

Butt-welding pipe fittings - Part 3: Wrought austenitic and austenitic-ferritic (duplex) stainless steels without specific inspection requirements

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Butt-welding pipe fittings - Part 3: Wrought austenitic and austenitic-ferritic (duplex) stainless steels without specific inspection requirements

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Formstücke zum Einschweißen - Teil 3: Nichtrostende austenitische und austenitisch-ferritische (Duplex-) Stähle ohne besondere Prüfanforderungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ECISS/TC 29.

If this draft becomes a European Standard, 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.

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Foreword

This document (prEN 10253-3:2004) has been prepared by Technical Committee ECISS/TC 29 "Steel tubes and fittings for steel tubes", the secretariat of which is held by UNI.

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 EU Directive(s).

Other parts of EN 10253 are published or are in course of preparation, namely :

- Part 1 : *Butt-welding pipe fittings — Part 1 : Wrought carbon steel for general use and without specific inspection requirements.*
- Part 2 : *Butt-welding pipe fittings — Part 2 : Wrought carbon and ferritic alloy steels with specific inspection requirements.*
- Part 4 : *Butt-welding pipe fittings — 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 for stainless steels, and decided to reflect these in the standard by differentiating between two parts.

Firstly the committee recognized the need to provide a basic type in which the minimum wall thickness of the fitting is guaranteed without formal reference to the pressure resistance. This type is considered in Part 3 and includes products that may be used in applications according to Article 3 Paragraph 3 of the Pressure Equipment Directive (97/23/EC).

Secondly the application standards for the Pressure Equipment Directive category I-IV will require that the fitting is designed to withstand a defined resistance to internal pressure. This approach imposes enhanced requirements that are considered in Part 4.

Annex A gives information about specific dimensions of fittings and Annex B indicates preferred inside diameters and wall thicknesses.

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

1.1 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 austenitic and austenitic – ferritic (duplex) stainless steel without specific inspection requirements.

It specifies :

- the steel grades ;
- the mechanical properties ;
- the dimensions and tolerances ;
- the requirements for inspection and testing ;
- the inspection documents ;
- the marking ;
- the handling and packaging.

1.2 Unless otherwise specified in this part of EN 10253 the general technical delivery requirements in EN 10021 shall apply.

1.3 Limitation of use

The allowed pressures and temperatures are the responsibility of the customer according to the state of the art and in application of the safety coefficients in the application regulations, codes and standards.

In common, joint coefficient are used in the calculation of the thicknesses of components which include one or several butt welds, other than circumferential :

- for equipment subject to random non-destructive testing : 0,85 ;
- for equipment not subject to non-destructive testing other than visual inspection : 0,7.

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 288-3, *Specification and approval of welding procedures for metallic materials — Part 3 : Welding procedure tests for the arc welding of steels.*

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

EN 1418, *Welding personal — 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, *Definition and classification of grades of steel.*
- EN 10021, *General technical delivery requirements for steel and iron products.*
- EN 10027-1, *Designation systems for steel — Part 1 : Steel names, principal symbols.*
- EN 10027-2, *Designation systems for steel — Part 2 : Numerical system.*
- EN 10028-7, *Flat products made of steels for pressure purposes — Part 7 : Stainless steels.*
- EN 10052, *Vocabulary of heat treatment terms for ferrous products.*
- EN 10079, *Definition of steel products.*
- EN 10088-1, *Stainless steels — Part 1 : List of stainless steel.*
- EN 10088-2, *Stainless steels — Part 2 : Technical delivery conditions for sheet/plate and strip for general purposes.*
- EN 10088-3, *Stainless steels — Part 3 : Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes.*
- 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 10234, *Metallic materials — Tubes — Drift expanding test.*
- EN 10236, *Metallic materials — Tubes — Ring expanding test.*
- EN 10266, *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 10296-2, *Welded circular steel tubes for mechanical and general engineering purposes — Technical delivery conditions — Part 2 : Stainless steel tubes.*
- EN 10297-2, *Seamless steel tubes for mechanical and general engineering purposes — Technical delivery conditions — Part 2 : Stainless steel tubes.*
- EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997).*
- EN ISO 1127, *Stainless steel tubes — Dimensions, tolerances and conventional masses per unit length.*
- EN ISO 2566-2, *Steel — Conversion of elongation values — Part 2 : Austenitic stainless steels (ISO 2566-2:1984).*

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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 3651-2:1998).*

