



SLOVENSKI STANDARD

SIST EN 10253-2:2008

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Cevni fittingi za soležne zware - 2. del: Nelegirana in feritna legirana jekla s posebnimi zahtevami kontrole

Butt-welding pipe fittings - Part 2: Non alloy and ferritic alloy steels with specific inspection requirements

Formstücke zum Einschweissen - Teil 2: Unlegierte und ferritisch legierte Stähle mit besonderen Prüfanforderungen

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Raccords a souder bout a bout (Partie 2: Aciers non alliés et aciers ferritiques alliés avec contrôle spécifique)

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23.040.40	Kovinski fittingi	Metal fittings
77.140.45	Nelegirana jekla	Non-alloyed steels

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English Version

Butt-welding pipe fittings - Part 2: Non alloy and ferritic alloy steels with specific inspection requirements

Raccords à souder bout à bout - Partie 2: Aciers non alliés et aciers ferritiques alliés avec contrôle spécifique

Formstücke zum Einschweißen - Teil 2: Unlegierte und legierte ferritische Stähle mit besonderen Prüfanforderungen

This European Standard was approved by CEN on 18 August 2007.

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Foreword

This document (EN 10253-2:2007) has been prepared by Technical Committee ECISS/TC 29 "Steel tubes and fittings for steel tubes", the secretariat of which is held by UNI/UNSIDER.

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of an identical text or by endorsement, at the latest by May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.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 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 (97/23/EC).

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

EN 10253 comprises a series of European Standards about *Butt-welding pipe fittings*, namely:

- *Part 1 : Wrought carbon steel for general use and without specific inspection requirements*
- *Part 2 : Non alloy and ferritic alloy steels with specific inspection requirements*
- *Part 3 : Wrought austenitic and austenitic-ferritic (duplex) stainless steels without specific inspection requirements*
- *Part 4 : Wrought austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements*

In writing this European Standard the competent committee recognized that there are two broad types of products commonly used, and decided to reflect these in the standard by differentiating between two parts.

EN 10253-1 describes fittings without formal reference to the pressure resistance, which are not intended to be used in applications covered by the Pressure Equipment Directive (97/23/EC).

EN 10253-2 defines two types of fittings : Type A fittings have the same wall thickness at the welding ends and at the body of the fitting than a pipe having the same specified wall thickness. Their resistance to internal pressure is, in general, less than that of a straight pipe with the same dimensions. Type B fittings showing increased wall thickness at the body of the fitting are designed to resist the same internal pressure as a straight pipe with same dimensions. These two types of fittings are intended to be used in applications covered by the EU Directive 97/23/EC. According to this Directive and further interpretation guidelines (e.g. guideline 7/19), seamless fittings are considered as materials whereas welded fittings are considered as components. Therefore, in some areas of this European Standard, provisions for seamless and welded fittings are different.

The selection of steel type and requirement level depend on many factors; the properties of the fluid to be conveyed, the service conditions, the design code and any statutory requirements should all be taken into consideration. Therefore this standard gives no detailed guidelines for the application of different parts. It is the ultimate responsibility of the user to select the appropriate part for the intended application.

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

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 the United Kingdom.

1 Scope

This Part of EN 10253 specifies the technical delivery requirements for seamless and welded butt-welding fittings (elbows, concentric and eccentric reducers, equal and reducing tees, caps) made of carbon and alloy steel which are intended for pressure purposes at room temperature, at low temperature or at elevated temperatures, and for the transmission and distribution of fluids and gases.

It specifies:

- type of fittings ;
 - type A : Butt-welding fittings with reduced pressure factor ;
 - type B : Butt-welding fittings for use at full service pressure ;
- steel grades ;
- mechanical properties ;
- dimensions and tolerances ;
- requirements for inspection and testing ;
- inspection documents ;
- marking ;
- protection and packaging.

