SLOVENSKI STANDARD
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Fitingi iz duktilne litine za PVC-U ali PE cevne sisteme - Zahteve in postopki preskušanja

Ductile iron fittings for PVC-U or PE piping systems - Requirements and test methods

Duktile Gußformstücke für PVC-U- oder PE-Rohrleitungssysteme - Anforderungen und Prüfverfahren

Raccords en fonte ductile pour systemes de canalisations en PVC-U ou en PE - Prescriptions et méthodes d'essai

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This European Standard was approved by CEN on 1 March 2000.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 203 "Cast iron pipes, fittings and their joints", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

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

This European Standard was prepared in co-operation with CEN/TC155 "Plastics piping systems".

Annex A of this European Standard is informative.

Introduction

This standard is in conformity with the general requirements already established by CEN/TC 164 in the field of water supply.

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

a) this 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.

1 Scope

This European Standard specifies the requirements and associated test methods applicable to ductile iron fittings and their joints to be used with poly(vinyl chloride) (PVC-U) pipes or polyethylene (PE) pipes, in conformity with EN 1452-1 to 7 and prEN 12201-1 to 7 respectively, for the construction of pipelines :

— to convey water (e.g. potable water) ;

— with or without pressure ;

— to be installed below or above ground, inside or outside buildings.

This standard is not intended to cover sewerage applications, where additional requirements may be necessary.

This standard specifies requirements for materials, dimensions and tolerances, mechanical properties and standard coatings of ductile iron fittings. It also gives performance requirements for all components, including restrained and non-restrained flexible joints.

This standard covers fittings cast by any type of foundry process or manufactured by fabrication of cast components, as well as corresponding joints, in a size range extending from DN 40 to DN 700, to be used with pipes of external diameter from 40 mm to 710 mm.

This standard applies to fittings which are :

— manufactured with socketed ends (for push-in or mechanical joints), flanged ends and/or spigot ends for jointing by means of various types of gaskets which are not within the scope of this standard ;

— normally delivered externally and internally coated ;

— suitable for PE and PVC-U pipes with fluid temperatures between 0°C and 25°C, excluding frost, and for pressures up to 16 bar (PFA). For higher temperatures (up to 45°C for PVC-U or 40°C for PE) the PFA is derated as given in EN 1452 and prEN 12201.

This standard does not cover ductile iron fittings intended to be used with different pipe materials other than PVC-U and PE.

NOTE 1 Temperature limitations and pressure limitations are those coming from the PVC-U or PE pipes.

NOTE 2 In this standard, all pressures are relative gauge pressures, expressed in bars (100 kPa = 1 bar).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 545:1994, *Ductile iron, pipes, fittings, accessories and their joints for water pipelines - Requirements and test methods.*

EN 681-1:1996, *Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications – Part 1 : Vulcanised rubber.*

EN 805: 1999, *Water supply - Requirements for external systems and components.*

EN 1092-2:1997, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 2: Cast iron flanges.*

EN 1333:1996, *Pipework components - Definition and selection of PN.*

EN 1452 - 1 to 7 , *Plastics piping systems for water supply - Unplasticized poly(vinyl chloride) (PVC-U).*

EN 1514- 1 to 4:1997, *Flanges and their joints - Dimensions of gaskets for PN-designated flanges.*

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

EN 10002-1:1990, *Metallic materials - Tensile testing - Part 1 : Method of test (at ambient temperature).*

prEN 12201 - 1 to 7, *Plastics piping systems for water supply - Polyethylene (PE).*

ISO 6506:1981, *Metallic materials - Hardness tests - Brinell test.*

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1
ductile iron
Cast iron used for pipes, fittings and accessories in which graphite is present substantially in spheroidal form.

3.2
fitting
Casting other than a pipe which allows pipeline deviation, change of direction or bore. Examples are : bends, tees, couplings, tapers,...

3.3
flange
Flat circular end of a fitting or pipe extending perpendicular to its axis, with bolt holes equally spaced on a circle.

NOTE A flange may be fixed (e.g. integrally cast or welded-on) or adjustable ; an adjustable flange comprises a ring, in one or several parts assembled together, which bears on an end joint hub and can be freely rotated around the axis before jointing.

3.4
spigot
Male end of a pipe or fitting.

3.5
socket
Female end of a pipe or fitting to make the connection with the spigot of the next component.

3.6
gasket
Sealing component of a joint.

3.7
joint
Connection between the ends of two pipes and/or fittings in which a gasket is used to effect a seal.

3.8
flexible joint
Joint which permits significant angular deflection both during and after installation and which can accept a slight offset of the centreline.

3.9
push-in flexible joint
Flexible joint assembled by pushing the spigot through the gasket in the socket of the mating component.

3.10
mechanical flexible joint
Flexible joint in which sealing is obtained by applying pressure to the gasket by mechanical means, e.g. a gland.

