



**SLOVENSKI STANDARD**  
**oSIST prEN 681-1:2016**  
**01-september-2016**

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**Elastomerna tesnila - Zahteve za material za tesnila za uporabo v napeljavah za vodo in kanalizacijo - 1. del: Vulkanizirana guma**

Elastomeric seals - Material 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: Elastomere

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

**Ta slovenski standard je istoveten z: prEN 681-1**

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**ICS:**

23.040.80	Tesnila za cevne zveze	Seals for pipe and hose assemblies
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## Elastomeric seals - Material 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: Elastomere

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 208.

If this draft becomes a European Standard, 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.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

	Page
European foreword.....	4
<b>1 Scope .....</b>	<b>5</b>
<b>2 Normative references .....</b>	<b>5</b>
<b>3 Terms and definitions .....</b>	<b>6</b>
<b>4 Application .....</b>	<b>6</b>
<b>5 Requirements .....</b>	<b>7</b>
<b>5.1 Materials.....</b>	<b>7</b>
5.1.1 General.....	7
5.1.2 Effect on water quality .....	7
5.1.3 Material requirements.....	8
<b>5.2 General requirements for seal products .....</b>	<b>11</b>
5.2.1 Dimensional tolerances .....	11
5.2.2 Imperfections and defects.....	11
<b>6 Test methods .....</b>	<b>11</b>
6.1 Test Samples.....	11
6.2 Test conditions.....	12
6.3 Hardness.....	12
6.4 Tensile strength and elongation at break.....	12
6.5 Compression set in air.....	12
6.5.1 Compression set at 23 °C, 70 °C and 125 °C.....	12
6.5.2 Compression set at - 10 °C and - 25 °C.....	12
6.6 Accelerated ageing in air .....	12
6.7 Stress relaxation in compression .....	12
6.8 Volume change in water .....	13
6.9 Ozone resistance .....	13
6.10 Tear strength for joint seals for hot water supply .....	13
6.11 Compression set in water.....	13
6.12 Strength of spliced joints.....	13
6.13 Volume change in oil.....	13
6.14 Hardness change at - 25 °C.....	13
<b>7 Assessment and verification of constancy of performance – AVCP.....</b>	<b>14</b>
7.1 General.....	14
7.2 Type testing.....	14
7.2.1 General.....	14
7.2.2 Test samples, testing and compliance criteria .....	14
7.2.3 Test reports.....	16
7.3 Factory production control (FPC) .....	16
7.3.1 General.....	16
7.3.2 Requirements.....	16
7.3.3 Product specific requirements.....	18
<b>8 Designation.....</b>	<b>19</b>
<b>9 Marking and labelling.....</b>	<b>19</b>

<b>Annex A (normative) Determination of stress relaxation in tension .....</b>	<b>20</b>
<b>A.1 Principle.....</b>	<b>20</b>
<b>A.2 Apparatus.....</b>	<b>20</b>
<b>A.3 Test pieces.....</b>	<b>20</b>
<b>A.4 Test conditions .....</b>	<b>20</b>
<b>A.5 Procedure.....</b>	<b>20</b>
<b>Annex B (normative) Determination of compression set in hot water at 110 °C .....</b>	<b>22</b>
<b>B.1 Principle.....</b>	<b>22</b>
<b>B.2 Apparatus .....</b>	<b>22</b>
<b>B.3 Test pieces.....</b>	<b>22</b>
<b>B.4 Procedure.....</b>	<b>23</b>
<b>Annex C (normative) Determination of splice strength.....</b>	<b>28</b>
<b>C.1 Principle.....</b>	<b>28</b>
<b>C.2 Test pieces.....</b>	<b>28</b>
<b>C.3 Procedure.....</b>	<b>28</b>
<b>Annex D (informative) Guidance on storage of seals.....</b>	<b>29</b>
<b>Annex ZA (informative) Relationship of this European Standard with Regulation (EU) No.305/2011 .....</b>	<b>30</b>
<b>ZA.1 Scope and relevant characteristics .....</b>	<b>30</b>
<b>ZA.2 System of Assessment and Verification of Constancy of Performance (AVCP) .....</b>	<b>31</b>
<b>ZA.3 Assignment of AVCP tasks .....</b>	<b>32</b>
<b>Bibliography .....</b>	<b>33</b>

**prEN 681-1:2016 (E)****European foreword**

This document (prEN 681-1:2016) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 681-1:1996.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Construction Products Regulation (305/2011/EU).

For relationship with EU Construction Products Regulation (305/2011/EU), see informative Annex ZA which is an integral part of this document.

The EN 681 series, *Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications* consists of four parts:

Part 1: *Vulcanized rubber*

Part 2: *Thermoplastic elastomers*

Part 3: *Cellular materials of vulcanized rubber*

Part 4: *Cast polyurethane sealing elements*

Products complying with this European Standard may be used for the transport of water for human consumption if they comply with the relevant national, regional or local regulatory provisions applicable in the place of use.

