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**Cevi, fitingi in dodatki iz duktilne litine za kanalizacijo - Zahteve in postopki preskušanja**

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

Rohre, Formstücke, Zubehörteile 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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23.040.40	Kovinski fitingi	Metal fittings
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# CEN

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This European Standard was prepared by AHG2 "Sewerage pipelines" of CEN/TC 203 "Cast iron pipes, fittings and their joints" of which the secretariat is held by AFNOR.

It is one of a series of standards for cast iron products for pipelines for various applications.

This European Standard has been prepared under a Mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements or EC Directive(s).

It deals with the subjects covered by the International Standards ISO 7186, ISO 4179 and ISO 8179. The major differences are the presentation in one single standard and the addition of product performance specifications.

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

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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of an identical text or by endorsement, at the latest by march 1995, and conflicting national standards shall be withdrawn at the latest by march 1995.

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

## 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, or with positive or negative pressure.
- Installed below or above ground.
- For conveyance of surface water, domestic waste water and certain types of industrial effluents, either in separate systems or in mixed systems.

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

This standard specifies products for gravity sewerage pipelines, for negative pressure pipelines and for pipelines operating at pressures which do not normally exceed 6 bar. For higher-pressure applications, special pipe thickness may be required by agreement between manufacturer and purchaser.

This 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.

This 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 100 to DN 2000 inclusive.

This standard applies to pipes, fittings and accessories which are:

- manufactured with socketed, flanged 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 fluid temperatures up to 50 °C excluding frost.

**2 Normative references**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place 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 196-1: 1989      **Methods of testing cement - Determination of strength**
- prEN 476: 1991      **General requirements for components used in discharge pipes, drains and sewers for gravity systems**
- EN 545: 1994      **Ductile iron pipes, fittings, accessories and their joints for water pipelines. Requirements and test methods**
- prEN 1092-2: 1993      **Cast iron flanges: PN designated**
- EN 10002-1: 1990      **Metallic materials - Tensile testing - Part 1: Method of test (at ambient temperature)**
- EN 29002: 1987      **Quality systems - Model for quality assurance in production and installation**
- EN 45012: 1989      **General criteria for certification bodies operating quality system certification**
- ISO 4633: 1983      **Rubber seals - Joint rings for water supply, drainage and sewerage pipelines - Specification for materials**
- ISO 6506: 1981      **Metallic materials - Hardness tests - Brinell test**
- ISO 6708: 1980      **Pipe components - Definition of nominal size**
- ISO 7268: 1983      **Pipe components - Definition of nominal pressure**
- ISO 7268/A1: 1984      **Pipe components - Definition of nominal pressure - Amendment 1**
- ISO 7483: 1991      **Dimensions of gaskets for use with flanges to ISO 7005**

### 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 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, e.g.

- 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-on.

**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.

**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.

**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 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 pipe axis before jointing.

**3.8 collar; coupling:** Connecting piece used to join together the spigots of mating pipes or fittings.

**3.9 spigot:** Male end of a pipe or fitting.

**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 centerline .

**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:** Numerical designation of size which is common to all components in a piping system. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions. [See ISO 6708].

**3.19 nominal pressure PN:** Numerical designation expressed by a number which is used for reference purposes. All components of the same nominal size DN designated by the same PN number have compatible mating dimensions. [See ISO 7268 and ISO 7268/A1].

**3.20 diametral stiffness of a pipe:** Characteristic of a pipe which allows it to resist ovalization under loading when installed.

**3.21 discharge system:** System of pipes, fittings, accessories and joints used to collect and drain waste water and rainwater of a building; it comprises discharge pipes, stack ventilation pipes and rainwater downpipes, installed within the limits of a building or attached to the building.

**3.22 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.

**3.23 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.

**3.24 gravity sewer:** Sewer operating normally under free flowing conditions.

**3.25 pressure sewer; pumping sewer:** Sewer (or section of a sewer) operating under positive pressure.

**3.26 vacuum sewer:** Sewer operating under negative pressure.

**3.27 combined system:** Sewerage system collecting together rainwater, surface water and waste water.

**3.28 separate system:** Sewerage system where are separately collected:

- rainwater and surface water;
- waste water.

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

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**3.30 type test:** Proof of design test which is done once and is repeated only after change of design.

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**3.31 length:** Effective length of a pipe or fitting (see figure in 9.1).

NOTE: For flanged pipes and fittings, the effective length  $L$  is equal to the overall length. For socketed pipes and fittings, the effective length  $L_u$  is equal to the overall length minus the spigot insertion depth as given in the manufacturer's catalogues.

**3.32 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 clause 4. 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 9.2 and 9.3, are supplied with reference to this standard, they shall comply with all the other requirements of this 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: 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1 000, 1 100, 1 200, 1 400, 1 500, 1 600, 1 800, 2 000.

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NOTE 2: These DN values are DN/D in the meaning of prEN 476.

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

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NOTE 3: When installed and operated under the conditions for which they are designed (see annexes A to C) ductile iron pipes, fittings, accessories and their joints maintain all their functional characteristics over their 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 a written procedure included in the manufacturer's quality assurance system;
- the repaired pipes and fittings shall comply with all the requirements of clauses 4 and 5.

### 4.1.3 *Types of joints and interconnection*

#### 4.1.3.1 *General*

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

Rubber gasket materials shall comply with the requirements of ISO 4633. When materials other than rubber are necessary (e.g. for flanged joints), they shall comply with the appropriate EN standard or where no EN standard exists, the appropriate ISO standard.

#### 4.1.3.2 *Flanged joints*

The dimensions and tolerances of the flanges of pipes and fittings shall comply with prEN 1092-2 and flange gaskets with ISO 7483. This ensures interconnection between all flanged components (pipes, fittings, valves, etc.) 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.

#### 4.1.3.3 *Flexible joints*

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Pipes and fittings with flexible joints shall comply with 4.2.1.1 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 which may have external diameters not in compliance with 4.2.1.1, the manufacturer's guidance should be followed as to the appropriate means of interconnection (e.g. adaptors).

#### 4.1.4 *Colour identification*

Pipes and fittings for sewers and drains shall be identified externally by one of the following colours: brown, red or grey.

NOTE: This is to allow easy identification of installed sewers and drains and to avoid mistaking with pipelines for water and gas supply.

## 4.2 Dimensional requirements

### 4.2.1 Diameter

#### 4.2.1.1 External diameter

Subclause 9.1 specifies the values of the external diameter DE of the spigot ends of pipes and fittings and their maximum allowable tolerances, when measured using a circumferential tape in accordance with 6.1.1.

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

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. For  $DN > 300$ , the same applies to a percentage of the pipes, when they need to be cut on site, after agreement between manufacturer and purchaser.

In addition, the ovality (see 3.32) of the spigot end of pipes and fittings shall:

- remain within the tolerances on DE (see table 11) for DN 100 to DN 200;
- not exceed 1 % for DN 250 to DN 600 or 2 % for DN > 600.

NOTE 2: 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.

#### 4.2.1.2 Internal diameter

The nominal values of the internal diameters of centrifugally cast 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 apply to lined pipes.

NOTE 1: These tolerances apply to the pipe thicknesses given in table 11 and to the internal cement mortar lining thicknesses given in table 4. Where thicker iron and/or lining thicknesses are agreed between manufacturer and purchaser, these tolerances do not apply.

NOTE 2: Due to the manufacturing process of iron pipes and their internal linings, internal diameters with a maximum negative tolerance will only appear locally along the pipe length.