BRL-K17504
14-01-2026

Evaluation Guideline

for the Kiwa product certificate for vulcanised rubber products for cold and hot drinking water applications

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Preface Kiwa

This Evaluation Guideline (BRL) has been accepted by the Kiwa Board of Experts [Water cycle] (CWK), in which all relevant parties in the field of [vulcanised rubber products for drinking water applications] are represented. This Board of Experts also supervises the certification activities and will adjust this BRL if required. All references to Board of Experts in this evaluation guideline pertain to the above mentioned Board of Experts.

This evaluation guideline will be used by Kiwa in conjunction with the Kiwa Regulations for Certification, which include the general rules employed by Kiwa for its certification activities.

Specific additional information

The requirements in this evaluation guideline cover the mechanical requirements of EN 681-1 for the applications WA, WB and WE at different temperature levels. In this guideline additional requirements are included for some special features to rings, such as a hard nose or a hard base, a hard under-layer or fixation rings.

Changes

The following parts of this BRL have been modified compared to BRL K17504 version 03 of 2018-10-10 and the amendment sheet of 29-07-2021:

- The latest Kiwa 2025 template has been adopted and the previous amendment sheet has been incorporated.
- The new Kiwa template updates general texts for clarity. Chapter 2 includes a few new terminology explanations for more clarity. New paragraphs have been added to chapters 3 (3.3–3.5) and 6 (6.5–6.6) compared to the previous version. In chapter 8, the frequency and scope of third-party audits and follow-up inspections are clarified in paragraph 8.5, including specific provisions for private label certificates and multi-site production.

- Chapter 4 has been reorganised for logical flow and alignment with the new template:
    - Paragraph 4.1 clarifies that certification for a higher temperature class (II or III) also covers Class I, provided the low-temperature compression set is verified.
    - Paragraph 4.2 replaces the previous 4.3.2;
    - 4.3 is new and introduces a clear classification system (sealing type, temperature, hardness, ozone). Class A (non-swelling, compression sealing) and Class B (swelling, butyl rubber) are now defined in line with ISO 9631.
    - Sampling and test piece requirements are now in 4.6 and 4.7 (previously 4.7).
    - Functional and basic requirements are consolidated in 4.8 (was 4.3/4.4); physical and mechanical property requirements are in 4.9 (was 4.5); 4.10 replaces the previous 4.6.
    - Criteria for certain O-rings with a cross section of ≤4 mm have been adjusted, with slightly broader acceptance for tensile properties, ageing, and compression set (see chapter 4 and Annex A).

- Chapter 9 is now divided into two paragraphs: paragraph 1 refers to Dutch legislation on drinking water, and paragraph 2 contains all relevant standards. New standards include:
    - NEN-ISO 4633 (Rubber seals – Joint rings for water supply, drainage and sewerage pipelines – Specification for materials)
    - NEN-ISO 9631 (Rubber seals – Joint rings for pipelines for hot-water supply up to 110 °C – Specification for the material)

- Annex A now contains all requirement tables by sealing and temperature class. The new tables also indicate type testing and yearly testing for greater clarity.

- Annex E (model certificate and IQC scheme) and Annexes G/H (O-ring requirements) have been updated for clarity and alignment.

- Annex F clarifies the approach to compound and product certification, explicitly referencing reduced type testing when a compound certificate is present.

Content

1. Introduction

1.1. General

The requirements included in this evaluation guideline will be employed by Kiwa when dealing with an application and the maintenance of a product certificate for cold and hot drinking water applications.

This BRL replaces BRL K17504/03, dated 10 October 2018 and amended on 17-07-2021 and validated by Kiwa on 30th of August 2021.

The quality declarations issued and based on that (amended) guideline will keep their validity.

When carrying out certification activities, Kiwa is bound by the requirements laid down in NEN-EN ISO/IEC 17065.

1.2. Field of application / scope

The scope of this guideline covers vulcanised rubber products used as sealing systems for drinking water applications. Product requirements are detailed in chapter 4, while the various types of sealing systems—including both standard and special products—are specified in paragraph 4.4.

In this evaluation guideline the products are classified in the following areas of use:

- Class I: Water supply at temperatures up to 50 °C (see footnote 1[1]).
- Class II: Hot water supply intermittent temperatures up to 85°C. Here the temperature is high (up to 85°C) during tapping and low (ambient) when no water is used. Incidental malfunctional temperatures up to 110°C can be possible.
- Class III: Hot water circulation systems based on the classification class 2 in ISO 10508 (continuous high temperature of 70°C).

Class I is equal to that used in EN 681-1 (Scope 1), described as "cold potable water supply up to 50°C" and that of ISO 4633 (Scope a), described as "cold drinking-water supplies (up to 50°C).

Class II is based on ISO 9631 (class T1). Hot water systems where the temperature is high (intermittently up to 85 °C) during tapping and low (ambient) when no water is used. The testing is aligned with EN-681-1 (scope 2). EN 681-1 describes scope 2 as suitable up to 110°C, however more recent insight as described in ISO 9631 shows that the test program for of EN 681-1 scope 2 is insufficient for continues use at temperatures up to 110°C. Incidental malfunction temperatures up to 110°C can be possible.

Class III is for the more severe conditions applicable for these systems. Here a continuously high temperature of 70°C is assumed for the system (class 2 of ISO 10508). To set the requirements for this class III, a lifetime expectation of at least 50 years for a piping system is assumed for setting up the tests in this Evaluation Guideline. This is in line with the requirements for such systems as given in EN 806-2 and NEN-ISO 9631 (class T2).

In this guideline the different classes are referred to as class I, II and III.

Certification is intended for actual products (seals). To reduce unnecessary testing it is also possible to issue a certificate on a rubber material intended to be used for the production of products afterwards. Having such a certificate will reduce the tests on the actual products (as described in Annex F).

[1] *In the Netherlands the maximum allowed drinking water temperature in piping systems is 25°C*

1.3. Acceptance of tests reports provided by the supplier

With regard to the requirements included in this evaluation guideline, the applicant, in the view of third party assessments, can submit conformity reports issued by evaluation bodies to prove that the requirements of this BRL are being met. It will have to be demonstrated that the relevant inspection, analysis, test, and/or evaluation reports have been prepared by an institution that meets the corresponding applicable accreditation standard, namely:

- EN-ISO/IEC 17020 for inspection bodies;
- EN-ISO/IEC 17021-1 for certification bodies certifying management systems;
- EN-ISO/IEC 17024 for certification bodies certifying persons;
- EN-ISO/IEC 17025 for laboratories;
- EN-ISO/IEC 17065 for certification bodies certifying products, processes, and services.

Remark:
This requirement is considered to be fulfilled when a certificate of accreditation can be shown, issued either by the Board of Accreditation (RvA) or by one of the institutions with which an agreement of mutual recognition and acceptance of accreditation has been concluded by the Board of Accreditation. If no certificate of accreditation can be submitted, the certification institution itself will verify if the accreditation criteria have been met.

1.4. Quality declaration

The quality declarations to be issued by Kiwa based on this evaluation guideline will be referred to as Kiwa product certificate. A model of the product certificate has been included for information purposes as Annex.

2. Terminology

2.1. Definitions

In this evaluation guideline, the following terms and definitions apply:

- **Board of Experts:** the Board of Experts [Water cycle (CWK)]
- **Certification mark**: a protected trademark of which the authorization of the use is granted by Kiwa to the supplier whose products can be considered to comply on delivery with the applicable;
- **Drinking water**: water intended or partly intended for drinking, cooking or food preparation or other domestic purposes, excluding hot tap water, which is made available by pipeline to consumers or other customers (source Dutch drinking water act*);*
- **Drinking water installation**: an installation directly or indirectly connected to the public drinking water distribution network of a drinking water company (source Dutch Drinking Water Act);
- **Evaluation Guideline (BRL):** The agreements made by the Board of Experts on the subject of certification;
- **Follow-up investigation:** the investigation carried out after granting the certificate to determine that the certified products and/or approved quality related processes continue to be in compliance with the requirements laid down in the evaluation guideline;
- **Household water**: non-potable water that may only be used within premises for flushing toilets (source Dutch Drinking Water Act);
- **Initial investigation:** The initial evaluation of the supplier and the investigation of the relevant products for the first issuance of a certificate.
- **Installatio**n: configuration consisting of the pipe work, fittings, and appliances;
- **IQC scheme**: a description of the quality inspections carried out by the supplier as part of his quality system;
- **Private Label Certificate**: A product certificate that only pertains to products that are also included in the product certificate of another supplier that has been certified by Kiwa, the only difference being that the products and product information of the private label holder bear a brand name that belongs to the private label holder.
- **Product certificate**: a document in which Kiwa declares that a product may be deemed, on delivery, to comply with the product specification recorded in the product certificate;
- **Product requirements**: requirements made specific by means of measures or figures, focusing on (identifiable) characteristics of products and containing a limiting value to be achieved, which can be calculated or measured in an unequivocal manner.
- **Pre-certification tests:** tests in order to ascertain that all the requirements recorded in the Evaluation Guideline are met during the initial investigation.
- **Inspection tests:** tests carried out after the certificate has been granted in order to ascertain whether the certified products continue to meet the requirements recorded in the Evaluation Guideline.
- **Supplier**: the party that is responsible for ensuring that the products meet and continue to meet the requirements on which the certification is based;

- **Tap wate**r: water intended or partly intended for drinking, cooking or food preparation or other domestic purposes;
  Remark: Tap water can be drinking water, warm tap water or household water.

- **Classification:** A system to classify the product in terms of sealing principles, temperature resistance, hardness and ozon resistance;

- **Sealing principle:** there are two principles in use (especially for the temperature class III seals):
  - sealing because of a low rate of stress relaxation which keeps the pressure between the surfaces high enough for a long period of time; for this the term 'compression sealing' is used; most known using this principle of sealing are rubbers like EPM, EPDM, NBR, SBR.
  - sealing because of swelling in combination with a material that has an outstanding resistance to aging and can deal with swelling without deterioration; for this the term 'swelling sealing' is used; this principle is in practice only used by IIR, although in theory there might be other elastomers capable of using this principle;

3. Procedure for obtaining a quality declaration

3.1. Initial investigation

The initial investigation to be performed based on the (product) requirements as contained in this evaluation guideline, including the test methods, depending on the type of product to be certified:

- a (type) testing to determine whether the products comply with the product and/or performance requirements;
- production process assessment;
- assessment of the quality system and the IQC scheme;
- verification on the presence and functioning of the further required procedures.

3.2. Granting the certificate

After completing the initial investigation, the results are presented to the Decision maker (see §8.2). This person evaluates the results and decides whether the certificate can be granted or if additional data and/or tests are necessary before the certificate can be granted.

3.3. Investigation into the product/process and/or performance requirements

Kiwa will investigate the products to be certified against the certification requirements as stated in this evaluation guideline or will have them investigated on its behalf.
The required samples will be drawn by or on behalf of Kiwa.

3.4. Production process assessment

When assessing the production process, it is investigated whether the producer is capable of continuously producing products that meet the certification requirements.

The evaluation of the production process takes place during the ongoing work at the producer.
The assessment will at least include:

- The quality of raw materials, semi-finished products, and end products;
- Internal transport and storage.

3.5. Contract assessment

If the supplier is not the producer of the products to be certified, Kiwa will assess the agreement between the supplier and the producer.

This written agreement, which is available to Kiwa, must at least include:
That accreditation bodies, scheme managers and Kiwa will be given the opportunity to observe the certification activities carried out by Kiwa or on behalf of Kiwa at the producer.

4. Product requirements & testing methods

4.1. General

This chapter describes the requirements the rubber product shall meet, as well as the determination methods to stablish that the requirements are being met.

The products shall be suitable for the intended purpose. The design, the type(s) of rubber selected and the construction shall be such that, with regard to the type of application, a good (non-leaking) sealing of the joints under normal circumstances is assured.

An explanation regarding the classification system is given in paragraph 4.2. Paragraph 4.3 described the various types of seals that are allowed. In Paragraph 4.4 the allowed types of materials are described. The test pieces that are needed to test the required properties are described in paragraph 4.5. Paragraph 4.6 contains information on sampling procedure of products. Paragraph 4.7 up to and including 4.10 describe all the requirements in detail. Special chemicals under 4.8.1 should be mentioned in the product certificate if applicable.

The requirements are also presented in table format in Annex A. The properties must be determined on test pieces prepared out of the rubber products unless otherwise specified.

At setting the requirements the uncertainties of the measurements are taken into account. Also small deviations on test pieces prepared out of products have been considered. This implies that drawing conclusions whether requirements are fulfilled these uncertainties do not need to be weighted anymore. These requirements will make part of the technical specification of the products, as included in the certificate.

In case a product is meant to be used for more than one temperature class, for instance for temperature class I and II or for class II and III or even for all three classes, only testing for the highest class is assumed to be sufficient with the addition of the testing of the low temperature compression set of the lower class.

4.2. Regulatory requirements

4.2.1. Requirements to avoid deterioration of the quality of drinking water

Products and materials that (may) enter into contact with drinking water or warm tap water, shall not release substances in quantities that may be harmful for the health of the consumer or affect the quality of the water in any other way. Therefore the products or materials must comply with the toxicological, microbiological, and organoleptic requirements laid down in the Ministerial Regulation on the Materials and Chemicals for Drinking and Warm Water Supply ("*Ministeriële Regeling materialen en chemicaliën drink- en warm tapwatervoorziening*") (published in the Government Gazette). This means that the procedure for obtaining a recognised quality declaration, as referred to in the current Regulations, has to be concluded with a positive result. Products or materials that are provided with a quality declaration,[2] issued by, for example, a foreign certification body, may also be used in the Netherlands, provided that this quality declaration has been declared equivalent by the Minister to the quality declaration as referred to in the Regulation.

