



**SLOVENSKI STANDARD  
SIST EN 682:2002**

**01-december-2002**

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**Elastomerna tesnila – Zahteve za materiale za tesnila za pipe in napeljavo za plin in vodikooljnikove tekočine**

Elastomeric Seals - Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids

Elastomer-Dichtungen - Werkstoff-Anforderungen für Dichtungen in Versorgungsleitungen und Bauteilen für Gas und flüssige Kohlenwasserstoffe

Garnitures d'étanchéité en caoutchouc - Spécification des matériaux pour garnitures d'étanchéité de joints de canalisations et des raccords véhiculant du gaz et des fluides hydrocarbures

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## Elastomeric Seals - Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids

Garnitures d'étanchéité en caoutchouc - Spécification des matériaux pour garnitures d'étanchéité pour joints de canalisations et des raccords véhiculant du gaz et des fluides hydrocarbures

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This European Standard was approved by CEN on 16 November 2001.

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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 Management Centre has the same status as the official versions.

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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of an identical text or by endorsement, at the latest by August 2002, and conflicting national standards shall be withdrawn at the latest by November 2003.

No existing European Standard is superseded.

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 EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

This European Standard is based on ISO 6447 and ISO 6448, bringing together the requirements for seals used in gas and hydrocarbon fluid applications. The major changes from ISO 6447 and ISO 6448 have been to introduce additional test requirements e.g. an ozone test and to modify some requirements. Finished joint seals have been classified according to their final application and operating temperatures.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

**EN 682:2002 (E)****1 Scope**

This European Standard specifies requirements for elastomeric materials used in seals for supply pipes and fittings, ancillaries and valves at operating temperatures in general from - 5 °C up to 50 °C and in special cases from - 15 °C up to 50 °C, for the following:

General applications (see Table 4, type G)

- a) gaseous fuel (manufactured, natural and liquefied petroleum gas [LPG] in gaseous phase);
- b) hydrocarbon fluids with aromatic content up to 30 % (V/V), including LPG in liquid phase.

Special applications (see Table 4, type H)

Materials suitable for carrying gaseous fuels containing gas condensates and hydrocarbon fluids of unrestricted aromatic content.

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 European Standard should be used where appropriate with product standards which specify performance requirements for joints.

This European Standard is applicable to joint seals for all pipeline materials including iron, steel, copper and plastics.

In the case of composite seals requirements in 4.2.8 and 4.2.9 apply only when the materials used for any elastomeric parts come into contact with gaseous fuel or hydrocarbon fluid.

Elongation at break, tensile strength, compression set and stress relaxation requirements for materials of hardness categories 80 and 90 apply only when they constitute that part of the seal which participates directly in the sealing function or in long term stability.

This standard is not applicable to the following:

- a) seals made from cellular materials;
- b) seals with enclosed voids as part of their design;
- c) seals with requirements of resistance to flame or to thermal stress;
- d) seals which contain splices joining pre-vulcanized profile ends.

## 2 Normative references

This European Standard incorporates by dated or undated reference, 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 (including amendments).

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 188:1998, *Rubber, vulcanized or thermoplastic – Accelerated ageing and 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 schemes indexed by acceptance quality limit (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.*

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**EN 682:2002 (E)****3 Classification**

Five categories of material for seals are specified in Tables 2 and 3.

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

**Table 1 - Hardness categories**

Hardness category	50	60	70	80	90
Range of hardness, IRHD	46 - 55	56 - 65	66 - 75	76 - 85	86 - 95

**4 Requirements****4.1 Materials**

The materials shall be free of any substances which can have a deleterious effect on the life of the seals, or on the pipe and fittings.

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**4.2 Finished seal requirements**

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**4.2.1 Dimensional tolerances**

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Tolerances shall be specified from the appropriate categories in ISO 3302-1.

**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 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 4.1.2.1 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 4.1.2.1 a) of ISO 9691:1992 can be considered as defects. This should be agreed between the interested parties; the acceptance criteria depends upon the seals' type or design respectively.

NOTE 2 Internal imperfections as described in 4.2 of ISO 9691: 1992 can be considered as defects. The compressive force can be determined according to ISO 7743. 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 conform to the requirements given in Tables 2 or 3.

NOTE If the dimensions of a seal are appropriate, the normal test method specified in ISO 48 can be used, provided that the micro-test method is used for reference purposes.

For the same seal, the difference between the minimum and maximum hardness values shall not be more than 4 IRHD. Each value shall be within the specified tolerances.

### 4.2.4 Tensile strength and elongation at break

Tensile strength and elongation at break shall be determined by the method specified in ISO 37. Dumbbell 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 conform to the requirements given in Tables 2 or 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.

#### 1.1.1.2 Compression set at 23 °C and 70 °C

When determined by the method specified in ISO 815, at 23 °C and 70 °C using the small type B test piece, the compression set shall conform to the requirements given in Tables 2 or 3.

#### 4.2.5.3 Low temperature compression set at -5 °C

When determined by the method specified in ISO 815 using the small type B test piece and a recovery time of  $(30 \pm 3)$  min, the compression set after 72 h at -5 °C, when measured at -5 °C, shall conform to the requirements given in Tables 2 or 3.

### 4.2.6 Accelerated ageing in air

Test pieces prepared for the determination of hardness (see 4.2.3) and for the determination of tensile strength and elongation at break (see 4.2.4) shall be aged in air at 70 °C for 7 days by the normal oven method specified in ISO 188:1998 (Method A).

