BRITISH STANDARD

BS EN
10311:2005

Joints for the connection of steel tubes and fittings for the conveyance of water and other aqueous liquids

The European Standard EN 10311:2005 has the status of a British Standard

ICS 23.040.60

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 10311:2005. It partially supersedes BS 534:1990 and supplements EN 10224:2004.

The UK participation in its preparation was entrusted to Technical Committee ISE/8, Steel pipes, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10311

May 2005

ICS 23.040.60

English version

Joints for the connection of steel tubes and fittings for the conveyance of water and other aqueous liquids

Assemblages pour le raccordement de tubes en acier et raccords pour le transport d'eau at d'autres liquides aqueux

Verbindungen für Stahlrohre und Fittings für den Transport von Wasser und anderen wässrigen Flüssigkeiten

This European Standard was approved by CEN on 25 March 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, 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 10311:2005: E

Contents

Foreword

This document (EN 10311:2005) 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 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 November 2005, and conflicting national standards shall be withdrawn at the latest by February 2007.

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 89/106/EEC.

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

Compliance of a product with this document does not confer a presumption of fitness of the product for the transport of water intended for human consumption within the meaning of the Directive 89/106/EEC. However, until the operation of the envisaged European Acceptance Scheme for construction products in contact with water intended for human consumption and the revision of the present document, products complying with this document may be used for the transport of water intended for human consumption if they comply with the relevant national, regional or local regulatory provisions applicable in the place of use.

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

Introduction

This European Standard applies to joints for use with non-alloy steel tubular products for use with all types of aqueous liquids.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by this European Standard:

a) This European Standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

Standards EN 1123-1 'Pipes and fittings of longitudinally welded hot-dip galvanized steel pipes with spigot and socket for waste water systems — Part 1: Requirements, testing, quality control' and EN 1123-2 'Pipes and fittings of longitudinally welded hot-dip galvanized steel pipes with spigot and socket for waste water system — Part 2: Dimensions' are also available for waste water systems which require galvanized tubes.

1 Scope

This European Standard specifies a range of jointing methods for connecting low alloy steel tubes and steel tubes and fittings for use with aqueous liquids.

The following specific joint types are covered by this document: butt welded joints, welded spigot and socket (or sleeve joints), welding collars, flange joints, threaded joints, spigot and socket joints with seal and mechanical couplings.

This European Standard specifies requirements for the strength and integrity of the joints and the testing of the joints.

This European Standard does not specify the requirements for the tubes or the fittings.

This European Standard is suitable for joints intended for the conveyance of water for human consumption, after an appropriate coating has been applied.

This European Standard is not intended for use in heating networks where elevated temperature properties are required.

Flexible joints which permit significant angular deflection, both during and after installation and which can accept slight offset of the centre line, are not covered by this European Standard.

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 681-1, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 1011-2, Welding — *Recommendations for welding of metallic materials — Part 2: Arc welding of ferritic steels*

EN 1092-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1591-1, *Flanges and their joints — Design rules for gasketed circular flange connections — Part 1: Calculation method*

EN 1759-1, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, Class designated — Part 1: Steel flanges, NPS $^1/_2$ to 24*

EN 10224, *Non-alloy steel tubes and fittings for the conveyance of aqueous liquids including water for human consumption - Technical delivery conditions*

EN 10226-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation*

prEN 10226-2*, Pipe threads where pressure tight joints are made on the threads — Part 2: Taper external threads and taper internal threads - Dimensions, tolerances and designation*

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

EN 13479*, Welding consumables – General product standard for filler metals and fluxes for fusion welding of metallic materials*

EN 13501-1, *Fire classification of construction products and building elements. Part 1: Classification using test data from reaction to fire tests.*

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

EN ISO 15607, *Specification and qualificationl of welding procedures for metallic materials - General rules (ISO 15607:2003)*

3 Terms, definitions and symbols

For the purposes of this European Standard, the symbols given in EN 10266:2003 apply together with the following terms and definitions.

3.1
allowable maximum operating pressure (p)
maximum pressure occurring from time to time, including surge, that a component is capable of withstanding in service
[EN 805:2000]

3.2
collar
short length of tube which is placed over the end of a tube or fitting and welded to it, to form a socket to receive the end of another tube or fitting

3.3
coupling
mechanical joint for connecting identical or different pipe diameters and/or identical or different materials

3.4
fitting
component, other than a pipe, which allows pipeline deviation, change of direction or bore of a tube. In addition, flanged-socket pieces, flanged-spigot pieces, collars and couplings are defined as fittings

3.5
joint
connection between the ends of two components including the means of sealing
[EN 805:2000]

3.6
adjustable joint
joint which permits significant angular deflection at the time of installation but not thereafter
[EN 805:2000]

3.7
rigid joint
joint that does not permit significant angular deflection, either during or after installation
[EN 805:2000]

3.8
nominal size (DN)
see EN ISO 6708

4 Types of joint

4.1 Butt welded joints

Butt-welded joints shall be made between tubes or tubes and fittings with their ends prepared in accordance with EN 10224. The maximum gap between the ends of the tubes or the tubes and fittings when set up for welding shall be in accordance with EN 1011-2.