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## 1 Scope

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

- cold water ( $T \leq 50 \text{ }^\circ\text{C}$ );
- cold water ( $T \leq 50 \text{ }^\circ\text{C}$ ) and intermittently hot water ( $T \leq 95 \text{ }^\circ\text{C}$ );
- cold water ( $T \leq 50 \text{ }^\circ\text{C}$ ) and continuously hot water ( $T \leq 110 \text{ }^\circ\text{C}$ ).

The different designations of seals specified are defined according to their type, application and requirements (see Table 1).

This European Standard defines requirements for seals, partially defining the properties of the vulcanized rubber material as a performance indicator of the finished seal. 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, pipe system material and pipe joint design. This standard should be used where appropriate with product standards which specify performance requirements for joints.

It is applicable to elastomeric components of composite or non-composite seals.

In case of composite seals for materials of hardness ranges from 55 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

[kSIST prEN 681-1:2017](https://standards.iteh.ai/catalog/standards/sist/e0d21ed1-c02c-41c3-bfe9-c4970279cc7/kSIST-prEN-681-1-2017)

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The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10088-1, *Stainless steels - Part 1: List of stainless steels*

ISO 34-2, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 2: Small (Delft) test pieces*

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 or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 815-2, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

**prEN 681-1:2016 (E)**

ISO 3302-1, *Rubber — Tolerances for products — Part 1: Dimensional tolerances*

ISO 3384-1, *Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression — Part 1: Testing at constant temperature*

ISO 3387, *Rubber — Determination of crystallization effects by hardness measurements*

ISO 3601-1, *Fluid power systems — O-rings — Part 1: Inside diameters, cross-sections, tolerances and designation codes*

ISO 3601-3, *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*

ISO 9691, *Rubber — Recommendations for the workmanship of pipe joint rings — Description and classification of imperfections*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

**3.1****drinking water**

water intended for human consumption

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**4 Application**

In Table 1a the application groups and in Table 1b the type and application for seal materials are defined.

**Table 1a — Application Group**

Group	Application	Table	Type
I	Cold water ( $T \leq 50 \text{ }^{\circ}\text{C}$ )	3	WA
II	Cold water ( $T \leq 50 \text{ }^{\circ}\text{C}$ ) and intermittently hot water ( $T \leq 95 \text{ }^{\circ}\text{C}$ )	3	WC, WG
III	Cold water ( $T \leq 50 \text{ }^{\circ}\text{C}$ ) and continuously hot water ( $T \leq 110 \text{ }^{\circ}\text{C}$ )	4 5	WB, WE WD, WF



Table 1b — Types

Type	Application	Table
WA	Cold drinking water supply ( $T \leq 50\text{ °C}$ )	3
WB	Cold drinking water supply ( $T \leq 50\text{ °C}$ ) and continuously hot drinking water supply ( $T \leq 110\text{ °C}$ )	4
WC	Water application, drainage, sewerage and rainwater systems pipes (continuously $T \leq 50\text{ °C}$ and intermittently $T \leq 95\text{ °C}$ )	3
WD	Cold non drinking water supply ( $T \leq 50\text{ °C}$ ) and continuously hot non drinking water supply ( $T \leq 110\text{ °C}$ )	4
WE	Cold drinking water supply ( $T \leq 50\text{ °C}$ ) and continuously hot drinking water supply ( $T \leq 110\text{ °C}$ ) seals manufactured from isoprene-isobutylene copolymer	5
WF	Cold non drinking water supply ( $T \leq 50\text{ °C}$ ) and continuously hot non drinking water supply ( $T \leq 110\text{ °C}$ ) seals manufactured from isoprene-isobutylene copolymer	5
WG	Water application, drainage, sewerage and rainwater systems pipes (continuously $T \leq 50\text{ °C}$ and intermittently $T \leq 95\text{ °C}$ ), where oil resistance is required according to Table 3. For specific oil resistance applications, consult the manufacturer.	3

If additional requirements for low temperature resistance are needed, then each type WA, WC and WG will be amended by an abbreviation "L".

EXAMPLE WAL means cold drinking water supply ( $\leq 50\text{ °C}$ ) with additional low temperature resistance.

A nominal hardness shall be specified within the ranges in Table 2.

Table 2 — Hardness categories

Hardness category	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

## 5 Requirements

### 5.1 Materials

#### 5.1.1 General

The materials shall be free of any substances which may have a deleterious effect on the fluid being conveyed, or on the function of the seal, or on the pipe or fitting.

#### 5.1.2 Effect on water quality

For cold and hot drinking water supply, 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.

**prEN 681-1:2016 (E)****5.1.3 Material requirements**

Table 3 describes the material requirements for type WA(L),WC(L), WG(L).