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NOTE In the case of a harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific item of equipment. Consequently it is essential that the technical data stated in the material standard be assessed against the design requirements of this specific item of equipment to verify that the ESRs of the 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, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 910, *Destructive tests on welds in metallic materials — Bend tests*

EN 1418, *Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10002-5, *Metallic materials — Tensile testing — Part 5: Method of testing at elevated temperature*

EN 10020:2000, *Definition and classification of grades of steel*

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

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

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

EN 10028-2, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-4, *Flat products made of steels for pressure purposes — Part 4: Nickel alloy steels with specified low temperature properties*

EN 10045-1, *Metallic materials - Charpy impact test — Part 1: Test method*

EN 10052:1993, *Vocabulary of heat treatment terms for ferrous products*

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

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

EN 10217-1, *Welded steel tubes for pressure purposes — Part 1: Non-alloy steel tubes with specified room temperature properties*

EN 10217-2, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10217-3, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 3: Alloy fine grain steel tubes*

EN 10217-4, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 4: Electric welded non-alloy steel tubes with specified low temperature properties*

EN 10217-5, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10217-6, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 6: Submerged arc welded non-alloy steel tubes with specified low temperature properties*

EN 10246-10, *Non-destructive testing of steel tubes — Part 10: Radiographic testing of the weld seam of automatic fusion arc welded steel tubes for the detection of imperfections*

EN 10246-11, *Non-destructive testing of steel tubes — Part 11: Liquid penetrant testing of seamless and welded steel tubes for the detection of surface imperfections*

EN 10246-12, *Non-destructive testing of steel tubes — Part 12: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections*

EN 10266:2003, *Steel tubes, fittings and structural hollow sections — Symbols and definitions of terms for use in product standards*

EN 10273, *Hot rolled weldable steel bars for pressure purposes with specified elevated temperature properties*

EN 13480-3:2002, *Metallic industrial piping — Part 3: Design and calculation*

EN ISO 377:1997, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997)*

EN ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*.

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:2006)*

EN ISO 6708, *Pipe work components — Definition and selection of DN (nominal size) (ISO 6708:1995)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

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 15614-1:2004)*

ISO 1027, *Radiographic image quality indicators for non-destructive testing — Principles and identification*

3 Terms and definitions

For the purposes of this document, the relevant definitions in EN 10020:2000, EN 10021:2006, EN 10052:1993 and EN ISO 377:1997 apply, except as defined below.

3.1

carbon steel grade

in this part of EN 10253, the following grades :

P235TR2 - P265TR2 - P235GH - P265GH - P355N - P355NH - P355NL1 - P215NL - P265NL

3.2

employer

organisation for which a person works on a regular basis

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NOTE The employer may be either the fitting manufacturer or supplier or a third party organisation providing a service, e.g. NDT.

3.3

model

for elbows and return bends, the model defines the bending radius of the piece

3.4

purchaser

person or organisation that orders products in accordance with this European Standard

NOTE 1 The purchaser is not necessarily, but may be, a manufacturer of pressure equipment in accordance with the EU Directive listed in Annex ZA.

NOTE 2 Where a purchaser has responsibilities under this EU Directive, this standard will provide a presumption of conformity with the essential requirements of the Directive so identified in Annex ZA.

3.5

weld during manufacture

weld made for obtaining a fitting

NOTE This term does not include the tube welds when a tube is used as starting material.

3.6

seamless fitting

fitting manufactured without welding from starting material which is not welded

3.7

welded fitting

3.7.1

fitting made from welded tubes

3.7.2

fitting made from sheet/plate or strip where welding is a part of the manufacturing process

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4 Symbols

For the purposes of this document, the symbols defined in EN 10266:2003 and the following apply:

