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Steel castings for structural uses - Part 1: General

Stahlguss für das Bauwesen - Teil 1: Allgemeines

Aciers moulés de construction - Partie 1: Généralités

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Steel castings for structural uses - Part 1: General

Aciers moulés de construction - Partie 1: Généralités

Stahlguss für das Bauwesen - Teil 1: Allgemeines

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European foreword

This document (prEN 10340-1:2017) has been prepared by Technical Committee ECISS/TC 111 “Steel castings and forgings”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Regulation (EU) No 305/2011.

For relationship with EU Regulation, see informative Annex ZA, which is an integral part of this document.

This document together with prEN 10340-2 will supersede EN 10340:2007.

The main changes with respect to the previous edition are listed below:

— document completely revised taking into account requirements of the Regulation (EU) 305/2011.

EN 10340, *Steel castings for structural uses* consists of the following parts:

— *Part 1: General*

— *Part 2: Technical delivery conditions*

1 Scope

This European Standard specifies the product characteristics, testing and sampling methods and the assessment and verification of constancy of performance of steel castings for structural uses in buildings and civil engineering works.

In cases where castings are joined by welding by the founder, this European Standard applies.

This European Standard does not apply in cases where castings are welded:

— to wrought products (plates, tubes, forgings...); or

— by non-founders.

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 1559-2:2014, *Founding - Technical conditions of delivery - Part 2: Additional requirements for steel castings*

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

EN 10315, *Routine method for analysis of high alloy steel by X-ray Fluorescence Spectrometry (XRF) by using a near by technique*

prEN 10340-2:2017, *Steel castings for structural uses - Part 2: Technical delivery conditions*

CR 10320, *Optical emission analysis of low alloy steels (routine method) - Method for determination of C, Si, S, P, Mn, Cr, Ni and Cu*

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

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

CEN ISO/TS 8062-2, *Geometrical Product Specifications (GPS) - Dimensional and geometrical tolerances for moulded parts - Part 2: Rules (ISO/TS 8062-2)*

EN ISO 8062-3, *Geometrical Product Specifications (GPS) - Dimensional and geometrical tolerances for moulded parts - Part 3: General dimensional and geometrical tolerances and machining allowances for castings (ISO 8062-3)*

EN ISO 11970:2016, *Specification and qualification of welding procedures for production welding of steel castings (ISO 11970:2016)*

EN ISO 14284, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284)*

EN ISO 15350, *Steel and iron - Determination of total carbon and sulfur content - Infrared absorption method after combustion in an induction furnace (routine method) (ISO 15350)*

EN ISO 15351, *Steel and iron - Determination of nitrogen content - Thermal conductimetric method after fusion in a current of inert gas (Routine method) (ISO 15351)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
product-type
set of representative performance levels or classes of a construction product, in relation to its essential characteristics, produced using a given combination of raw materials or other elements in a specific production process

3.2
essential characteristics
mandated characteristics of the construction product which relate to the basic requirements for construction works

3.3
performance of a construction product
characteristics of the construction product which relate to the basic requirements for construction works

3.4
product range
group of products produced by one manufacturer for which the test results for one or more characteristics from any one product within the range are valid for all other products within this range

4 Product characteristics

4.1 General

The following product characteristics apply when sampling, preparation of test pieces and testing specified in Clause 5 are carried out.

4.2 Tolerances on dimensions and shape

Tolerances on dimensions and shape shall be in accordance with the requirements given in CEN ISO/TS 8062-2 and EN ISO 8062-3.

4.3 Mechanical properties (yield strength, tensile strength, elongation and impact strength)

4.3.1 General

Under the inspection and testing conditions as specified in Clause 5, the yield strength, the tensile strength, the elongation and impact strength shall comply with the requirements specified in prEN 10340-2:2017, 7.2.2.

4.3.2 Yield strength, tensile strength

The values of yield and tensile strength given in prEN 10340-2:2017, Table 2 also apply to the casting itself up to the maximum relevant wall thickness stated.

The yield strength values at room temperature correspond to 0,2 % proof strength ($R_{p0,2}$).

4.4 Weldability

All grades specified in the present European Standard are weldable.

Welding conditions concerning preheat, interpass temperature and postweld heat-treatment are given in prEN 10340-2:2017, Table A.1.

The conditions used shall be documented in a welding procedure qualification record (WPQR) according to EN ISO 11970:2016, 8.3. This qualification remains valid as long as it remains within the same group of the grouping system (see EN ISO 11970:2016, 8.3.1) and within the same range of thickness for which the welding procedure is qualified (see EN ISO 11970:2016, 8.3.2).

4.5 Durability (chemical composition)

The chemical composition determined as a cast analysis shall comply with the values given in prEN 10340-2:2017, Table 1.

4.6 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets. In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through:
http://ec.europa.eu/enterprise/construction/cpd-ds/.

5 Testing, assessment and sampling methods

5.1 Tolerances on dimensions and shape

The verification on dimensions and shape shall be carried out on products to be delivered in conformance with CEN ISO/TS 8062-2 and EN ISO 8062-3.

The results of dimensional measurements shall not be rounded off.

5.2 Mechanical properties

5.2.1 General

Mechanical properties are determined as follows:

— tensile testing (yield strength, tensile strength, elongation);

— impact testing (impact strength).

5.2.2 Test frequency

The test frequency for the grades specified in this European Standard shall be:

— one test per heat;

— one test per heat treatment lot.

NOTE One heat treatment lot represents all the castings put in a same furnace at the same time for undergoing the same heat treatment cycle.

