



SLOVENSKI STANDARD

SIST EN 681-1:2000

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Elastomerna tesnila – Zahteve za materiale za tesnila za uporabo v napeljavah za vodo in kanalizacijo – 1. del: Vulkanizirana guma

Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber

Elastomer-Dichtungen - Werkstoff-Anforderungen für Rohrleitungs-Dichtungen für Anwendungen in der Wasserversorgung und Entwässerung - Teil 1: Vulkanisierter Gummi

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Garnitures d'étanchéité en caoutchouc - Spécification des matériaux pour garnitures d'étanchéité pour joints de canalisations utilisées dans le domaine de l'eau et de l'évacuation - Partie 1: Caoutchouc vulcanisé

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ICS:

23.040.80	Tesnila za cevne zveze	Seals for pipe and hose assemblies
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English version

**Elastomeric seals - Materials requirements for pipe
joint seals used in water and drainage applications
- Part 1: Vulcanized rubber**

Garnitures d'étanchéité en caoutchouc -
Spécification des matériaux pour garnitures
d'étanchéité pour joints de canalisations
utilisées dans le domaine de l'eau et de
l'évacuation - Partie 1: Caoutchouc vulcanisé

Elastomer-Dichtungen - Werkstoff-Anforderungen
für Rohrleitungs-Dichtungen für Anwendungen in
der Wasserversorgung und Entwässerung - Teil 1:
Vulkanisierter Gummi

This European Standard was approved by CEN on 1996-04-07. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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European Committee for Standardization
Comité Européen de Normalisation
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Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 208 “Elastomeric seals for joints in pipework and pipelines” the secretariat of which is held by BSI.

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 October 1996, and conflicting standards shall be withdrawn at the latest by October 1996.

This part is based on ISO 4633 and ISO 9631, bringing these two sets of requirements (for cold and hot water respectively) under one specification. The major changes from ISO 4633 and ISO 9631 have been to incorporate requirements for effect on water quality and ozone resistance. The emphasis in respect of low temperature testing has moved away from hardness measurement to compression set, which is more discriminating.

A European Standard is to be prepared for material effects on water quality and when published it is intended that materials comply with the requirements of that standard.

A European Standard is also to be prepared for microbiological deterioration requirements and when published it is intended that materials comply with the requirements of that standard.

Part 2 has been prepared by CEN/TC 208 in response to requests from CEN/TC 155 for a material specification for thermoplastic elastomer seals for use in conjunction with non-pressure thermoplastic pipe systems.

Part 3 has been prepared in response to those sections of the pipeline industry which employ cellular seals of vulcanized rubber.

Part 4 has been prepared in response to those sections of the pipeline industry which employ cast polyurethane seals.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of 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 and the United Kingdom.

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0 Introduction

The product (in accordance with this standard) which is in permanent or temporary contact with water, intended for human consumption, does not adversely affect the quality of the drinking water and does not contravene the EC Directives and EFTA Regulations on the quality of drinking water.

1 Scope

This Standard specifies requirements for materials used in vulcanized rubber seals for:

- 1) cold potable water supply (up to 50 °C);
- 2) hot potable and non-potable water supply (up to 110 °C);
- 3) drainage, sewerage and rainwater systems (continuous flow up to 45 °C and intermittent flow up to 95 °C);

The different designations of seals specified are defined according to their type, application and requirements (see table 4)

General requirements for finished joint seals are also given; any additional requirements called for by the particular application are specified in the relevant product standards taking into account that the performance of pipe joints is a function of the seal material properties, seal geometry and pipe joint design. This standard should be used where appropriate with product standards which specify performance requirements for joints.

This Standard is applicable to joint seals for all pipeline materials, including iron, steel, clay, fibre cement, concrete, reinforced concrete, plastics and glass-reinforced plastics.

It is applicable to elastomeric components of composite or non composite seals. In case of composite seals for materials of hardness ranges from 76 IRHD to 95 IRHD the requirements for elongation at break, compression set and stress relaxation apply only when the material is participating in the sealing function, or the long term stability of the seal.

Joint seals made with an enclosed void as part of their design are included in the scope of this European Standard.

2 Normative references

This European Standard incorporates by dated or undated references, 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.

