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**Cevi, fittingi in dodatni deli iz nodularne litine za kanalizacijo - Zahteve in preskusne metode**

Ductile iron pipes, fittings, accessories and their joints for sewerage applications - Requirements and test methods

Rohre, Formstücke, Zuberhörteile aus duktilem Gusseisen und ihre Verbindungen für die Abwasser-Entsorgung - Anforderungen und Prüfverfahren

Tuyaux, raccords et accessoires en fonte ductile et leurs assemblages pour l'assainissement - Prescriptions et méthodes d'essai

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**Ta slovenski standard je istoveten z: EN 598:2007+A1:2009**

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23.040.10	Železne in jeklene cevi	Iron and steel pipes
23.040.40	Kovinski fittingi	Metal fittings
93.030	Zunanji sistemi za odpadno vodo	External sewage systems

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und ihre Verbindungen für die Abwasser-Entsorgung -  
Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 11 August 2007 and includes Amendment 1 approved by CEN on 23 May 2009.

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## Foreword

This document (EN 598:2007+A1:2009) 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of an identical text or by endorsement, at the latest by December 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

This document includes Amendment 1, approved by CEN on 2009-05-23.

This document supersedes A1 EN 598:2007 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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 Construction Products Directive (89/106/EEC).

For relationship with EU Construction Products Directive, see informative Annex ZA, which is an integral part of this document.

This European Standard is in conformity with the general requirements already established by CEN/TC 165 in the field of sewerage.

Annex ZA includes the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC). Only if the requirements specified in Annex ZA are met, the CE marking will be effected.

For reasons of conformity with mandate M/131 “Pipes, tanks and ancillaries not in contact with water intended for human consumption”, EN 598:1994 has been revised by extension with Annex ZA (see Resolution CEN/BT 113/1994 and CEN/BT 63/1996) and Clause 9 for the evaluation of conformity.

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

**EN 598:2007+A1:2009 (E)****1 Scope**

This European Standard specifies the requirements and associated test methods applicable to ductile iron pipes, fittings, accessories and their joints for the construction of drains and sewers outside buildings:

- operating without pressure (gravity sewerage), or with positive or negative pressure (see Table 5);
- to be installed below or above ground;
- to convey surface water, domestic waste water and certain types of industrial effluents, either in separate systems or in combined systems.

This European Standard applies to pipes, fittings and accessories which are:

- manufactured with socketed, flanged or spigot ends;
- normally delivered externally and internally coated;
- suitable for continuous fluid temperatures between 0 °C excluding frost, and 45 °C for DN ≤ 200 or 35 °C for DN > 200, according to EN 476;
- not intended for use in areas subject to reaction to fire regulations.

NOTE 1 This does not preclude special arrangements for the products to be used at higher temperatures.

This European Standard covers pipes, fittings and accessories cast by any type of foundry process or manufactured by fabrication of cast components, as well as corresponding joints, of a size range extending from DN 80 to DN 2000 inclusive.

This European Standard specifies requirements for materials, dimensions and tolerances, mechanical properties and standard coatings of ductile iron pipes and fittings. It also gives performance requirements for all components including joints. Joint design and gasket shapes are outside the scope of this European Standard.

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

**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 applies (including any amendments).

EN 196-1, *Methods of testing cement — Part 1: Determination of strength*

EN 545, *Ductile iron pipes, fittings, accessories and their joints for water pipelines — Requirements and test methods*

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

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

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

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



EN ISO 4016, *Hexagon head bolts — Product grade C (ISO 4016:1999)*

EN ISO 4034, *Hexagon nuts — Product grade C (ISO 4034:1999)*

EN ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:2005)*

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

EN ISO 7091, *Plain washers — Normal series — Product grade C (ISO 7091:2000)*

### 3 Terms and definitions

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

#### 3.1

##### **ductile iron**

cast iron used for pipes, fittings and accessories in which graphite is present substantially in spheroidal form

#### 3.2

##### **pipe**

casting of uniform bore, straight in axis, having either socket, spigot or flanged ends, except for flanged-socket pieces, flanged-spigot pieces and collars which are classified as fittings