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

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000).*

ISO 3419, *Non-alloy and alloy steel butt-welding fittings.*

ISO 5251, *Stainless steel butt-welding fittings.*

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

CR 10260, *Designation systems for steels — Additional symbols.*

3 Terms and definitions

3.1

general

for the purpose of this part of EN 10253, the relevant definitions in EN 10020, EN 10021, EN 10052, EN 10079 and EN ISO 377 apply, except as defined below :

3.2

type

for elbows and return bends the type defines the bending radius of the piece

3.3

welded fitting

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3.3.1

fittings made from welded tubes

3.3.2

fittings made from plate/sheet or strip where welding is a part of the fabrication

3.4

purchaser

the person or organisation that orders products in accordance with this standard

3.5

employer

the organisation for which a person works on a regular basis. The employer may be either the fitting manufacturer or supplier or a third party organisation providing a service, e.g. NDT

3.6

symbols

for the purpose of this part of EN 10253, the symbols of EN 10266 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 and equal tees 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 ($C = 2R$), 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
h	Height of the straight part of dished ends, expressed in millimetres
H	Face to centre distance for 45° elbows, expressed in millimetres
K ₂	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	Bending radius of elbows and return bends, expressed in millimetres
R _m	Tensile strength at room temperature, expressed in MPa
R _{p0,2}	Minimum 0,2 % proof strength at room temperature, expressed in MPa
R _{p1,0}	Minimum 1,0 % proof strength at room temperature, expressed in MPa
A	Percentage of elongation at rupture, with reference to gauge length of $5,65 \sqrt{S_0}$
HB	Brinell hardness
W0	Welded from hot or cold rolled plate, sheet or strip 1D, 2D, 2E, 2B (Symbols of flat products according to EN 10088-2)
W1	Welded from hot rolled plate, sheet or strip 1D, descaled
W2	Welded from cold rolled plate, sheet or strip 2D, 2E, 2B, descaled

4 Classification of grades and designation

4.1 Classification of grades

Steels covered in this part of EN 10253 are classified according to their structure into :

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- austenitic steels ;
- austenitic – ferritic(duplex) steels.

For more details see EN 10088-1.

4.2 Designation

For the fittings covered by this part of EN 10253 the designation shall consist of :

- the number of this European Standard (EN 10253-3) ;
- plus either :
- the steel name in accordance with EN 10027-1 and CR 10260 ;
- or :
- the steel number allocated in accordance with EN 10027-2.

5 Information to be supplied by the purchaser

5.1 Mandatory information

5.1.1 Designation of fittings

5.1.1.1 Elbows and return bends

Elbows and return bends are designated by the type (1D, 1,5D, 2,5D, D+100 and so on), the angle and the outside diameter D.

5.1.1.2 Reducers

The reducers are designated by the type (concentric or eccentric), the major diameter D and the minor diameter D_1 .

5.1.1.3 Tees

The equal tees are designated by the outside diameter D.

The reducing tees are designated by the major diameter D and the minor diameter D_1 .

5.1.1.4 Caps

The caps are designated by the outside diameter D.

5.1.2 Information

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

- a) the quantity required (number of pieces) ;
- b) designation of fittings (see 5.1.1) and the wall thickness T (T_1) ;

- c) the designation of the steel grade according to this part of EN 10253 ;
- d) reference to this part of EN 10253.

5.2 Options

A number of options are specified in this part of EN 10253 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 5.1).

- 1) steelmaking process (see 6.1) ;
- 2) heat treatment of the fittings (see 6.2.3.1) ;
- 3) additional testing of the fittings shall be agreed at the time of enquiry and order (7.3.1) ;
- 4) agreed mechanical properties for wall thicknesses greater than 60 mm apply (see Table 4) ;
- 5) intergranular corrosion test (see 7.4) ;
- 6) pickling (see 7.5.1.9) ;
- 7) shot blasting or bright annealing (see 7.5.1.9) ;
- 8) pickling and passivation (see 7.5.1.9) ;
- 9) non-destructive testing of the weld area (see 7.5.2) ;
- 10) specific dimensions of fittings according to Annex A (see 10.1.2) ;
- 11) fittings are ordered with tolerance class D3 or D4 (see Table 6) ;
- 12) end bevelling shall be agreed at the time of enquiry and order (see 7.6.4) ;
- 13) type of inspection document other than the standard document (see 8.1.1) ;
- 14) the test unit size shall be as specified on the purchase order (see Table 9) ;
- 15) weld bend test (welded fittings) (see Table 10) ;
- 16) tensile test on the weld at room temperature (see Table 10) ;
- 17) liquid penetrant examination of welds and weld ends (see 10.8.2) ;
- 18) liquid penetrant examination of surfaces, extent shall be specified at the time if the enquiry (see 10.8.2) ;
- 19) additional marking (see 11.1) ;
- 20) special packaging, coating or end plugs as agreed at the time of enquiry or order shall be applied (see 12).