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|------------|--|
| ISO 37 | Rubber, vulcanized or thermoplastic - Determination of tensile stress - strain properties |
| ISO 48 | Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD) |
| ISO 188 | Rubber, vulcanized - Accelerated ageing or heat-resistance tests |
| ISO 471 | Rubber - Times, temperatures and humidities for conditioning and testing |
| ISO 815 | Rubber, vulcanized or thermoplastic - Determination of compression set at ambient, elevated or low temperatures |
| ISO 816 | Rubber, vulcanized - Determination of tear strength of small test pieces (Delft test pieces) |
| ISO 1431-1 | Rubber, vulcanized or thermoplastic - Resistance to ozone cracking
Part 1 : Static strain test |
| ISO 1629 | Rubber and latices - Nomenclature |
| ISO 1817 | Rubber, vulcanized - Determination of the effect of liquids |
| ISO 2285 | Rubber, vulcanized or thermoplastic - Determination of tension set at normal and high temperatures |
| ISO 2859-1 | Sampling procedures for inspection by attributes - Part 1 : Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection |
| ISO 3302 | Rubber - Dimensional tolerances for use with products |
| ISO 3384 | Rubber, vulcanized or thermoplastic - Determination of stress relaxation in compression at ambient and at elevated temperatures |
| ISO 3387 | Rubbers - Determination of crystallization effects by hardness measurements |
| ISO 3951 | Sampling procedures and charts for inspection by variables for percent nonconforming |

ISO 4661-1	Rubber, vulcanized or thermoplastic - Preparation of samples and test pieces Part 1 : Physical tests
ISO 9691:1992	Rubber - Recommendations for the workmanship of pipe joint rings - Description and classification of imperfections
EN ISO 9002	Quality Systems - Model for quality assurance in production and installation
EN 45011	General criteria for certification bodies operating product certification
EN 45012	General criteria for certification bodies operating quality system certification

3 Classification

Six classes of materials for pipe joint seals are specified in table 2, and 5 classes of materials in table 3.

A nominal hardness shall be specified within the ranges in table 1.

Table 1: Hardness classification

Hardness class	40	50	60	70	80	90
Range of hardness, IRHD	36 to 45	46 to 55	56 to 65	66 to 75	76 to 85	86 to 95

4 Requirements

4.1 Materials

4.1.1 General

The materials shall be free of any substances which may have a deleterious effect on the fluid being conveyed, or on the life of the seal, or on the pipe or fitting. Elastomeric components of composite seals not exposed to the contents of the pipeline are not required to meet clause 4.1.2.

4.1.2 Effect on water quality

For cold and hot potable water applications, the materials shall not impair the quality of the water under the conditions of use. The materials shall comply with the national requirements in the country of use.

4.2 Finished seal requirements

4.2.1 Dimensional tolerances

Tolerances shall be specified from the appropriate classes in ISO 3302.

4.2.2 Imperfections and defects

The seals shall be free of defects or irregularities which could affect their function. Classification of imperfections shall be according to ISO 9691 : 1992, as follows:

- surface imperfections in zones involved in the sealing function as described in clause 4.1.1 of ISO 9691 : 1992 shall be considered as defects.

- surface imperfections in zones not involved in the sealing function as described in clause 4.1.2.1 b) of ISO 9691 : 1992 shall not be considered as defects.

NOTE 1: Major surface imperfections in zones not involved in the sealing function as described in clause 4.1.2.1 a) of ISO 9691 : 1992 could be considered as defects. This should be agreed between the interested parties; the acceptance criteria depend upon the seals' type or design respectively.

NOTE 2: Internal imperfections as described in clause 4.2 of ISO 9691 : 1992 could be considered as defects. The compressive force can be determined according to ISO 7743¹⁾. The acceptable limiting values of the compressive force should be agreed between the interested parties; they depend upon the seals' type or design respectively.

4.2.3 Hardness

When determined by the micro-test method specified in ISO 48, the hardness shall comply with the requirements given in tables 2 and 3.