3.11
restrained flexible joint
Flexible joint in which a means is provided to prevent separation of the assembled joint.

3.12
flanged joint
Joint between two flanged ends.

3.13
nominal size (DN)
See EN ISO 6708:1995.

3.14
nominal outside diameter (d_n)
See EN 1452-1 for PVC-U and prEN 12201-1 for PE.

3.15
minimum socket inside diameter (d_i min)
Minimum value of the internal diameter of the socket mouth.

3.16
PN
See EN 1333:1996 relevant for flanges.

3.17
allowable operating pressure (PFA)
Internal pressure, exclusive of surge, that a component can safely withstand in permanent service (see EN 805:1999).

NOTE to *3.15* and *3.16* In EN 1452 and prEN 12201, the term nominal pressure (PN) at 20°C is used in place of PFA.

3.18
leaktightness test pressure
Pressure applied to a component during manufacture in order to ensure its leaktightness.

3.19
allowable maximum operating pressure (PMA)
Maximum internal pressure, including surge, that a component can safely withstand in service (see EN 805:1999).

3.20
allowable test pressure (PEA)
Maximum hydrostatic pressure that a newly installed component can withstand for a relatively short duration, when either fixed above ground level or laid and backfilled underground, in order to measure the integrity and tightness of the pipeline (see EN 805:1999).

NOTE This test pressure is different from the system test pressure (STP), which is related to the design pressure of the pipeline and is intended to ensure its integrity and leaktightness.

3.21
batch
Quantity of castings from which a sample is taken for testing purposes during manufacture.

3.22
type test
Proof of design test which is done once and is repeated only after change of design.

3.23
length
Effective length of a fitting, as shown on the figures of clause 8.

NOTE For flanged fittings the effective length L (l for branches) is equal to the overall length. For socketed fittings, the effective length is designated Z in plastics piping systems standards and L_u (l_u for branches) in EN 545:1994; it is equal to the overall length minus the spigot insertion depth as given in the manufacturer's catalogues.

4 Technical requirements

4.1 General

4.1.1 Ductile iron fittings

Nominal sizes, minimum wall thicknesses, lengths and coatings are specified in 4.1.2, 4.2.1, 4.2.2 and 4.4 respectively. When, for specific needs, fittings with different lengths and/or coatings and other types of fittings than those given in clause 8 are supplied with reference to this standard, they shall comply with all other requirements of this standard.

4.1.2 Standardized sizes

The standardized sizes of fittings, corresponding to the nominal outside diameter d_n of the pipes to which they have to be connected, are as follows : 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710.

4.1.3 Surface condition and repairs

Fittings shall be free from defects and surface imperfections which could lead to non-compliance with clauses 4 and 5.

When necessary, fittings may be repaired, for example by welding, in order to remove surface imperfections and localised defects which do not affect the entire wall thickness, provided that the repaired fittings comply with all the requirements of clauses 4 and 5.

4.1.4 Types of joints and interconnection

4.1.4.1 General

Joint design and gasket shapes are outside the scope of this standard.

Rubber gasket materials shall comply with the requirements of EN 681-1:1996 for the type WA or WC as relevant.

4.1.4.2 Flanged joints

The dimensions and tolerances of the flanges of fittings shall comply with EN 1092-2:1997. This ensures interconnection between all flanged components (pipes, fittings, valves, ...) of the same PN and DN and adequate joint performance.

Although it does not affect interconnection, the manufacturer shall state in his catalogues whether his products are normally delivered with fixed flanges or adjustable flanges.

4.1.4.3 Flexible joints

The dimensions of sockets for push-in and mechanical, restrained and non restrained flexible joints shall comply with 4.2.3 and with any additional requirements related to the gasket design. This ensures interconnection between all ductile iron fittings and all PVC-U and PE pipes.

Unless otherwise specified, the flexible joints used with PE pipes shall be restrained.

NOTE 1 Supporting sleeves (inserts) may be necessary depending on pipe material, on pipe wall thickness, on joint design and on local authorities ; they shall provide adequate support over the entire compression area of the gasket.

NOTE 2 Where applicable, the minimum thickness of the PE pipes should be declared by the manufacturer of the fittings.

4.1.5 Materials in contact with potable water

Ductile iron fittings, their joints and their internal coatings and paints (linings) include several materials given in this standard. When used under the conditions for which they are designed, in permanent or in temporary contact with water intended for human consumption, ductile iron fittings, their joints and their internal coatings and paints (linings) shall not change the quality of that water to such an extent that it fails to comply with the requirements of EU and EFTA regulations at the end user.

For this purpose, reference shall be made to the relevant national regulations and national standards, transposing EN standards when available, dealing with the influence of materials on water quality, and to the requirements for external systems and components (see EN 805:1999).

4.2 Dimensional requirements

4.2.1 Minimum wall thickness

The minimum wall thickness of the ductile iron, at any point, shall be as given in table 1, provided that the requirements of 4.3, 4.6 and 7 are complied with.