[2] The "Regulation" states (Article 16): "A quality declaration issued by an independent certification body in another Member State of the European Union or in another state that is party to the Agreement on the European Economic Area is equivalent to a recognised quality declaration, insofar as in the opinion of the Minister, the first mentioned quality declaration evidences that at least equivalent requirements as referred to in this regulation are being met."

4.3. Classification

4.3.1. Sealing principal type

Materials for pipe joint seals are classified based on their sealing principle type as specified in Table 1

Table 1: sealing principle type

Type	Description
Type A	Non-swelling seals: seals based on EPM, EPDM, NBR, SBR or equivalent polymers with low swelling in water
Type B	Swelling seals: seals based on IIR, CIIR or BIIR (butyl rubbers) or equivalent polymer with swelling properties in water.

4.3.2. Temperature class classification

Materials for pipe joint seals are classified based on their temperature during use as specified in Table 2

Table 2: temperature classification

Class	Application
I	Water supply at temperatures up to 50 °C (see footnote [3]).
II	Based on ISO 9631 (class T1). Hot water supply intermittent temperatures up to 85°C. Here the temperature is high (up to 85°C) during tapping and low (ambient) when no water is used. Incidental malfunctional temperatures up to 110°C can be possible.
III	Hot water circulation systems based on the classification class 2 in ISO 10508

4.3.3. Hardness classification

Materials for pipe joint seals are classified based on their nominal hardness.
A nominal hardness shall be specified within the ranges in Table 3

Table 3: hardness classification

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

4.3.4. Ozone classification

Materials for pipe joint seals are classified based on ozone resistance and use.

The ozone resistance class shall be specified as described in Table 4

Table 4: ozone classification

Class	Description
Class-1	Class of resistance I is intended for products with a high risk of attack by ozone, for instance in case of separately supplied products without sufficient packaging or in case of connections with preinstalled rubbers
Class-2	Class of resistance II is intended for products for which a normal resistance to ozone is required.
Class-3	Class of resistance III is only permissible for rubbers which are never (partly) exposed to the open air when they are in tension. Transport shall always take place in sealed packages.

[3] *In the Netherlands the maximum allowed drinking water temperature in piping systems is 25°C*

4.4. Types of rubber seals

4.4.1. Solid rubber products

The rubber shall fulfil the requirements of this Evaluation Guideline in paragraph 4.8up to and including 4.9.

Joints shall also fulfil the requirements in paragraph 4.10.1 and 4.10.2. In case joints are present in class II or class III products such products having a joint shall be used for testing.

4.4.2. O-rings

The rubber shall fulfil the requirements of this Evaluation Guideline in paragraphs 4.2, 4.8 up to and including 4.9.

Joints shall also fulfil the requirements in paragraph 4.10.1 and 4.10.2.

In this Evaluation Guideline test methods for O-rings are included in Annex H.

In Annex B a classification of O-ring sizes in groups is given. For each group the compression set at the relevant elevated temperature has to be verified before approval by a certification institute can be granted.

4.4.3. Rubber products combining two different rubber compounds (i.e. a hard and a soft rubber)

Both rubbers shall fulfil the requirements of this evaluation guideline in paragraphs 4.2, 4.8 up to and including 4.9. The adhesion between the two rubbers shall fulfil the requirements of paragraph 4.10.3.

In cases where one of the rubbers is meant to be a kind of back up ring, only the rubber for the product shall fulfil all requirements. The rubber used for the back-up function shall fulfil the requirements with respect to the toxicological aspects (4.7.1) and the mechanical properties (4.8). The weld between the two rubbers shall fulfil the requirements of paragraph 4.10.1, 4.10.2 and 4.10.3.

4.4.4. Rubber vulcanised or attached to rigid materials

The rubber shall fulfil the requirements of this evaluation guideline in paragraphs 4.2, 4.8 up to and including 4.9. The adhesion between rubber and the other material shall fulfil the requirements of 4.10.3.

4.4.5. Rubber products containing other rigid non-adhered materials (e.g. metal springs)

The rubber shall fulfil the requirements of this evaluation guideline in paragraphs 4.2, 4.8 up to and including 4.9. The non-rubber material shall not have a negative influence on the functioning of the rubber according to paragraph 4.10.4.

4.4.6. Products containing voids (not porosity)

The rubber shall fulfil the requirements of this evaluation guideline in paragraphs 4.2, 4.8 up to and including 4.9. Joints shall also fulfil the requirements in paragraph 4.10.1 and 4.10.2.

In cases where the part containing the void has to function in the same manner as a solid rubber the complete product shall fulfil the requirements for the compression set as given in section 4.9.6 measured at the place of the void.

4.5. Types of materials

4.5.1. General

Within the scope of this evaluation guideline all types of vulcanized rubber may be used for manufacturing products as long as they fulfil the requirements as described in the evaluation guidelines.

4.5.2. Blends of polymers

Blends of rubber polymers may only be used for the manufacture of products with permission of the manufacturer of the pipes and/or fittings. Both the customer and the inspection body shall be notified of the ratio of the polymers used.

4.6. Test pieces

4.6.1. General

The test pieces required shall, in accordance with ISO 23529, be made out of the products (see 4.5.2) or out of the test sheets (see 4.5.3).

By preparing test pieces out of actual products it is unavoidable that some deviations from the standards can occur. The allowed deviations are described in this chapter and Annex G. In case the products are O-rings a more product specific approach is chosen. For such products the procedure as mentioned in Annex H shall be followed.

4.6.2. Test pieces from products

If the dimensions of the rubber products are such that it is possible to take out the test pieces from them, the tests shall be carried out on such test pieces. Depending on the dimensions of the products it is allowed and can be necessary to take test pieces with other (smaller) dimensions then those prescribed in the standards. A guideline for this preparation is given in Annex G or Annex H.

4.6.3. Test pieces from test plates

If the dimensions of the rubber products are such that the test pieces required cannot be manufactured from them, taking into account the allowed deviations as mentioned in this guideline, test plates produced in the manufacturer's own laboratory shall be used.

Care has to be taken that the vulcanisation conditions for the sheets are similar to those for the products to obtain matching properties.

Details with respect to the vulcanisation and the direction of milling shall be given to the inspection body.

Test pieces for tensile strength and elongation at break, as well as those for tear resistance, shall be taken perpendicular to the direction of milling and compression moulding or the direction of injection moulding flow

4.6.4. Test piece of complete product

In carrying out the tests according to 4.8.2 up to 4.8.5 inclusive, a complete rubber product or an unmachined part of a rubber product shall be used.

4.7. Sampling of products for testing

4.7.1. General

The sample shall be representative for the product to be checked and been taken out of a normal production lot. Sampling is done by Kiwa.

4.8. Functional & basic requirements

4.8.1. Resistance to chemicals

Limit Value
The rubber products have to be resistant to any chemicals drinking water can contain under usual circumstances.

In case there are additional requirements on chemical resistance which are not already mentioned in this evaluation guideline or if a limit value needs to be specified, these shall be laid down by mutual agreement of the manufacturer and the buyer.

Determination method
If necessary, the resistance to chemicals must be determined according to a procedure suitable for the purpose, see for instance ISO 1817.

Pre-certification test and periodic inspection
If requirements have been agreed this aspect is checked at the initial assessment. This aspect is also compared on the basis of IQC inspection (indirectly by controlling the ingredients) with the aspect found for approval.

4.8.2. Effect of rubber products on the pipe and/or fitting materials

Limit Value
The rubber products may not contain substances that, under normal circumstances, can have an adverse effect on the material of the pipes and fittings.

In case there are additional requirements which are not already mentioned in this evaluation guideline, these shall be laid down by mutual agreement of the manufacturer and the buyer.

Determination method
In case of doubt a suitable method to verify this can be taken out of ISO 3865.

Pre-certification test and periodic inspection
If requirements have been agreed this aspect is checked at the initial assessment. This aspect is also compared on the basis of IQC inspection (indirectly by controlling the ingredients) with the aspect found for approval.

4.8.3. Appearance

Limit Value
The appearance of the products shall comply with ISO 9691 whereby the sealing zone shall be free of all surface imperfections other than bloom. Outside of the sealing zone no major imperfections are allowed. For the appearance of O-rings also reference can be made to ISO 3601-3

Determination method
The appearance aspect of a random selection of a number of at least 5 seals is reviewed against the criteria as laid down in ISO 9691 or ISO 3601-3.

Pre-certification test and periodic inspection
To be checked at the initial assessment and during yearly inspections. During inspections this aspect is only controlled visually. In case of reasonable doubt samples will be taken and sent to an accredited laboratory for determination of this property.

4.8.4. *Homogeneity*

Limit Value
The products may not contain foreign bodies and shall be free of imperfections and defects such as cracks, entrapped air, bubbles or other irregularities as described in ISO 9691.

Determination method
Take a random selection of at least five seals and cut them in flat slices or parts of 1 to 2 mm in thickness. Stretch those seals 100 % and judge if the material does not contain foreign bodies and is free of imperfections and defects such as cracks, entrapped air, bubbles or other irregulates as described in ISO 9691.

Pre-certification test and periodic inspection
To be checked at the initial assessment and during yearly inspections. During inspections this aspect is only controlled visually. In case of reasonable doubt samples will be taken and sent to an accredited laboratory for determination of this property.

4.8.5. *Dimensions*

Limit Value
The nominal measurements of the products and the acceptable deviations shall be in accordance with the figures stated by the manufacturer and they shall be laid down in a drawing. Tolerances shall be specified from the appropriate classes of ISO 3302-1. For dimensions of O-rings also reference could be made to ISO 3601-1.

Determination method
Determine the dimensions by means of appropriate measuring equipment (see ISO 23529) by the manufacturer

Pre-certification test and periodic inspection
To be checked at the initial assessment and during yearly inspections (IQC) when applicable.

4.9. Physical and mechanical property requirements

4.9.1. *General*

Unless stated otherwise, tests shall be carried out at a temperature of 23 °C according to ISO 23529. The allowed tolerances for all mentioned test durations and test temperatures shall be according to ISO 23529.

For tests carried out at the production location during inspection, a temperature between 15 °C and 30 °C is allowed.

Annex G and H describe details about the preparation of test pieces from products and testing in case the products are O-rings.

4.9.2. *Hardness*

The hardness shall be suitable for the material and the construction of the joints for which the rubber products are intended. Therefore the hardness shall be set in consultation between the manufacturer of the pipes and fittings and the manufacturer of the rubber products. The hardness concerned shall be reported to the inspection body as nominal hardness. This value shall be within the range of a class of hardness (table 3) The tolerance range for the products is ± 5 IRHD from the reported nominal value.

The difference in hardness (the difference between the highest and lowest value measured) of a seal shall not exceed 5 IRHD.

Limit Values
Reported nominal value ±5 IRHD-M
Nominal value should fit the hardness class of table-3
The difference between the maximum and minimum measured values on a seal shall not exceed 5 IRHD-M.

Determination method
Determine the hardness according to ISO 48-2 Method M. (see also Annex G and H).The hardness should be determined on an **original surface** (unmachined).

Only in the case where the form and the dimensions of the ring do not allow measurement according to the standard mentioned previously, or in case of a check measurement (non-destructive), the apparent hardness shall be determined in a way which both parties (buyer and manufacturer) have agreed upon. In that case the following issues must be laid down and submitted to the inspection body: the nominal apparent hardness plus the corresponding tolerance, the method of measurement and the place(s) of measurement.

Pre-certification test and periodic inspection
To be checked at the initial assessment and during yearly testing.

4.9.3. Tear resistance

Limit Value
The tear resistance shall be at least 20 N.

Determination method
The tear resistance measured according to NEN-ISO 34-2
See Annex G and H.

Pre-certification test and periodic inspection
To be checked at the initial assessment.

4.9.4. Tensile properties
Tensile strength and elongation at break requirement depend on the temperature class, hardness class and specimen type. The requirements are laid down in applicable tables below (table 5 to 7).

Limit Value

Table 5: Class I rubber

Temp. Class	Hardness class	Sealing principal type	Tensile Strength (MPa)	Elongation at Break (%)
			All specimen types	All specimen types
I	40	A & B	≥9,0	≥400
	50			≥375
	60			≥300
	70			≥200
	80			≥125
	90			≥100

Table 6 Class II rubbers

Temp. Class	Hardness class	Sealing principal type	Tensile Strength (MPa)		Elongation at Break (%)	
			Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm	Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm
II	50	A&B	≥9,0	≥8,5	≥250	≥225
	60				≥200	≥175
	70				≥150	≥130
	80				≥100	≥85
	90				≥100	≥85

Table 7: Class III rubbers

Temp. Class	Hardness class	Sealing principal type	Tensile Strength (MPa)		Elongation at Break (%)		
			Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm	Sheet	Products or test specimen made out of products	O-rings with a cross section of ≤4 mm
III	60	A&B	≥9,0	≥8,5	≥200	≥175	≥175
	70				≥150	≥130	≥130
	80				≥100	≥100	≥85

See also applicable overview tables in Annex A.

Determination method
The test method is according to NEN-ISO 37 including the described and allowed deviations as described in Annex G and H.

Dumbbell shaped test pieces of type 2 shall be used preferably. In case of O-rings the test may be carried out on complete rings, depending on the product dimensions, see Annex G and H. The test report shall state the test piece that is used (dumbbell type or complete ring)

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection

4.9.5. Resistance against ageing in air

Hardness, tensile strength and elongation at break requirements after ageing depend on the temperate class, hardness class and specimen type. The requirements are laid down in applicable tables below (tables 8 to10). See also applicable overview tables in Annex A.

Limit Value

Table 8: Class I rubbers – ageing for 168h at 70 °C

Temp. Class	Hardness class	Sealing principal type	Hardness change (IRHD-M)	Change in tensile strength (%)	Change in elongation at Break (%)
			All specimen types	All specimen types	All specimen types
I	40	A & B	+8 / -5	Max. -20	+10 / -30
	50				+10 / -30
	60				+10 / -30
	70				+10 / -30
	80				+10 / -40
	90				+10 / -40

Table 9: Class II rubbers – ageing for 168h at 125 °C

Temp. Class	Hardness class	Sealing principal type	Hardness change (IRHD-M)	Change in tensile strength (%)		Change in elongation at Break (%)
			All specimen types	Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm	All specimen types
II	50	A&B	+8 / -5	Max -20	Max -20	+10 / -30
	60				Max -20	+10 / -30
	70				Max -25	+10 / -30
	80				Max -30	+10 / -40
	90				Max -30	+10 / -40

Table 10: Class III rubbers – ageing for 168h at 125 °C

Temp. Class	Hardness class	Sealing principal type	Hardness change (IRHD-M)	Change in tensile strength (%)		Change in elongation at Break (%)
			All specimen types	Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm	All specimen types
III	60	A&B	+8 / -5	Max -20	Max -20	+10 / -30
	70				Max -25	+10 / -30
	80				Max -30	+10 / -40

Determination method
Ageing for 168 hours at a temperature of 70 °C (temp. class I) or 125 °C (Class II and III) according to NEN-ISO 188. See also Annex G and H.

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection.

4.9.6. Compression set

The compression set requirements depend on the temperate class, hardness class and specimen type. The requirements are laid down in applicable tables below (tables 11 to13). See also applicable overview tables in Annex A.

Limit Value

Table 11: Class I rubbers

Temp. Class	Hardness class	Sealing principal type	Compression set (%) 72h -10 °C	Compression set (%) 72h 23 °C	Compression Set (%) 24h 70 °C
			All specimen types	All specimen types	All specimen types
I	40	A	≤40	≤12	≤20
	50				
	60		≤50	≤15	
	70				
	80		≤60		
	90				
	40	B	≤40	≤15	≤20
	50				
	60		≤50		
	70				
	80		≤60		
	90				

Table 12: Class II rubbers

Temp. Class	Hardness class	Sealing principal type	Compression set (%) 72h -10 °C	Compression set (%) 72h 23 °C	Compression set (%) 24h 125 °C	
			All specimen types	All specimen types	Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm
II	50	A	≤40	≤15	≤20	
	60		≤50			
	70					
	80		≤60			
	90					
	50	B	≤40	≤15	≤20	≤25
	60		≤50			
	70					
	80		≤60			
	90					

Table 13: Class III rubbers

Temp. Class	Hardness class	Sealing principal type	Compression set (%) 72h -10 °C	Compression set (%) 72h 23 °C	Compression set (%) 24h 125 °C	
			All specimen types	All specimen types	Test specimen out of sheets, products or test specimen made out of products	O-rings with a cross section of ≤4 mm
III	60	A	≤50	≤15	≤20	
	70		≤50			
	80		≤60			
	60	B	≤50	≤15	≤20	≤25
	70		≤50			
	80		≤60			

Determination method
The compression set at ambient and elevated temperatures is measured according to NEN-ISO 815-1 (method A) The required test conditions are mentioned in tables 11 to 13. See also Annex G and H.

The low temperature compression set at low temperatures is measured according to NEN-ISO 815-2 (method 1). The value is determined after 30 minutes of recovery. See also Annex G and H.

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

Pre-certification test and periodic inspection
To be checked at the initial assessment. For the yearly inspection only the compression set for 24 hours at elevated temperature is carried out.

4.9.7. Stress relaxation

Limit Value

Table 14: Class I rubbers

Temp. Class	Hardness class	Sealing principal type	Stress relaxation (%) 168h at 23 °C	Stress relaxation (%) 100 days at 23 °C
			All specimen types	All specimen types
I	40	A	≤13	≤19
	50		≤14	≤20
	60		≤15	≤22
	70		≤16	≤23
	80		≤17	≤25
	90		≤18	≤26
	40	B	≤15	≤30
	50			
	60			
	70			
	80		≤18	
	90			

Table 15: Class II rubbers

Temp. Class	Hardness class	Sealing principal type	Stress relaxation (%) 168h at 23 °C	Stress relaxation (%) 100 days at 23 °C	Stress relaxation (%) 7 days at 125 °C
			All specimen types	All specimen types	
II	50	A	≤15	≤20	≤30
	60			≤22	
	70			≤23	
	80		≤18	≤25	
	90			≤26	
	50	B	≤15	≤30	No requirement
	60				
	70				
	80		≤18		
	90				

Table 16: Class III rubbers

Temp. Class	Hardness class	Sealing principal type	Stress relaxation (%) 168h at 23 °C	Stress relaxation (%) 100 days at 23 °C	Stress relaxation (%) 7 days at 125 °C	Stress relaxation (%) 4 weeks at 140 °C
			All specimen types	All specimen types	All specimen types	All specimen types
III	60	A	≤15	≤22	≤30	≤55
	70					
	80					
	60	B	≤15	≤30	No requirement	No requirement
	70					
	80		≤18			

Determination method
The stress relaxation shall be determined in accordance with ISO 3384 (compression, method A, cylindrical test pieces or O-rings, see Annex G and H) or ISO 6914 (tension, test pieces or O-rings from product group A, see Annex D, G and H).

Minimum measurements shall be taken after 3 hrs, 1, 3, 7 days for the 7 day test and after 3 hrs, 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. The 7 and 100 days requirements are those derived from this straight line. The values obtained by regression shall not exceed the maximum values given in the applicable tables 14 to 16.

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

Where the cross section is too small to obtain compression buttons from the product, as an alternative to moulding buttons, the stress relaxation in tension of the product may be determined, at a temperature of 23 °C, using method A specified in ISO 6914 with the same requirements as for stress relaxation in compression

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly testing.

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

For the yearly inspection only the 7 days test; at 23 °C for class I and II rubbers and at 125 °C for class III rubbers.

4.9.8. *Ozone resistance*

Limit Value
The rubber shall show no cracks after exposure to the applicable test conditions.

This requirement does not need to be tested for 100 % EPM/EPDM compounds. In this case Ozone class 1 is automatically fulfilled. If a product is not based on pure EPDM the ozone resistance should be tested to either class 1, 2 or 3.

If the material is based on 100% IIR testing is only needed if ozone class 1 is required. Ozone class 2 is automatically fulfilled and testing is not needed. Ozone resistance testing for IIR is only mandatory if a product is not based on pure IIR. The ozone resistance should be tested to either class 1, 2 or 3.

Determination method
The Ozone resistance is measured according to NEN-ISO 1431-1. The testconditions are mentioned in as mentioned in tables 17 and 18.

Table 17A test conditions

Ozone class of resistance	Ozone concentration (pphm) for testing	Period of exposure (hours) for testing	Temperature(°C) for testing
1	50	120	40
2	50	48	40
3	25	48	40

Table 17B elongation not be used in ozone test

Hardness class	Elongation in %
40-70	20
80	15
90	10

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection.

4.9.9. *Changes in volume after storage in hot water*

4.9.9.1. *Type A materials (Class I, II and III)*

Limit Value
The change in volume after immersion for 168 hours at 70°C (class I) or 95°C (class II and III) shall be within the limits -1 and +8% (v/v).

After the immersion the samples shall be intact and it must be possible to handle them without problems before the measurements.

Determination method
Test in accordance with NEN-ISO 1817

Pre-certification test and periodic inspection
To be checked at the initial assessment

4.9.9.2 *Type B materials (Class I, II and III)*

Limit Value
Type B materials: the change in volume after immersion for 10 weeks at 150°C shall be more than 10% (v/v).

After the immersion the samples shall be intact and it must be possible to handle them without problems before the measurements.

Determination method
Test in accordance with NEN-ISO 1817

Pre-certification test and periodic inspection
To be checked at the initial assessment.

4.9.10. *Compression set in water on specified products (Class III only)*

Limit Value
The compression set shall be maximal 40 % after 10000 hours in water at a temperature of 110 °C.

If the result after 3000 hours is below 20% the test can be stopped and the material is OK for this aspect. If the result after 3000 hours is above 30% the test can be stopped and the material is not OK for this aspect.

Determination method
Use the method given ISO 9631 Annex B

Pre-certification test and periodic inspection
To be checked at the initial assessment.

4.10. Requirements for special types of products

4.10.1. *Number of welds*

Limit Value
A ring made of rubber which has been vulcanized in advance shall not contain more than one weld, separate from eventual joints between compounds, except by agreement between the manufacturer and the client.

A ring made from two compounds shall not contain more than one weld in the direction of the outline of the products.

Determination method
Visual inspection

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection

4.10.2. *Behaviour at elongation*

4.10.2.1. *Massive products with a weld*

Limit Value
When tested the weld shall not crack or contract for at least 30 seconds.

Determination method
Elongate each rubber product with a weld with a tensile speed of 500 mm/min to 100% elongation, unless a reduced elongation has been agreed upon by both the buyer and the manufacturer. This must be reported to the inspection body. Keep the rings in an elongated state for at least 30 seconds.

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection.

4.10.2.2. *Products made from two compounds*

Limit Value
When tested the joint shall not crack or contract for at least 30 seconds.

Determination method
Elongate test pieces containing the joint between the two materials with a tensile speed of 500 mm/min to 100% elongation. Keep the test pieces in an elongated state for at least 30 seconds.

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection

4.10.2.3. *Elongation test for welded products after ageing*

Limit Value
When tested the weld or joint shall not crack or contract for at least 30 seconds.

Determination method
After ageing for 168 hours at 70 ± 2°C in accordance with NEN-ISO 188 the test of 4.6.2.1 or 4.6.2.2 is repeated.

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection

4.10.3. *Adhesion*

4.10.2.1. *Products made from two compounds*

Limit Value
The adhesion between both types of rubber shall be at least 100 N/25 mm.
In cases where the rigid parts are too small for a test according to ISO 813 the rubber shall tear and not detach when it is tried to separate the bond

Determination method
ISO 813

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection

4.10.2.2. Rubbers vulcanized or attached to rigid materials

Limit Value
The adhesion between rubber and the other material shall be at least 100N/25 mm.
In cases where the rigid parts are too small for a test according to ISO 813 the rubber shall tear and not detach when it is tried to separate the bond

Determination method
ISO 813

Pre-certification test and periodic inspection
To be checked at the initial assessment.

4.10.4. Rubber products containing other rigid non-adhered materials (e.g. metal springs)

Limit Value
The non-rubber material shall not have a negative influence on the functioning of the rubber, for instance by having sharp edges that could cut the rubber under deformation.

Determination method
This shall be judged by deforming the complete assembly in a way as intended during use followed by an inspection for damage to the rubber (outside and inside).

Pre-certification test and periodic inspection
To be checked at the initial assessment and yearly inspection.

5. Markings

5.1. General

The products shall be marked with following indelible marks and indications:

- name or logo of the manufacturer or the deposited trade mark;
- the certification mark as described in 5.2;
- the nominal dimension or dimensions;
- the nominal hardness;
- date or code indicating the date of production (year and preferably the quarter);
- type of rubber according to the letter codes of the nomenclature according to ISO 1629;
- Temperature class (I, II or III)
- On products from elastomer blends, the letter B ("blend") shall be placed behind the first letter code;
- The ozone resistance class ("Ozone 1, 2 or 3"). For rubber rings made from two compounds the compound with the lowest class is valid.

or:

- If the dimensions of the products are such that the indications applied to them may impair the product, the products may be marked per package in consultation with the manufacturer, the buyer and Kiwa.
- Products produced by cutting or die cutting out of sheets may be marked per package.

5.2. Certification mark

After entering into a Kiwa certification agreement, the certified products shall be clearly and indelibly marked with the certification mark.

For products intended for contact with drinking water:

The Kiwa Water Mark "KIWA", on smaller items or or KK or KK with the following guidance in table 18.

Table 18: guidance on KIWA marking

Marking	Explanation
KIWA	Standard marking for products (and/or the smallest packaging unit in consultation with the manufacturer, the buyer and Kiwa)
	Allowed limited marking for smaller products
	Allowed alternative limited marking for smaller products (in consultation with the manufacturer, the buyer and Kiwa)
KK	Allowed limited marking for smaller products (in consultation with the manufacturer, the buyer and Kiwa)
KK	Allowed limited marking for smaller products (in consultation with the manufacturer, the buyer and Kiwa)

6. Requirements in respect of the quality system

6.1. General

This chapter contains the requirements that have to be met by the supplier's quality system.

6.2. Manager of the quality system

Within the supplier's organizational structure, an employee who will be in charge of managing the supplier's quality system must have been appointed.

6.3. Internal quality control/quality plan

The supplier shall have an internal quality control scheme (IQC scheme) which is applied by them.

The following must be demonstrably recorded in this IQC scheme:

- which aspects must be inspected by the supplier;
- according to what methods such inspections are carried out;
- how often these inspections are carried out;
- in what way the inspection results are recorded and kept.

This IQC scheme should at least be an equivalent derivative of the model IQC scheme as shown in the Annex.