5.2.3 Preparation of samples

Samples (test blocks) shall be taken in accordance with EN 1559-2:2014, 8.4.

5.2.4 Preparation of test pieces

5.2.4.1 General

The test pieces shall be taken from a test block (sample) representing each heat and heat treatment lot as follows:

— one test piece for the tensile test;

— three test pieces for the impact test.

5.2.4.2 Tensile test piece

The requirements for tensile test piece of EN ISO 6892-1 shall apply.

Proportional test pieces having a gauge length Lo = 5,65 $\sqrt{S_0}$ shall be used (see 5.2.5.1).

5.2.4.3 Impact test piece

V-notch test pieces shall be machined and prepared in accordance with EN ISO 148-1.

The absorbed energy value is defined as KV_2, in Joules, and is to be determined by three test pieces at the temperature given in prEN 10340-2:2017, Table 3.

5.2.5 Test methods

5.2.5.1 Tensile tests

The tensile test shall be carried out in accordance with EN ISO 6892-1.

For the specified yield strength, the 0,2 % proof strength ($R_{p0,2}$) shall be determined.

The initial gauge length shall be Lo = 5,65 $\sqrt{S_0}$ where S_o is the cross section of the test piece.

5.2.5.2 Impact test

The impact test shall be carried out in accordance with EN ISO 148-1 on V-notch specimen using 2 mm striker.

The average value of energy shall not be smaller than the specified value indicated in Table 2 for the specified grade; one of the individual values may be smaller than specified, provided that it is not smaller than 70 % of this specified value.

Three additional test pieces shall be taken from the same sample in accordance with 5.2.3 and tested in any one of the following cases:

— if the average of three impact values is lower than the minimum average value specified;

— if the average value meets the specified requirement, but two individual values are lower than the minimum average value specified.

In the case of retest, see EN 1559-2:2014, 8.7.

5.2.6 Identification of samples and test pieces

The samples shall be legibly marked to allow traceability through test pieces and castings.

The identification marks shall be stamped or cast on each sample.

5.3 Chemical composition (durability)

Test frequency shall be once per heat.

For the determination of the chemical composition, the selection and preparation of samples shall be in accordance with EN ISO 14284.

Test methods shall be based on EN 10315, EN ISO 15350, EN ISO 15351 or CR 10320 depending on the elements to be analysed and their content.

Values of elements defined in prEN 10340-2:2017, Table 1, for each heat shall be reported

NOTE The list of available European Standards on chemical analysis is given in CEN/TR 10261.

5.4 Weldability

Weldability tests shall be carried out prior to production of a new grade of thickness range (test frequency).

Weldability is assessed through the methods described in EN ISO 11970.

6 Assessment and verification of constancy of performance (AVCP)

6.1 General

The compliance of steel casting for structural uses with the requirements of this standard and with the performances declared by the manufacturer in the DoP shall be demonstrated by:

— determination of the product type;

— factory production control by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity of the product with its declared performance(s).

6.2 Type testing

6.2.1 General

All performances related to characteristics included in this standard shall be determined when the manufacturer intends to declare the respective performances unless the standard gives provisions for declaring them without performing tests (e.g. use of previously existing data, CWFT (Classified Without Further Testing) and conventionally accepted performance).

Assessment previously performed in accordance with the provisions of this standard, may be taken into account provided that they were made to the same or a more rigorous test method, under the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

For the purposes of assessment, the manufacturer's products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristics for all products within that same family.

NOTE 1 Products can be grouped in different families for different characteristics.

NOTE 2 Reference to the assessment method standards can be made to allow the selection of a suitable representative sample.

In addition, the determination of the product type shall be performed for all characteristics included in the standard for which the manufacturer declares the performance:

— at the beginning of the production of a new or modified steel casting for structural uses (unless a member of the same product range); or

— at the beginning of a new or modified method of production (where this may affect the stated properties); or

they shall be repeated for the appropriate characteristic(s), whenever a change occurs in the steel casting for structural uses design, in the raw material or in the supplier of the components, or in the method of production (subject to the definition of a family), which would affect significantly one or more of the characteristics.

Where components are used whose characteristics have already been determined, by the component manufacturer, on the basis of assessment methods of other product standards, these characteristics need not be re-assessed. The specifications of these components shall be documented.

Products bearing regulatory marking in accordance with appropriate harmonized European specifications may be presumed to have the performances declared in the DoP, although this does not replace the responsibility on the steel casting for structural uses manufacturer to ensure that the steel casting for structural uses as a whole is correctly manufactured and its component products have the declared performance values.

6.2.2 Test samples, testing and compliance criteria

The number of samples of steel casting for structural uses to be tested/assessed shall be in accordance with Table 1.

Table 1 — Number of samples to be tested and compliance criteria

Characteristics	Requirements	Assessment method	No. of samples	Compliance criteria
Tolerances on dimensions and shape	4.2	5.1	One per test unit	4.2
Elongation	4.3	5.2	One per heat and heat treatment lot	4.3
Yield strength	4.3	5.2	One per heat and heat treatment lot	4.3
Tensile strength	4.3	5.2	One per heat and heat treatment lot	4.3
Impact strength	4.3	5.2	One per heat and heat treatment lot	4.3
Weldability	4.4	5.4	One per welding group and thickness range	4.4
Durability (chemical composition)	4.5	5.3	One per heat	4.5

6.2.3 Test reports

The results of the determination of product type shall be documented in test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the steel casting for structural uses to which they relate.