SLOVENSKI STANDARD

SIST EN 10213:2008

01-januar-2008

Nadomeģļ a:

SIST EN 10213-1:1997

SIST EN 10213-2:1997

SIST EN 10213-3:1997

SIST EN 10213-4:1997

Jekleni ulitki za tlaļ ne posode

Steel castings for pressure purposes

Stahlguss für Druckbehälter

Pieces moulées en acier pour service sous pression

Ta slovenski standard je istoveten z: **EN 10213:2007**

ICS:

77.140.30	Jekla za uporabo pod tlakom	Steels for pressure purposes
77.140.80	Železni in jekleni ulitki	Iron and steel castings

SIST EN 10213:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10213

November 2007

ICS 77.140.30

Supersedes EN 10213-1:1995, EN 10213-2:1995, EN 10213-3:1995, EN 10213-4:1995

English Version

Steel castings for pressure purposes

Pièces moulées en acier pour service sous pression

Stahlguss für Druckbehälter

This European Standard was approved by CEN on 30 September 2007.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 10213:2007: E

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Foreword

This document (EN 10213:2007) has been prepared by Technical Committee ECISS/TC 31 “Steel castings”, 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 May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

This document supersedes EN 10213-1:1995, EN 10213-2:1995, EN 10213-3:1995 and EN 10213-4:1995.

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 EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

EN 10213, *Technical delivery conditions for steel castings for pressure purposes* is a revision of the European Standard, EN 10213:1995, in four parts:

— *Part 1: General*

— *Part 2: Steel grades for use at room temperature and elevated temperatures*

— *Part 3: Steel grades for use at low temperatures*

— *Part 4: Austenitic and austenitic-ferritic steel grades*

The revision consists of:

— merging of the four previous parts and new arrangement of steel grades in tables;

— GP240GR has been deleted;

— GX10NiCrSiNb32-20 has been added.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This European Standard retains the same format for clauses as EN 1559-2:2000. This European Standard needs to be used in conjunction with EN 1559-2:2000. Where no text is given under a clause heading, the corresponding clause of EN 1559-2:2000 applies.

The structure of this European Standard is as follows:

— clauses and subclauses preceded by ■ indicates no additional conditions to EN 1559-2;

— subclauses and paragraphs marked with a single dot ● indicate that the conditions shall be agreed at the time of enquiry and order;

— subclauses marked with two dots ●● indicate that conditions may be agreed at the time of enquiry and order (optional);

— subclauses without dot marking are mandatory.

1 Scope

This European Standard applies to steel castings for pressure containing parts. It includes materials which are used for the manufacture of components, for pressure equipment.

This European Standard relates to castings characterised by their chemical composition (see Table 2) and mechanical properties (see Tables 3 to 6).

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

In cases where castings are welded:

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

— by non founders,

this European Standard does not apply.

NOTE For this harmonised supporting standard for materials, presumption of conformity to the Essential Requirements of the Directive is limited to technical data of the material in the standard and does not presume adequacy of the material to specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the Essential Requirements of the Pressure Equipment Directive (PED) are satisfied.

2 Normative references

The following referenced documents are indispensable for the application 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 287-1:2004, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 444:1994, *Non-destructive testing — General principles for radiographic examination of metallic materials by X- and gamma-rays*

EN 462-1:1994, *Non-destructive testing — Image quality of radiographs — Part 1: Image quality indicators (wire type) — Determination of image quality value*

EN 571-1:1997, *Non destructive testing — Penetrant testing — Part 1: General principles*

EN 583-1:1998, *Non-destructive testing — Ultrasonic examination — Part 1: General principles*

EN 1369:1996, *Founding — Magnetic particle inspection*

EN 1371-1:1997, *Founding — Liquid penetrant inspection — Part 1: Sand, gravity die and low pressure die castings*

EN 1371-2:1998, *Founding — Liquid penetrant inspection — Part 2: Investment castings*

EN 1559-2:2000, *Founding — Technical conditions of delivery — Part 2: Additional requirements for steel castings*

EN 10027-1:2005, *Designation system for steels — Part 1: Steel names*

EN 10027-2:1992, *Designation system for steels — Part 2: Numerical system*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 12454:1998, *Founding — Visual examination of surface discontinuities — Steel sand castings*

EN 12680-1:2003, *Founding — Ultrasonic examination — Part 1: Steel castings for general purposes*

EN 12680-2:2003, *Founding - Ultrasonic examination - Part 2: Steel castings for highly stressed components*

EN 12681:2003, *Founding — Radiographic examination*

EN ISO 3651-2:1998, *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 3651-2:1998)*

EN ISO 9934-1:2001, *Non-destructive testing — Magnetic particle testing — Part 1: General principles (ISO 9934-1:2001)*

EN ISO 11970:2007, *Specification and approval of welding procedures for production welding of steel castings (ISO 11970:2001)*

■ 3 Terms and definitions

4 Information to be supplied by the purchaser

● 4.1 Mandatory information

The relevant (ruling) wall thickness shall be agreed.

In cases of grades with different mechanical properties relating to heat treatment conditions, the purchaser shall specify the heat treatment symbol (see Clause 5).

■ 4.2 Optional information

5 Designation

In addition to EN 1559-2:2000:

Cast steels shall be designated in accordance with EN 10027-1 and EN 10027-2:

— either by their minimum yield strength (tensile test) for non alloy steels (preceded by letter P related to pressure uses);

— or by their chemical composition for alloy steels.