6.4. Management of test and measuring equipment

The supplier shall verify the availability of necessary test and measuring equipment for demonstrating product conformity with the requirements in this evaluation guideline.
If and when required, the test and measuring equipment shall be calibrated at specified intervals.
The supplier shall record and evaluate the validity of the previous measuring data if at the time of calibration it is established that the equipment is not functioning properly.
The measuring equipment in question must carry an identification that allows for determining the calibration status.
The supplier shall record the results of the calibration.

6.5. Procedures and working instructions

The supplier shall be able to submit the following:
procedures for:

- dealing with product showing deviations;
    - corrective actions to be taken if non-conformities are found;
    - dealing with complaints about product and/or services delivered.
- the working instructions and inspection forms used.

6.6. Quality control of rubber products

The following routine tests shall be carried out according to the test methods mentioned in this evaluation guideline:

- Dimensions
- Surface imperfections
- Hardness
- Tensile strength and elongation at break
- Compression set for 24 hours at 70 °C or 125 °C

The product control tests shall be carried out on lots of finished components using sampling procedures in accordance with either:

- ISO 2859-l with a specified inspection level of S2 and an AQL of 2,5 % for attributes; or
- ISO 3951 with a specified inspection level of S3 and an AQL of 2,5 % for variables.

These requirements do not preclude the use by the manufacturer of more stringent combinations of inspection levels and AQL values from ISO 2859-1 and ISO 3951.

7. Summary of tests and inspections

7.1. General

This chapter contains an overview of the steps required for certification:

- **initial investigation**: the investigation to determine that compliance is given to all the requirements laid down in the evaluation guideline;
- **follow-up investigation:** the investigation carried out after granting the certificate to determine whether the certified product continue to comply with the requirements laid down in the evaluation guideline; the required frequency for the follow-up investigation by the certification body (CB) is also specified;
- **inspection of the quality system of the supplier:** monitoring compliance with the IQC scheme and procedures.

7.2. Test matrix

Table 19: Test and inspection matrix table

Description of requirement	Article no. of BRL	Tests within the scope of:		Frequency (no./year)
		Pre-certification	Inspection by Kiwa after granting of certificate [a)]	
Regulatory requirements				
Quality of the drinking water	4.2	X	X	1x year
Functional and basic requirements				
Resistance to chemicals	4.8.1	X		
Effect of rubber products on the pipe and/or	4.8.2	X		
Appearance	4.8.3	X	X[b)]	1x year
Homogeneity	4.8.4	X	X[b)]	1x year
Dimensions	4.8.5	X	X[c]	1x year
Physical and mechanical property requirements				
Hardness	4.9.2	X	X	1x year
Tear resistance	4.9.3	X		1x year
Tensile properties (strength and elongation)	4.9.4	X	X	1x year
Properties after ageing	4.9.5	X	X	1x year
Compression set	4.9.6	X	X	1x year
Stress relaxation	4.9.7	X	X[d]	1x year
Resistance to ozone attack	4.9.8	X[e]	X[e]	1x year
Swelling in water	4.9.9	X		
Compression set in water (class III only)	4.9.10	X		
Requirements for special types of products				
Number of welds	4.10.1	X	X	1x year
Behaviour at elongation	4.10.2	X	X	1x year
Adhesion	4.10.3	X	X	1x year
No negative influence on the rubber	4.10.4	X	X	1x year
Marking				
Certification mark	5.2	X	X[c]	1x year

a) In case the bill of material, product or production process changes, it must be determined whether the performance requirements are still met. Properties not marked in the table for inspection shall be tested by the manufacturer at least once per 5 years, to be verified by the inspector during inspections. The frequency of inspection visits is defined in chapter 8.5 of this evaluation guideline.
b) These product properties are only visually controlled during the inspection. In case of reasonably doubt samples will be taken and send to an accredited test laboratory for determination of these properties.
c) These product properties are determined during the inspection.
d) Only 7 days test; at 23 °C for class I and II rubbers and at 125 °C for class III rubbers.
e) Not for 100% EPM/EPDM. Also 100% IIR doesn't need to be tested for ozone class 2 and 3.

7.3. Inspection of the quality system

The supplier's quality system will be assessed by Kiwa based on the IQC scheme.
The inspection contains at least those aspects mentioned in chapter 6.

8. Agreements on the implementation of certification

8.1. General

The certification body must have a procedure in place in which the general regulations used for certification are established.

8.2. Certification staff

The staff involved in the certification may be sub-divided into:

- Certification assessor/Reviewer **(CAS/RV**): in charge of carrying out the design and documentation evaluations, pre-certification tests, initial investigations, and evaluation of applications and reviewing conformity assessments.
- Site assessor (**SAS**): in charge of carrying out external inspections at the supplier's works;
- Decision maker (**DM**): in charge of taking decisions in connection with the pre-certification tests carried out, continuing the certification based on the inspections carried out and taking decisions on the need to take corrective actions.

8.2.1. Competence criteria certification staff

The competence criteria for the implementing certification staff are laid down in the following table. The competence of the certification staff involved must have been demonstrably recorded.

Basic competences	**Evaluation criteria**
Knowledge of company processes. Skills for conducting professional assessments on products, processes, services, installations, design, and management systems.	*Relevant work experience* **SAS, CAS/RV**: 1 year **DM**: 4 years, including 1 year related to certification *Relevant technical knowledge and experience at the level of:* **SAS:** High school **CAS/RV, DM**: Bachelor
Skills with regard to site assessments to be performed Adequate communication skills (e.g. writing reports, presentation skills and interviewing skills).	**SAS**: Kiwa Assessment training or equivalent and 4 site assessments including 1 supervised self-reliant assessment.
Execution of Initial Investigation	**CAS**: 4 initial assessments under supervision.
Conducting reviews	**RV**: evaluation of 3 reviews

Technical competences	**Evaluation criteria**
Education	**General:** Education in one of the following technical areas: • Civil Engineering; • Engineering; • Technical higher level professional education; • Internal training certification and Kiwa policy; • Training auditing.
Testing skills	**General:** • 1 week laboratory training (general and scheme specific) including measuring techniques and conducting tests under supervision; • Conducting tests (per scheme).

Experience – specific	**CAS** • 4 complete applications (excluding the initial assessment of the production site) under the direction of the **PM**; **SAS** • 4 inspection assessments together with a qualified **SAS**; • 1 inspection assessment self-reliant (evaluated by **PM);**
Skills in performing witnessing	**PM** Internal training witness testing

Legenda:

- Product manager: (**PM**)
- Site assessor (**SAS**)
- Certification assessor (**SAS**)
- Reviewer (**RV)**
- Decision maker (**DM**)

8.2.2. Qualifications Certification staff

The qualification of the Certification staff shall be demonstrated by means of assessing the education and experience to the above mentioned requirements. In case staff is to be qualified on the basis of deflecting criteria, written records shall be kept.
The authority regarding qualifications shall be recorded in the quality assurance system of the certification body.

8.3. Report on Initial investigation

The certification body records the results of the initial investigation in a report. This report shall comply with the following requirements:

- completeness: the report provides a verdict about all requirements included in the evaluation guideline;
- traceability: the findings on which the verdicts have been based shall be recorded and traceable;
- basis for decision: the DM shall be able to base their decision on the findings included in the report.

8.4. Decision for granting the certificate and/or imposition of measures

The decision for granting the certificate or the imposition of measures with regard to the certificate shall be based on the results recorded in the file.
The results of an initial investigation and a periodic assessment (in case of critical non-conformities) must be assessed by a reviewer.
Based on the performed review, the decision maker will decide if:

- The certificate can be granted,
- Sanctions are imposed,
- The certificate shall be suspended or revoked.

The reviewer and the decision maker shall not have been involved in the preparation of the results based on which the decision is being made.
The decision shall be recorded in a traceable manner.

8.5. Nature and frequency of third party assessments

The certification body shall carry out surveillance assessments on site at the supplier to verify compliance with their obligations. The Board of Experts decides on the frequency of assessments.

At the time this BRL entered into force, the frequency of assessments amounts to «4» assessment(s) per year:

- For suppliers with a quality management system in accordance with ISO 9001 and/or IATF 16494, certified by an accredited body (in accordance with ISO/IEC 17021), and where the IQC scheme is an integrated part of the quality management system, «2» per year.

An overview of the assessments to be performed by the certification body is given in the test matrix and must cover at least:

- the product specifications laid down in the certificate;

- the production process of the products;
- the supplier's IQC Scheme and the results of the inspections performed by the supplier;
- the correct way of applying markings to the certified products;
- compliance with the required procedures;
- dealing with complaints about delivered products.

For suppliers with a private label certificate, the frequency of assessments for the products covered by this certificate is established at 1 assessment per 2 years. The assessments are conducted at the site of private label holder and focused on the aspects inserted in the IQC scheme and the results of the control performed by the private label holder. The IQC scheme of the private label holder shall at least refer to:

- the correct way of applying markings to the certified products;
- compliance with required procedures for receiving and final inspection;
- the storage of products and goods;
- dealing with complaints about delivered products.

If the production of the product is divided over multiple production locations, from compounding to the finished article (either own production sites or outsourced activities), the following applies:

- The certification body shall also perform assessments at these locations.
- The frequency of these assessments is established at 1 assessment per 2 years for compounding locations and 1 assessment per year for other types of locations. The specific inspection frequency for each location shall be defined in the certification agreement.
- The assessment will cover the applicable subjects as laid down in the test matrix described above.

The certificate holder remains responsible for ensuring that the outsourced location complies with all requirements laid down in the certification scheme.

The results of each assessment shall be recorded by Kiwa in a traceable manner in a report.

8.6. Non conformities

When the certification requirements are not met, measures are taken by Kiwa in accordance with the sanctions policy as written in the Kiwa Regulation for Certification. The Kiwa Regulation for Certification and the Sanctions Policy are available page on the Kiwa website.

The following applies with regards to the relevance, follow-up of nonconformities, and the sanctions policy.

8.6.1. Severity of nonconformities

The severity of the issued nonconformity in relation to the assessment conducted after granting the product certificate by certification body can be differentiated as follows:

- Nonconformities entitled as critical are deviations that can directly affect the quality and/or performance of product and/or process;
- Other" nonconformities (noncritical nonconformities).

8.6.2. Follow-up nonconformities

The follow-up procedure for nonconformities by a certification body is as follows:

- The certification body shall be able to deal with critical nonconformities within the time frame established by the certification body, but shall not exceed the maximum term of «3» *decision BoE* months;
- The certification body shall be able to deal with noncritical nonconformities within the time frame established by the certification body, but shall not exceed the maximum term of «6» *decision BoE* months,

8.7. Report to the Board of Experts

The certification body shall report at least annually about the performed certification activities. In this report the following aspects shall be included:

- mutations in number of issued certificates (granted/withdrawn);
- number of executed assessments in relation to the established minimum;
- results of the inspections;

- measures imposed in case of nonconformities;
- complaints received from third parties about certified products.

8.8. Interpretation of requirements

The Board of Experts may record the interpretation of requirements of this evaluation guideline in one or more separate interpretation document(s). This or those interpretation documents will be available to the members of the Board of Expert, the certification bodies, and the certificate holders who are active based on this evaluation guideline. This or those interpretation documents will be published on Kiwa's website.

9. Titles of the standards

9.1. Public law rules

BJZ2011048144 Regulation from the State Secretary for Instructure and
29 June 2011 Environment [4]

9.2. Standards / normative documents

Number	Title	Version *
EN-ISO/IEC 17020	Conformity assessment - General criteria for the operation of various types of bodies performing inspection	
EN ISO/IEC 17021	Conformity assessment - Requirements for bodies providing audit and certification of management systems	
EN-ISO/IEC 17024	Conformity assessment - General requirements for bodies operating certification of persons	
EN-ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	
EN-ISO/IEC 17065	Conformity assessment - Requirements for bodies certifying products, processes, and services	
NEN-ISO 10508 including amendment sheet: A1	Plastics piping systems for hot and cold water installations -Guidance for classification and design	
NEN-EN 681-1 Including amendment sheets: A1, A2, A3 & C1	Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage applications – Part 1: Vulcanised rubber	
NEN-ISO 4633	Rubber seals - Joint rings for water supply, drainage and sewerage pipelines - Specification for materials.	
NEN-ISO 9631	Rubber seals - Joint rings for pipelines for hot-water supply up to 110 °C - Specification for the material	
NEN-EN 806-2	Specification for installations inside buildings conveying water for human consumption – Part 2: Design	
NEN-ISO 34-2	Determination of the tear strength of small test pieces (Delft test pieces)	
NEN-ISO 37	Rubber, vulcanised or thermoplastic - Determination of tensile stress - strain properties	
NEN-ISO 48-2	Rubber, vulcanized or thermoplastic - Determination of hardness - Part 2: Hardness between 10 IRHD and 100 IRHD	
NEN-ISO 188	Rubber, vulcanised – Accelerated ageing or heat-resistance tests	
NEN-ISO 813	Rubber, vulcanised - Determination of adhesion to a rigid substrate – 90 degree peel method	
NEN-ISO 815-1	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 1: At ambient or elevated temperatures	
NEN-ISO 815-2	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 2: At low temperatures	
NEN-ISO 1431-1	Rubber, vulcanised or thermoplastic - Resistance to ozone cracking - Part 1: Static strain test	
NEN-ISO 1817	Rubber, vulcanised – Determination of the effect of liquids	
NEN-ISO 2285	Rubber, vulcanised or thermoplastic - Determination of tension set at normal and high temperatures	
NEN-ISO 3302-1	Rubber - Tolerances for products - Part 1: Dimensional tolerances	
NEN-ISO 3384-1	Rubber, vulcanized or thermoplastic - Determination of stress relaxation in compression - Part 1: Testing at constant temperature	
NEN-ISO 3601-1	Fluid power systems - O-rings - Part 1: Inside diameters, cross-sections, tolerances and designation code	
NEN-ISO 3601-3	Fluid power systems - O-rings - Part 3: Quality acceptance criteria	

[4] *Applicable from 1 july 2017*

NEN-ISO 3865	Rubber, vulcanized or thermoplastic - Methods of test for staining in contact with organic material
NEN-ISO 4661	Rubber, vulcanised or thermoplastic – Preparation of samples and test pieces
NEN-ISO 6914	Rubber, vulcanized; Determination of ageing characteristics by measurement of stress at a given elongation
NEN-ISO 9691	Rubber – Recommendation for the workmanship of pipe joint rings – Description and classification of imperfections
NEN-ISO 23529	Rubber – General procedures for preparing and conditioning test pieces for physical test methods
NEN-EN-ISO 9001	Quality management systems - Requirements
IATF 16949	Technical Specification Quality management system requirements for automotive production and relevant service parts organisations

*) If no date of issuance is specified in this column, the current version of the document applies.

