



TECHNICAL PRESCRIPTIONS
FOR
ELASTOMERIC SEALS:
Part 1: Vulcanized Rubber

Version 1.0 dated 2017-10-17

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FOREWORD

This document contains the technical prescriptions for elastomeric seals for pipe joint seals in water and drainage applications. The elastomeric seals are made of vulcanized rubber. The requirements included in these PTV respond to needs established by the various interested parties according to local customs. The requirements can be divided in 2 parts – obligated requirements and voluntary requirements. For the obligated requirements, this PTV refers to the standard NBN EN 681-1. For the additional, voluntary requirements, this PTV describes requirements and test methods. A manufacturer can decide for each seals to which additional requirements his seals comply.

The conformity of elastomeric seals can be certified under the voluntary BENOR mark. With the BENOR mark, the supplier has to declare the performance of the elastomeric seals for all the characteristics relevant to guaranteeing the application and limit values imposed by this PTV 8681-1.

BENOR certification is based on full product certification in accordance with NBN EN ISO/IEC 17067.

The CE mark applies to elastomeric seals – vulcanized rubber coming under the area of application of NBN EN 681-1. Pursuant to European Regulation (EU) no. 305/2011 (Construction Product Regulation – CPR) dated 2011-03-09, the CE mark relates to the essential characteristics of the elastomeric seals – vulcanized rubber specified in NBN EN 681-1, Annex ZA, Table ZA.1.

The CE mark is the only mark to declare that the elastomeric seals – vulcanized rubber complies with the declared performance of the essential characteristics covered by NBN EN 681-1.

1 INTRODUCTION

1.1 TERMINOLOGY

1.1.1 Definitions

Article	Set of units of a product with the same characteristics and performance that are produced in a specific manner and comply with the technical file.
Supplier	The party having to ensure that elastomeric seals complies with the technical regulations. This definition can apply to the producer, the dealer, the importer or the distributor.
Impartial body	Body that is independent of the supplier or user and is entrusted with conducting the acceptance test on delivery.
Producer	The party responsible for producing elastomeric seals.
Product	The result of an industrial activity or process. Meant by this in the context of these technical regulations is elastomeric seals. It is the collective term for all articles and product types to which these PTV apply.
Production unit	Technical facility/facilities tied to a geographical location used by a producer and in which one or more products are made.
Test	Technical action comprising the determination of one or more properties of a raw material or product according to a specified process.
Reference document	Document specifying the technical characteristics with which the materials, equipment, raw materials, production process and/or the product must comply (a standard, specification or any other technical specification).
Type testing	A series of checks for initially establishing (initial type testing) or, possibly, periodically confirming (repeat type testing) the characteristics of an article or product type and its conformity.

1.1.2 Abbreviations

PTV Technical Prescriptions

All symbols and abbreviations described in NBN EN 681-1 are also valid in this PTV.

1.1.3 References

ISO 3302-1	Rubber - Tolerances for products - Part 1: Dimensional tolerances
ISO 48	Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)
ISO 37	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
ISO 815-1	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 1: At ambient or elevated temperatures
ISO 188	Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests
ISO 9691	Rubber - Recommendations for the workmanship of pipe joint rings - Description and classification of imperfections
ISO 815-2	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 2: At low temperatures
ISO 1817	Rubber, vulcanized or thermoplastic - Determination of the effect of liquids
ISO 1431-1	Rubber, vulcanized or thermoplastic - Resistance to ozone cracking - Part 1: Static and dynamic strain testing
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 34-2	Rubber, vulcanized or thermoplastic - Determination of tear strength - Part 2: Small (Delft) test pieces
NBN EN 681-1	Elastomeric seals – Material requirements for pipe joint seals used in water and drainage applications – Part 1: Vulcanized rubber

This PTV contains dated and undated references. Only the cited version applies to dated references. The latest version always applies to undated references, including any errata, addenda and amendments.

Of all the EN standards referred to in these regulations, the corresponding Belgian publication NBN EN applies in each case. COPRO can allow the use of a publication other than the Belgian one provided its content is identical to that of the Belgian publication.

