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

Ductile iron pipes, fittings, accessories and their joints for gas pipelines - Requirements and test methods

iTeh STANDARD PREVIEW

Rohre, Formstücke, Zuberhörteile aus duktilem Gusseisen und ihre Verbindungen für Gasleitungen - Anforderungen und Prüfverfahren

[SIST EN 969:2009](#)

Tuyaux, raccords et accessoires en fonte ductile et leurs assemblages pour canalisations de gaz - Prescriptions et méthodes d'essai

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Ductile iron pipes, fittings, accessories and their joints for gas pipelines - Requirements and test methods

Tuyaux, raccords et accessoires en fonte ductile et leurs assemblages pour canalisations de gaz - Prescriptions et méthodes d'essai

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This European Standard was approved by CEN on 10 February 2009.

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Contents

Page

Foreword.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Technical requirements	9
4.1 General.....	9
4.1.1 Ductile iron pipes and fittings	9
4.1.2 Surface condition and repair	10
4.1.3 Types of joints and interconnection.....	10
4.2 Dimensional requirements.....	11
4.2.1 Wall thickness	11
4.2.2 Diameter.....	12
4.2.3 Length	12
4.2.4 Straightness of pipes	14
4.3 Material characteristics	14
4.3.1 Tensile properties	14
4.3.2 Hardness.....	14
4.4 Coatings and linings for pipes	15
4.4.1 General.....	15
4.4.2 External coating of zinc with finishing layer.....	16
4.5 Coatings for fittings and accessories.....	16
4.5.1 General.....	16
4.5.2 Paint coatings	17
4.6 Marking of pipes and fittings.....	17
4.7 Leak tightness.....	18
5 Performance requirements for joints.....	18
5.1 General.....	18
5.2 Flexible joints	18
5.2.1 General.....	18
5.2.2 Test conditions	19
5.2.3 Test parameters	19
5.3 Restrained flexible joints	20
5.4 Flanged joints as cast, screwed, welded and adjustable	20
6 Test methods.....	21
6.1 Pipe dimensions	21
6.1.1 Wall thickness	21
6.1.2 External diameter.....	21
6.1.3 Internal diameter	21
6.1.4 Length	21
6.2 Straightness of pipes	22
6.3 Tensile testing.....	22
6.3.1 Samples	22
6.3.2 Preparation of test bar	22
6.3.3 Apparatus and test method	23
6.3.4 Test results.....	24
6.4 Brinell hardness.....	24
6.5 Works leak tightness test for pipes and fittings.....	24
6.5.1 General.....	24
6.5.2 Centrifugally cast pipes	24