In cases of grades with different mechanical properties relating to heat treatment conditions, the purchaser shall specify the heat treatment symbol. For example: GX8CrNi12 + QT1 or GP280GH + N.

6 Manufacture

6.1 Manufacturing process

6.1.1 Melting

In addition to EN 1559-2:2000:

— alternative processes are left to the discretion of the manufacturer.

6.1.2 Heat treatment

6.1.2.1 Unless otherwise agreed, the type of heat treatment represented by its symbol shall comply with Table 3.

■ **6.1.2.2**

6.2 Welding operations

6.2.1 General

Unless otherwise agreed welding is permitted, provided that all welds shall conform to the same criteria for non-destructive testing as the relevant part of the casting. A welding procedure qualification is required (it may include prior agreement for major welds, weld maps…) according to EN ISO 11970.

6.2.2 Production welding

Conditions for preheat, interpass and postweld heat-treatment related to welding operations are given in Annex A. These conditions are informative for ferritic and martensitic grades, and are normative for austenitic and austenitic-ferritic grades.

The heat treatment procedure established to qualify the weld procedure for the austenitic and austenitic-ferritic steels is mandatory.

6.2.3 Permanent joint welding

The welding personnel for permanent joining of components shall be qualified according to EN 287-1.

■ 6.3 Further processing

7 Requirements

■ 7.1 General

7.2 Materials

7.2.1 Chemical composition

In addition to EN 1559-2:2000:

— chemical composition determined by a cast analysis shall conform with the values given in Table 2;

— elements unspecified shall not be intentionally added without agreement of the purchaser other than for the purpose of finishing the heat;

— permissible deviations between the specified cast analysis and the check analysis on test blocks are indicated EN 1559-2:2000;

●● a maximum carbon equivalent value (CEV) of 0,45 % for the cast analysis may be agreed at the time of enquiry and order for grades GP280GH (1.0625) and G20Mn5 (1.6220). The carbon equivalent value shall be calculated according to the following formula:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

7.2.2 Mechanical properties

7.2.2.1 The mechanical properties at room temperature shall conform to the values given in Table 3.

The mechanical properties at low temperature for impact testing:

— shall conform to the values given in Table 4 for ferritic and martensitic grades;

— ●● may be agreed to the values given in Table 5 for austenitic and austenitic-ferritic grades.

They are verified on test blocks. In all cases the maximum thickness shall be limited to 150 mm.

● In cases where the ruling thickness specified by the purchaser is above the maximum thickness given in Table 3, the mechanical properties shall be agreed.

7.2.2.2 Proof strength at elevated temperatures shall conform to the values given in Table 6.

●● However, the verification is only made by agreement between the purchaser and the manufacturer at the time of enquiry and order.

7.2.2.3 The values of yield and tensile strength at room temperature also apply to the casting itself up to the maximum wall thickness as given in Table 3.

The yield strength values at room temperature correspond to:

— 0,2 % proof strength ($R_{p0,2}$) for ferritic, martensitic and austenitic-ferritic steels;

— 1,0 % proof strength ($R_{p1,0}$) for austenitic steels.

■ 7.2.3 Other properties

■ 7.3 Casting

■ 7.3.1 Chemical composition

■ 7.3.2 Mechanical properties

7.3.3 Non destructive testing

7.3.3.1 Requirements regarding the outer and/or inner conditions shall be agreed. They shall specify:

— method of non-destructive testing to be used;

— extent (area and/or frequency) of testing;

— acceptance criteria.

In those areas where non-destructive testing has been agreed, the required surface condition shall be ensured by the use of an appropriate process.

References to discontinuities shall be expressed in terms of dimension, quantity and location.

7.3.3.2 Where minor surface defects do not impair the application or if the surface of the casting corresponds to that of the initial sample, they need not be removed.

NOTE Examples of minor surface defects include small areas of sand or slag, small cold laps, small scabs, small shrink-holes, groups of small pores, residues of the moulding material, uneven areas, flash.

7.3.3.3 A conforming procedure for unacceptable external and internal discontinuities may be agreed between the purchaser and the manufacturer. In the case of as-cast castings, it is recommended that the purchaser discusses with the manufacturer the choice of any non-destructive testing and criteria to determine the acceptability of a subsequently machined surface. Unless specifically agreed, discontinuities revealed on the machined surface are not to be regarded as a non-conformity.

7.3.3.4 ●● If required, the surface condition including burrs and parting line flash shall be agreed upon.

NOTE Examples of acceptable surfaces include surface comparators or another casting used as a reference comparator etc.

7.3.3.5 Non destructive testing

In addition to EN 1559-2:2000:

● The castings shall be subjected to non destructive examination under conditions agreed at the time of enquiry and order.

— every order shall include information about:

— non destructive method involved (visual, magnetic particle, liquid penetrant, ultrasonic, radiographic …);

— severity levels for every method;

— areas of the casting to be tested (location and extent);

— percentage of castings to be inspected.

However, different acceptance criteria can be specified for different areas of the same casting (e.g. inner and outer zones). Moreover for the same area of the casting different acceptance criteria can be specified according to the non destructive methods selected.

The inspection shall be performed according to the relevant European Standard according to Table 1: