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Open die steel forgings for general engineering purposes - Part 1: General requirements

Freiformschmiedestücke aus Stahl für allgemeine Verwendung - Teil 1: Allgemeine Anforderungen

Pièces forgées en acier pour usage général - Partie 1: Exigences générales

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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 10250-1:2022) has been prepared by Technical Committee CEN/TC 459 “ECISS - European Committee for Iron and Steel Standardization”[1], the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10250-1:1999.

In comparison with the previous edition, the following technical modifications have been made:

— updating of normative references;

— alignment of the text with reference standards.

EN 10250, *Open die steel forgings for general engineering purposes*, consists of the following parts:

— *Part 1: General requirements;*

— *Part 2: Non-alloy quality and special steels;*

— *Part 3: Alloy special steels;*

— *Part 4: Stainless steels.*

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

[1] Through its sub-committee SC 11 “Steel castings and forgings” (secretariat: AFNOR).

1 Scope

This document specifies the general technical delivery conditions for open die forgings, forged bars, and products pre-forged and finished in ring rolling mills, for general engineering purposes.

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

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.

CEN/TR 10261, *Iron and steel - European standards for the determination of chemical composition*

EN 10020, *Definition and classification of grades of steel*

EN 10021:2006, *General technical delivery conditions for steel products*

EN 10027-1, *Designation systems for steels - Part 1: Steel names*

EN 10027-2, *Designation systems for steels - Part 2: Numerical system*

EN 10079, *Definition of steel products*

EN 10168, *Steel products - Inspection documents - List of information and description*

EN 10204, *Metallic products - Types of inspection documents*

EN 10228-1, *Non-destructive testing of steel forgings - Part 1: Magnetic particle inspection*

EN 10228-2, *Non-destructive testing of steel forgings - Part 2: Penetrant testing*

EN 10228-3, *Non-destructive testing of steel forgings - Part 3: Ultrasonic testing of ferritic or martensitic steel forgings*

EN 10228-4, *Non-destructive testing of steel forgings - Part 4: Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings*

EN 10250-2, *Open die steel forgings for general engineering purposes - Part 2: Non-alloy quality and special steels*

EN 10250-3, *Open die steel forgings for general engineering purposes - Part 3: Alloy special steels*

EN 10250-4, *Open die steel forgings for general engineering purposes - Part 4: Stainless steels*

EN ISO 148-1, *Metallic materials - Charpy pendulum impact test - Part 1: Test method (ISO 148-1)*

EN ISO 377, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377)*

EN ISO 3651-2, *Determination of resistance to intergranular corrosion of stainless steels - Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels - Corrosion test in media containing sulfuric acid (ISO 3651-2)*

EN ISO 4885, *Ferrous materials - Heat treatments - Vocabulary (ISO 4885)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 9606-1, *Qualification testing of welders - Fusion welding - Part 1: Steels (ISO 9606-1)*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1)*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1)*

3 Terms and definitions

For the purposes of this document the terms and definitions given in EN 10020, EN 10021, EN 10079, EN ISO 377, EN ISO 4885, and the following apply.

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

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
batch
forgings of similar dimensions from the same cast, made by the same forging procedure and from the same heat treatment charge

Note 1 to entry: "Similar dimensions" are to be taken as forgings having dimensions within ± 10 % of the equivalent thickness.

4 Classification and designation

4.1 Classification

The steels covered by this document are classified as follows:

— Non-alloy quality and special steels, see EN 10250-2;

— Alloy special steels, see EN 10250-3;

— Stainless steels, see EN 10250-4.

4.2 Designation

The steels in EN 10250-2, EN 10250-3 and EN 10250-4 shall be designated in accordance with the requirements of EN 10027-1 and EN 10027-2.

5 Information to be provided by the purchaser

5.1 Mandatory information

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

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

a) the quantity of forgings required;

b) the forging dimensions, or the drawing number(s) containing the dimensions, tolerances and surface finish, with which the forging shall conform;

c) the steel designation (name or number) of the material of which the forgings are made (see 4.2);

d) whether the purchaser has any specific requirements on the hot working process or need to be informed of the forging procedure (see A.2 and A.3);

e) 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 14);

f) any required options (see 5.2 and Annex A);

g) if required, the type of inspection document in accordance with EN 10204.

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 document.

If the purchaser does not specify any options at the time of enquiry and order, the manufacturer shall provide 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 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 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 delivered in a heat-treated condition as specified in the relevant part of EN 10250, unless otherwise agreed at the time of enquiry and order.

7.4 Weldability

The steels in this document are generally regarded as being weldable.

Welding shall be carried out in accordance with EN ISO 9606-1 and EN ISO 15607.

8 Surface condition and internal soundness

8.1 General

The forgings shall be sound and free from such segregation, cracks, laminations or defects that preclude their intended use (see A.4, A.5 and A.6).

8.2 Removal or surface defects

8.2.1 Conformity to 8.1

Before forgings are dispatched 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, the 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, surface defects exceeding the acceptance criteria shall be removed by chipping and/or grinding followed by resurfacing by welding and levelling the weld.

Any welding operations shall be in accordance with EN ISO 9606-1, EN ISO 15607, EN ISO 15609-1 and EN ISO 15614-1.

8.3 Dimensions, shape, tolerances and nominal mass

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

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

— non-alloy and alloyed steels in EN 10250-2 and EN 10250-3 7,85 kg/dm^3;

— austenitic stainless CrNi steels in EN 10250-4 7,9 kg/dm^3;

— austenitic stainless CrNiMo steels in EN 10250-4 8,0 kg/dm^3.

8.4 Compatibility with non-destructive testing (NDT)

The agreed requirements for surface finish shall be compatible with the requirements of the applied NDT standards, see EN 10228-1 up to EN 10228-4.

9 Chemical composition

9.1 Cast analysis

The chemical composition of the steel, determined by cast analysis, shall conform to the requirement specified in the relevant parts of EN 10250.

Elements not listed in the composition tables in the relevant parts of EN 10250 shall not be intentionally added without the agreement of the purchaser except for finishing the cast (see options A.7 and A.8).

9.2 Product analysis (optional requirement)

The permissible deviation between the values of the product analysis and those specified for the cast analysis shall not deviate from the specified limits for the cast analysis by more than the values given in the tables of permissible deviations of the product analysis in the relevant parts of EN 10250 (see options A.9 to A.11), unless otherwise agreed between manufacturer and purchaser at the time of the order.

If required and specified by the purchaser a product analysis shall be carried out and reported instead of a cast analysis (see A.9).

The results of a product analysis on samples taken and prepared in accordance with Clause 11, shall not deviate from the specified limits for the cast analysis by more than the values given in the tables of permissible deviations of product analysis in the relevant parts of EN 10250 (see options A.9 to A.11).

10 Mechanical properties

The mechanical properties obtained from the test pieces, selected, prepared and tested in accordance with the requirements of Clauses 11 and 12 shall comply with the values specified in the relevant parts of EN 10250.

Details of the assessment of impact tests based on the sequential method are given in 8.3 of EN 10021:2006.

The average value for the Charpy impact strength obtained in 3 tests at room temperature shall not be less than the value specified in the relevant part of EN 10250 for the appropriate limiting ruling section (see Annex B) of the steel concerned.

One individual value may be below the specified value but no individual value shall be less than 70 % of the specified value.

Impact tests at temperatures below room temperature may be specified (see A.12).