The changes in hardness, tensile strength and elongation at break shall conform to the requirements given in Tables 2 or 3.

### 4.2.7 Stress relaxation in compression

The stress relaxation shall be determined by Method A of ISO 3384:1999, using a test piece in accordance with 5.1, after applying mechanical and thermal conditioning. Measurements shall be taken after 3 h, 1 day, 3 days and 7 days for the 7 days test and after 3 h, 1 day, 3 days, 7 days, 30 days and 90 days for the 90 days test. The best fit straight line shall be determined by regression analysis using a

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logarithmic time scale. The 7 days and 90 days requirements in Tables 2 and 3 are those derived from these straight lines.

The stress relaxation in compression shall conform to the requirements given in Tables 2 or 3.

For continuous measurements using an apparatus described in paragraph one of 5.2 of ISO 3384:1999, the 7 days and 90 days requirements in Tables 2 and 3 are those derived from the measurement at 7 days and 90 days.

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 90 days test shall be considered as a type approval test.

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.

**4.2.8 Volume change in liquid B**

When determined by the method specified in ISO 1817, the volume change after a 7 days immersion at 23 °C in liquid B and, in addition, followed by drying in air for 4 days at 70 °C, shall conform to the requirements given in Tables 2 or 3.

**4.2.9 Volume change in oil**

When determined by the method specified in ISO 1817, after a 7 days immersion at 70 °C in oil IRM 903, the volume change shall conform to the requirements given in Tables 2 or 3.

**4.2.10 Ozone resistance**

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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
Pre-tension time	(72 + 0/-2) h
Exposure time	(48 + 0/-2) h
Elongation:	
hardness categories 50, 60 and 70	(20 ± 2) %
hardness category 80	(15 ± 2) %
hardness category 90	(10 ± 1) %
Relative humidity	(55 ± 10) %

the test pieces shall conform to the requirements given in Tables 2 or 3.

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

**4.2.11 Compression set at - 15 °C**

When determined by the method specified in ISO 815 using the small test piece type B and a recovery time of (30 ± 3) min, the compression set of elastomeric materials which are intended to be used at

temperatures below - 5 °C and down to - 15 °C shall, after 72 h at -15 °C, when measured at - 15 °C, conform to the requirements given in Table 2.

**Table 2 - Requirements for materials used for seals suitable for carrying gaseous fuel and hydrocarbon fluids with aromatic content of up to 30 % (V/V) - (see Table 4, type G)**

Property	Unit	Test method	Clauses	Requirements for hardness categories				
				50	60	70	80	90
Permissible tolerance on nominal hardness	IRHD	ISO 48	4.2.3	± 5	± 5	± 5	± 5	+ 3/-5
Tensile strength, min.	MPa	ISO 37	4.2.4	10	10	10	10	10
Elongation at break, min.	%	ISO 37	4.2.4	400	300	200	150 <sup>a</sup>	80 <sup>a</sup>
Compression set, max.								
72 h at 23 °C	%	ISO 815	4.2.5.2	10	10	10	15 <sup>a</sup>	15 <sup>a</sup>
24 h at 70 °C	%	ISO 815	4.2.5.2	18	18	18	20 <sup>a</sup>	20 <sup>a/b)</sup>
72 h at -5 °C	%	ISO 815	4.2.5.3	25	25	25	40 <sup>a</sup>	40 <sup>a/b)</sup>
Ageing 7 days at 70 °C		ISO 188	4.2.6					
- hardness change, max.	IRHD	ISO 48		± 5	± 5	± 5	± 5	± 5
- tensile strength change, max.	%	ISO 37		± 15	± 15	± 15	± 15	± 15
- elongation at break change, max.	%	ISO 37		+10/-25	+10/-25	+10/-25	+10/-25	+10/-25
Stress relaxation, max.								
- 7 days at 23 °C	%	ISO 3384	4.2.7	12	13	14	15 <sup>a</sup>	15 <sup>a</sup>
- 90 days at 23 °C	%	ISO 3384	4.2.7	18	19	20	22 <sup>a</sup>	22 <sup>a</sup>
Volume change in liquid B after 7 days at 23 °C, max.	%	ISO 1817	4.2.8	+ 35	+ 35	+ 30	+ 30	+ 25
Volume change in liquid B and subsequent 4 days at 70 °C air drying, max.	%	ISO 1817	4.2.8	- 15	- 12	- 10	- 10	- 10
Volume change in oil IRM 903 after 7 days at 70 °C <sup>c</sup>	%	ISO 1817	4.2.9	+ 10/-1	+ 10/-1	+ 10/-1	+ 10/-1	+ 10/-1
Ozone resistance		ISO 1431-1	4.2.10	No cracking when viewed without magnification				
Compression set after 72 h at -15 °C, max <sup>d</sup>	%	ISO 815	4.2.11	40	40	50	60 <sup>a</sup>	65 <sup>a</sup>

<sup>a</sup> Requirements for material of hardness categories 80 IRHD and 90 IRHD are applied only when this material participates directly in the sealing function or in long term stability.

<sup>b</sup> For materials with a hardness ≥ 90 IRHD, the requirement for the compression set at 70 °C is ≤ 40 %. For materials with a hardness ≥ 90 IRHD, the requirement for the compression set at -5 °C is ≤ 50 %.

<sup>c</sup> Not applicable to sealing material types GA and GAL (see Table 4).

<sup>d</sup> For types GAL and GBL only (see Table 4).