4.2 Welded spigot and socket (sleeve) joints

4.2.1 General

Welded spigot and socket (sleeve) joints for welding shall comply with 4.2.2 or 4.2.3.

The general form of the joints given in Figure 1 may differ in detail from one manufacturer to another, however the principal dimensions shown shall be measured, using appropriate equipment, and values shall be as stated, subject to the manufacturers stipulated tolerances.

NOTE The dimensions of sleeve joints apply when they are shaped or made on tubes and/or fittings.

On tubes and fittings of outside diameter smaller than 711 mm, the joint may be welded on the outside only. On tubes or fittings with outside diameter 711 mm and larger, welding may be either inside, or outside, or both inside and outside. Such joints have been designed to allow the same forces to be transmitted as if the welds were fillet welds of a size appropriate to the thickness of the materials being joined.

4.2.2 Spigot and socket (sleeve) joints (type 1)

For type 1 joints (see Figure 1) the tubes or fittings shall be supplied with spigot end parallel and sleeve end either parallel or with the diameter tapered by approximately 0,8 mm on diameter per 25 mm length of sleeve.

These latter joints are designed for taper sleeves, so that the depth of penetration of the spigot into the sleeve anywhere around the circumference shall be not less than 30 mm but shall also be sufficient, if applicable, to accommodate any holes made in the sleeve to permit testing of the joint. When used to accommodate small changes in pipeline direction, the spigot shall additionally penetrate the sleeve around the whole circumference to an average depth of not less than 40 mm.

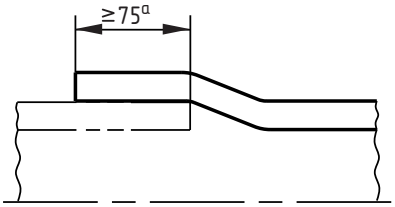
NOTE 1 At maximum penetration, the spigot can locate in the undimensioned transition area between the sleeve and the tube body. Care should be taken in expanding the tube end to prevent excessive weld gaps between the spigot and sleeve.

The manufacturer or supplier shall obtain from the purchaser at the time of enquiry and order specific details of the end preparation necessary for tubes and fittings for use with these types of joint.

NOTE 2 Assembly of sleeve joints on site in preparation for welding may require mechanical alignment aids e.g. props, jacks or wedges.

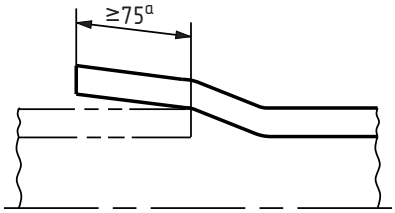
4.2.3 Spigot and socket (sleeve) joints (type 2)

For type 2 joints (see Figure 1) the tubes or fittings shall be supplied with the spigot end and the sleeve end parallel. The collar forming the sleeve shall be fabricated with not more than one longitudinal weld and shall be welded externally and internally to the sleeve tube. To ensure an adequate space between the spigot end and the internal collar weld to effect the inside joint weld, if required, the minimum sleeve length shall be $(150 + 2T)$ mm for $D > 168{,}3$ mm and $(100 + 2T)$ mm for $D \leq 168{,}3$ mm, where T is the wall thickness of the sleeve.



a)

Type 1
(parallel sleeve)

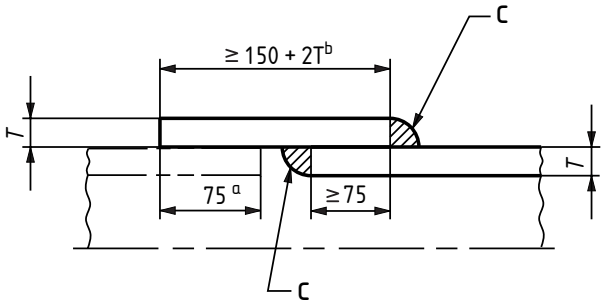


b)

Type 1 (taper sleeve: taper approx. 0,8 mm on diameter

for each 25 mm on length of socket)

NOTE All dimensions are in millimetres.



c)

Type 2 (collar sleeve)

NOTE All dimensions are in millimetres.

Key

a For outside diameters ≤ 168,3 mm, the length indicated shall be ≤ 50 mm
b For outside diameters ≤ 168,3 mm, the length indicated shall be 100 + 2*T* min
c Workshop fabrication weld

Figure 1 — Welded spigot and socket joints (these figures are idealised and do not take account of tolerances or site assembly conditions)

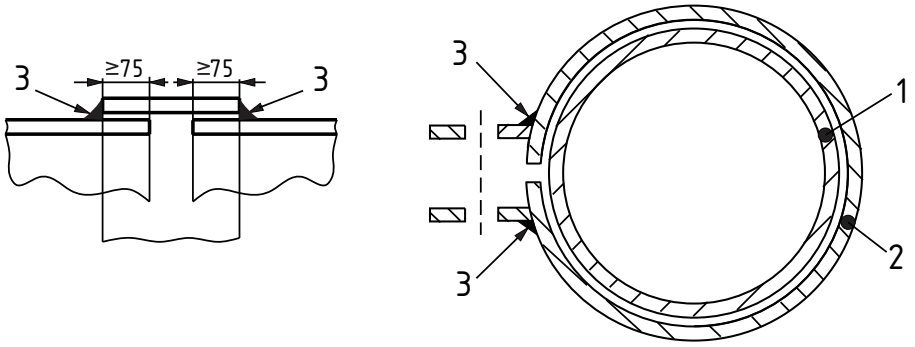
4.3 Welded collars

An example of a welding collar is shown in Figure 2. Welding collars shall be at least equal in thickness to the adjoining components; the length of sleeve shall be not less than 250 mm.