5.3 Examples of an order

5.3.1 Example 1

1 000 elbows in accordance with this European Standard of type 3D with angle 90° and dimensions 60,3 × 2,9 made of steel grade 1.443 6 and with a joint coefficient 0.7.

1 000 elbows – EN 10253-3 – type 3D – 90° – 60,3 × 2,9 – 1.443 6

5.3.2 Example 2

1 000 elbows in accordance with this European Standard of type 3D with angle 90° and dimensions 60,3 × 2,9 made of steel grade 1.443 6 and with random NDT of the seam weld (joint coefficient 0.85)

1 000 elbows – EN 10253-3 – type 3D – 90° – 60,3 × 2,9 – 1.4436 – Option 13

5.3.3 Example 3

2 000 concentric reducers in accordance with this European Standard with dimensions 219,1 × 6,3 – 139,7 × 4,0 with a length according to Annex A made of steel grade X2CrNi19-11 and with a joint coefficient 0.7.

2 000 concentric reducers – EN 10253-3 – 219,1 × 6,3 – 139,7 × 4,0 – X2CrNi19-11

5.3.4 Example 4

3 000 equal tees in accordance with this European Standard with dimension ID 40.0 × 2.0 made of steel grade 1.430 1 and with a joint coefficient 0.85.

3 000 equal tees – EN 10253-3 – ID 40.0 × 2.0 – 1.430 1 – Option 13

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6 Manufacturing process

6.1 Steelmaking process

The steelmaking process is left at the discretion of the manufacturer.

The manufacturer shall operate a quality management system according to or equivalent to EN ISO 9001.

Option 1 : *The purchaser shall be informed about the steelmaking process used. The process shall be reported in the inspection document.*

6.2 Product making process for fittings and heat treatment

6.2.1 Product making process

The method of manufacturing is left at the discretion of the manufacturer.

The manufacturer shall operate a quality management system according to or equivalent to EN ISO 9001.

The product making process shall be so applied that it will not produce injurious imperfections in the fittings.

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

- the choice of the tubes (seamless or welded) is left at the discretion of the manufacturer ;
- material according to EN 10216-5 or EN 10297-2 (seamless) and EN 10217-7 or EN 10296-2 (welded) shall be used.

Material according to EN 10028-7 or EN 10088-2 shall be used if plate/sheet or strip is used as starting material.

Material according to EN 10272 or EN 10088-3 shall be used if bars are used as starting material.

6.2.2 Welding

When producing fittings from plate or strip, welding is considered being a part of the manufacturing of fittings, the following criteria's is valid :

- welding process/procedures shall be qualified in accordance with EN 288-3 ;
- welders and/or welding operators shall be qualified in accordance with EN 287-1 and/or EN 1418.

All welds carried out during the manufacture of the fitting shall be fusion weld type. All welds shall have complete penetration.

Local repair of weld seam which have been made with filler metal is permitted provided that the repair procedure/welders are qualified in accordance with the relevant part the above mentioned standards.

If heat treatment is required, the repair welding shall be carried out in advance.

6.2.2.1 Finished joint requirement oSIST prEN 10253-3:2004

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As welded surfaces are permitted provided the surface imperfections permit proper interpretation of radiographic or other non destructive examination.

A reduction in thickness due to the welding process is acceptable provided that the material of the joining surfaces shall not be reduced below minimum required thickness at any point.

Concavity due to the welding process on the root side of a single welded joint is permitted when the resulting thickness of the weld is at least equal to the minimum thickness of the thinner part of the parts being joined and the contour of the concavity is smooth.

The height of the reinforcement on each face of the weld shall not exceed the values specified in Table 1.

Table 1 — Height of reinforcement

Base metal thickness (T)	Reinforcement
$T < 2,5$ mm	1,0 mm
$2,5 \leq T \leq 5,0$ mm	1,5 mm
$5,0 < T \leq 10,0$ mm	2,0 mm
$10,0 < T \leq 25,0$ mm	2,5 mm
$25,0 < T \leq 50,0$ mm	3,5 mm