#### 3.3

##### **fitting**

casting other than a pipe which allows pipeline deviation, change of direction or bore. In addition flanged-socket pieces, flanged-spigot pieces and collars are also classified as fittings

#### 3.4

##### **accessory**

any casting other than a pipe or fitting which is used in a pipeline, for example:

- inspection chambers (see 3.5);
- manholes (see 3.6);
- glands and bolts for mechanical flexible joints (see 3.15);
- glands, bolts and locking rings for restrained flexible joints (see 3.16);
- adjustable flanges and flanges to be welded or screwed

NOTE Valves of all types are not covered by the term accessory.

#### 3.5

##### **inspection chamber**

component of a discharge system, of a drain or of a sewer providing access from the ground surface for inspection and maintenance equipment

[EN 476:1997]

#### 3.6

##### **manhole**

component of a sewer of sufficient size to provide access from the ground surface for inspection and maintenance operations by personnel and equipment

[EN 476:1997]

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**3.7  
flange**  
flat circular end of a pipe or fitting extending perpendicular to its axis, with bolt holes equally spaced on a circle

NOTE A flange is either 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 pipe axis before jointing.

**3.8  
spigot**  
male end of a pipe or fitting

**3.9  
spigot end length**  
spigot over a length equal to maximum insertion depth plus 50 mm

**3.10  
socket**  
female end of a pipe or fitting to make the connection with the spigot of the next component

**3.11  
gasket**  
sealing component of a joint

**3.12  
joint**  
connection between the ends of two pipes and/or fittings in which a gasket is used to effect a seal

**3.13  
flexible joint**  
joint which permits significant angular deflection both during and after installation and which can accept a slight offset of the centreline

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**3.14  
push-in flexible joint**  
flexible joint assembled by pushing the spigot through the gasket in the socket of the mating component

**3.15  
mechanical flexible joint**  
flexible joint in which sealing is obtained by applying pressure to the gasket by mechanical means, e.g. a gland

**3.16  
restrained flexible joint**  
flexible joint in which a means is provided to prevent separation of the assembled joint

**3.17  
flanged joint**  
joint between two flanged ends

**3.18  
nominal size (DN)**  
alphanumerical designation of size for components of a pipework system, which is used for reference purposes. 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

[EN ISO 6708:1995]

**3.19****nominal pressure (PN)**

alphanumerical designation used for reference purposes related to a combination of mechanical and dimensional characteristics of a component of a pipework system. It comprises the letters PN followed by a dimensionless number

[EN 1333:2006]

NOTE All equipment of the same nominal size DN designated by the same PN number have compatible mating dimensions.

**3.20****leak tightness test pressure**

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

**3.21****allowable operating pressure (PFA)**

maximum hydrostatic pressure that a component can withstand continuously in service

[EN 773:1999]

**3.22****allowable maximum operating pressure (PMA)**

maximum hydrostatic pressure, including surge, that a component can withstand from time to time in service

[EN 773:1999]

**3.23****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 ensure the integrity and tightness of the pipeline

[EN 773:1999]

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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 leak tightness.

**3.24****diametral stiffness of a pipe**

characteristic of a pipe which allows it to resist ovalization under loading when installed

**3.25****discharge system**

system of pipes, fittings, accessories and joints used to collect and drain waste water and rainwater of a building

NOTE It comprises discharge pipes, stack ventilation pipes and rainwater downpipes, installed within the limits of a building or attached to the building.