When positioned for welding the collar shall be a good fit on the outside diameter of the components to be joined. To ensure good welding conditions the gap between the collar and the tube shall be not greater than 3 mm.

Welds employed shall be fillet welds of a size appropriate to the thickness of materials being joined and the forces to be transmitted, taking into account the guidelines in EN 1011-2.

NOTE Dimensions are in millimetres.



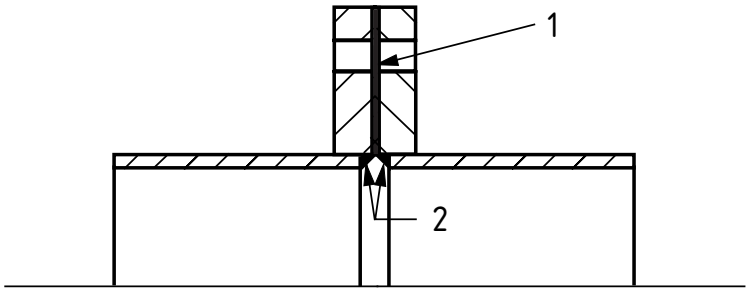
Key
1. Pipe
2. Collar
3. Weld

Figure 2 — Welding collar

4.4 Flange joints

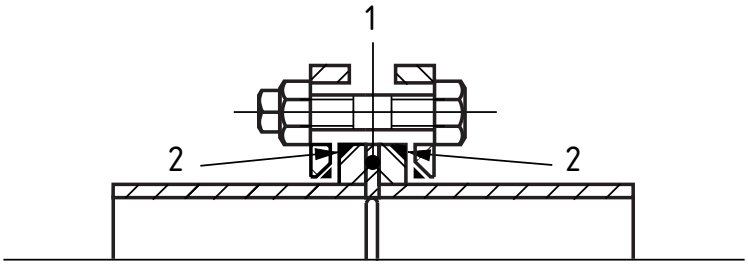
Flange joints shall have flanges in accordance with EN 1092-1 or EN 1759-1, as appropriate to the design conditions (see Figure 3).

The flange manufacturer or supplier shall obtain information at the time of enquiry and order specifying the type of flanges required.



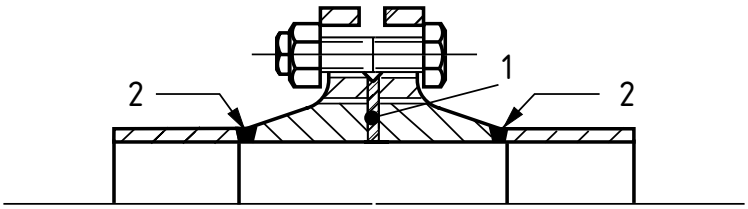
a)

Plate flange



b)

Loose flange



c)

Welded neck flange

Key
1 Seal
2 Weld

Figure 3 — Flange joints

4.5 Threaded joints

The threads of threaded joints shall be in accordance with EN 10226-1 or prEN 10226-2.

The manufacturer or supplier of the threaded joints shall obtain information at the time of enquiry and order confirming the appropriate part of EN 10226 required.

NOTE 1 Threaded joints are normally made between tubes in accordance with EN 10255 and fittings in accordance with EN 10241 (steel) and/or EN 10242 (malleable cast iron).

NOTE 2 An appropriate sealing material should be applied to the threads before making the joint.

4.6 Spigot and socket joints with seal

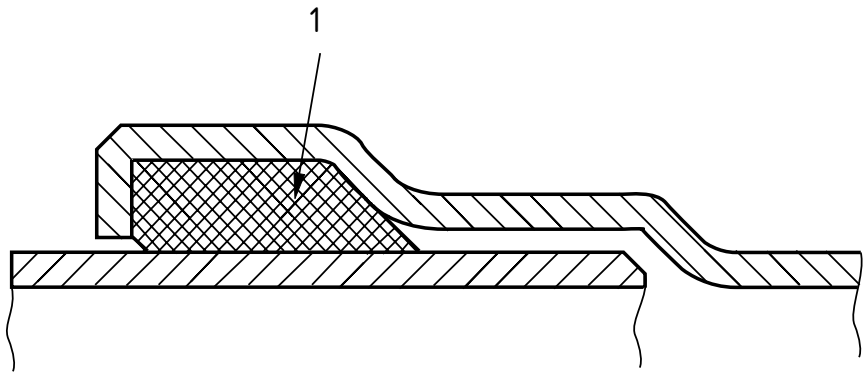
A general form of a spigot and socket joint with seal is given in Figure 4. As these types of joint can differ in detail from one manufacturer to another, the manufacturer shall define the principal dimensions at the time of enquiry and order. These dimensions shall be measured, using appropriate equipment, and values shall be as stated, subject to the manufacturers stipulated tolerances.

