SLOVENSKI STANDARD
SIST EN 12842:2012

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Fitingi iz duktilne litine za PVC-U ali PE cevne sisteme - Zahteve in preskusne metode

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 systèmes de canalisations en PVC-U ou en PE - Prescriptions et méthodes d'essai

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

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Foreword

This document (EN 12842:2012) 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of an identical text or by endorsement, at the latest by February 2013, and conflicting national standards shall be withdrawn at the latest by February 2013.

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

This document supersedes EN 12842:2000.

The significant changes made since the previous version are as follows:

a) Wording (relating to accessories, fittings, coupling and flange adaptor) modified in accordance with EN 545;

b) Improvement of shear load test for flange adapter and one socket fitting;

c) Addition of aging test for PE pipe fittings and accessories.

This European Standard was prepared in co-operation with CEN/TC 155 "Plastics piping systems".

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 on the quality of water intended for human consumption caused by the product covered by this standard:

— 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;

— it should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of these products remain in force.

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

1 Scope

This European Standard specifies the requirements and associated test methods applicable to ductile iron fittings, ductile iron and mild steel couplings and flange adaptors and their joints to be used with poly(vinyl chloride) (PVC-U) pipes or polyethylene (PE) pipes. It is in conformity with EN 1452-1 to -5, ENV 1452-6 and -7 and EN 12201-1 to -5 respectively, for the construction of pipelines:

— to convey water (e.g. water intended for human consumption);

— with or without pressure;

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

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

This European Standard is applicable to fittings which are:

— manufactured with socketed, flanged or spigot ends;

— supplied 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 EN 12201;

— not intended for use in areas subjected to reaction to fire regulations.

NOTE 1 This does not preclude special arrangements for the products to be used at higher temperatures. Temperature limitations and pressure limitations are those coming from the PVC-U or PE pipes.

This European Standard covers ductile iron fittings, couplings and flange adaptors 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 60 to DN 700, to be used with pipes of external diameter from 63 mm to 710 mm.

As long as no equivalent European Standard exists for mild steel accessories, this European Standard also covers couplings and flange adaptors for use with PVC-U and PE pipes which are fabricated partly or entirely from mild steel as well as corresponding joints, in a size range extending from DN 60 to DN 700, to be used with pipes of external diameter from 63 mm to 710 mm.

This European Standard specifies requirements for materials, dimensions and tolerances, mechanical properties and standard coatings. It also gives minimum performance requirements for all components, including restrained and non-restrained flexible joints. Joint design and gasket shapes are outside the scope of this standard.

This European Standard does not cover fittings, couplings and flange adaptors intended to be used with different pipe materials other than PVC-U and PE.

NOTE 2 Fittings, couplings and flange adaptors complying with the requirements of this European Standard for PVC-U also usually meet the requirements for PVC-O and PVC-A pipes. Where this is not the case, the manufacturer is expected to declare this in the relevant literature.

NOTE 3 In this European Standard, all pressures are relative pressures, expressed in bars (100 kPa = 1 bar).

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

EN 805:2000, *Water supply — Requirements for systems and components outside buildings*

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

EN 10025-1:2004, *Hot rolled products of structural steels — General technical delivery conditions*

EN 10310, *Steel tubes and fittings for onshore and offshore pipelines — Internal and external polyamide powder based coatings*

EN 14901, *Ductile iron pipes, fittings and accessories — Epoxy coating (heavy duty) of ductile iron fittings and accessories – Requirements and test methods*

EN 15189, *Ductile iron pipes, fittings and accessories — External polyurethane coating for pipes — Requirements and test methods*

EN 15655, *Ductile iron pipes, fittings and accessories — Internal polyurethane lining for pipes and fittings — Requirements and test methods*

EN ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method (ISO 1167-1:2006)*

EN ISO 4016, *Hexagon head bolts — Product grade C (ISO 4016)*

EN ISO 4034, *Hexagon nuts — Product grade C (ISO 4034)*

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part1: Test method (ISO 6506-1)*

EN ISO 7091, *Plain washers — Normal series — Product grade C (ISO 7091)*

EN ISO 9001:2008, *Quality management systems — Requirements (ISO 9001:2008)*

EN ISO 13846:2000, *Plastic piping systems — End-load-bearing and non-end-load-bearing assemblies and joints for thermoplastics pressure piping — Test method for long-term leaktightness under internal water pressure (ISO 13846:2000)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
ductile iron
cast iron used for fittings in which graphite is present substantially in spheroïdal form

3.2
fitting
casting other than a pipe which allows pipeline deviation, change of direction or bore

[SOURCE: EN 545]

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

Note 1 to entry: A flange can be fixed (e.g. integrally cast or welded) 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 components 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/OD
alphanumeric designation of size for components of a pipework system, which is used for reference purposes

Note 1 to entry: It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections.

