Further restriction to composition may be imposed by the purchaser by the use of the carbon equivalent values (see A.13).

NOTE 2: Greater tolerances to composition may be agreed for large forgings at the time of enquiry and order.

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