NOTE 1 The spigot and socket joint with seal shown in Figure 4 is a general form. Details of other versions can be found in international and national publications.

NOTE 2 The connection is produced by inserting the spigot end into the socket end that contains a rubber seal. By inserting the spigot end into the socket, the rubber seal is deformed in an axial direction and seals the connection by the resilience present in the rubber seal.

NOTE 3 The insertion depth of the spigot into the socket is critical to ensure good sealing. Joint details can differ from one manufacturer to another and the insertion depth is normally specific to the particular make of joint used.

NOTE 4 To absorb axial forces in the connection, special rubber rings can be required.



Key
1 Seal

Figure 4 — Spigot and socket joints with seal (general form)

4.7 Seals

Where joints utilise elastomeric seals (seals) these shall be in accordance with EN 681-1.

4.8 Couplings (slip-on type couplings)

4.8.1 Sleeve couplings

A general form of sleeve coupling for use with plain end tube or fittings is given in Figure 5. As the lengths S and L can vary from one manufacturer to another, the manufacturer shall define these principal dimensions at the time of enquiry and order. These dimensions shall be measured, using appropriate equipment, and values shall be as states, subject to the manufacturer's stipulated tolerances.

NOTE 1 The sleeve length and tolerance at the end of the tube or fitting is specific to the particular make of coupling used.

NOTE 2 This type of coupling can be used for the connection of different diameters and/or different materials.

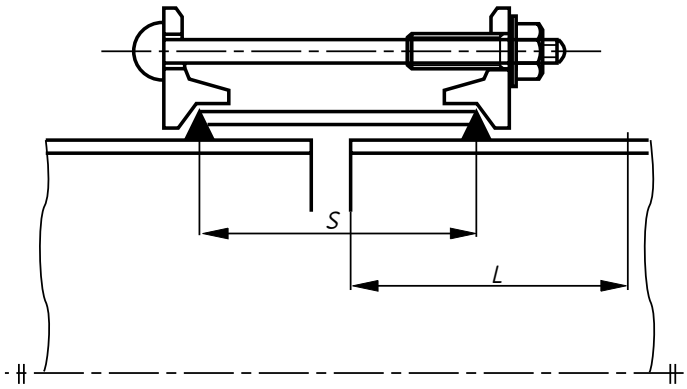


Figure 5 — Slip-on type couplings (general form)

4.8.2 Grooved and shoulder couplings

A general form of a mechanical coupling for the axial alignment of tubes, or tubes and fittings, is given in Figure 6. Each groove and coupling shall have a designated allowable operating pressure. As these types of joint can differ in detail from one manufacturer to another, the manufacturer shall define the principal dimensions at the time of enquiry and order. These dimensions shall be measured, using appropriate equipment, and values shall be as stated, subject to the manufacturers stipulated tolerances.

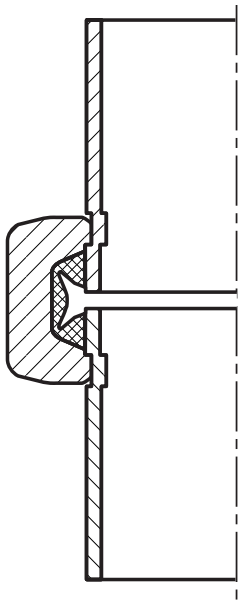


Figure 6 — Grooved and shouldered couplings (general form)

5 Classification

5.1 General

Joints shall be classified as non-restrained (see 5.2) or restrained (see 5.3) and either rigid (see 5.4) or adjustable, (see 5.5).

5.2 Non-restrained joints

Non-restrained joints shall have adequate axial withdrawal to accommodate any axial spigot movement induced by temperature fluctuations and the Poisson contraction of the tube or tube and fitting under internal pressure in addition to the specified angular deflection.

NOTE Spigot and socket joints with seal and some mechanical joints e.g. slip-on couplings are non-restrained joints.

5.3 Restrained joints

Restrained joints shall withstand the end-thrust due to internal pressure and, where applicable, due to temperature fluctuation and the Poisson contraction of the tube or tube and fitting under internal pressure.

NOTE Butt-welded joints, welded spigot and socket (or sleeve) joints, welding collars, flanged joints, threaded joints and some mechanical couplings are restrained joints.

5.4 Rigid joints

Rigid joints shall maintain the axial alignment of tubes or tubes and fittings to within 2°.

NOTE Butt-welded joints, spigot and socket (or sleeve) joints (after welding), welding collars, flanged joints, threaded joints and some mechanical couplings are rigid joints.

5.5 Adjustable joints

Adjustable joints shall accommodate angular displacement of tubes or tube and fitting of not less than:

3 ° 30’ for $D \leq 300$

2 ° 30’ for D 300 mm to 700 mm

1 ° 30’ for $D > 700$ mm

NOTE Welded spigot and socket (or sleeve) joints with taper sleeves before welding, spigot and socket joints with seal and some mechanical couplings are adjustable joints.

