European foreword

This document (prEN 10253-4:2017) has been prepared by Technical Committee ECISS/TC 110 " Steel tubes, and iron and steel fittings", the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 10253-4:2008.

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 2014/68/EU.

For relationship with EU Directive(s), 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*.

Introduction

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 10253-3 describes fittings without formal reference to the pressure resistance, which are not intended to be used in applications, covered by the Pressure Equipment Directive (2014/68/EU) in classes I to IV.

EN 10253-4 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 2014/68/EU. 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.

For some fittings (elbows METRIC, pulled tees ISO/METRIC, branch welded tees ISO/METRIC, concentric and eccentric reducers straight ISO/METRIC and dished ends ISO/METRIC) there is no determination of pressure factors and wall-thickness available. It is assumed, that this fittings are of type A.

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.

1 Scope

This draft European Standard specifies the technical delivery requirements for seamless and welded butt-welding fittings (elbows, concentric and eccentric reducers, equal and reducing tees, caps) made of austenitic and austenitic-ferritic (duplex) stainless steel in two test-categories 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:

a) type of fittings;

   1) type A: butt-welding fittings with reduced pressure factor;

   2) type B: butt-welding fittings for use at full service pressure;

b) steel grades and their chemical compositions;

c) mechanical properties;

d) dimensions and tolerances;

e) requirements for inspection and testing;

f) inspection documents;

g) marking;

h) protection and packaging.

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 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 10020:2000, *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 10028-7, *Flat products made of steels for pressure purposes — Part 7: Stainless steels*

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

EN 10160, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

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

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

EN 10216-5, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 5: Stainless steel tubes*

EN 10217-7, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 7: Stainless steel tubes*

EN 10222-5, *Steel forgings for pressure purposes — Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels*

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

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

EN 10272, *Stainless steel bars for pressure purposes*

EN 13480-3:2012, *Metallic industrial piping — Part 3: Design and calculation*

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

EN ISO 377:2013, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377:2013, Corrected version 2015-06-01)*

EN ISO 1127, *Stainless steel tubes — Dimensions, tolerances and conventional masses per unit length (ISO 1127)*

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

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

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 4136, *Destructive tests on welds in metallic materials — Transverse tensile test (ISO 4136)*

EN ISO 5173, *Destructive tests on welds in metallic materials — Bend tests (ISO 5173)*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817)*

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

EN ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO 6892-2)*

EN ISO 8493, *Metallic materials — Tube — Drift-expanding test (ISO 8493:1998)*

EN ISO 8495, *Metallic materials —Tube — Ring-expanding test (ISO 8495:2013)*

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

EN ISO 10893-2, *Non-destructive testing of steel tubes — Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections (ISO 10893-2)*

EN ISO 10893-4, *Non-destructive testing of steel tubes — Part 4: Liquid penetrant inspection of seamless and welded steel tubes for the detection of surface imperfections (ISO 10893-4)*

EN ISO 10893-6, *Non-destructive testing of steel tubes — Part 6: Radiographic testing of the weld seam of welded steel tubes for the detection of imperfections (ISO 10893-6)*

EN ISO 10893-7, *Non-destructive testing of steel tubes — Part 7: Digital radiographic testing of the weld seam of welded steel tubes for the detection of imperfections (ISO 10893-7)*

EN ISO 10893-8, *Non-destructive testing of steel tubes — Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections (ISO 10893-8)*

EN ISO 10893-10, *Non-destructive testing of steel tubes — Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections (ISO 10893-10)*

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

EN ISO 14732, *Welding personnel — Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732)*

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 10020:2000, EN 10021:2006, EN 10052:1993 and EN ISO 377:2013 and the following apply.

3.1
employer
organisation for which a person works on a regular basis

Note 1 to entry: The employer may be either the fitting manufacturer or supplier or a third party organisation providing a service, e.g. NDT.

3.2
model
3.2.1
for elbows and return bends, the model defines the bending radius of the piece
3.2.2
for reducers, the model defines concentric or eccentric shape of the piece
3.3
purchaser
person or organisation that orders products in accordance with this European Standard

Note 1 to entry: 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 to entry: 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.

3.4
weld during manufacture
weld made for obtaining a fitting

Note 1 to entry: This term does not include the tube welds when a tube is used as starting material.

3.5
seamless fitting
fitting manufactured without welding from starting material which is not welded

3.6
welded fitting
3.6.1
fitting made from welded tubes
3.6.2
fitting made from sheet/plate or strip where welding is a part of the manufacturing process
3.7
test category
classification that indicates their extent and level of inspection and testing