1.2 AVAILABILITY OF THIS PTV

The current version of this PTV is available free of charge on the COPRO website.

A paper version of this PTV can be ordered from COPRO. COPRO has the right to charge for this.

No changes may be made to the original PTV approved by the sectoral commission and/or confirmed by the Board of Directors of COPRO.

1.3 STATUS OF THIS PTV

1.3.1 Version of this PTV

This PTV concerns version 1.0.

1.3.2 Approval of this PTV

This PTV was approved by the Sectoral Commission on 2018-03-30.

1.3.3 Confirmation of this PTV

This PTV was confirmed by the Board of Directors of COPRO on 2018-05-02.

1.3.4 Registration of this PTV

This PTV was submitted to the association BENOR on 2018-05-02.

1.4 HIERARCHY OF RULES AND REFERENCE DOCUMENTS

1.4.1 Legislation

If certain rules contained in this PTV are inconsistent with applicable law, the rules arising from the legislation shall prevail. It is the responsibility of the supplier to monitor this and report any contradictions to COPRO in advance.

1.4.2 Directives concerning health and safety

If certain technical regulations are inconsistent with the directives concerning health and safety, such directives shall prevail. It is the responsibility of the supplier to monitor this and report any contradictions to COPRO in advance.

1.4.3 Special specification

If certain rules from the applicable special specification are inconsistent with these technical regulations, the supplier can report this to COPRO.

1.5 QUESTIONS AND COMMENTS

Questions or comments concerning these technical regulations are directed to COPRO.

2 POSITIONING OF TECHNICAL PRESCRIPTIONS

2.1 PTV FORMAT

2.1.1 Format of this PTV

These technical prescriptions for the elastomeric seals – vulcanized rubber are drawn up by the Sectoral Commission of COPRO for elastomeric seals.

2.2 OBJECTIVES

2.2.1 Purpose of this PTV

- 2.2.1.1 The aim of this PTV is to specify requirements for the elastomeric seals – vulcanized rubber used for pipe joint used in water and drainage applications.
- 2.2.1.2 According to the legislation in the Member State where elastomeric seals – vulcanized rubber for pipe joint in water and drainage applications is brought onto the market, the performance for some essential characteristics has to be declared for the CE mark by the supplier on the basis of its Performance Declaration in accordance with the harmonized standard NBN EN 681-1. Unless other statutory provisions apply, the supplier has the choice in the context of the CE mark to declare no performance for one or more essential characteristics. This PTV clarifies some requirements and adds supplementary provisions with regard to use and sustainable behavior.

2.3 SCOPE

2.3.1 Subject of these technical regulations

- 2.3.1.1 The subject of these technical prescriptions is the same as the scope in NBN EN 681-1, clause 1.
- 2.3.1.2 The area of application of this PTV is entirely or partially covered by the intended use included in the harmonized standard NBN EN 681-1. This PTV imposes additional application requirements and/or provisions for an area of application that is more specifically defined or delineated.

The requirements included in this PTV for the elastomeric seals – vulcanized rubber for the pipe joint used in water and drainage applications respond to needs determined by the various interested parties according to local construction technologies and customs.

2.3.2 Circulars

COPRO can supplement this PTV with one or more circulars forming an integral part of this PTV.

2.4 REFERENCE DOCUMENTS

2.4.1 Product standards

The applicable product standard is NBN EN 681-1.

2.4.2 Tenders

There aren't any applicable tenders.

2.4.3 Test methods

ISO 3302-1	Rubber - Tolerances for products - Part 1: Dimensional tolerances
ISO 48	Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)
ISO 37	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
ISO 815-1	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 1: At ambient or elevated temperatures
ISO 188	Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests
ISO 9691	Rubber - Recommendations for the workmanship of pipe joint rings - Description and classification of imperfections
ISO 815-2	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 2: At low temperatures
ISO 1817	Rubber, vulcanized or thermoplastic - Determination of the effect of liquids
ISO 1431-1	Rubber, vulcanized or thermoplastic - Resistance to ozone cracking - Part 1: Static and dynamic strain testing
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 34-2	Rubber, vulcanized or thermoplastic - Determination of tear strength - Part 2: Small (Delft) test pieces

2.4.3 Other

There aren't any other applicable reference documents.