6 Requirements

6.1 General

Joints shall exhibit no visible leakage or ingress, as appropriate, of aqueous liquid when subjected to the following type tests by the manufacturer:

— **Test 1**: positive internal hydrostatic pressure in accordance with 7.3.2; the type test pressure shall be 1,5 p + 5 bar[1)].

— **Test 2**: negative internal pressure of 0,8 bar below atmospheric pressure (approximately 0,1 bar[1)] absolute pressure), in accordance with 7.3.3.

— **Test 3**: positive external hydrostatic pressure of 2 bar[1)], in accordance with 7.3.4 when intended for use at depths greater than 5 m below water level.

1) 1 bar = 100 kN/m^2 = 100 kPa.

— **Test 4**: under test condition 1 (see 7.2.1), dynamic internal hydraulic pressure in accordance with 7.3.5; the test shall comprise at least 24 000 pressure cycles between 0,5 *p* and *p*. This test applies to spigot and socket joints with seal (see 4.6).

— Where *p* is the allowable maximum operating pressure of the joint declared by the manufacturer.

Where it can be shown by either physical test results (see 8.1), calculation or compliance with tabulated values that joint designs that have already been in service for a minimum of 10 years prior to the first publication of this document can meet the necessary essential characteristics, then Test 4 shall be deemed not to be necessary.

NOTE These joints are generally tested after on-site installation.

All other types of joint shall be leak-tight when tested in accordance with Clause 7.

6.2 Reaction to fire

Uncoated ferrous product material is class A1.[2)].

Products supplied coated or lined, when the coating contains more than 1,0 % by weight or volume (whichever is the lower) of homogeneously distributed organic material shall be tested and classified according to EN 13501-1

NOTE Seals are encased in steel or cast iron and their reaction to fire is therefore not relevant.

6.3 Dangerous substances

Materials used in the production of joints shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination

7 Testing

7.1 General

Type testing shall be carried out under the most adverse conditions of tolerance, angularity of tubes and or fittings, and joint movement relevant to the design of joint.

Type testing shall be carried out using one representative tube (or fitting) size in each of the groups given in Table 1:

Table 1 — Preferred outside diameter of tubular products for type testing

Dimensions in millimetres

	Outside diameter groups			
	≤ 323,9	>323,9 ≤ 610	>610 ≤ 1016	>1016
D, preferred, in each group	219,1	406,4	813	1626

2) In accordance with Commission Decision 96/603/EEC of 4th October 1996 (as amended by Commission Decision 2000/605/EC) the ferrous product material is class A1 and therefore does not require to be tested for reaction to fire.

If a group covers products of different designs and/or manufactured by a different process, the group shall be sub-divided into families representative of the different types and designs.

NOTE If, for a manufacturer a group contains only one outside diameter (D) this may be considered as part of the adjacent group provided that it is of identical design and manufactured by the same process.

The thinnest wall thickness tubular product shall be tested in each size range.

7.2 Test conditions

7.2.1 Spigot and socket joints

Spigot and socket joints shall be tested in the conditions indicated below:

a) Joint of maximum annulus (see 7.2.2) aligned, withdrawn to the allowable value declared by the manufacturer, and subject to shear (see 7.2.3).

b) Joint of maximum annulus (see 7.2.2) deflected to the allowable value declared by the manufacturer.

7.2.2 Annulus

Spigot and socket joints shall be type tested at the extremes of manufacturing tolerance such that the annular gap between the sealing surfaces of the socket and of the spigot is equal to the maximum design value plus 0 %, minus 2 %. It is permissible to machine socket internal surfaces to achieve the required annulus for the type-test even though the resultant diameter can be slightly outside the normal manufacturing tolerance.

7.2.3 Shear

All joints shall be type-tested with a resultant shear force across the joints of not less than 50 times *D* in Newtons, taking into account the weight of the tube or fitting, its contents and the geometry of the test assembly (see Figure 7).

7.3 Type tests

7.3.1 General

The type tests to demonstrate compliance with the requirements specified in Clause 6 are given in 7.3.2, 7.3.3, 7.3.4 and 7.3.5.

7.3.2 Leak tightness of joints to positive internal pressure

7.3.2.1 General

The test shall be carried out on an assembled joint comprising two tubes and/or fittings with sections each at least 1 m long (see Figure 7).

The test apparatus shall be capable of providing suitable end and lateral restraints whether the joint is in the aligned position, or deflected, or subjected to a shear load. It shall be equipped with a pressure gauge with an accuracy of ± 3 %.

The vertical force *W* shall be applied to the spigot end by means of a V shaped block with an angle of 120 ° located at approximately 0,5 times *D* in millimetres or 200 mm from the socket face whichever is the largest; the socket shall bear on a flat support. The vertical force *W* shall be such that the resultant shear force, *F,* across the joint is equal to the specified value, taking into account the mass *M* of the pipe and its contents and the geometry of the test assembly:

$$W = \frac{F \times c - M(c - b)}{c - a}$$

where a, b and c are as shown in Figure 7.