4 Symbols and abbreviations

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

A	Percentage of elongation after rupture, with reference to gauge length of 5,65 $\sqrt{S_o}$
B	Back to face distance for return bends, expressed in millimetres
C	Centre to centre distance for return bends ($C = 2R$), expressed in millimetres
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
D_{max}	Bigger diameter in one section, expressed in millimetres
D_{min}	Smaller diameter in the same section, 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
h	Distance from the face of the branch outlet to the body of the pulled tee, expressed in millimetres
ID	Inside 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	Inside diameter at the minor welding end of reducers and reducing tees ($ID_1 = D_1 - 2T_1$)
K	Total height for caps, expressed in millimetres
L	Face to face distance for reducers, expressed in millimetres
P	Tolerance on the form of elbows
R	Bending radius of elbows and return bends, expressed in millimetres
R_1	Inside spherical radius of cap
R_2	Inside knuckle radius of cap
R_m	Tensile strength, expressed in megapascals
$R_{p1,0}$	Minimum 1,0 % proof strength, expressed in megapascals
$R_{p0,2}$	Minimum 0,2 % proof strength, expressed in megapascals
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
TC	Test category
W	Distance from the extrados to the centre of a 90° elbow at the welding ends
X	Tolerance on the form of fittings
Z	Distance from the extrados to the centre of a 45° elbow at the welding ends

5 Classification of grades and designation

5.1 Classification of grades

In accordance with the classification system in EN 10088-1, the steel grades covered in this European Standard are classified according to their structure into:

— austenitic steels;

— austenitic–ferritic (duplex) steels.

For more details see EN 10088-1.

5.2 Designation of steel grades

For fittings covered by this European Standard the steel designation consists of:

— number of this European Standard (EN 10253-4);

plus either:

— steel name in accordance with EN 10027-1;

or

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

5.3 Designation of fittings

5.3.1 General

Fittings are designated by their name and the following parameters.

5.3.2 Elbows and return bends

Elbows and return bends are designated by the following parameters:

a) model (2D, 3D or 5D);

b) type (type A or type B);

c) angle;

d) outside diameter (D);

e) wall-thickness (T).

5.3.3 Reducers

Reducers are designated by the following parameters:

a) model (concentric (con) or eccentric (ecc));

b) type (type A or type B);

c) major diameter (D) and wall-thickness (T);

d) minor diameter (D_1) and wall-thickness (T_1).

For straight reducers the embodiment shall be noticed in addition.

5.3.4 Tees

Equal tees are designated by the following parameters:

a) type (type A or type B);

b) outside diameter (D);

c) wall-thickness (T).

Reducing tees are designated by the following parameters:

a) type (type A or type B);

b) major diameter (D) and wall-thickness (T);

c) minor diameter (D_1) and wall-thickness (T_1).

For pulled tees and branch welded tees the embodiment shall be noticed in addition.

5.3.5 Caps and dished ends

Caps and dished ends are designated by the following parameters:

a) Type (type A or type B);

b) Outside diameter (*D*);

c) Wall-thickness (*T*).

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) designation of fittings (see 5.3);

d) designation of the steel grade (see 5.2);

e) test category 1 or 2 (TC1/TC2) (see 12.3).

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) Method of manufacture of the fitting (see 8.2.1);

2) Starting product form and/or delivery condition (see 8.2.1);

3) Method of manufacture (see 8.2.1);

4) Starting materials when manufacturing seamless fittings (see 8.2.1);

5) Deviations from applicable evaluation (see 8.2.2.2);

6) heat treatment to be applied (see 8.2.3.1);

7) Other steel grades in accordance to harmonized material standards (see 9.2.1);

8) Product analysis (see 9.2.2);

9) Verification of impact properties at room temperature (see 9.3.1);

10) Agreed mechanical properties for wall thicknesses (see 9.3.1);

11) Verification of tensile properties at elevated temperature (see 9.3.2);

12) Verification of impact properties at low temperature (see 9.3.3);

13) Intergranular corrosion test (see 9.6);

14) Pickling (see 10.2);

15) Shot blasting, brushing or bright annealing (see 10.2);

16) Pickling and passivation (see 10.2);

17) Tolerance on diameter to inside (see 11.2.1.1);

18) Special tolerances (see 11.2.1.2);

19) Plus tolerances on the body of the fitting (see 11.2.3);

20) Special ends preparation (see 11.3);

21) Type of inspection document other than the standard document (see 12.2.1);

22) Product analysis (see 12.3 Table 10);

23) Tensile test at elevated temperature (see 12.3 Table 10);

24) Tensile test transverse to the weld at room temperature (see 12.3 Table 10);

25) Impact test at room temperature (see 12.3 Table 10);

26) Impact test at low temperature (see 12.3 Table 10);

27) Intergranular corrosion test (see 12.3 Table 10);

28) Bend test transverse to the weld (see 12.3 Table 10);

29) Impact test of the heat affected zone (see 12.3 Table 10);

30) Liquid penetrant testing of weld and weld ends (see 12.3 Table 10);

31) Liquid penetrant testing of surfaces (see 12.3 Table 10);

32) NDT for the detection of laminar imperfections (see 12.3 and 14.9.4);

33) NDT of bars and forgings (see 12.3 Table 10);

34) Positive material identification (PMI) (see 12.3 Table 10);

35) Registration records of the temperatures (see 13.1.1);

36) Test unit size – Table 13 (see 13.1.1);

37) Test unit size – purchase order (see 13.1.1);

38) Verification of impact properties transverse to the weld (see 13.2.6);

39) Additional marking (see Clause 15);

40) Special packaging (see Clause 16).