NOTE : If the dimensions of a seal are appropriate, the normal test method specified in ISO 48 may be used, provided that the micro-test method is used for reference purposes. (standards.iteh.ai)

For the same seal, or along the greatest length of an extruded profile cut to make the seal, the difference between the minimum and maximum hardness shall not be more than 5 IRHD. Each value shall be within the specified tolerances.

4.2.4 Tensile strength and elongation at break

¹⁾ ISO 7743 Rubber, vulcanized or thermoplastic - Determination of compression stress - strain properties

The tensile strength and elongation at break shall be determined by the method specified in ISO 37. Dumb-bell shaped test pieces of types 1, 2, 3 or 4 shall be used. Type 2 is the preferred type. The test report shall state the dumb-bell type whenever type 2 is not used.

The tensile strength and the elongation at break shall comply with the requirements given in tables 2 and 3.

4.2.5 Compression set in air

4.2.5.1 General

If the test piece is taken from a seal, then the measurement shall be carried out as far as possible in the direction of compression of the seal in service.

4.2.5.2 Compression set at 23 °C, 70 °C and 125 °C

When determined by the method specified in ISO 815, at 23 °C, 70 °C and 125 °C, using the small type B test piece, the compression set shall comply with the requirements given in tables 2 and 3.

Where the cross section is too small to obtain compression buttons from the product, as an alternative to moulding buttons, the tension set of the product may be determined, using the method specified in ISO 2285 with a strain of 50 % and shall comply with the same test conditions (except strain) and requirements as for compression set.

4.2.5.3 Low temperature compression set at (-10 °C)

When determined by the method specified in ISO 815, at - 10 °C, using the small type B test piece and the (30 ± 3) minute recovery measurement, the compression set of seals used in cold water supply, drainage and sewerage applications shall comply with the requirements given in table 2.

4.2.6 Accelerated ageing in air

Test pieces prepared for the determination of hardness according to 4.2.3 and for the determination of tensile strength and elongation at break (see 4.2.4) shall be aged in air by the normal oven method specified in ISO 188, for the following temperatures and times:

- joint seals for cold water supply, drainage and sewerage, 7 days at 70 °C.
- joint seals for continuous hot water supply, 7 days at 125 °C.

The changes in hardness, tensile strength and elongation at break shall comply with the requirements given in tables 2 and 3.

4.2.7 Stress relaxation in compression

The stress relaxation shall be determined by method A of ISO 3384 using the small cylindrical test piece after applying mechanical and thermal conditioning. Measurements shall be taken after 3 hours, 1, 3, 7 days for the 7 day test and after 3 hours, 1, 3, 7, 30, 100 days for the 100 days test. The best fit straight line shall be determined by regression analysis using a logarithmic time scale and the correlation coefficient r derived from this analysis shall not be lower than 0,98. The 7 and 100 days requirements in tables 2 and 3 are those derived from this straight line.

The stress relaxation in compression shall comply with the requirements given in tables 2 and 3 at the following temperatures and times:

Joint seals for cold water supply, drainage, sewerage and rainwater systems	7 days at $23\text{ °C} \pm 2\text{ °C}$ and 100 days at $23\text{ °C} \pm 2\text{ °C}$
Joint seals for hot water supply	7 days at $23\text{ °C} \pm 2\text{ °C}$ and 7 days at $125\text{ °C} \pm 2\text{ °C}$

The test temperature shall be maintained within the specified tolerance during the whole period of the test and verified by suitable recording equipment on a continuous basis.

The 100 days test shall be considered as a type approval test. The requirement in respect of stress relaxation per logarithmic decade shall also be regarded as a type approval requirement.

If the test piece is taken from a seal, then the measurement shall be carried out as far as possible in the direction of compression of the seal in service.

Where the cross section is too small to obtain compression buttons from the product, as an alternative to moulding test pieces the stress relaxation in tension of the product may be determined, using the method specified in Annex A with the same requirements as for stress relaxation in compression.

For seals manufactured from isoprene - isobutylene copolymers see 4.2.11 for an alternative test.

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4.2.8 Volume change in water

When determined by the method specified in ISO 1817 after 7 days immersion in distilled or deionised water at the temperatures specified below:

- Joint seals for cold water supply, drainage, sewerage and rainwater systems 70 °C
- Joint seals for hot water supply 95 °C