Remark: if standards or normative documents are dated:
An annual verification will take place to verify if the normative documents are still up to date. Modifications of the applicable normative documents will be published on the services page of Kiwa's website.

Annex A - Summary for the requirements for rubber products and/or rubber material sheets

Table 20A: Summary of the requirements for type A materials used for class I applications (§4.9)

Property	Units	Method	BRL clause	Requirement for hardness classes						Type testing	Yearly testing
				40	50	60	70	80	90		
Hardness on std sheets[1], products[2] or std. test pieces made out of products[2]	IRHD-M	ISO 48-2	4.9.2	± 5	± 5	± 5	± 5	± 5	± 5	●	●
Tear resistance on standard sheets[1] or on test pieces made out of products[2]	N	ISO 34-2	4.9.3	≥20	≥20	≥20	≥20	≥20	≥20	●	
Tensile strength on std sheets[1], products[2] or std. test pieces made out of products	MPa	ISO 37[2]	4.9.4	≥9,0	≥9,0	≥9,0	≥9,0	≥9,0	≥9,0	●	●
Elongation at break on sheets[1], products[2] or std. test pieces made out of products	%			≥400	≥375	≥300	≥200	≥125	≥100	●	●
Ageing 168 hours in air at 70°C tested on std. test sheet[1], products[2] or test pieces made from products		ISO 188									
- change hardness	IRHD-M	ISO 48-2	4.9.5	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5	●	●
- change tensile strength maximum	%	ISO 37[2]		-20	-20	-20	-20	-20	-20		
- change elongation	%	ISO 37[2]		+10/-30	+10/-30	+10/-30	+10/-30	+10/-40	+10/-40		
Compression set tested on std. test pieces[1], products[2] or test pieces from products		ISO 815-2									
- 72 h, -10°C	%	ISO 815-1	4.9.6	≤ 40	≤ 40	≤ 50	≤ 50	≤ 60	≤ 60	●	
- 72 h, 23°C		or		≤ 12	≤ 12	≤ 12	≤ 15	≤ 15	≤ 15	●	
- 24 h, 70°C		ISO 2285		≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	●	●
Stress relaxation on std. test pieces[1], products[2] or test pieces from products		ISO 3384									
- 168 h at 23°C	%	or	4.9.7	≤ 13	≤ 14	≤ 15	≤ 16	≤ 17	≤ 18	●	●
- 100 days at 23°C		ISO 6914		≤ 19	≤ 20	≤ 22	≤ 23	≤ 25	≤ 26	●	
Ozone resistance [3] on std. test pieces[1], products[2] or test pieces from products											
Class 1 – required elongation				20%	20%	20%	20%	15%	10%		
120h, 40°C, 50 pphm				No cracks							
Class 2 – required elongation	-	ISO 1431/1	4.9.8	20%	20%	20%	20%	15%	10%	●	●
48 h, 40°C, 50 pphm				No cracks							
Class 3 – required elongation				20%	20%	20%	20%	15%	10%		
48 h, 40°C, 25 pphm				No cracks							
Changes in volume after storage in water on std. test pieces[1], products or test pieces from products - 168 h at 70°C	% (v/v)	ISO 1817	4.9.9	+8/-1	+8/-1	+8/-1	+8/-1	+8/-1	+8/-1	●	

[1]Testing on test pieces made from standard lab sheets/buttons is only allowed for certification of the compound, see last paragraph in chapter 1.2 and Annex F, an exception is made for the tear resistance when it is not possible to prepare standard test pieces from the product.[2] See BRL 17504 Annex G or H for testing on products or O-rings. [3] Ozone resistance test is not mandatory for products based on pure polymers of EPM/EPDM, yearly testing according to the applicable ozone class.

Table 20B: Summary of the requirements for type B materials used for class I applications (§4.9)

Property	Units	Method	BRL clause	Requirement for hardness classes						Type testing	Yearly testing
				40	50	60	70	80	90		
Hardness on std sheets[1], products or std. test pieces made out of products[2]	IRHD-M	ISO 48-2	4.9.2	± 5	± 5	± 5	± 5	± 5	± 5	●	●
Tear resistance on standard sheets[1] or on test pieces made out of products[2]	N	ISO 34-2	4.9.3	≥20	≥20	≥20	≥20	≥20	≥20	●	
Tensile strength on std sheets[1], products[2] or std. test pieces made out of products	MPa	ISO 37[2]	4.9.4	≥9,0	≥9,0	≥9,0	≥9,0	≥9,0	≥9,0	●	●
Elongation at break on sheet test piece[1], products[2] or std. test piece made out of products	%			≥400	≥375	≥300	≥200	≥125	≥100	●	●
Ageing 168 hours in air at 70°C tested on std. test sheet[1], products[2] or test pieces made from products		ISO 188	4.9.5							●	●
- change hardness	IRHD-M	ISO 48-2		+8/-5	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5		
- change tensile strength maximum	%	ISO 37[2]		-20	-20	-20	-20	-20	-20		
- change elongation	%	ISO 37[2]		+10/-30	+10/-30	+10/-30	+10/-30	+10/-40	+10/-40		
Compression set tested on std. test pieces[1], products[2], or test pieces from products		ISO815-2	4.9.6								
- 72 h, -10°C	%	ISO 815-1		≤ 40	≤ 40	≤ 50	≤ 50	≤ 60	≤ 60	●	
- 72 h, 23°C		or		≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	●	
- 24 h, 70°C		ISO 2285		≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	●	●
Stress relaxation on std. test pieces[1], products[2] or test pieces from products		ISO 3384	4.9.7								
- 168 h at 23°C	%	or		≤ 15	≤ 15	≤ 15	≤ 15	≤ 18	≤ 18	●	●
- 100 days at 23°C		ISO 6914		≤ 30	≤ 30	≤ 30	≤ 30	≤ 30	≤ 30	●	
Ozone resistance [5] on std. test pieces[1], products[2] or test pieces from products											
Class 1 – required elongation				20%	20%	20%	20%	15%	10%		
120h, 40°C, 50 pphm				No cracks							
Class 2 – required elongation	-	ISO 1431/1	4.9.8	20%	20%	20%	20%	15%	10%	●	●
48 h, 40°C, 50 pphm				No cracks							
Class 3 – required elongation				20%	20%	20%	20%	15%	10%		
48 h, 40°C, 25 pphm				No cracks							
Changes in volume after storage in water on std. test pieces[1], products[2] or test pieces from products - 1680 h at 150°C	% (v/v)	ISO 1817	4.9.9	≥10	≥10	≥10	≥10	≥10	≥10	●	

[1] Testing on test pieces made from standard lab sheets/buttons is only allowed for material certification of the compound. See last paragraph in chapter 1.2 and Annex F for more information. An exception is made for the tear resistance when it is not possible to prepare standard test pieces from the product. [2] See BRL 17504 Annex G or H for testing on products or O-rings. [3] Ozone resistance testing for IIR is only mandatory if the following cases apply: a) The material is based on pure IIR but it needs to fulfil ozone class 1, yearly testing according to ozone class-1. b) If a product is not based on pure IIR the ozone resistance should be tested to either class 1, 2 or 3, yearly testing to the applicable ozone class. c) If the material is based on pure IIR ozone class 2 and/or 3 are considered to be fulfilled and testing is not needed. The material will be automatically regarded as a ozone class-2 material.

Table 21A: Summary of the requirements for type A materials used for class II applications (§4.9)

Property	Units	Method	BRL clause	Requirement for hardness classes					Type testing	Yearly testing
				50	60	70	80	90		
Hardness on std sheets[1], products[2] or std. test pieces made out of products	IRHD-M	ISO 48-2	4.9.2	± 5	± 5	± 5	± 5	± 5	●	●
Tear resistance on standard sheets[1] or on test pieces made out of products[2]	N	ISO 34-2	4.9.3	≥20	≥20	≥20	≥20	≥20	●	
Tensile strength on std sheets[1], products[2] or std. test pieces made out of products	MPa	ISO 37[2]	4.9.4	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	●	●
Elongation at break on sheet test piece[1], products[2] or std. test piece made out of products	%			≥250 or ≥225[3]	≥200 or ≥175[3]	≥150 or ≥130[3]	≥100 or ≥85[3]	≥100 or ≥85[3]	●	●
Ageing 168 hours in air at 125 °C tested on std. test sheet[1], products[2], O-rings or test pieces made from products		ISO 188	4.9.5						●	●
- change hardness	IRHD-M	ISO 48-2		+8/-5	+8/-5	+8/-5	+8/-5	+8/-5		
- change tensile strength maximum	%	ISO 37[2]		-20	-20	-20 or -25[3]	-20 or -30[3]	-20 or -30[3]		
- change elongation	%	ISO 37[2]		+10/-30	+10/-30	+10/-30	+10/-40	+10/-40		
Compression set tested on std. test pieces[1], products, O-rings or test pieces from products		ISO 815-2	4.9.6							
- 72 h, -10 °C[4]	%	ISO 815-1		≤ 40[4]	≤ 50[4]	≤ 50[4]	≤ 60[4]	≤ 60[4]	●	
- 72 h, 23 °C		or		≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	●	
- 24 h, 125 °C		ISO 2285		≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	●	●
Stress relaxation on std. test pieces[1], products or test pieces from products			4.9.7							
- 168 h at 23 °C	%	ISO 3384 or ISO 6914		≤ 15	≤ 15	≤ 15	≤ 18	≤ 18	●	●
- 100 days at 23 °C				≤ 20	≤ 22	≤ 23	≤ 25	≤ 26	●	
- 7 days at 125 °C				≤ 30	≤ 30	≤ 30	≤ 30	≤ 30	●	
Ozone resistance [5] on std. test pieces[1], products[2] or test pieces from products			4.9.8							
Class 1 – required elongation	-	ISO 1431/1		20%	20%	20%	15%	10%	●	●
120h, 40°C, 50 pphm				No cracks						
Class 2 – required elongation				20%	20%	20%	15%	10%		
48 h, 40°C, 50 pphm				No cracks						
Class 3 – required elongation				20%	20%	20%	15%	10%		
48 h, 40°C, 25 pphm				No cracks						
Changes in volume after storage in water on std. test pieces[1], products[2] or test pieces from products - 168 h at 95°C	% (v/v)	ISO 1817	4.9.9	+8/-1	+8/-1	+8/-1	+8/-1	+8/-1	●	

[1]Testing on test pieces made from standard lab sheets/buttons is only allowed for material certification of the compound. See last paragraph in chapter 1.2 and Annex F for more information. An exception is made for the tear resistance when it is not possible to prepare standard test pieces from the product. [2] See BRL 17504 Annex G or H for testing on products or O-rings. [3]This requirement is only applicable to O-rings or press-fit rings with a cross-section that is ≤4 mm. See Annex H for more information. For cross sections > 4 mm use the standard requirement for products apply. [4]Only applicable if a lowered temperature class should be covered by the certificate (class I). [5] Ozone resistance test is not mandatory for products based on pure polymers of EPM/EPDM, Yearly testing according to the applicable ozone class.