The requirements in Table 3 for:

- elongation at break;
- compression set;
- stress relaxation;

are partly different to the requirements in Table 4 and 5. Products according to Table 3 have higher requirements due to their assembly process.

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Table 3 — Physical property requirements for materials used in types WA(L), WC(L) and WG(L)

Types WA (L), WC (L), WG (L)				Requirements for hardness categories					
Property	Unit	Test method	Clause	40	50	60	70	80	90
Permissible tolerance on nominal hardness	IRHD	ISO 48	6.3	±5	±5	±5	±5	±5	±5
Tensile strength, min.	MPa	ISO 37	6.4	9	9	9	9	9	9
Elongation at break, min.	%	ISO 37	6.4	400	375	300	200	125	100
Compression set									
72 h/23 °C, max.	%	ISO 815-1	6.5.1	12	12	12	15	15	15
24 h/70 °C, max.	%	ISO 815-1	6.5.1	20	20	20	20	20	20
72 h/- 10 °C, max.	%	ISO 815-2	6.5.2	40	40	50	50	60	60
Ageing, 168 h/70 °C		ISO 188	6.6						
Hardness change	IRHD	ISO 48	6.3	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5
Tensile change, max.	%	ISO 37	6.4	-20	-20	-20	-20	-20	-20
Elongation at break change	%	ISO 37	6.4	+10/-30	+10/-30	+10/-30	+10/-30	+10/-40	+10/-40
Stress relaxation	%	ISO 3384-1	6.7						
168 h/23 °C, max.	%			13	14	15	16	17	18
2400 h/23 °C, max.	%			19	20	22	23	25	26
Volume change in water	%	ISO 1817	6.8						
168 h/70 °C, max.				+8/-1	+8/-1	+8/-1	+8/-1	+8/-1	+8/-1
Ozone resistance <sup>a</sup>	—	ISO 1431-1	6.9	No cracking when viewed without magnification					
<b>Additional requirement for Type WG (L) only</b>									
Volume change in oil, 72 h/70 °C, max	%	ISO 1817	6.13						
Oil IRM 901	%			±10	±10	±10	±10	±10	±10
Oil IRM 903	%			+ 50/- 5	+ 50/- 5	+ 50/- 5	+ 50/- 5	+ 50/- 5	+ 50/- 5
<b>Additional requirements for Type WAL, WCL and WGL</b>									
Compression set	%	ISO 815-2	6.5.2						
72 h/- 25 °C, max.				60	60	60	70	70	70
Hardness change	IRHD	ISO 3387	6.14						
168 h/- 25 °C, max				+ 18	+ 18	+ 18	—	—	—

<sup>a</sup> This requirement is not applicable for unblended EPM and unblended EPDM

prEN 681-1:2016 (E)

Table 4 describes the requirements for type WB and WD.

**Table 4 — Physical property requirements for materials used in types WB and WD**

Types WB, WD				Requirements for hardness categories				
Property	Unit	Test method	Clause	50	60	70	80	90
Permissible tolerance on nominal hardness	IRHD	ISO 48	6.3	±5	±5	±5	±5	±5
Tensile strength, min.	MPa	ISO 37	6.4	9	9	9	9	9
Elongation at break, min.	%	ISO 37	6.4	250	200	150	100	100
Compression set								
72 h/23 °C, max.	%	ISO 815-1	6.5.1	15	15	15	15	15
24 h/125 °C, max.	%	ISO 815-1	6.5.1	20	20	20	20	20
72 h/- 10 °C, max.	%	ISO 815-2	6.5.2	40	50	50	60	60
Ageing, 168 h/125 °C		ISO 188	6.6					
Hardness change	IRHD	ISO 48	6.3	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5
Tensile change, max.	%	ISO 37	6.4	-20	-20	-20	-20	-20
Elongation at break change	%	ISO 37	6.3	+10/-30	+10/-30	+10/-30	+10/-40	+10/-40
Stress relaxation		ISO 3384-1	6.7					
168 h/23 °C, max.	%			15	15	15	18	18
2400 h/23 °C, max.	%			20	22	23	25	26
168 h/125 °C	%			30	30	30	30	30
Volume change in water	%	ISO 1817	6.8					
168 h/95 °C, max.				+8/-1	+8/-1	+8/-1	+8/-1	+8/-1
Ozone resistance <sup>a</sup>	—	ISO 1431-1	6.9	No cracking when viewed without magnification				
Tear strength, min.	N	ISO 34-2	6.10	20	20	20	20	20
Compression set in water		Annex B	6.11					
3000 h/110 °C, max.	%			30	30	30	30	30
10000 h/110 °C, max.	%			40	40	40	40	40

<sup>a</sup> This requirement is not applicable for unblended EPM and unblended EPDM