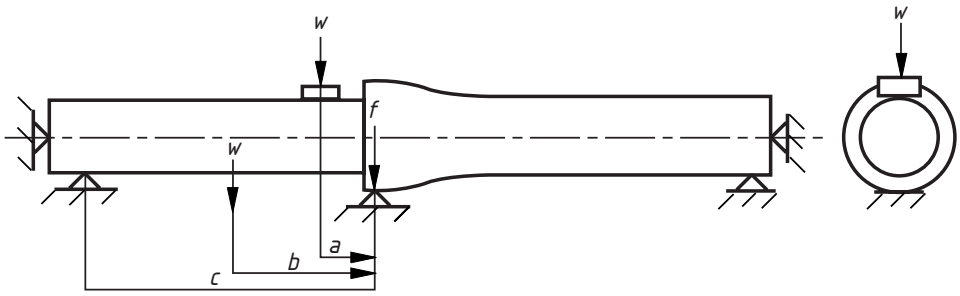


Figure 7 — Test assembly for test for leak tightness of joints subjected to positive internal pressure

7.3.2.2 Procedure

Fill the test assembly with water. Vent the test assembly of air.

Raise the pressure steadily until it reaches the test pressure given in Clause 6.

Ensure the rate of pressure increase does not exceed 1 bar[3)] per s.

Keep the test pressure constant within ± 0,5 bar[3)] for at least 2 h. During this time, inspect the joint thoroughly every 15 min.

Take all necessary safety precautions during the pressure test.

For a restrained joint, the test assembly, the test apparatus and the test procedure are identical except that there is no end restraint, so that the restrained joint under test takes the axial thrust. Possible axial movement of the spigot is measured every 15 min.

7.3.3 Leak tightness of joint to negative internal pressure

7.3.3.1 General

The test assembly and test apparatus shall be as given in 7.3.2 with the tube and/or fittings sections axially restrained to prevent them moving towards each other, or as given in 7.3.4. The test assembly shall be empty of water.

7.3.3.2 Procedure

Evacuate the test assembly to a negative internal pressure of 0,8 bar[3)] (see 6.3.4) and isolate from the vacuum pump.

Leave the test assembly under vacuum for 2 h. At the end of 2 h check the vacuum has not changed by more than 0,09 bar[3)].

Begin the test at a temperature between 15 °C and 25 °C. Keep the temperature within ± 2 °C of the chosen test temperature, for the duration of the test.

NOTE For a restrained joint, the test assembly, the test apparatus and the test procedure are identical.

[3)] 1 bar = 100 kN/m^2 = 100 kPa

7.3.4 Leak tightness of joints to positive external pressure

7.3.4.1 General

This test applies to spigot and socket joints with seal (see 4.7). For couplings, the test shall be indicated at the time of enquiry and order.

The test assembly shall comprise two joints made with two tube and/or fittings sockets welded together and one double-spigot piece (see Figure 8).

NOTE The test assembly creates an annular chamber that allows testing of one joint under internal pressure and one joint under external pressure.

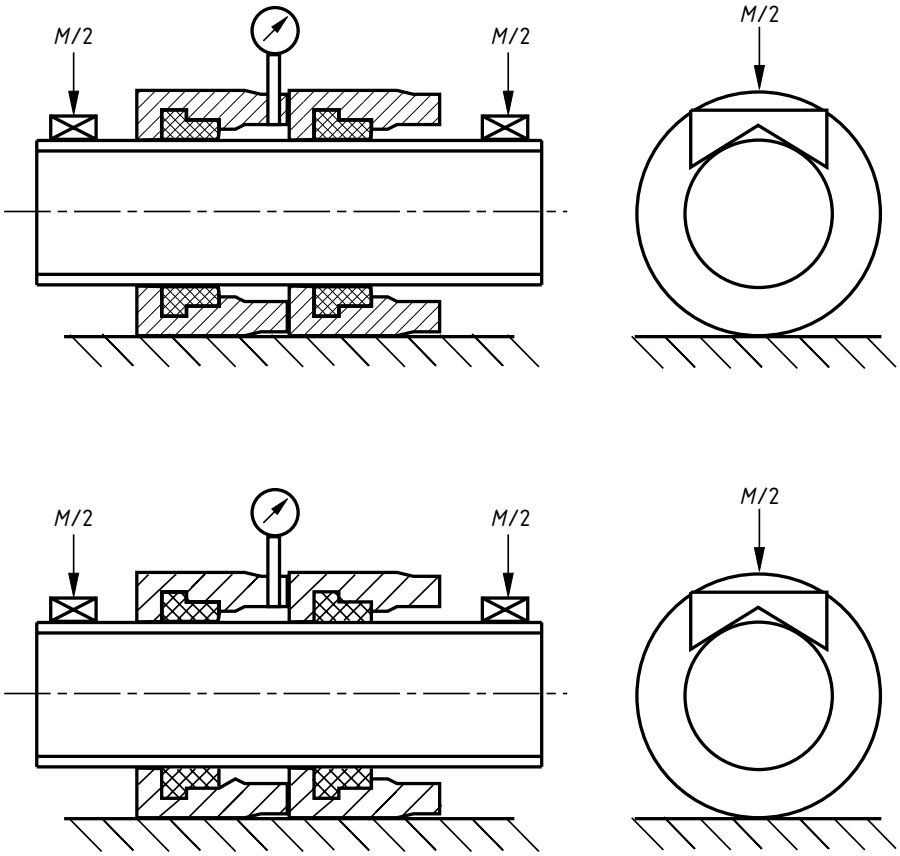


Figure 8 — Test assembly for test for leak tightness of joints to positive external pressure

7.3.4.2 Procedure

Fill the test assembly with water and vent to remove air.

