
Elastomerna tesnila – Zahteve za materiale za tesnila za uporabo v napeljavah za vodo in kanalizacijo – 3. del: Celularni materiali iz vulkanizirane gume

Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 3: Cellular materials of vulcanized rubber

Elastomer-Dichtungen - Werkstoff-Anforderungen für Rohrleitungs-Dichtungen für Anwendungen in der Wasserversorgung und Entwässerung - Teil 3: Zellige Werkstoffe aus vulkanisiertem Kautschuk

Garnitures d'étanchéité en caoutchouc - Spécification des matériaux pour garnitures d'étanchéité pour joints de canalisation utilisés dans le domaine de l'eau et de l'évacuation -Partie 3: Matériaux cellulaires en caoutchouc vulcanisé

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English version

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This European Standard was approved by CEN on 3 June 2000.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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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of an identical text or by endorsement, at the latest by January 2001, and conflicting national standards shall be withdrawn at the latest by January 2001.

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

This standard should be used where appropriate with product standards which specify performance requirements for joints.

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

It is recommended that third party inspection be carried out at least twice a year without previous notice, the assessment body complying with the requirements of EN 45011 and EN 45012 or equivalent.

Part 1 of this Standard 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.

Part 2 has been prepared in response to requests from CEN/TC155 for a material specification for thermoplastic elastomer seals for use in conjunction with non-pressure thermoplastic pipe systems.

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

This standard should be used where appropriate with product standards which specify performance requirements for joints.

Seals and pipe joints using cellular materials of vulcanized rubber should be designed and tested to take into account the different requirements compared with those specified in Part 1 of this Standard.

The annexes A and B are normative. Annex C is informative.

1 Scope

This standard specifies requirements for materials used in vulcanized rubber seals of cellular materials for non pressurized drainage, sewerage and rainwater systems and non-pressure non-potable water supply (continuous flow up to 45 °C).

General requirements for the 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 is applicable to joint seals for pipeline materials of vitrified clay, fibre cement, concrete, reinforced concrete, plastics and glass-reinforced plastics.

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.

ISO 37	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
ISO 188	Rubber, vulcanized - Accelerated ageing or heat-resistance tests
ISO 471	Rubber - Temperatures, humidities and times for conditioning and testing
ISO 815	Rubber, vulcanized or thermoplastic - Determination of compression set at ambient, elevated or low temperatures
ISO 1431-1	Rubber, vulcanized or thermoplastic - Resistance to ozone cracking - Part 1 : Static strain test
ISO 1817	Rubber, vulcanized - Determination of the effect of liquids
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 3302-1	Rubber - Tolerances for products - Part 1: Dimensional tolerances
ISO 3384:1999	Rubber, vulcanized or thermoplastic - Determination of stress relaxation in compression at ambient and at elevated temperatures

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, installation and servicing (ISO 9002:1994)
EN ISO 9003	Quality systems - Model for quality assurance in final inspection and test (ISO 9003:1994)

3 Requirements

3.1 Materials

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 sealing ring, or on the pipe or fitting.

3.2 Finished seal requirements

3.2.1 Dimensional tolerances

Tolerances shall be specified from Class E2 of ISO 3302-1.

3.2.2 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 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 4.1.2.1b) 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 4.1.2.1a) 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 seal's type or design respectively.

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

3.2.3 Compression stress

When determined by the method specified in Annex A, at 25 % deformation, the compression stress shall comply with the requirements in table 1.

The measurement shall be carried out in the direction of compression of the seal in service.

3.2.4 Tensile strength and elongation at break

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 table 1.

3.2.5 Compression set in air

3.2.5.1 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, at 40 % deformation in compression.

3.2.5.2 Compression set at 23° C and 70° C

When determined by the method specified in ISO 815, at 23 °C and 70 °C, using a test piece in accordance with 4.1, the compression set shall comply with the requirements given in table 1.

3.2.5.3 Low temperature compression set at -10° C

When determined by the method specified in ISO 815, at -10 °C, using a test piece in accordance with 4.1 and the (30 ± 3) min recovery measurement, the compression set shall comply with the requirements given in table 1.

3.2.6 Accelerated ageing in air

Test pieces prepared for the determination of compression stress (see 3.2.3), tensile strength and elongation at break (see 3.2.4) shall be aged in air by the normal oven method specified in ISO 188 for 7 days at 70 °C.

The changes in compression stress, tensile strength and elongation at break shall comply with the requirements given in table 1.

3.2.7 Stress relaxation in compression

The stress relaxation shall be determined at 23 °C by method A of ISO 3384:1999, using a test piece in accordance with 4.1, after applying mechanical and thermal conditioning. Measurements shall be taken after 3 h, 1, 3, 7 days for the 7 day test and after 3 h, 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 coefficients derived from these analyses shall not be lower than 0,93 for the 7 day test and 0,83 for the 100 day test. The 7 and 100 days requirements in table 1 are those derived from this straight line.

For continuous measurement using an apparatus described in the first paragraph of 5.2 of ISO 3384 the 7 days and 100 days requirements in table 2 are those derived from the measurements at 7 days and 100 days.

The stress relaxation in compression shall comply with the requirements given in table 1.

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.

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

3.2.8 Volume change in water

When determined by the (volumetric) method specified in ISO 1817 after 7 days immersion (of test pieces) in distilled or deionized water at 70 °C the change in volume shall comply with the requirements given in table 1.

3.2.9 Ozone resistance

When determined by the method specified in ISO 1431-1 under the conditions set out below:

Ozone concentration	(50 ± 5) pphm
Temperature	(40 ± 2) °C
Pretension time	(72 ± 0/-2) h
Exposure time	(48 ± 0/-2) h
Elongation	(20 ± 2)%
Relative humidity	max. (55 ± 10) %

The ozone resistance of sealing elements which are attached to the pipe or fittings shall comply with the requirements given in table 1.

Sealing elements which are protected and packaged separately up to the time of installation shall meet the same requirement but using an ozone concentration of (25 ± 5) pphm.