Table 21B: Summary of the requirements for type B materials used for class II applications (§4.9)

Property	Units	Method	BRL clause	Requirement for hardness classes					Type testing	Yearly testing
				50	60	70	80	90		
Hardness on std testpieces[1], products[2] or std. test pieces made out of products	IRHD-M	ISO 48-2	4.9.2	± 5	± 5	± 5	± 5	± 5	●	●
Tear resistance on standard sheets or on test pieces made out of products	N	ISO 34-2	4.9.3	≥20	≥20	≥20	≥20	≥20	●	
Tensile strength on std sheets[1], products[2] or std. test pieces made out of products	MPa	ISO 37[2]	4.9.4	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	●	●
Elongation at break on sheet test piece[1], products[2],or std. test piece made out of products	%			≥250 or ≥225[3]	≥200 or ≥175[3]	≥150 or ≥130[3]	≥100 or ≥85[3]	≥100 or ≥85[3]	●	●
Ageing 168 hours in air at 125 °C tested on std. test sheet[1], products[2], O-rings or test pieces made from products		ISO 188								
- change hardness	IRHD-M	ISO 48-2	4.9.5	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5	●	●
- change tensile strength maximum	%	ISO 37[2]		-20	-20	-20 or -25[3]	-20 or -30[3]	-20 or -30[3]		
- change elongation	%	ISO 37[2]		+10/-30	+10/-30	+10/-30	+10/-40	+10/-40		
Compression set tested on std. test pieces[1], products[2] or test pieces from products		ISO 815-2								
- 72 h, -10 °C[4]	%	ISO 815-1	4.9.6	≤ 40[4]	≤ 50[4]	≤ 50[4]	≤ 60[4]	≤ 60[4]	●	
- 72 h, 23 °C		or		≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	●	
- 24 h, 125 °C		ISO 2285		≤ 20 or 25[3]	≤ 20 or 25[3]	≤ 20 or 25[3]	≤ 20 or 25[3]	≤ 20 or 25[3]	●	●
Stress relaxation on std. test pieces[1], products[2] or test pieces from products		ISO 3384								
- 168 h at 23 °C	%	or	4.9.7	≤ 15	≤ 15	≤ 15	≤ 18	≤ 18	●	●
- 100 days at 23 °C		ISO 6914		≤ 30	≤ 30	≤ 30	≤ 30	≤ 30	●	
Ozone resistance [5] on std. test pieces[1], products[2] or test pieces from products										
Class 1 – required elongation				20%	20%	20%	15%	10%		
120h, 40 °C, 50 pphm				No cracks						
Class 2 – required elongation	-	ISO 1431/1	4.9.8	20%	20%	20%	15%	10%	●	●
48 h, 40 °C, 50 pphm				No cracks						
Class 3 – required elongation				20%	20%	20%	15%	10%		
48 h, 40 °C, 25 pphm				No cracks						
Changes in volume after storage in water on std. test pieces[1], products[2] or test pieces from products - 1680 h at 150 °C	% (v/v)	ISO 1817	4.9.9	≥10	≥10	≥10	≥10	≥10	●	

[1]Testing on test pieces made from standard lab sheets/buttons is only allowed for material certification of the compound. See last paragraph in chapter 1.2 and Annex F for more information. An exception is made for the tear resistance when it is not possible to prepare standard test pieces from the product. [2] See BRL 17504 Annex G or H for testing on products or O-rings. [3]This requirement is only applicable to O-rings or press-fit rings with a cross-section that is ≤4 mm. See Annex H for more information. For cross sections > 4 mm use the standard requirement for products apply. [4]Only applicable if a lowered temperature class should be covered by the certificate (class I). [5]Ozone resistance testing for IIR is only mandatory if the following cases apply: a) The material is based on pure IIR but it needs to fulfil ozone class 1, yearly testing according to ozone class-1. b) If a product is not based on pure IIR the ozone resistance should be tested to either class 1, 2 or 3, yearly testing to the applicable ozone class. c) If the material is based on pure IIR ozone class 2 and/or 3 are considered to be fulfilled and testing is not needed. The material will be automatically regarded as a ozone class-2 material.

Table 22A: Summary of the requirements for type A materials used for class III applications (§4.9)

Property	Units	Method	BRL clause	Requirement for hardness classes			Type testing	Yearly testing
				60	70	80		
Hardness on std test sheet[1], products[2] or std. test pieces made out of products	IRHD-M	ISO 48-2	4.9.2	± 5	± 5	± 5	●	●
Tear resistance on standard sheets or on test pieces made out of products[2]	N	ISO 34-2	4.9.3	≥20	≥20	≥20	●	
Tensile strength on std sheets[1], products[2] or std. test pieces made out of products	MPa	ISO 37[2]	4.9.4	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	●	●
Elongation at break on sheet test piece[1], products[2] or std. test piece made out of products	%			≥200[4] or ≥175	≥150[4] or ≥130	≥100 or ≥85[3]	●	●
Ageing 168 hours in air at 125 °C tested on std. test sheet[1], products[2] or test pieces made from products		ISO 188	4.9.5				●	●
- change hardness	IRHD-M	ISO 48-2		+8/-5	+8/-5	+8/-5		
- change tensile strength maximum	%	ISO 37[2]		-20	-20 or -25[3]	-20 or -30[3]		
- change elongation	%	ISO 37[2]		+10/-30	+10/-30	+10/-40		
Compression set tested on std. test pieces[1], products[2] or test pieces from products		ISO 815-2 ISO 815-1 or ISO 2285	4.9.6					
- 72 h, -10 °C[5]	%			≤ 50[5]	≤ 50[5]	≤ 60[5]	●	
- 72 h, 23 °C				≤ 15	≤ 15	≤ 15	●	
- 24 h, 125 °C				≤ 20	≤ 20	≤ 20	●	●
Stress relaxation on std. test pieces[1], products[2] or test pieces from products		ISO 3384 or ISO 6914	4.9.7					
- 168 h at 23 °C	%			≤ 15	≤ 15	≤ 15	●	
- 100 days at 23 °C				≤ 22	≤ 22	≤ 22	●	
- 7 days at 125 °C				≤ 30	≤ 30	≤ 30	●	●
- 4 weeks at 140°C				≤ 55	≤ 55	≤ 55	●	
Ozone resistance [6] on std. test pieces[1], products[2] or test pieces from products		ISO 1431/1	4.9.8					
Class 1 – required elongation	-			20%	20%	15%	●	●
120h, 40°C, 50 pphm				No cracks				
Class 2 – required elongation				20%	20%	15%		
48 h, 40°C, 50 pphm				No cracks				
Class 3 – required elongation				20%	20%	15%		
48 h, 40°C, 25 pphm				No cracks				
Changes in volume after storage in water on std. test pieces[1], products[2] or test pieces from products - 168 h at 95°C	% (v/v)	ISO 1817	4.9.9	+8/-1	+8/-1	+8/-1	●	
Compression set in water on specified products[2]		ISO 815-1 & ISO 9631 Annex B	4.9.10					
- 10000h 110 °C[7]	%			≤ 40[7]	≤ 40[7]	≤ 40[7]	●	
- 3000h 110 °C				≤ 20 / 30[7]	≤ 20 / 30[7]	≤ 20 / 30[7]		

[1]Testing on test pieces made from standard lab sheets/buttons is only allowed for material certification of the compound. See last paragraph in chapter 1.2 and Annex F for more information. An exception is made for the tear resistance when it is not possible to prepare standard test pieces from the product. [2] See BRL 17504 Annex G or H for testing on products or O-rings. [3]This requirement is only applicable to O-rings or press-fit rings with a cross-section that is ≤4 mm. See Annex H for more information. For cross sections > 4 mm use the standard requirement for products apply.[4]Only applicable for test specimen cut from std. test sheets. [5]Only applicable if also class I should be covered in the certificate. [6] Ozone resistance test is not mandatory for products based on pure polymers of EPM/EPDM, Yearly testing according to the applicable ozone class.
[7] If the result after 3000 hours is below 20% the test can be stopped and the material is OK for this aspect; if the result after 3000 hours is above 30% the test can be stopped and the material is not OK for this aspect. If the result after 3000 hours is between 20 and 30% the test can continue to 10000 hours.

. Table 22B: Summary of the requirements for type B materials used for class III applications (§4.9)

Property	Units	Method	BRL clause	Requirement for hardness classes			Type testing	Yearly testing
				60	70	80		
Hardness on std test sheet[1], products[2] or std. test pieces made out of products	IRHD-M	ISO 48-2	4.9.2	± 5	± 5	± 5	●	●
Tear resistance on standard sheets or on test pieces made out of products[2]	N	ISO 34-2	4.9.3	≥20	≥20	≥20	●	
Tensile strength on std sheets[1], products[2] or std. test pieces made out of products	MPa	ISO 37[2]	4.9.4	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	≥9,0 or ≥8,5[3]	●	●
Elongation at break on sheet test piece[1], products[2] or std. test piece made out of products	%	ISO 37[2]	4.9.4	≥200[4] or ≥175	≥150[4] or ≥130	≥100 or ≥85[3]	●	●
Ageing 168 hours in air at 125 °C tested on std. test sheet[1], products[2] or test pieces made from products - change hardness - change tensile strength maximum - change elongation	 IRHD-M % %	ISO 188 ISO 48-2 ISO 37[2] ISO 37[2]	4.9.5	 +8/-5 -20 +10/-30	 +8/-5 -20 or -25[3] +10/-30	 +8/-5 -20 or -30[3] +10/-40	●	●
Compression set tested on std. test pieces[1], products[2] or test pieces from products - 72 h, -10 °C[5] - 72 h, 23 °C - 24 h, 125 °C	%	ISO 815-2 ISO 815-1 or ISO 2285	4.9.6	 ≤ 50[5] ≤ 15 ≤ 20 or ≤25[3]	 ≤ 50[5] ≤ 15 ≤ 20 or ≤25[3]	 ≤ 60[5] ≤ 15 ≤ 20 or ≤25[3]	 ● ● ●	 ●
Stress relaxation on std. test pieces[1], products[2] or test pieces from products - 168 h at 23 °C - 100 days at 23 °C	%	ISO 3384 or ISO 6914	4.9.7	 ≤ 15 ≤ 30	 ≤ 15 ≤ 30	 ≤ 18 ≤ 30	 ● ●	 ●
Ozone resistance [6] on std. test pieces[1], products[2] or test pieces from products Class 1 – required elongation 120h, 40°C, 50 pphm Class 2 – required elongation 48 h, 40°C, 50 pphm Class 3 – required elongation 48 h, 40°C, 25 pphm	-	ISO 1431/1	4.5.8	 20% 20% No cracks 20% No cracks 20% No cracks	 20% 20% 20% 	 15% 15% 15% 	●	●
Changes in volume after storage in water on std. test pieces[1], products[2] or test pieces from products - 1680 h at 150°C	% (v/v)	ISO 1817	4.9.9	≥10	≥10	≥10	●	
Compression set in water[6] on specified products[2] - 10000h 110 °C - 3000h 110 °C	%	ISO 815-1 & ISO 9631 Annex B	4.9.10	 ≤ 40[7] ≤ 20 / 30[7]	 ≤ 40[7] ≤ 20 / 30[7]	 ≤ 40[7] ≤ 20 / 30[7]	 ●	

[1]Testing on test pieces made from standard lab sheets/buttons is only allowed for certification of the compound. See last paragraph in chapter 1.2 and Annex F. An exception is made for the tear resistance when it is not possible to prepare standard test pieces from the product. [2] See BRL 17504 Annex G or H for testing on products or O-rings. [3]This requirement is only applicable to O-rings or press-fit rings with a cross-section that is ≤4 mm, see Annex H for more information, for cross sections > 4 mm use the standard requirement for products apply.[4]Only applicable for test specimen cut from std. test sheets. [5]Only applicable if also class I should be covered in the certificate.[6] Ozone resistance testing for IIR is only mandatory if the following cases apply: a) The material is based on pure IIR but it needs to fulfil ozone class 1, yearly testing according to ozone class-1. b) If a product is not based on pure IIR the ozone resistance should be tested to either class 1, 2 or 3, yearly testing to the applicable ozone class. c) If the material is based on pure IIR ozone class 2 is considered to be fulfilled and testing is not needed, the material will be automatically regarded as a ozone class-2 material. [7]If the result after 3000 hours is below 20% the test can be stopped and the material is OK for this aspect; if the result after 3000 hours is above 30% the test can be stopped and the material is not OK for this aspect. If the result after 3000 hours is between 20 and 30% the test can continue to 10000 hours.

Table-23: regulatory requirements (§4.7)

Property	Dimension	Method	BRL clause	Requirement
Products and materials which (may) come into contact with drinking water or warm tap water, shall not release substances in quantities which can be harmful to the health of the consumer, or negatively affect the quality of the drinking water	-	BRL K17504	4.2	The products or materials shall meet toxicological, microbiological and organoleptic requirements as laid down in the currently applicable "Ministerial Regulation materials and chemicals drinking water and warm tap water supply",

Table-24: summary of the functional & basic requirements (§4.8)

Property	Dimension	Method	BRL clause	Requirement
Chemical resistance	-	ISO 1817	4.8.1	The rubber products have to be resistant to any chemicals drinking water can contain under usual circumstances. See 4.8.1 for more information.
Effect of rubber products on the pipe and/or fitting materials	-	ISO 3865	4.8.2	The rubber products may not contain substances that, under normal circumstances, can have an adverse effect on the material of the pipes and fittings. See 4.8.2 for more information
Appearance	-	ISO 9691	4.8.3	The sealing zone shall be free of all surface imperfections other than bloom. Outside of the sealing zone no major imperfections are allowed.
Homogeneity	-	ISO 9691	4.8.4	No foreign bodies, free of imperfections and defects such as cracks, entrapped air, bubbles or other irregularities
Dimensions	-	ISO 23529 ISO 3302-1 ISO 3601-1	4.8.5	Dimensions should be determined by means of appropriate measuring equipment. Tolerances shall be specified from the appropriate classes. The nominal measurements and the acceptable deviations shall be in accordance with the figures stated by the manufacturer and they shall be laid down in a drawing

Table-25: requirements for special types of products (§4.10)

Property	Dimension	Method	BRL clause	Requirement
Number of welds	-	BRL K17504	4.10.1	≤1
Behaviour at elongation for products with a weld before ageing	-	BRL K17504	4.10.2	No crack or constrain
Behaviour at elongation for products with a weld after ageing	-	BRL K17504	4.10.2	No crack or constrain
Adhesion	N	BRL K17504	4.10.3	100 N / 25 mm
Other requirements: rubber products containing other rigid non-adhered materials	-	BKL K17504	4.10.4	No negative effect on rubber

Annex B - Categorization of O-ring sizes

Table 26: categorization of O-ring sizes in groups

Groups of products	Cross section diameter	
	Minimum [mm]	Maximum [mm]
A	-	2,75
B	2,75	6,0
C	6,0	12
D	12	25
E	>25	-

Annex C - explanations (informative)

Permanent seal under load

When applying seals in pipe joints it must be kept in mind that under the load and the own weight of the pipe, after a certain lapse of time the deformation of the ring may be such that the seal is no longer sufficient on the opposite side. The pipe manufacturer is recommended to take measures to prevent this.