3 PRESCRIPTIONS

3.1 PRODUCTION UNIT AND EQUIPMENT

There aren't any requirements for the production unit and the equipment.

3.2 RAW MATERIALS

3.2.1 General

- 3.2.1.1 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 3.2.1.2.
- 3.2.1.2 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.

3.3 PRODUCTION PROCESS

There aren't any requirements for the production process.

3.4 ELASTOMERIC SEALS

3.4.1 General

- 3.4.1.1 The elastomeric seals – vulcanized rubber meets all the obligatory requirements set out in articles 3.4.2 to 3.4.13 and voluntarily some of the additional requirements set out in articles 3.4.14 to 3.4.18. If the seal meets any optional requirement as specified in articles 3.4.14 to 3.4.18, they shall be appropriately marked according clause 3.5.
- 3.4.1.2 The supplier shall in each case declare the performance for the characteristics set out in articles 3.4.2 to 3.4.13 for the elastomeric seals – vulcanized rubber for pipe joints used in water and drainage applications. The supplier shall also declare the performance for the applicable additional characteristics set out in articles 3.4.14 to 3.4.18 for the elastomeric seals – vulcanized rubber for pipe joints used in water and drainage applications. If it concerns an essential characteristic, the supplier shall declare this on its Declaration Of Performance.

3.4.2 Dimensional tolerances (obligatory)

See NBN EN 681-1, article 4.2.1.

To be considered as an elastomeric seal – vulcanized rubber for pipe joints in water and drainage applications according to this PTV, the tolerances are as specified in ISO 3302-1, with the following classes:

- Class M2 for the functional dimensions of moulded profiles,
- Class M3 for the non-functional dimensions of moulded profiles,
- Class E1 for the functional dimensions of extruded profiles,
- Class E2 for the non-functional dimensions of extruded profiles.

The functionality of dimensions is established on the technical data sheet of the product.

The tolerance for the length is ± 1 %.

3.4.3 Imperfections and defects (obligatory)

See NBN EN 681-1, article 4.2.2.

3.4.4 Hardness (obligatory)

See NBN EN 681-1, article 4.2.3.

3.4.5 Tensile strength and elongation at break (obligatory)

See NBN EN 681-1, article 4.2.4.

3.4.6 Compression set in air (obligatory)

See NBN EN 681-1, article 4.2.5.

3.4.7 Accelerated ageing in air (obligatory)

See NBN EN 681-1, article 4.2.6.

3.4.8 Stress relaxation in compression (obligatory)

See NBN EN 681-1, article 4.2.7.

3.4.9 Volume change in water (obligatory)

See NBN EN 681-1, article 4.2.8.

3.4.10 Ozone resistance (obligatory)

See NBN EN 681-1, article 4.2.9.

3.4.11 Tear strength for joint seals for hot water supply (obligatory)

See NBN EN 681-1, article 4.2.10.

3.4.12 Compression set in water for joint seals for hot water supply (obligatory)

See NBN EN 681-1, article 4.2.11.

3.4.13 Splices of pre-vulcanized profile ends (obligatory)

See NBN EN 681-1, article 4.2.12.

To be considered as an elastomeric seal – vulcanized rubber for pipe joints in water and drainage applications according to this PTV, maximum 3 splices per seal are allowed.

3.4.14 Low temperature performance at -25 °C (voluntary)

See NBN EN 681-1, article 4.3.2.

When the high temperature resistance (clause 3.4.17) is also applicable, this test is carried out after conditioning the seal and the splices according clause 3.4.17.

3.4.15 Volume change in oil (voluntary)

See NBN EN 681-1, article 4.3.3.

When the high temperature resistance (clause 3.4.17) is also applicable, this test is carried out after conditioning the seal and the splices according clause 3.4.17.