6.5.3	Pipes not centrifugally cast and fittings	25
6.6	Zinc mass	25
6.7	Thickness of paint coatings	26
7	Performance test methods	26
7.1	Leak tightness of flexible joints to positive internal pressure	26
7.2	Leak tightness of flexible push-in joints to positive external pressure	27
7.3	Leak tightness and mechanical resistance of flanged joints	28
8	Tables of dimensions	28
8.1	Socket and spigot pipes	28
8.2	Flanged pipes	29
8.2.1	General	29
8.2.2	Centrifugally cast pipes with welded flanges	30
8.2.3	Centrifugally cast pipes with screwed flanges	30
8.2.4	Pipes with integrally cast flanges	30
8.3	Fittings for socketed joints	30
8.3.1	General	30
8.3.2	Flanged sockets	30
8.3.3	Flanged spigots	31
8.3.4	Collars	32
8.3.5	Double socket 90° (1/4) bends	33
8.3.6	Double socket 45° (1/8) bends	33
8.3.7	Double socket 22°30' (1/16) bends	34
8.3.8	Double socket 11°15' (1/32) bends	35
8.3.9	All socket tees	36
8.3.10	Double socket tees with flanged branch, DN 40 to DN 250	38
8.3.11	Double socket tees with flanged branch, DN 300 to DN 600	40
8.3.12	Double socket tapers	41
8.4	Fittings for flanged joints	43
8.4.1	Double flanged 90° (1/4) bends	43
8.4.2	Double flanged duckfoot 90° (1/4) bends	43
8.4.3	Double flanged 45° (1/8) bends	45
8.4.4	Double flanged 22°30' (1/16) bends	46
8.4.5	Double flanged 11°15' (1/32) bends	46
8.4.6	All-flanged tees, DN 40 to DN 250	47
8.4.7	All-flanged tees, DN 300 to DN 600	49
8.4.8	Double flanged tapers	50
8.4.9	Blank flanges PN 10	51
8.4.10	Blank flanges PN 16	51
8.4.11	Reducing flanges PN 10	52
8.4.12	Reducing flanges PN 16	53
9	Evaluation of conformity	54
9.1	General	54
9.2	Initial performance testing	54
9.2.1	General	54
9.2.2	Characteristics	54
9.2.3	Treatment of calculated values and design	54
9.2.4	Sampling, testing and conformity criteria	55
9.3	Factory production control (FPC)	55
9.3.1	General	55
9.3.2	FPC requirements for all manufacturers	56
9.3.3	Manufacturer-specific FPC system requirements	58
Annex A (normative)	Longitudinal bending resistance of pipes	60
Annex B (normative)	Diametral stiffness of pipes	61
Annex C (informative)	Field of use, characteristics of soils	63
Annex D (informative)	Calculation method of buried pipelines, heights of cover	64
D.1	Calculation method	64

EN 969:2009 (E)

D.1.1	Calculation formula	64
D.1.2	Pressure from earth loading	64
D.1.3	Pressure from traffic loading.....	65
D.1.4	Bedding factor, K	65
D.1.5	Factor of lateral pressure, f	65
D.1.6	Modulus of soil reaction, E'	65
D.2	Heights of cover.....	66
Annex ZA	(informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	67
ZA.1	Scope and relevant characteristics	67
ZA.2	Procedure for attestation of conformity of ductile iron pipes, fittings, accessories and their joints for gas applications.	69
ZA.2.1	System of attestation of conformity	69
ZA.2.2	Declaration of conformity	69
ZA.3	CE marking and labelling.....	70
Bibliography	73

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[SIST EN 969:2009](#)

<https://standards.iteh.ai/catalog/standards/sist/d0d8871f-cbe6-44c6-a9fc-bfa7480777ff/sist-en-969-2009>

Foreword

This document (EN 969:2009) 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 September 2009, and conflicting national standards shall be withdrawn at the latest by December 2010.

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 969:1995.

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 of the EU Construction Products Directive (89/106/EEC).

This European Standard is in conformity with the general requirements already established by CEN/TC 165 "Waste water engineering" 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 969 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 the United Kingdom.

EN 969:2009 (E)**1 Scope**

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

- to convey air or combustible gases (e.g. natural gas or town gas) at pressures up to 16 bar;
- to be installed below or above ground.

NOTE 1 A combustible gas is a gas or any fuel that is in gaseous state at a temperature of 15 °C at a pressure of 1 bar.

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 gas temperatures between – 15 °C and 50 °C.

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, in a size range extending from DN 40 to DN 600 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 shape 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).

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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 545:2006, *Ductile iron pipes, fittings, accessories and their joints for water pipelines — Requirements and test methods*

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

EN 682, *Elastomeric seals — Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids*

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

3 Terms and definitions

For the purposes of this European Standard, 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:

- glands and bolts for mechanical flexible joints (see 3.13)
- glands, bolts and locking rings for restrained flexible joints (see 3.14)
- pipe saddles for service cock connection
- adjustable flanges and flanges to be welded or screwed-on

NOTE

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

3.5

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) or adjustable; an adjustable flange comprises a ring, in one or several parts assembled together, which bears on an end hub and can freely rotate around the barrel axis before jointing.