Raise the pressure steadily until it reaches 2,0 bar[4)].

Keep the test pressure constant within ± 0,1 bar[4)] for a minimum of 2 h. During this time, inspect the joint thoroughly every 15 minutes.

NOTE For a restrained joint, the test assembly, the apparatus and the test procedure are identical.

Subject the test assembly to a vertical force *W* equal to the shear force, *F* defined in 7.3.2.1.

Apply one half of the load to the spigot end on each side of the test assembly, by means of a V shaped block with an angle of 120 °, located at approximately 0,5 times *D* in millimetres or 200 mm from the ends of the sockets whichever is the larger.

The sockets bear on a flat support.

7.3.5 Leak tightness of joints to dynamic internal pressure

7.3.5.1 General

The test assembly and test apparatus shall be as given in 7.3.2.

7.3.5.2 Procedure

Fill the test assembly with water and vent to remove air.

Use the following pressure cycle:

a) steady pressure reduction to 0,5 *p*;

b) maintain 0,5 *p* for at least 5 s;

c) steady pressure increase to *p*;

d) maintain *p* for at least 5 s.

Take all necessary safety precautions during the pressure test.

Automatically record the number of cycles.

NOTE The test should stop automatically in the event of a failure of the joint. The test assembly, the test apparatus and the test procedure are identical, except that there is no end restraint so that the axial thrust is taken by the restrained joint under test.

For a restrained joint, the test assembly, the test apparatus and the test procedure are identical, except that there is no end restraint so that the axial thrust is taken by the restrained joint under test.

7.4 Documentation

The joint manufacturer, as evidence of compliance, shall retain full reports of the type tests carried out in accordance with this document.

[4)] 1 bar = 100 kN/m^2 = 100 kPa

8 Evaluation of conformity

8.1 General

The compliance of joints with the requirements of this document and with the stated values (including classes) shall be demonstrated by:

— initial type testing;

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

8.2 Type testing

8.2.1 Initial type testing

Initial type testing shall be performed to show conformity with this document. Tests previously performed in accordance with the provisions of this document (same product, same characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account. For the purposes of testing (including FPC testing), joints may be grouped into families where it is considered that the selected property is common to all joints within that family.

In addition, initial type testing shall be performed at the beginning of the production of a new joint type (unless a member of the same family) or at the beginning of a new method of production (where this may affect the stated properties).

All characteristics in Clause 6 shall be subject to initial type testing, with the following exceptions:

— release of dangerous substances may be assessed indirectly by controlling the content of the substance concerned;

— welded joints produced in accordance with EN ISO 15607 and EN 13479;

— flanged joints in accordance with EN 1092-1 or EN 1759-1, calculated in accordance with EN 1591-1.

8.2.2 Further type testing

Whenever a change occurs in the joint design, the raw material or supplier of the components, or the production process (subject to the definition of a family), which would change significantly one or more of the characteristics, the type tests shall be repeated for the appropriate characteristic(s).

The number of joints to be tested (or assessed) shall be in accordance with Table 2.

Table 2 — Number of units and compliance criteria for initial and further testing

Characteristic	Requirement clause	Assessment methods	Number of units	Compliance criteria
Dimensional tolerances	4.2, 4.3, and 4.8	4	1 per group (See 7.1)	Pass/fail
Tightness: Liquid	6.1, (excluding test 3)	7.3	1 per group (See 7.1)	Pass/fail

The results of all type tests shall be recorded and retained by the joint manufacturer for at least 5 years.

8.3 Factory production control (FPC)

8.3.1 General

The manufacturer shall establish, document and maintain an FPC system to ensure that the products placed on the market conform with the stated performance characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

An FPC system conforming with the requirements of EN ISO 9001, and made specific to the requirements of this document, is considered to satisfy the above requirements.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

8.3.2 Equipment

Testing - All weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

Manufacturing - All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

8.3.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their conformity.

8.3.4 Design process

The factory production control system shall document the various stages in the design of products, identify the checking procedure and those individuals responsible for all stages of design.

During the design process itself, a record shall be kept of all checks, their results, and any corrective actions taken. This record shall be sufficiently detailed and accurate to demonstrate that all stages of the design phase, and all checks, have been carried out satisfactorily.

8.3.5 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of all of the characteristics are maintained. The characteristics, and the means of control, are:

a) Dimensional tolerances shall be checked on joint types covered by 4.2, 4.3, and 4.8;

b) Tightness tests shall be carried out in accordance with Clause 6;

c) Testing of the characteristics shown in Table ZA.1 of this document shall be carried out with the largest and thickest and the smallest and thinnest product produced. If the difference in size between these two sizes is less than 10% of the outside diameter of the largest size only one test needs to be carried out. For the purposes of type testing this shall constitute the range;

d) Further type testing is required when the dimensions to be supplied are more than 10% outside the range previously tested.