**3.26****drain**

system of pipes, fittings, accessories and joints installed outside the limits of a building in order to connect the discharge system of this building to a sewer or a septic tank

**3.27****sewer**

pipeline designed to collect waste water and rainwater from buildings and surface water and to convey them to the point of disposal or treatment

**EN 598:2007+A1:2009 (E)****3.28****gravity sewer**

sewer operating normally under free flowing conditions (see Table 5)

**3.29****pressure sewer; pumping sewer**

sewer (or section of a sewer) operating under positive pressure (see Table 5)

**3.30****vacuum sewer**

sewer operating under negative pressure (see Table 5)

**3.31****combined system**

sewerage system collecting together rainwater, surface water and waste water

**3.32****separate system**

sewerage system which collects waste water separately from rainwater and surface water

**3.33****performance test (initial type test – ITT)**

test which is done once and is repeated only after change of design, material or process

**3.34****length**

effective length of a pipe or fitting as shown on Figure 6 for socket and spigot pipes and as given in 4.2.3.2 for flanged pipes and 4.2.3.3 for fittings

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**3.35****deviation**

design length allowance with respect to the standardised length of a pipe

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**3.36****ovality**

out of roundness of a pipe section; it is equal to :  $100 \left( \frac{A_1 - A_2}{A_1 + A_2} \right)$

where

$A_1$  is the maximum axis in millimetres;

$A_2$  is the minimum axis, in millimetres

**4 Technical requirements****4.1 General****4.1.1 Ductile iron pipes and fittings**

Nominal sizes, thicknesses, lengths and coatings are specified in 4.1.1, 4.2.1, 4.2.3, 4.4 and 4.5 respectively. When, by agreement between manufacturer and purchaser, pipes and fittings with different wall thicknesses, lengths and/or coatings and other types of fittings than those given in 8.1, 8.2 and 8.3 are supplied with reference to this European Standard, they shall comply with all the other requirements of this European Standard.

NOTE 1 Other types of fittings include tees and tapers with other combinations DN × dn, draining tees etc.

The standardized nominal sizes, DN of pipes and fittings are as follows: 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1400, 1500, 1600, 1800, 2000. These DN values are DN/ID according to EN 476.

The functional properties of ductile iron pipes and fittings shall be as given in Clause 5.

NOTE 2 When installed and operated under the conditions for which they are designed (see Annexes A to E) ductile iron pipes, fittings, accessories and their joints maintain all their functional characteristics over their reasonable economic operating life, due to the constant material properties, to the stability of their cross section and to their design with high safety factors.

#### 4.1.2 Surface condition and repairs

Pipes, fittings and accessories shall be free from defects and surface imperfections which could lead to non-compliance with Clauses 4 and 5.

When necessary, pipes and fittings may be repaired, for example by welding, in order to remove surface imperfections and localized defects which do not affect the entire wall thickness, provided that:

- the repairs are carried out according to the manufacturer's written procedure;
- the repaired pipes and fittings shall comply with all the requirements of Clause 4 and of Clause 5.

#### 4.1.3 Types of joints and interconnection

##### 4.1.3.1 Gasket materials

Rubber gasket materials shall comply with the requirements of EN 681-1 for the type WC or WG. 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.

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##### 4.1.3.2 Flanged joints

Flanged joints 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 and adequate joint performance.

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 make the information available as to whether his products are normally delivered with fixed flanges or adjustable flanges.

Flange gaskets may be one of any type given in EN 1514.

##### 4.1.3.3 Flexible joints

Pipes and fittings with flexible joints shall comply with 4.2.2.1 for their spigot external diameters DE and their tolerances. This offers the possibility of interconnection between components equipped with different types of flexible joints. In addition, each type of flexible joint shall be designed to fulfil the performance requirements of Clause 5.

NOTE 1 For interconnection with certain types of joints operating within a tighter tolerance range on DE, the manufacturer's guidance should be followed as to the means of ensuring adequate joint performance at high pressures (e.g. measurement and selection of external diameter).

NOTE 2 For interconnection with existing pipelines having external diameters not in compliance with 4.2.2.1, the manufacturer's guidance should be followed as to the appropriate means of interconnection (e.g. adaptors).

**EN 598:2007+A1:2009 (E)****4.1.4 Colour identification**

Pipes for sewers and drains shall be identified externally by one of the following colours: brown, red or grey. This is to allow easy identification of installed sewers and drains. Pipes specifically intended for rain water or surface water sewers (separate systems) may be identified by a different colour other than those used for potable water pipes.