3.6

spigot

male end of a pipe or fitting

3.7

spigot end

maximum insertion depth of the spigot plus 50 mm

3.8

socket

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

3.9

gasket

sealing component of a joint

EN 969:2009 (E)**3.10****joint**

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

3.11**flexible joint**

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

3.12**push-in flexible joint**

flexible joint assembled by pushing the spigot through the gasket in the socket of the mating component

3.13**mechanical flexible joint**

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

3.14**restrained flexible joint**

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

3.15**flanged joint**

joint between two flanged ends

3.16**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]

3.17**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]

3.18**leak tightness test pressure**

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

3.19**allowable operating pressure****PFA**

maximum pressure that a component can withstand continuously in service

3.20**allowable maximum operating pressure****PMA**

maximum pressure occurring from time to time, including surge, that a component is capable of withstanding in service

3.21**allowable test pressure****PEA**

maximum hydrostatic pressure that a newly installed component is capable of withstanding for a relatively short duration, in order to insure the integrity and tightness of the pipeline

3.22**diametral stiffness of a pipe**

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

3.23**performance test**

proof of design test which is done once and is repeated only after change of design

3.24**length**

effective length of a pipe or fitting, as shown on the figures of Clause 8

NOTE For flanged pipes and fittings, the effective length L (l for branches) is equal to the overall length. For socketed pipes and fittings, the effective length L_U (l_U for branches), is equal to the overall length minus the spigot insertion depth as given in the manufacturer's catalogues.

3.25**deviation**

design length allowance with respect to the standardized length of a pipe or a fitting

3.26**ovality**

out of roundness of a pipe section; it is equal to:

$$100 \left(\frac{A_1 - A_2}{A_1 + A_2} \right)$$

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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**

The supplier shall make available the allowable service pressure of his pipes and fittings.

Nominal sizes, thickness classes, 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 (insofar as this agreement does not conflict with any regulatory requirement), pipes and fittings with different wall thickness classes, lengths and/or coatings and other types of fittings than those given in 8.3 and 8.4, 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 angle branches, tees and tapers with other combinations DN × dn, etc.

EN 969:2009 (E)

The standardized nominal sizes DN of pipes and fittings are as follows: 40, 50, 60, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500 and 600.

Annexes A and B, respectively, give the longitudinal bending resistance and the diametral stiffness of ductile iron pipes.

NOTE 2 The maximum allowable pressure for gas application is 16 bar which gives a mechanical safety factor of at least $2,25 \cdot 3 = 6,75$ for the DN 600 or more for smaller diameters (see Annex A of EN 545:2006 for the calculation method).

NOTE 3 When installed and operated under the conditions for which they are designed (see Annex C and Annex D), 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 repair

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 extend through the entire wall thickness, provided that:

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

4.1.3 Types of joints and interconnection

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4.1.3.1 General

Rubber gasket materials shall comply with the requirements of EN 681-1 or EN 682 depending on air or gas. When materials other than rubber are necessary (e.g. for flanged joints), they shall comply with the appropriate European Standard or, where no European Standard exists, the appropriate International Standard.

4.1.3.2 Flanged joints

Flanges shall be constructed in such a way 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 state in his catalogues whether his products are normally delivered with fixed flanges or adjustable flanges.

NOTE 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 diameter 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 different 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 can have 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).

NOTE 3 If components of different suppliers are used, care should be taken to ensure that the requirements of the performance tests are met.

4.2 Dimensional requirements

4.2.1 Wall thickness

The nominal iron wall thickness of pipes and fittings shall be calculated as a function of the nominal size, DN, by the following formula (K class formula), with a minimum of 6 mm for pipes and 7 mm for fittings:

$$e = K(0,5 + 0,001 \text{ DN}) \quad (1)$$

where

e is the nominal wall thickness, in millimetres;

DN is the nominal size;

K is a coefficient used for thickness class designation. It is selected from a series of whole numbers: e.g. 8, 9, 10, 11, 12, etc.

For pipes, the standardized thickness classes are given in 8.1. Other thicknesses are possible for pipes.