3.4.16 Chemical resistance (voluntary)

After being submitted to the conditions mentioned according clause 4.3, the seal shall comply with the requirements given in following table.

Property	Unit	Clause	Requirement
Volume change	%		± 10
Tensile strength change, maximum	%	3.4.5	- 20
Elongation at break change, maximum	%	3.4.5	+ 10/- 40

After being tested according clause 4.4, there shall be no visible separations in the cross sectional area of the splice, when viewed without magnification.

When the high temperature resistance (clause 3.4.17) is also applicable, the chemical resistance is carried out after conditioning the seal and the splices according clause 3.4.17.

3.4.17 High temperature resistance (voluntary)

A manufacturer can declare that his elastomeric seals – vulcanized rubber can resist a high temperature T °C for a certain period H minutes.

After conditioning the whole seals including the splices according clause 4.5, the seals and the splices shall comply with all the obligatory requirements set out in articles 3.4.2 to 3.4.13 and voluntary some of the additional requirements set out in articles 3.4.14 to 3.4.18.

3.4.18 High chemical resistance (voluntary)

When tested according clause 4.6, the change in volume ΔV_7 shall be lower than or equal to 5 %.

3.5 CLASSIFICATION

3.5.1 Classification

The elastomeric seals – vulcanized rubber for which the performance for following characteristics complies with the prescriptions of the clause mentioned will be categorized as follows:

- Low temperature performance at -25 °C – clause 3.4.14: L;
- Volume change in oil – clause 3.4.15: O;
- Chemical resistance – clause 3.4.16: C;
- High temperature resistance – clause 3.4.17: HT-temperature-time (f.e. HT-135 °C-15 min);
- High chemical resistance – clause 3.4.18: HC.

4 TEST METHODS

4.1 SAMPLING

4.1.1 Sampling

See NBN EN 681-1, article 7.1.

4.2 SAMPLE PREPARATION

4.2.1 Sample preparation

See NBN EN 681-1, article 5.1.

4.2.2 Test temperature

See NBN EN 681-1, article 5.2.

4.3 Chemical resistance of the seal

4.3.1 Aim and principle

This test is used to determine the resistance of the seal to pH1 and pH12 for a certain period. Therefore the samples are immersed in pH1 and pH12 and the test results for certain characteristics are compared with the results without immersion.

4.3.2 Instruments

See ISO 1817, article 3.1.

4.3.3 Sample preparation

The samples for the tests to be executed after immersion in the different liquids shall be prepared before immersing them in the liquid according the relevant test procedure.

4.3.4 Method

The chemical resistance is determined by testing the test pieces according the test method mentioned, after being immersed according ISO 1817 in a fluid with pH1 and pH12 at $45\text{ °C} \pm 2\text{ °C}$ for 28 days.

4.3.5 Result

The result is calculated as the difference in % with the result on test pieces that weren't submitted in the test liquid.

4.3.6 Test report

The test report sets out at least:

- the details of the laboratory,
- the details and identification of the sample,
- a description of the packaging in which the sample was delivered (possible damage, et cetera),
- the date of the test,
- the result of each characteristic,
- a reference to PTV 8681-1, clause 3.4.16.

Each test report is supplemented by an assessment of conformity to the requirements.

4.4 Chemical resistance of the splice

4.4.1 Aim and principle

This test is used to determine the resistance of the splice to pH1 and pH12 for a certain period. Therefore the splice is immersed into pH1 and pH12 and then elongated and examined.

4.4.2 Instruments

See ISO 1817, Art. 3.1.

4.4.3 Sample preparation

There isn't any specific sample preparation for this test.

4.4.4 Method

The test is executed according Annex C from NBN EN 681-1, taking into account the following prescriptions:

- the test pieces are, before the test, conditioned for 7 days at $45\text{ °C} \pm 2\text{ °C}$ in pH1 and pH12,
- the extension is executed at $50\text{ °C} \pm 2\text{ °C}$,
- the extension is maintained for 5 minutes instead of 1 minute.