Recommendations of a general nature

Percentage of compression

The extent, to which different types of rubber are compressed in the joints, varies. General rules cannot be given. The following factors affect the acceptable percentage of compression:

- the type of rubber and the way the rings are manufactured;
- the construction of the joint;
- the conditions (temperature, pressure, medium and additional assembly tensions).

Therefore, the type of rubber to be used must always be determined in consultation with the buyer, the pipe manufacturer and the rubber manufacturer.

Additional requirements

Sometimes it is necessary to have additional requirements, e.g. with regards to rigidity. Also, it may be useful to demand better resistance against ozone when longterm storage under extreme conditions is planned.
If additional requirements are judged necessary, the manufacturer of the pipes or attachments shall inform the rubber manufacturer and the inspection body of such requirements.

Application

TR 7620 can be used as a first reference of application of the various types of rubber.

Recommendations for the storage and use of rubber products

During storage and use of rubber products, appropriate measures must be taken to shield off environment influences (light, air, humidity and temperature).
The preservation of quality is aided as follows.

Storage in a warehouse or temporary indoor storage

a) Preferably, use a separate and closed room:
   - screened against artificial and day light;
   - ventilated with air containing as little ozone as possible (ozone is produced e.g. by generators, electric motors and arc welding);
   - with an ambient temperature between 5 and 25 °C;
   - with a relative humidity between 40% and 70%;
   - free of oil, grease and other hydrocarbons and/or vapours emanating from these.

b) Keep the storage time as short as possible.
   Apply the "first in - first out" method.
   In the case of indoor storage for a period exceeding 6 months, extra measures are required despite good conditions. These include airtight package, female ends of pipes, attachments or fittings.
   Hanging or stacking may cause extra load -pressure, elongation or tensile- and thus the formation of cracks.

Outdoor transport and storage

It is recommended to protect the rubber products as much as possible during transport or outdoor storage.

a) Keep exposure to influences of weather as short as possible and certainly protect against frost (temperature below -5 °C).

b) In the case of exposure to outdoor conditions for a period exceeding 2 weeks, extra measures are required such as packing, covering and screening against weather influences. Always prefer indoor storage or covered outdoor storage.

Recommendations for processing

Some general preventive rules for processing are:

a) Keep attachments and ends free of dust, sand and dirt in order to prevent damage at assembly.
b) At assembly, loose products shall be processed directly from the - possibly temporary - package.
c) Rubber products are susceptible to mechanical damage caused by sharp objects, burrs, cutting edges and undue elongation, distortion and forcing. Check the male ends of the pipes for burrs etc. prior to assembly.
d) In the case of repeated of long term arc welding in ambient air, the rubbers shall be protected.
e) Avoid contact with oil, grease, petrol, etc. and their vapours.
f) Cleaning with chemical products varies for many applications; follow the instructions of the manufacturer.
g) Application of lubricants shall take place strictly according to the instructions of the manufacturer or supplier.
h) After processing, make sure the joint is not exposed to frost; therefore cover in time.

Products in aboveground installations

Rubber products in aboveground installations or in permanent contact with atmospheric conditions require extra attention with regard to long term resistance. Not all rubber compounds and/or types are suitable for long term aboveground applications. The choice of a rubber compound shall therefore be well-considered

Annex D - Model certificate (example)

Certificate

Product certificate

K-XXXXXXX-X

kiwa

Valid from Fill in date Replaces Fill in text

Page 1 of xx

Vulcanised rubber products for cold and hot drinking water applications

STATEMENT BY KIWA

With this product certificate, issued in accordance with the Kiwa Regulations for Certification, Kiwa declares that legitimate confidence exists that the products supplied by

Name of business

as specified in this product certificate and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with Kiwa evaluation guideline BRL K17504 "Vulcanised rubber products for cold and hot drinking water applications", dated xx-xx-2026.

Wim van Loon
Managing Director Nederland

Publication of this certificate is allowed.
Advice: consult www.kiwa.com in order to ensure that this certificate is still valid.

PRODUCTS RvA C 002

Kiwa Nederland B.V.
Sir Winston Churchilllaan 273
P.O. Box 70
2280 AB RIJSWIJK
The Netherlands
Tel. +31 88 998 44 00
NL.Kiwa.Info@kiwa.com
www.kiwa.com

Certificate holder
Fill in text

Production location
Fill in text

20250801

Product certificate
K-XXXXXXX-X

Vulcanised rubber products for cold and hot drinking water applications

PRODUCT SPECIFICATION

The products mentioned below belong to this product certificate. The products as specified in the table below fulfil the requirements of BRL K17504. BRL K17504 covers the requirements of EN 681-1, "*Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber*".

TECHNICAL SPECIFICATION OF THE PRODUCT

Rubber Compound: Compound code / name			
Compound sealing type: Type A / Type B	**Temperature class:** I / II /III	**Hardness:** Class 60 Nominal xx±5	**Ozone Class:** 1 / 2 /3
Product reference: "O-ring" **Nominal Dimensions [mm]:** x - xxx **Cross Section [mm]:** x - xx **Production method:** Compr./ Inj. moulding / Extrusion.	Image of product/remark	**Product reference:** "O-ring" **Nominal Dimensions [mm]:** x - xxx **Cross Section [mm]:** x - xx **Production method:** Compr./ Inj. moulding / Extrusion.	Image of product/remark
Product reference: "O-ring" **Nominal Dimensions [mm]:** x - xxx **Cross Section [mm]:** x - xx **Production method:** Compr./ Inj. moulding / Extrusion.	Image of product/remark	**Product reference:** "O-ring" **Nominal Dimensions [mm]:** x - xxx **Cross Section [mm]:** x - xx **Production method:** Compr./ Inj. moulding / Extrusion.	Image of product/remark
Rubber Compound: Compound code / name			
Compound sealing type: Type A / Type B	**Temperature class:** I / II /III	**Hardness:** Class 60 Nominal xx±5	**Ozone Class:** 1 / 2 /3
Product reference: "O-ring" **Nominal Dimensions [mm]:** x - xxx **Cross Section [mm]:** x - xx **Production method:** Compr./ Inj. moulding / Extrusion.	Image of product/remark	**Product reference:** "O-ring" **Nominal Dimensions [mm]:** x - xxx **Cross Section [mm]:** x - xx **Production method:** Compr./ Inj. moulding / Extrusion.	Image of product/remark

Remark(s):

Rubber rings can be supplied with xxxxx lubrication.

The rings together with the lubrication form one product that conforms to BRL K17504.

Sealing principle type

- Type A – Non-swelling seals: seals based on EPM, EPDM, NBR, SBR or equivalent polymers with low swelling in water.
- Type B – Swelling seals: seals based on IIR, CIIR, BIIR (butyl rubbers) or equivalent polymers with selling properties in water.

Field of application / Temperature class according to BRL K17504:

- Class I - Water supply at temperatures up to 50 °C (see footnote #);
- Class II - Based on ISO 9631 (class T1). Hot water supply intermittent temperatures up to 85°C. Here the temperature is high (up to 85°C) during tapping and low (ambient) when no water is used. Incidental malfunctional temperatures up to 110°C can be possible;
- Class III - Hot water circulation systems based on the classification class 2 in ISO 10508 (continuous high temperature of 70°C).

Product certificate
K-XXXXXXX-X

Vulcanised rubber products for cold and hot drinking water applications

Ozone resistance class according to BRL K17504:

- Class 1 - For products with a high risk of attack by ozone, for instance in case of separately supplied products without sufficient packaging or in case of connections with preinstalled rubbers under strain;
- Class 2 - For products for which a normal resistance to ozone is required;
- Class 3 - For rubbers which are never (partly) exposed to the open air when they are in tension. Transport shall always take place in sealed packages.

Field of application according to EN 681-1:

WA	As in BRL K17504 type A, temperature class I;
WB	As in BRL K17504 type A, temperature class II;
WE	As in BRL K17504 type B (for IIR-copolymer), temperature class II.

In the Netherlands the maximum allowed temperature for cold drinking water is 25°C

Details of the products are included in the drawing list, which forms a part of the IQC schedule. Kiwa authenticates this list. A copy of this list can be obtained from the producer.

Fitness for contact with drinking water

This product is approved on the basis of the requirements for hygienic aspects set in the "Regeling materialen en chemicaliën drink- en warm tapwatervoorziening" ("Materials and chemicals in the supply of drinking water and warm tap water Regulation" dated 01-07-2017; published in the Government Gazette).

These hygienic aspects are based on two main criteria. The product shall permanently comply with:

- The product recipe approved during the assessment procedure. This recipe is not to be changed without prior approval by Kiwa according to the Kiwa approval procedure for the hygienic aspects;
- Specific product requirements for the hygienic aspects.

The recipe and specific product requirements are laid down in the for confidentiality reasons undisclosed 'appendix hygienic aspects' to this certificate.

MARKING

The Kiwa®-mark products are marked with "KIWA , *, KK* of **KK***

** Allowed limited marking for smaller products (in consultation with the manufacturer, the buyer and the inspection body).*

Further compulsory specifications:

- name or logo of the manufacturer or the deposited trade mark;
- the certification mark as described in 5.2 of BRL K17504;
- the nominal dimension or dimensions;
- the nominal hardness;
- date or code indicating the date of production (year and preferably the quarter);
- type of rubber according to the letter codes of the nomenclature according to ISO 1629;
- temperature class (I, II or III);
- on products from elastomer blends, the letter B ("blend") shall be placed behind the first letter code;
- the ozone resistance class ("Ozone 1, 2 or 3") for rubber rings made from two compounds the compound with the lowest class is valid.

Place of the mark:

Each product and product packaging should be marked in a clear, legible and indelible way according to chapter 5.2 of BRL K17504. However if the dimensions of the products are such that the indications applied to them may impair the product, the products may be marked per package in consultation with the manufacturer, the buyer and the inspection body. Products produced by cutting or die cutting out of sheets may be marked per package.

Method of marking:

- Non-erasable;
- Visible after assembly.

Product certificate
K-XXXXXXX-X

Vulcanised rubber products for cold and hot drinking water applications

APPLICATION AND USE

Class I corresponds to the classification used in EN 681-1 (Scope 1), described as "cold potable water supply up to 50 °C", and ISO 4633 (Scope a), described as "cold drinking-water supplies (up to 50 °C)". In the Netherlands, however, the maximum permitted drinking water temperature in piping systems is 25 °C. It is expected that the average temperature does not exceed 23 °C.

Class II is based on ISO 9631 (Class T1) and applies to hot water systems where the temperature is high during tapping (intermittently up to 85 °C) and low (ambient) when no water is used. Testing is aligned with EN 681-1 (Scope 2), which describes suitability up to 110 °C. However, more recent insights from ISO 9631 indicate that the EN 681-1 Scope 2 test program is insufficient for continuous use at such high temperatures. Incidental malfunction temperatures up to 110 °C may occur, but the average operating temperature is expected not to exceed 60 °C.

Class III covers more demanding conditions. It assumes a continuously high system temperature of 70 °C, in line with Class 2 of ISO 10508. For this class, a service life of at least 50 years is assumed when defining the test requirements in this Evaluation Guideline. This approach aligns with the requirements for such systems as specified in EN 806-2 and ISO 9631 (Class T2). The average temperature is expected not to exceed 85 °C.

Migration testing is conducted at representative average temperatures for each class: 23 °C for Class I, 60 °C for Class II, and 85 °C for Class III.

RECOMMENDATIONS FOR THE CUSTOMERS

Check at the time of delivery whether:

- the supplier has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc.

If you should reject a product on the basis of the above, please contact:

- Fill in company name of customer

and, if necessary,

- Kiwa Nederland B.V.

Consult the supplier's processing guidelines for the proper storage and transport methods.

Annex E - Model IQC-scheme (example)

<table>
<tr><td><u>IQC-schedule</u>

<u>INTERNAL QUALITY PLAN</u></td><td>Manufacturer / supplier :
Production location address :</td><td>Number of appendices:</td></tr>
<tr><td colspan="3"><u>Field(s) of application</u>

<u>According Evaluation Guideline(s)</u></td></tr>
<tr><td><u>Number of production shifts:</u></td><td rowspan="3" colspan="2"><u>Quality manual, procedures and working instructions</u>
Is the Quality Management System (QMS) certified according to ISO 9001[1)]?
If yes, by which certification body:
If yes, is the certification body accredited for the particular scope of certification?