8.3.6 Non-conforming products

The manufacturer shall have written procedures which specify how non-conforming products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under a mandate M131 (Pipes, Tanks and Ancillaries not in contact with water intended for human consumption) given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction products covered by this annex for their intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

WARNING: Other requirements and other EU Directives, not affecting the fitness for intended use, may be applicable to the construction products falling within the scope of this standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm).

This annex has the same scope as Clause 1 of this standard with regard to the products covered. It establishes the conditions for the CE marking of joints intended for the use indicated below and shows the relevant clauses applicable (see Table ZA.1).

Construction Product: Joints or jointing systems for tubes or tubes and fittings.

Intended uses: In installations for the transport/disposal/storage of water not intended for human consumption.

The requirement on a certain characteristic is not applicable in those Member States where there are no regulatory requirements on that characteristic for the intended end use of the product. In this case, manufacturers placing their products on the market of these Member States are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see ZA.3) may be used.

Table ZA.1 – Relevant clauses

Essential characteristics	Requirement clauses in this (or another) European Standard	Levels and/or classes	Notes
Reaction to fire	6.2	Ferrous products are Class A1	Class
Dimensional tolerances	4.2, 4.3, and 4.8.		Tolerance (<mm) Pass
Tightness: Liquid	6.1		Test method + Pass
Dangerous substances	6.3		8.2.1 parts per million (ppm) or NPD
Durability – Joints Seals	- 4.7		NPD EN 681-1

ZA.2 Procedure(s) for the attestation of conformity of joints

ZA.2.1 Systems of attestation of conformity

The system(s) of attestation of conformity of joints indicated in Table ZA.1 in accordance with the Decision of the Commission 99/472/EC of 1999-07-17 as given in Annex III of the mandate for (Pipes, Tanks and Ancillaries not in contact with water intended for human consumption) is shown in Table ZA.2 for the indicated intended use and relevant class:

The systems of attestation of conformity of joints indicated in Table ZA.1, as given in Annex III of the mandate, are shown in Table ZA.2 for the intended uses and relevant level(s) and classes.

Table ZA.2 – Attestation of conformity systems

Product	Intended use	Level(s) or class(es)	Attestation of conformity systems
Joints or jointing systems for tubes and/or fittings	In installations for the transport/disposal/storage of water not intended for human consumption.	-	4
System 4: See Directive 89/106/EEC (CPD) Annex III.2. (ii), Third possibility			

The attestation of conformity of the joints in Table ZA.1 shall be according to the evaluation of conformity procedures indicated in Table ZA.3 resulting from the application of the clauses of this European Standard indicated therein.

Table ZA.3 - Assignment of evaluation of conformity tasks for joints under system 4

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (FPC)	Parameters related to all relevant characteristics of Table ZA.1	8.3
	Initial type testing	All characteristics of Table ZA.1	8.2

ZA.2.2 Declaration of conformity

When compliance with this annex is achieved, the manufacturer or his agent established in the EEA, shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

— description of the product (joints for use in installations for the transport/disposal/storage of water not intended for human consumption), and a copy of the information accompanying the CE marking (Annex ZA of this European Standard);

— provisions to which the product conforms (i.e. Annex ZA of this EN);

— this product is not intended for use in heating networks where elevated temperature properties are required;

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The above mentioned declaration shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE Marking

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol shall be in accordance with Directive 93/68/EEC and shall be shown on the accompanying commercial documents. The following information and characteristics shall accompany the CE marking symbol (where relevant):

— name or identifying mark and registered address of the producer;

— last two digits of the year in which the marking is affixed;

— number of this European Standard [EN 10311];

— product name and description e.g.. welded collar;

— reaction to fire i.e. Class A1 (uncoated) or Class ‘X’ (coated);

— tightness: Liquid - test method used;

— dimensional tolerance for product;

— dangerous substance (if any identified);

— durability (where relevant) i.e. coating type and thickness.

The NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the country of destination.

Figure ZA.1 gives an example of the information to be given on the commercial documents.

CE	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, P.O. Box 21, B - 1050 **05**	*Name or identifying mark and registered address of the producer* *Last two digits of the year in which the marking was affixed*
EN 10311 Welded collar for use in installations for the transport/disposal/storage of water not intended for human consumption. National regulations establish the suitability of this product if intended to be used in contact with water intended for human consumption. This product is not suitable for use in elevated temperatures (heating networks) Dimensional tolerances <3mm Passed Tightness: Liquid (Test 1) Passed **Reaction to fire:** Class A1 Dangerous substances either NPD or Dangerous substance 'x' less than 'y' ppm **Durability:** NPD	*No. of European standard* *Description of product* *and* *information on regulated characteristics*

Figure ZA.1 – Example CE marking information

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

Bibliography

[1] EN 805, *Water supply – Requirements for systems and components outside buildings*

[2] EN 10241, *Steel threaded pipe fittings*

[3] EN 10242, *Threaded pipe fitting in malleable cast iron*

[4] EN 10255, *Non-alloy steel tubes suitable for welding and threading – Technical delivery conditions*

[5] EN ISO 9001, *Quality management systems – Requirements (ISO 9001:2000)*

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