Table 1— Minimum wall thickness

d_n	Minimum wall thickness mm
$d_n \leq 225$	4,0
$225 < d_n \leq 315$	5,0
$315 < d_n \leq 710$	6,0

NOTE The thickness given in table 1 is the minimum wall thickness corresponding to the main part of the body. The actual thickness at any particular point may require to be increased to meet localised high stresses depending on the shape of the casting (e.g. at internal radius of bends, at the branch-body junction of tees...).

4.2.2 Length

The lengths (see 3.22) of fittings shall be as given in the manufacturers' catalogues taking into account the minimum lengths given in tables of clause 8.

4.2.3 Dimensions of sockets

The minimum internal diameter of sockets and the minimum depth of engagement of sockets shall comply with the values given in tables 5 and 6.

4.3 Mechanical properties of ductile iron

4.3.1 Tensile properties

Ductile iron fittings shall have a minimum tensile strength of 420 MPa and a minimum elongation after fracture of 5 %. The tensile strength shall be tested in accordance with 6.1.

4.3.2 Hardness

The Brinell hardness, when measured in accordance with 6.2, shall not exceed 250 HB. For components manufactured by welding, a higher Brinell hardness is allowed in the heat affected zone of the weld.

4.4 Coatings

4.4.1 General

Unless otherwise required, all fittings shall be delivered internally and externally coated by paint conforming to 4.4.2.

If required, the following coatings may also be supplied, depending on the external and internal conditions of use :

a) External coatings :

— epoxy;

— adhesive tapes;

— polyurethane;

— vitreous enamel.

b) Internal coatings (linings) :

— epoxy;

— polyurethane;

— vitreous enamel.

These external and internal coatings and their application process shall comply with the corresponding EN standards or, where no EN standard exists, they shall comply with ISO standards or with national standards valid in the place of use of the product, or with an agreed technical specification.

All coatings shall be works-applied.

4.4.2 Paint coatings

4.4.2.1 General

The coating material shall be of a bitumen or synthetic resin base ; appropriate additives (such as solvents, inorganic fillers...) to allow easy application and drying are permitted.

Prior to application of the coating, the casting surface shall be dry, free from rust or non adhering particles or foreign matter such as oil or grease.

4.4.2.2 Coating characteristics

The coating shall uniformly cover the whole surface of the casting and have a smooth regular appearance. Drying shall be sufficient to ensure that it will not stick to adjacent coated pieces.

4.5 Marking

All fittings shall be legibly and durably marked and shall bear at least the following information :

— the manufacturer's name or mark ;

— the identification of the year of manufacture ;

— the identification of ductile iron ;

— the d_n and/or the DN as relevant ;

— the PN rating of flanges when applicable ;

— the reference to this standard ;

— "PVC" or/and "PE".

The first five markings given above shall be cast-on or cold stamped ; the other markings may be applied by any method, e.g. painting on the casting or attached to the packaging.

4.6 Leaktightness

4.6.1 Fittings

Fittings shall be watertight at their allowable test pressure (PEA).

They shall be tested in accordance with 6.3 and shall exhibit no visible leakage, sweating or any other sign of failure.

4.6.2 Joints

Joints shall be designed in conformity with clause 5 in order :

a) to durably withstand without leakage the allowable maximum operating pressure (PMA) of corresponding pipes and fittings under all normal service conditions, including foreseeable surge pressures and joint movements (angular, radial and axial) ;

b) to be leaktight under negative internal pressure, which may occur under surge conditions.

5 Performance requirements for joints

5.1 General

In order to ensure the fitness for purpose of the joints in the field of water supply, there shall be a type test (see 3.21) for at least one d_n for each of the groupings given below :

— d_n 40 to d_n 140 (preferred d_n: 110);

— d_n 160 to d_n 315 (preferred d_n: 200);

— d_n 355 to d_n 710 (preferred d_n: 400).

One d_n is representative of a grouping when the performances are based on the same design parameters throughout the size range. Type tests shall be carried out with PVC-U pipes and with PE pipes when the joint is meant to be used with either PVC-U pipes or PE pipes.

If a grouping covers products of different designs and/or manufactured by different processes, the grouping shall be sub-divided.

If for a manufacturer a grouping contains only one d_n, this d_n must be tested instead of the preferred d_n.

NOTE The maximum pressure for a fitting with a flange on one or more size is limited by the maximum test pressure related to the flange dimensions.

5.2 Flexible joints

5.2.1 General

The allowable angular deflection per joint declared by the manufacturer shall be not less than :

Table 2 — Allowable angular deflection

	Push in joints and Mechanical restrained joints	Mechanical non-restrained joints
d_n 40 to 315	1,5°	3,5°
d_n 355 to 630	1,0°	2,5°
d_n 710	0,5°	1,5°

All non-restrained joints shall be designed to provide axial movement; thereby the allowable withdrawal shall be declared by the manufacturer.