For the fittings, the thickness e given in tables and on figures of 8.3 and 8.4, is the nominal thickness corresponding to the main part of the body. The actual thickness at any particular point requires to be increased to meet localized high stresses depending on the shape of the casting (e.g. at internal radius of bends, at the branch-body junction of tees, etc.).

The limit deviations on the nominal wall thickness of pipes and fittings shall be as given in Table 1. The measurement of wall thickness shall be in accordance with 6.1.1.

Table 1 – Limit deviations on thickness of pipes and fittings

Dimensions in millimetres

Type of casting	Nominal iron wall thickness	Limit deviation on the nominal wall thickness ^a
Pipes centrifugally cast	≤ 6,0	– 1,3
	> 6,0	– (1,3 + 0,001 DN)
Pipes not centrifugally cast and fittings	≤ 7,0	– 2,3
	> 7,0	– (2,3 + 0,001 DN)

^a The lower limit only is given, so as to ensure sufficient resistance to internal pressure.

EN 969:2009 (E)**4.2.2 Diameter****4.2.2.1 External diameter**

Subclause 8.1 specifies the values of the external diameter DE of the coated spigot ends of pipes and fittings and their maximum allowable limit deviations, when measured using a circumferential tape in accordance with 6.1.2. These limit deviations apply to the spigot ends of all thickness classes of pipes and fittings.

NOTE 1 Certain types of flexible joints operate within a different 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 when the pipe needs to be cut on site.

For $DN > 300$, the above requirement applies to a minimum of 5 % of the pipes manufactured, defined by agreement between manufacturer and purchaser insofar as any such agreement would not be in conflict with any regulatory requirements. Such pipes shall be marked.

In addition, the ovality (see 3.26) of the spigot end of pipes and fittings shall:

- remain within the tolerance on DE (see Table 11) for DN 40 to DN 200;
- not exceed 1 % for DN 250 to DN 600.

NOTE 2 For specific projects, the purchaser should consider any requirement for pipes $DN > 300$ meeting the above specification.

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

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The nominal values of the internal diameter of centrifugally cast pipes, expressed in millimetres, are equal to the numbers indicating their nominal size, DN.

Their lower limit deviation shall be – 10mm, which 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.

4.2.3 Length**4.2.3.1 Standardized lengths of socket and spigot pipes**

Pipes shall be supplied in standardized lengths of 3 m, 5 m, 5,5 m and 6 m.

The deviations (see 3.25) on the standardized length L_u of pipes may be ± 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 Table 4.

The manufacturer shall show his design lengths (see 3.24) in his catalogues.

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

4.2.3.2 Standardized lengths of flanged pipes

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

Table 2 – Standardized lengths of flanged pipes

Dimensions in metres

Type of pipe	Standardized lengths L^a
With cast flanges	0,5 or 1 or 2 or 3
With screwed or welded flanges	2 or 3 or 4 or 5
^a See 3.24. Other lengths are available by agreement between manufacturer and purchaser.	

4.2.3.3 Standardized lengths of fittings

Fittings shall be supplied to the standardized lengths as given in 8.3 and 8.4.

NOTE Two series of dimensions are shown, the series A corresponding to ISO 2531 and the series B, generally limited up to DN 450.

The permissible deviations (see 3.25) on the standardized length of series A fittings shall be as given in Table 3. No deviation is permitted for the fittings of series B. Fittings 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 deviations given in Table 4.

Table 3 – Permissible deviations on standardized lengths of fittings

Dimensions in millimetres

Type of fitting	Deviation
Flanged sockets Flanged spigots Collars, tapers	± 25
Tees	+ 50 / – 25
Bends 90° (1/4)	$\pm (15 + 0,03) \text{ DN}$
Bends 45° (1/8)	$\pm (10 + 0,025) \text{ DN}$
Bends 22°30' and 11°15' (1/16 and 1/32)	$\pm (10 + 0,02) \text{ DN}$

4.2.3.4 Limit deviations

The limit deviations on lengths shall be as given in Table 4.