DN, DN_1	Conventional dimension used in piping ; non measurable value (See EN ISO 6708) ;
D	Specified outside diameter for elbows, return ends, equal tees, caps and the major outside diameter for reducers and reducing tees, expressed in millimetres ;
D_1	Specified minor outside diameter for reducers and reducing tees, expressed in millimetres ;
T	Specified wall thickness at the welding ends for elbows, return bends, equal tees and bends or on the D end for reducers and reducing tees, expressed in millimetres ;
T_1	Specified wall thickness on the D_1 welding end of reducers and reducing tees, expressed in millimetres ;
ID	Internal diameter at the welding ends of elbows, return bends, equal tees and at the major welding end of reducers and reducing tees ($ID = D - 2T$) ;
ID_1	Internal diameter at the minor welding end of reducers and reducing tees ($ID_1 = D_1 - 2T_1$) ;
C	Centre to centre distance for return bends ($C \approx 2R$), expressed in millimetres ;
B	Back to face distance for return bends, expressed in millimetres ;
F	Distance from the axis of the branch outlet to the face of the centre body of tees, expressed in millimetres ;
G	Distance from the axis of the centre line to the face of the branch outlet of reducing tees, expressed in millimetres ;
k	Total height for caps, expressed in millimetres ;
L	Face to face distance for reducers, expressed in millimetres ;
X	Tolerance on the form of fittings ;
r	Inside knuckle radius of cap ;
R	Bending radius of elbows and return bends, expressed in millimetres ;
$R1$	Inside spherical radius of cap ;
P	Tolerance on the form of elbows ;
W	Distance from the extrados to the centre of a 90° elbow at the welding ends ;

- Z Distance from the extrados to the centre of a 45° elbow at the welding ends ;
- R_m Tensile strength at room temperature, expressed in megapascals ;
- $R_{p0,2}$ Minimum 0,2 % proof strength at room temperature, expressed in megapascals ;
- A Percentage of elongation at rupture, with reference to gauge length of $5,65 \sqrt{S_0}$.

5 Designations

5.1 Designation of steel grades

For fittings covered by this European Standard the designation shall consist of :

— number of this European Standard (EN 10253-2) ;

plus either :

— steel name in accordance with EN 10027-1 ;

or

— steel number allocated in accordance with EN 10027-2.

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5.2 Designation of fittings

Elbows and return bends are designated by the model (2D, 3D or 5D), the angle, the outside diameter D .

Reducers are designated by the model (concentric or eccentric), the major diameter D , the minor diameter D_1 .

Equal tees are designated by the outside diameter D .

Reducing tees are designated by the major diameter D , the minor diameter D_1 .

Caps are designated by the outside diameter D .

6 Information to be supplied by the purchaser

6.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

- a) quantity required (number of pieces) ;
- b) reference to this European Standard ;
- c) type of fitting, A or B ;
- d) designation of fittings (see 5.2) and the wall thickness $T(T_1)$;
- e) designation of the steel grade (see 5.1) ;

6.2 Options

A number of options are specified in this European Standard and these are listed below. In the event that the purchaser does not indicate a wish to implement any of these options at the time of enquiry and order, the fittings shall be supplied in accordance with the basic specification (see 6.1).

- 1) Steelmaking process (see 8.1) ;
- 2) method of manufacture of the fitting (see 8.2) ;
- 3) starting product form and /or delivery condition (see 8.2.1) ;
- 4) information about the product-making process (see 8.2.1) ;
- 5) type of heat treatment (see 8.2.3) ;
- 6) other grades as specified on the purchase order (see 9.2.1) ;
- 7) product analysis (see 9.2.2) ;
- 8) verification of the proof strength at elevated temperature (see 9.3) ;
- 9) tolerance to be applied to the outside diameter (see 11.2.1.1) ;
- 10) special ID tolerances for pigging (see 11.2.1.2) ;
- 11) plus tolerances on the body of the fitting (see 11.2.2) ;
- 12) end finishing (see 11.3) ;
- 13) inspection document 3.2 (see 12.2.1) ;
- 14) mechanical properties determined on the finished product (see 9.2) ;
- 15) hardness testing of each fitting (see Table 20) ;
- 16) impact testing for grades listed in footnote ^e of Table 20 (see Table 20) ;
- 17) registration records of the heat treatment temperatures (see 13.1.1) ;
- 18) size of the test unit per Table 21 (see 13.1.1) ;
- 19) size of the test unit per Table 22 (see 13.1.1) ;
- 20) special test unit size (see 13.1.1) ;
- 21) impact test of the heat affected zone (see 13.2.6) ;
- 22) NDT of welds after forming (see 14.9.2.1) ;
- 23) NDT of welds mandatory after forming (see 14.9.2.1) ;

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- 24) NDT of the starting material for the detection of laminar imperfections (see 14.9.4) ;
- 25) method of marking to be applied (see 15.2) ;
- 26) special provisions concerning marking (see 15.2) ;
- 27) protection to be applied (see Clause 16).