Note 2 to entry: Adapted from EN ISO 6708:1995, definition 2.1.

Note 3 to entry: Plastic pipes are only defined as DN/OD.

3.14
nominal outside diameter (d_n)
specified outside diameter, in millimetres, assigned to a nominal size DN/OD

[SOURCE: EN 12201-1]

3.15
minimum socket inside diameter ($d_{i\ min}$)
minimum value of the internal diameter of the socket mouth

3.16
nominal pressure PN
alphanumerical designation, which comprises a convenient rounded number used for reference purposes

Note 1 to entry: All components of the same nominal size, DN, designated by the same PN have compatible mating dimensions.

Note 2 to entry: Adapted from EN 1333:2006.

Note 3 to entry: In EN 1452 and EN 12201, the term nominal pressure (PN) at 20°C is used in place of PFA.

3.17
allowable operating pressure (PFA)
maximum hydrostatic pressure that a component is capable of withstanding continuously in service

[SOURCE: EN 805:2000]

Note 1 to entry: In EN 1452 and EN 12201, the term nominal pressure (PN) at 20°C is used in place of PFA.

3.18
leak tightness test pressure
pressure applied to a component during manufacture in order to ensure its leak tightness

3.19
allowable maximum operating pressure (PMA)
maximum pressure occurring from time to time, including surge, that a component is capable of withstanding in service

[SOURCE: EN 805:2000]

3.20
allowable test pressure (PEA)
maximum hydrostatic pressure that a newly installed component is capable of withstanding for a relatively short duration, in order to ensure the integrity and tightness of the pipeline

[SOURCE: EN 805:2000]

Note 1 to entry: 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 leak tightness.

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

3.22
performance 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 1 to entry: 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; it is equal to the overall length minus the spigot insertion depth as given in the manufacturer's catalogues.

3.24
flange adaptor
accessory which:

— is used in a pipeline to make the connection with a spigot of a pipe or fitting and the flange of another component of the pipeline (e.g. pipe, fitting, valve etc.); and

— allows for angular and axial displacements for unrestrained joints and angular displacements for restrained flexible joints

Note 1 to entry: Some flange adaptors are designed such that they can be slid over the pipes in order to facilitate easy assembly.

Note 2 to entry: As defined in EN 545, Flange Adaptors are accessories.

3.25
coupling
accessory which:

— is used in a pipeline to make the connection between two spigots of pipes, fittings or valves, etc.; and

— allows for angular and axial displacements for unrestrained joints and angular displacements for restrained flexible joints

Note 1 to entry: Some couplings are designed such that they can be slid over the pipes in order to facilitate easy assembly.

Note 2 to entry: As defined in EN 545, Couplings are accessories.

4 Technical requirements

4.1 General

4.1.1 Fittings

Nominal sizes, minimum wall thicknesses, lengths and coatings are specified in 4.1.2, 4.2.1/4.2.2, 4.2.3 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 standardised sizes of fittings, corresponding to the nominal outside diameter d_n (in millimetres) of the pipes to which they shall be connected, are as follows: 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, couplings and flange adaptors shall be free from defects and surface imperfections which could lead to non-compliance with Clauses 4 and 5.

When necessary, fittings, couplings and flange adaptors may be repaired, for example by welding, in order to remove surface imperfections and localised defects which do not extend through the entire wall thickness, provided that:

— the repairs are carried out according to the manufacturer's written procedure;

— the repaired products comply with all the requirements of Clauses 4 and 5.

4.1.4 Types of joints and interconnection

4.1.4.1 General

Rubber gasket materials shall comply with the requirements of EN 681-1 for the type WA. When materials other than rubber are necessary (e.g. for high temperature flanged joints), they shall comply with the appropriate European Technical Specification or, where no European Technical Specification exists, the appropriate International Standard.

4.1.4.2 Flexible joints

The dimensions of sockets for push-in and mechanical, restrained and non-restrained flexible joints shall comply with 4.2.4 and with any additional requirements related to the gasket design. This ensures interconnection between all fittings and all PVC-U and PE pipes.

In addition, each type of flexible joint shall be designed to fulfil the performance requirements of Clause 5.

Taking into account the temperature and pressure effects on PE pipe, all joints intended for use with PE pipe shall be restrained.

Supporting sleeves (inserts) may be necessary depending on pipe material, on pipe wall thickness, on joint design and on national requirements; they should provide adequate support over the entire compression area of the gasket and restraining mechanism.