**4.2 Dimensional requirements****4.2.1 Wall thickness**

For pipes the standardised thicknesses and limit deviations are given in Table 11. They are such that the diametral stiffnesses of pipes are not less than the values shown in Table 10. The measurement of the wall thickness shall be in accordance with 6.1.1.

The iron thickness of fittings used for pressure sewers shall be in accordance with EN 545.

The iron thickness of fittings used for gravity sewers shall be equal to or higher than those of pipes of the same DN.

**4.2.2 Diameter****4.2.2.1 External diameter**

8.1 specifies the values of the external diameter DE of the coated spigot end length of pipes and fittings and their maximum allowable tolerances, when measured using a circumferential tape in accordance with 6.1.2.

NOTE 1 Certain types of flexible joints operate within a tighter range of tolerance (see 4.1.3.3).

NOTE 2 Thick external coatings should be removed, according to the manufacturer's guidance, in order to comply with the specified external diameter DE, when the pipe needs to be cut on site.

For  $DN \leq 300$ , the external diameter of the pipe barrel measured with a circumferential tape shall be such as to allow the assembly of the joint over at least two thirds of the pipe length from the spigot end when the pipe needs to be cut on site.

In addition, the ovality (see 3.9) of the spigot end of pipes and fittings shall

- remain within the tolerance on DE (see Table 11) for DN 80 to DN 200 and
- not exceed 1 % for DN 250 to DN 600 or 2 % for DN > 600.

NOTE 3 The manufacturer's guidance should be followed as to the necessity and means of ovality correction; certain types of flexible joints can accept the maximum ovality without a need for spigot re-rounding prior to jointing.

**4.2.2.2 Internal diameter**

The nominal values of the internal diameters of pipes, expressed in millimetres, are equal to the numbers indicating their nominal size, DN, and the tolerances shall be as given in Table 1 which applies to cement mortar lined pipes.

These tolerances apply only to the pipe with iron thickness as given in Table 11 and cement mortar lining thickness as given in Table 4.

NOTE Due to the manufacturing process of the ductile iron pipes and their internal linings, internal diameters with the lower limit deviation will only appear locally along the pipe length.

Compliance shall be demonstrated according to 6.1.3 or by calculation from the measurements taken for pipe external diameter, iron wall thickness and lining thickness.

**Table 1 — Limit deviation on internal diameter**

DN	Limit deviation <sup>a</sup> mm
80 to 1000	- 10
1100 to 2000	- 0,01 DN
<sup>a</sup> The lower limit only is given.	

### 4.2.3 Length

#### 4.2.3.1 Standardized lengths of socket and spigot pipes

Pipes shall be supplied to the standardized lengths given in Table 2.

**Table 2 — Standardized length of socket and spigot pipes**

DN	Standardized length $L_u$ <sup>a</sup> m
80 to 600	3 or 5 or 5,5 or 6
700 to 800	5,5 or 6 or 7
900 to 1400	6 or 7 or 8,15
1500 to 2000	8,15
<sup>a</sup> See 3.34.	

The permissible deviations (see 3.35) on the standardized length  $L_u$  of pipes shall be as follows:

- for standardized length 8,15 m  $\pm$  150 mm;
- for all other standardized lengths  $\pm$  100 mm.

Pipes shall be designed to a length taken in the range: standardized length plus or minus the permissible deviation; they shall be manufactured to this design length plus or minus the limit deviation given in 4.2.3.4.

The manufacturer shall make the information available as to his design lengths.

The length shall be measured according to 6.1.4 and shall be within the limit deviations given in 4.2.3.4.

Of the total number of socket and spigot pipes to be supplied in each diameter, the percentage of shorter pipes shall not exceed 10 %, in which case the length reduction shall be:

- up to 0,15 m for the pipes in which samples have been cut for testing (see 4.3);
- up to 2 m by increments of 0,5 m for DN < 700;
- up to 3 m by increments of 0,1 m for DN  $\geq$  700.

#### 4.2.3.2 Standardized lengths of flanged pipes

The length of flanged pipes shall comply with EN 545.