4.4.5 Result

Examine the splice without magnification.

4.4.6 Test report

The test report sets out at least:

- the details of the laboratory,
- the details and identification of the sample,
- a description of the packaging in which the sample was delivered (possible damage, et cetera),
- the date of the test,
- the result of the examination,
- a reference to PTV 8681-1, clause 3.4.16.

Each test report is supplemented by an assessment of conformity to the requirements.

4.5 High temperature resistance

4.5.1 Aim and principle

This test is used to determine the resistance of the seal and the splices to a temperature T for a certain time H . The principle is that the seal and the splices are conditioned at a temperature for a certain time and then all the relevant tests are executed.

4.5.2 Instruments

An oven as specified in ISO 188.

4.5.3 Sample preparation

There isn't any specific sample preparation. The whole seal and the splices are conditioned.

4.5.4 Method

The seals with the joints is aged in the oven at a temperature $T + 15$ °C for a time $H + 15$ minutes.

After this ageing, the seal and the joints are stored at room temperature for 24 hours and then submitted to the relevant tests.

4.5.5 Result

The result for every specific test is determined according the relevant test method.

4.5.6 Test report

The test report sets out at least:

- the details of the laboratory,
- the details and identification of the sample,
- a description of the packaging in which the sample was delivered (possible damage, et cetera),
- the date of the test,
- the temperature T and the time H ,
- the result of each relevant characteristic,
- a reference to PTV 8681-1, clause 3.4.17.

Each test report is supplemented by an assessment of conformity to the requirements.

4.6 High chemical resistance

4.6.1 Aim and principle

This test is used to determine the resistance of the seal to environments with pH0 and pH14. The principle is that a piece of the seal are conditioned at pH0 and pH14 for a certain time and then the change in volume is determined.

4.6.2 Instruments

See ISO 1817, article 3.1 and 3.3.

4.6.3 Sample preparation

The test samples shall have 1 of the following dimensions in mm:

- Cylinder (diameter x height): $(13 \pm 0,5) \times (6,3 \pm 0,3)$, with parallel end faces,
- Cuboid $(11,5 \pm 0,5) \times (11,5 \pm 0,5) \times (6,3 \pm 0,3)$.

4.6.4 Method

- Measure the dimensions of the test sample and calculate the volume. The volume shall be determined at $0,005 \text{ cm}^3 \Rightarrow V_0$.
- Expose the test samples to sulphuric acid (pH level about 0) and caustic soda (pH level about 14) over 168 hours at a temperature of $23 \pm 2 \text{ }^\circ\text{C}$.
- Remove the test samples out of the test fluid and measure the dimensions within 5 minutes after removal out of the test fluid. Calculate the volume V_1 at $0,005 \text{ cm}^3$.

4.6.5 Result

The result ΔV_7 is calculated as follows:

$$\Delta V_7 = \text{abs}((V_1 - V_0) / V_0) * 100 \%$$

4.6.6 Test report

The test report sets out at least:

- the details of the laboratory,
- the details and identification of the sample,
- a description of the packaging in which the sample was delivered (possible damage, et cetera),
- the start-date and the end-date of the test,
- V_0, V_1 and ΔV_7 ,
- a reference to PTV 8681-1, clause 3.4.18.

Each test report is supplemented by an assessment of conformity to the requirements.

5 PRODUCT IDENTIFICATION

5.1 PRODUCT NAME

5.1.1 Official name

Elastomeric seal – vulcanized rubber.

5.1.2 Commercial name

The commercial is freely chosen by the supplier insofar as it does not lead to confusion or clash with the official name.

5.2 IDENTIFICATION

5.2.1 Delivery modes

5.2.1.1 The product shall be delivered in a package.

5.2.1.2 Each packaging unit (e.g. per bucket or per bag) is identified.

5.2.2 Individual packages

The following information must be given on each packaging unit:

- name and address of the supplier and/or producer,
- commercial name of the product,
- referral to this PTV 8681-1,
- the applicable classification according clause 3.5 of this PTV 8681-1.