In case the QMS is <u>not</u> certified according to ISO 9001:
• Working instructions, test instructions and procedures are documented as follows:

• The following procedure for dealing with <u>complaints</u> applies:
• The following procedure for <u>nonconformity review</u> applies:</td></tr>
<tr><td><u>Quality Control</u>
Total number of employees in QC department :
Number of QC-operators per shift :

If no QC-inspections are carried out during night shifts, state the QC procedure(s)/instruction(s) to be followed: , documented in:</td></tr>
<tr><td><u>Inspection and test records</u>
All records shall be maintained for a minimum of years.</td></tr>
<tr><td><u>Specific agreements/comments/explanations</u></td><td colspan="2">Signature of the manufacturer/supplier:

Date :</td></tr>
</table>

A. Calibration of measuring and test equipment

Applicable procedure(s) nr(s):

Equipment to be calibrated	Calibration aspect	Calibration method	Calibration frequency	Calibration file (name and location)

B. Raw material and additives

Applicable procedure(s) nr(s):

B.1 Receipt

For each delivery of raw material or additives data with respect to dates, producers, types and quantities are recorded as follows:

B.2 Entry control

Type of raw material	Inspection aspect	Inspection method	Inspection frequency	Registration file (name and location)

C. Batch release tests per machine (including in-process and finished product testing)

Applicable procedure(s) nr(s):

Production process(es):

Type of product	Type of test	Test method	Test frequency	Registration file (name and location)

Specific agreements/comments/explanations:

D.	**Process verification tests** Applicable procedure(s) nr(s):			
Type of product	Type of test	Test method	Test frequency	Registration file (name and location)

E.	**Control of nonconforming and/or rejected products** Applicable procedure(s) nr(s):
E.1	**Method of registration**
E.2	**Method of identification**
E.3	**Method of nonconformity review and disposition**

F.	**Inspection with regard to packaging, storage and transportation of the finished product** Applicable procedure(s) nr(s):		
Inspection aspects	Inspection method	Inspection frequency	Registration file (name and location)
F.1 **Packaging/storage/ transportation etc**			

Specific agreements/comments/explanations:

Raw materials list **(not required to fill-out this appendix in case reference can be made to the Kiwa hygienic aspects part of the certification agreement)**	**Appendix I** Date: .....

I.1 The product is built-up of the following raw materials:

a) In case of products made from ready-made raw materials: listing of name and/or unique code of the raw material(s);

b) In case of products made from own compounded raw materials: reference to raw material/compound sheets which are (only) available at the production location and which have to be authenticated by Kiwa (e.g. by the Kiwa inspector);

c) In case of composed products (e.g. plastics fitting body, with separate nut, clamp ring and rubber sealing ring): of each part a specification according to a) or b) (whatever applicable).

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List of technical drawings			**Appendix II** Date:.....
Drawing title and number	Drawing date	Drawing title and number	Drawing date

Annex F - Difference between requirements on raw material and those on products (informative)

In the table beneath an overview is given on what type tests are applicable in case of starting the application for certification with the rubber compound and afterwards with the product manufactured from that compound.

In the column “Compound” all the necessary type tests are listed for the compound certification. They are all determined on standard specimen made from a vulcanised sheet. The vulcanisation conditions of this sheet should be in line with the later end-product. In the column “Product” all the necessary type tests are listed for the product certification. They are determined on standard specimen made out of the product, specimen with allowed deviations made out of the product or directly on product test pieces (see Annex G and H for more information).

Having a compound certificate therefore reduces some type testing that would normally be needed to be tested on the product. However both compound and product require yearly testing as would be applicable normally.

Table-27: overview of required testing in case of compound certification

Certification of compound and product	**Compound**	**Product**
Test specimen	**Raw material** (test specimen made from vulcanised sheet)	**Product** [1] (products or test specimen made from products)
Hardness	X[3]	X[3]
Tensile strength (before and after ageing)	X[3]	X[3]
Elongation at break (before and after ageing)	X[3]	X[3]
Compression set in air (Class I rubbers - cold)		
- 72 h at 23 °C	X	
- 24 h at 70 °C	X[3]	X[3]
- 72 h at -10 °C	X	
Compression set in air (Class II and III rubbers - hot)		
- 72 h at 23°C	X	
- 24 h at 125°C	X[3]	X[3]
Compression set in water (Class III rubbers only)		
- 3000 h at 110 °C	[2]	X
- 10000 h at 110 °C	[2]	X
Swelling in water		
- 168 h in water at 70 °C (Class I rubbers, Type A)	X	
- 168 h in water at 95 °C (Class II and III rubbers, Type A)	X	
- 10 weeks in water at 150 °C (Class I, II, III rubbers, Type B)	X	
Stress relaxation		
- 168 h at 23 °C (Class I rubbers, Type A and B)	X[3]	X[3]
- 100 days at 23 °C	X	
- 168 h at 125 °C (Class II, III rubbers, Type A)	X[3]	X[3]
- 672 h at 140 °C (Class III rubbers, Type A)	X	
Ozone resistance (not for EPM/EPDM, for IIR see §)	X[3]	X[3]
Strength of bond or weld (if applicable)		X[3]

1) *When dimensions of products are suitable.*
2) *Covered by test on product.*
3) *Yearly testing, see Annex A and §7.1 for more information on applicability.*

Annex G - Test pieces from products (Normative)

Out of end products it is often not possible to prepare test pieces having all the dimensions as prescribed in the standard. Still knowing about the properties of the actual products is useful because they have to function well in practice. Therefore it is decided for this evaluation guideline that some deviations with respect to the dimensions are to be allowed.

Most end products are rings. There using a knife the rubber part can be separated from eventually present other materials. From that point further preparation can be done using the techniques given in ISO 23529. By selecting the appropriate shape and part of the product for preparing the test pieces the following things should be kept in mind:

- For hardness also small pieces can be used by taking the micro method of ISO 48-2.
- For tensile strength and elongation, ISO 37 gives also smaller test pieces (type 3 and 4) and ring test pieces, but using type 2 is preferred. Furthermore having a constant cross section of the parallel section is the most important. Using thinner test pieces or missing a few parts of the clamping sections will hardly influence the results as long as failure stays within the parallel section. This combined with the possible smaller test pieces make that almost every end product can be tested.
- Compression set is a material property which is not very sensitive to dimensions of the test pieces. Taking rectangular test pieces lead to the same results. Combined with the possibility of stacking up to three layers almost every product can be tested. In case of too thin material available the test pieces can be scaled down to a smaller thickness. Then of course other spacers have to be applied to get a compression of about 25 %. More important than having a compression of exact 25 % is knowing the compressed height exactly. It is known that a compression between 20 and 30 % will lead to the same results.
- For the change in volume the thickness is more important than the length or width. Also here it is not really necessary to have complete flat test pieces. Often parts of the full products can be used without having different results.
- For stress relaxation more or less the same applies as with compression set, although here knowing the exact deformation is of no importance at all.
- For ozone resistance it is important to have none machined surfaces. Here, for small products, taking full sections of the products is often better and giving more realistic results then trying to get the test pieces as mentioned in the standard.

For all preparations it goes that after preparation the test pieces should be conditioned at least 16 hours before testing.

Annex H - Testing in case the products are O-rings (normative)

How to test depends on the size of the rings.

Over 100 x 10 mm

These products are big enough to prepare proper test pieces in accordance with ISO 23529 and Annex G. No special instructions are needed.

Between 15 x >4 mm and ≤100 x ≤10 mm

These rings are most of the time too small to prepare exact test pieces out of them. However in this case well defined testing is possible on complete rings or sections of complete rings.

- Hardness is measured in micro-IRHD on the rings. Care shall be taken to place the device on top of the ring. Normally the highest values are the most accurate as a small misplacement of the device always will lead to a lower value for the hardness.
- Tensile tests can be done on complete rings with the devices mentioned in ISO 37. Most dimensions are best tested using the small clamps. At least 5 rings shall be tested. See also I.8.4. From a cross-section of 7 mm it is possible to also prepare type-4 dumbbells from the rings.
- Tear resistance is possible with those rings where the cross section is 7 mm or more. In those cases the test pieces can be prepared according to ISO 23529 with only small deviations from the prescribed dimensions. For smaller rings the tear strength has to be carried out on test sheets.
- Compression set can be measured on complete rings or in case the rings are too large for the clamps on sections of the rings. Method is further as given in ISO 815. A small higher value (3 to 5 %) can be the result but normally there will be enough distance of the limits.
- Stress relaxation at compression. Here goes the same as for compression set although here no higher values are found. Stress relaxation at tension can be measured on complete rings. This is limited to rings with cross section of max 2,75 mm and internal diameter of max 30 mm.
- Stress relaxation at tension can be measured on complete rings. This is limited to rings with cross section of max 2,75 mm and internal diameter of max 30 mm.
- Stress relaxation on O-rings with a diameter > 30 mm can be measured by using a part of the ring (so not the complete ring).
- Ozone test can be done on either stretching the cut open parts of the rings or by stretching the complete rings by mounting them on a thorn in such a way that the required elongation is obtained.
- Swelling test can be done on complete rings or on section in those cases that the complete rings are too big.
-

Between 15 x 2 mm and ≤100 x ≤4 mm

The same applies as written above (I.8.2) with the following adaptations:

- As O-rings with a cross section of ≤4 mm can have slightly lower tensile properties the requirements have been slightly lowered for these types of O-rings for class II and class III applications as listed in tables 25A to 26B.
- O-ring test pieces with a cross section of ≤4 mm could show a slightly different and faster ageing behaviour. For this reason the requirements have been slightly lowered if the results are based on tests of whole O-rings with a cross sections of 4 mm or less and from a hardness of 70 IRHD or higher for class II and class III applications as listed in table 25A to 26B
- For O-rings with a cross section of 4 mm or less the requirements have been extended slightly for the standard compression set at elevated temperature if they are based on type B materials. As listed in table 25A to 26B.
- Tables 25A to 26B only show the extended specification. Please refer to tables 20A to 23B for a full list of requirements.

Table 28A: extended requirements for O-rings with a cross section of ≤4,0 mm for type A materials used for class II applications

Property	Units	Method	BRL clause	Requirement for hardness classes				
				50	60	70	80	90
Tensile strength for O-rings or press-fit rings with a cross-section that is ≤4 mm	MPa	ISO 37[2]	4.9.4	**≥8,5**	**≥8,5**	**≥8,5**	**≥8,5**	**≥8,5**
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤4 mm	%	ISO 37[2]	4.9.4	**≥225**	**≥175**	**≥130**	**≥85**	**≥85**
Ageing 168 hours in air at 125 °C for O-rings or press-fit rings with a cross-section that is ≤4 mm - change tensile strength maximum	% %	ISO 188 ISO 37[2]	4.9.5	-20	-20	**-25**	**-30**	**-30**

[2] *See BRL 17504 Annex G or H for testing on products or O-rings*

Table 28B: extended requirements for O-rings with a cross section of ≤4,0 mm for type B materials used for class II applications

Property	Units	Method	BRL clause	Requirement for hardness classes				
				50	60	70	80	90
Tensile strength for O-rings or press-fit rings with a cross-section that is ≤4 mm	MPa	ISO 37[2]	4.9.4	**≥8,5**	**≥8,5**	**≥8,5**	**≥8,5**	**≥8,5**
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤4 mm	%	ISO 37[2]	4.9.4	**≥225**	**≥175**	**≥130**	**≥85**	**≥85**
Ageing 168 hours in air at 125 °C for O-rings or press-fit rings with a cross-section that is ≤4 mm - change tensile strength maximum	% %	ISO 188 ISO 37[2]	4.9.5	-20	-20	**-25**	**-30**	**-30**
Compression set for O-rings or press-fit rings with a cross-section that is ≤4 mm - 24 h, 125 °C	%	ISO 815-1 or ISO 2285	4.9.6	**≤25**	**≤25**	**≤25**	**≤25**	**≤25**

[2] *See BRL 17504 Annex G or H for testing on products or O-rings*

Table 29A: extended requirements for O-rings with a cross section of ≤4,0 mm for type A materials used for class III applications

Property	Units	Method	BRL clause	Requirement for hardness classes		
				60	70	80
Tensile strength for O-rings or press-fit rings with a cross-section that is ≤4 mm	MPa	ISO 37[2]	4.9.4	**≥8,5**	**≥8,5**	**≥8,5**
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤4 mm	%	ISO 37[2]	4.9.4	**≥175**	**≥130**	**≥85**
Ageing 168 hours in air at 125 °C for O-rings or press-fit rings with a cross-section that is ≤4 mm - change tensile strength maximum	% %	ISO 188 ISO 37[2]	4.9.5	-20	**-25**	**-30**

[2] *See BRL 17504 Annex G or H for testing on products or O-rings*

Table 29B: extended requirements for O-rings with a cross section of ≤4,0 mm for type B materials used for class III applications

Property	Units	Method	BRL clause	Requirement for hardness classes		
				60	70	80
Tensile strength for O-rings or press-fit rings with a cross-section that is ≤4 mm	MPa	ISO 37[2]	4.9.4	**≥8,5**	**≥8,5**	**≥8,5**
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤4 mm	%	ISO 37[2]	4.9.4	**≥175**	**≥130**	**≥85**
Ageing 168 hours in air at 125 °C for O-rings or press-fit rings with a cross-section that is ≤4 mm - change tensile strength maximum	% %	ISO 188 ISO 37[2]	4.9.5	-20	**-25**	**-30**
Compression set for O-rings or press-fit rings with a cross-section that is ≤4 mm - 24 h, 125 °C	%	ISO 815-1 or ISO 2285	4.9.6	**≤25**	**≤25**	**≤25**

[2] *See BRL 17504 Annex G or H for testing on products or O-rings*

Testing the tensile strength on O-rings with the use of pins or pulleys.

O-rings can be tested with the use of pulleys (see also ISO 5893) or pins/hooks. The testing speeds are derived from ISO 37 whereby smaller rings (≤30 mm inner diameter) are pulled with a speed of 100 mm/min and larger rings (>30 mm diameter) are pulled with a speed of 500 mm/min. Hooks or pins are also allowed, typically when testing smaller O-rings (typically below an inner diameter of ~24 mm) as the pulleys are not always available in the correct size. It is however important to make sure the O-rings are lubricated when testing as the O-ring should move freely and easily over the pin . Otherwise high tensions can cause a premature break. Therefore the use of a lubricant is required. Typically a silicone oil is very suitable for this purpose (i.e. as mentioned in ISO 815-1 with a nominal kinematic viscosity of 100 mm^2/s). Furthermore a suitable diameter of the pin should be used in relation to the inner diameter of the O-ring.