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

4.1.4.3 Flanged joints

Flanges shall be designed such that they can be attached to flanges whose dimensions and tolerances comply with EN 1092-2. This ensures interconnection between all flanged components (pipes, fittings, valves etc.) of the same PN and DN.

Bolts and nuts shall comply as a minimum with the requirements of EN ISO 4016 and EN ISO 4034, grade 4.6. Where washers are required, they shall comply with EN ISO 7091.

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

Flange gaskets may be one of any type given in EN 1514 (all parts).

4.1.5 Materials in contact with water intended for human consumption

Components of a pipe system 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/mild steel fittings and their joints shall not change the quality of that water to such an extent that it fails to comply with the requirements of national regulations.

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

4.2 Dimensional requirements

4.2.1 Minimum wall thickness of ductile iron fittings, couplings and flange adaptors

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 Clause 7 are complied with.

Table 1 — Minimum wall thickness of ductile iron fittings, couplings and flange adaptors

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

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 might 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, etc.).

4.2.2 Minimum wall thickness of mild steel couplings and flange adaptors

The minimum wall thickness of the steel, at any point, shall be as given in Table 2, provided that the requirements of 4.3, 4.6 and 7 are complied with.

Table 2 — Minimum wall thickness of mild steel couplings and flange adaptors

d_n	Minimum wall thickness for material grade as specified in 4.3.2 mm
$d_n \leq 315$	3
$315 < d_n \leq 560$	4
$560 < d_n \leq 710$	5

For higher grade materials, it is permissible to use thicknesses less than those specified in Table 2 with an absolute minimum of 3mm.

4.2.3 Length

The lengths (see 3.23) of fittings shall be as given in the manufacturers' catalogues taking into account the minimum lengths given in the tables of Clause 8.

4.2.4 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 7 and 8.

4.2.5 Jointing gap for couplings and flange adaptors

The manufacturer shall declare his maximum jointing gap for couplings and flange adaptors for PVC-U pipes (see Figure 1) and it shall not be less than the values given in Table 3.

NOTE The jointing gap between the pipes or the flange to be connected might be affected by the pipe contraction or expansion occurring as a result of temperature or pressure change.

Jointing gaps for PE pipes and restrained joints for PVC-U pipes are related to the joint design; the manufacturer shall declare these where relevant.

The manufacturer shall declare the minimum depth of engagement in the jointing instructions. The minimum depth of engagement shall be such that the pipes can support the loads imparted by the jointing/anchorage system.

Key

1 maximum joint gap
2 flange adaptor
3 coupling

Figure 1 — Jointing gap for couplings and flange adaptors

Table 3 — Dimensions of jointing gap for non-restrained couplings and flange adaptors for PVC-U pipes

PVC-U Pipes		
Nominal outside diameter of pipe d_n	Coupling jointing gap mm	Flange adaptor jointing gap mm
63	20	16
75	21	17
90	22	18
110	24	19
125	26	19
140	28	20
160	30	21
180	32	22
200	34	23
225	36	25
250	39	26
280	42	28
315	46	29
355	38	25
400	41	27
450	44	29
500	48	30
560	52	33
630	57	35
710	63	38

4.3 Material characteristics

4.3.1 Ductile iron

4.3.1.1 Tensile properties

Ductile iron fittings, couplings and flange adaptors 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.

4.3.1.2 Hardness

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

4.3.2 Mild steel for couplings and flange adaptors

Mild steel for couplings and flange adaptors shall comply as a minimum with the requirements of EN 10025-1:2004, grade S275.

4.3.3 Fastener for couplings and flange adaptors

The maximum operating load on a fastener should not be greater than 80% of the yield strength of the fastener.

Fasteners shall be suitably protected to inhibit corrosion. The following coatings may be supplied:

— polymeric (e.g. epoxy/polyamide);

— zinc based corrosion protection;

— PTFE;

— a combination of the above.

4.4 Coatings

4.4.1 General

All fittings, couplings and flange adaptors shall be delivered with an external and internal epoxy coating in compliance with EN 14901. Alternatively, the following coatings may also be supplied:

a) External coatings:

1) polyamide in accordance with EN 10310;

2) polyurethane in accordance with EN 15189;

3) enamel[1)].

b) Internal coatings (linings):

1) polyamide in accordance with EN 10310;

2) polyurethane in accordance with EN 15655;

3) enamel[1)].

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.

1) Enamel is a glass material containing raw material oxides fully or partly molten in the glass. This non-organic preparation can be laid in one or more layers on the metal part at a temperature higher than 480°C.