6.3 Examples of an order

6.3.1 Example 1

1 000 elbows in accordance with this European Standard, of type A (not having an increased wall thickness for the body of the fitting) and model 3D, with angle 90°, having an outside diameter 114, and a wall thickness 6,3, made of steel grade P265GH.

1000 elbows - EN 10253-2 - Type A – Model 3D - 90° - 114,3 X 6,3 - P265GH

6.3.2 Example 2

500 reducing tees in accordance with this European Standard of type B (having an increased wall thickness for the body of the fitting), with dimensions 114,3 X 6,3 - 88,9 X 4,0 and made of steel grade P265GH.

500 reducing tees - EN 10253-2 – Type B - 114, 3X6,3 - 88,9 X 4,0 - P265GH

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7 Resistance to internal pressure (standards.iteh.ai)

7.1 General

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The Pressure Equipment Directive (EU Directive 97/23/EC — Annex I — subclause 2.2.2) imposes that the design for adequate strength shall be based on a calculation method or, with restrictions, on an experimental method.

The resistance to internal pressure of a fitting conforming to this European Standard shall be determined according to the relevant design rules laid down in e.g. EN 13480-3.

The selection of the appropriate fitting (material, thickness) is the ultimate responsibility of the manufacturer of the pressure equipment (See Annex ZA for presumption of conformity of the material to the ESR's of Directive 97/23/EC).

For fittings of type A in carbon steel grades, when the manufacturer is able to guarantee that the minimum yield strength of the delivered products is higher than the specified minimum yield strength, the wall thickness may be reduced such as the product of the reduced thickness times the minimum product yield strength shall at least equal the product of the specified wall thickness times the specified minimum yield strength of the specified grade. For such products the mechanical properties shall be determined on the finished product and they shall be clearly identified on the inspection documents and by specific marking. See 12.2 for relevant documents, 12.3 for testing and Clause 15 for relevant information on marking.

7.2 Fittings of type A

Type A fitting have the same wall thickness at the welding ends and at the body of the fitting than a pipe having the same specified wall thickness. Their resistance to internal pressure is less than that of a pipe with the same specified diameter, wall thickness and of the same steel grade. The determination of the reducing pressure factor is given in Annex A and tables of pressure factors are given in Annex B.

For reducers the wall thickness at the conical section shall be the specified wall thickness at the major end.

7.3 Fittings of type B

Fittings of type B have increased wall thickness at the body of the fitting. They will, in general, withstand the same pressure than a pipe having the same specified diameter, wall thickness and the same steel grade.

Wall thickness requirements for this type of fittings are defined by the calculation procedures given in Annex A. For some preferred, specified wall thicknesses the resulting wall thicknesses at the body of the fitting are listed in the tables given in Annex C.

8 Manufacturing process

8.1 Steelmaking process

The steelmaking process is left at the discretion of the manufacturer and shall be reported. The steels shall be fully killed.

Option 1 : *The steelmaking process shall be as specified on the purchase order.*

8.2 Product making process for fittings and heat treatment

8.2.1 Product making process

The different allowed processes and the relevant starting product forms are listed in Table 1. Differing starting materials and production routes are associated with variations in the types of controls applied. The method of manufacturing is left at the discretion of the manufacturer. When choosing the method the manufacturer shall take suitable precautions to prevent the occurrence of ageing problems in the final product form.

Where tubes are used as starting material, the following conditions shall apply:

- unless otherwise specified, the choice of the tubes (seamless or welded) is left at the discretion of the manufacturer ;
- when manufacturing fittings from welded tubes, only tubes according to EN 10217, Parts 1 to 6 shall be used. Tubes marked "C1" and/or " C2" are not allowed ;
- helical SAW tubes are not permitted ;
- after forming, repair of the pipe weld seam is only permitted for weld seams made with filler metal. These repairs shall be carried out as described in 8.2.2.

Where plate/strip are used as starting material for welded fittings, the following condition shall apply :

- only plate / strip according to EN 10028-2 to -4 shall be used.

Where bars are used as starting material for welded or machined fittings, the following condition shall apply :

- only bars according to EN 10273 shall be used.