

Draft BRL 17504 27-05-2024

Comments before 1st of November 2024

Evaluation Guideline

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

Preface

This evaluation guideline has been accepted by the Kiwa Board of Experts Watercycle (CWK), in which all relevant parties in the field of vulcanised rubber products for drinkingwater applications are represented. The Board of Experts also supervises the certification activities and where necessary requires the evaluation guideline to be revised. 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.

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.

This evaluation guideline is to be assessed by the Board of Experts at least every 5 years, but at the latest on **2030-01-31**.

Kiwa Nederland B.V.

Sir Winston Churchillaan 273
Postbus 70
2280 AB RIJSWIJK
The Netherlands

Tel. +31 88 998 44 00
Fax +31 88 998 44 20
NL.Kiwa.info@Kiwa.com
www.kiwa.nl

© 2024 Kiwa N.V.

All rights reserved. No part of this report may be reproduced, stored in a database or retrieval system, or published, in any form or in any way, electronically, mechanically, by print, photoprint, microfilm or any other means without prior written permission from the publisher.

The use of this evaluation guideline by third parties, for any purpose whatsoever, is only allowed after a written agreement is made with Kiwa to this end.

Validation

This evaluation guideline has been validated by the Director Certification and Inspection of Kiwa on

Date

Contents

	Preface	1
	Contents	2
1	Introduction	5
1.1	General	5
1.2	Field of application / scope	5
1.3	Acceptance of test reports provided by the supplier	6
1.4	Quality declaration	6
2	Terms and definitions	7
2.1	Definitions	7
3	Procedure for granting a product certificate	8
3.1	Initial investigation	8
3.2	Granting the product certificate	8
3.3	Investigation into the product and/or performance requirements	8
3.4	Production process assessment	8
3.5	Contract assessment	8
4	Product requirements and test methods	9
4.1	General	9
4.2	Classification	9
4.2.1	Sealing principal type	9
4.2.2	Temperature class classification	10
4.2.3	Hardness classification	10
4.2.4	Ozone classification	10
4.3	Types of rubber seals	10
4.3.1	Solid rubber products	10
4.3.2	O-rings	11
4.3.3	Rubber products combining two different rubber compounds (i.e. a hard and a soft rubber)	11
4.3.4	Rubber vulcanised or attached to rigid materials	11
4.3.5	Rubber products containing other rigid non-adhered materials (e.g. metal springs)	11
4.3.6	Products containing voids (not porosity)	11
4.4	Types of materials	12
4.4.1	General	12
4.4.2	Blends of polymers	12
4.5	Test pieces	12
4.5.1	General	12
4.5.2	Test pieces from products	12
4.5.3	Test pieces from test plates	12
4.5.4	Test piece of complete product	12

4.6	Sampling of products for testing	12
4.6.1	General	12
4.7	Regulatory requirements	13
4.7.1	Requirements to avoid deterioration of the quality of drinking water	13
4.8	Functional & basic requirements	13
4.8.1	Resistance to chemicals	13
4.8.2	Effect of rubber products on the pipe and/or fitting materials	13
4.8.3	Appearance	14
4.8.4	Homogeneity	14
4.8.5	Dimensions	14
4.9	Physical and mechanical property requirements	15
4.9.1	General	15
4.9.2	Hardness	15
4.9.3	Tear resistance	15
4.9.4	Tensile properties	16
4.9.5	Resistance against ageing in air	17
4.9.6	Compression set	18
4.9.7	Stress relaxation	19
4.9.8	Ozone resistance	20
4.9.9	Changes in volume after storage in hot water	21
4.9.9.1	Type A materials (Class I, II and III)	21
4.9.9.2	Type B materials (Class I, II and III)	21
4.9.10	Compression set in water on specified products (Class III only)	22
4.10	Requirements for special types of products	22
4.10.1	Number of welds	22
4.10.2	Behaviour at elongation	22
4.10.2.1	Massive products with a weld	22
4.10.2.2	Products made from two compounds	23
4.10.2.3	Elongation test for welded products after ageing	23
4.10.3	Adhesion	23
4.10.3.1	Products made from two compounds	23
4.10.3.2	Rubbers vulcanized or attached to rigid materials	23
4.10.4	Other requirements	24
4.10.4.1	Rubber products containing other rigid non-adhered materials (e.g. metal springs)	24
5	Marking	25
5.1	General	25
5.2	Certification mark	25
6	Requirements in respect of the quality system	26
6.1	Manager of the quality system	26
6.2	Internal quality control/quality plan	26
6.3	Control of test and measuring equipment	26
6.4	Procedures and working instructions	26
6.5	Quality control of rubber products	27
7	Summary of tests and inspections	28
7.1	Test matrix	28
7.2	Inspection of the quality system of the supplier	29
8	Agreements on the implementation of certification	30

8.1	General	30
8.2	Certification staff	30
8.2.1	Qualification requirements	30
8.2.2	Qualification	31
8.3	Report initial investigation	32
8.4	Decision for granting the certificate	32
8.5	Layout of quality declaration	32
8.6	Nature and frequency of third party audits	32
8.7	Non conformities	33
8.8	Report to the Board of Experts	33
8.9	Interpretation of requirements	33
9	Titles of standards	34
9.1	Public law rules	34
9.2	Standards / normative documents	34

Annexes

I.1	Annex A – Summary for the requirements for rubber products and/or rubber material sheets	36
I.2	Annex B: Categorization of O-ring sizes	42
I.3	Annex C: explanations (informative)	44
I.3.1	Permanent seal under load	44
I.3.2	Recommendations of a general nature	44
I.3.2.1	Percentage of compression	44
I.3.2.2	Additional requirements	44
I.3.2.3	Application	44
I.3.3	Recommendations for the storage and use of rubber products	44
I.3.3.1	Storage in a warehouse or temporary indoor storage	44
I.3.3.2	Outdoor transport and storage	45
I.3.4	Recommendations for processing	45
I.3.5	Products in aboveground installations	45
I.4	Annex D - Model certificate (example)	46
I.5	Annex E - Model IQC-scheme (example)	46
I.6	Annex F -Difference between requirements on raw material and those on products (informative)	54
I.7	Annex G - Test pieces from products	55
I.8	Annex H Testing in case the products are O-rings	56
I.8.1	Over 100 x 10 mm	56
I.8.2	Between 15 x ≥4 mm and ≤100 x ≤10 mm	56
I.8.3	Between 15 x 2 mm and ≤100 x ≤4 mm	56

1 Introduction

1.1 General

This evaluation guideline includes all relevant requirements which are employed by Kiwa when dealing with applications for the issue and maintenance of a certificate for products used for cold and hot drinking water applications.

This guideline replaces the evaluation guideline 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.

For the performance of its certification work, Kiwa is bound to the requirements as included in NEN-EN-ISO/IEC 17065 "Conformity assessment - Requirements for bodies certifying products, processes and services".

1.2 Field of application / scope

The products are intended to be applied as sealing systems for drinking water. For other applications as mentioned here a more explicit testing might be necessary to assure a correct function of the products. Special types of products are described in more detail in paragraph 2.1.

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).
- 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 class II. EN 681-1 describes Class II suitable up to 110°C, however more recent insight as described in ISO 9631 shows that the test program for of EN 681-1 class II is insufficient for continues use 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).

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

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).

1.3 Acceptance of test reports provided by the supplier

If the supplier provides reports from test institutions or laboratories to prove that the products meet the requirements of this evaluation guideline, the supplier shall prove that these reports have been drawn up by an institution that complies with the applicable accreditation standards, namely:

- NEN-EN-ISO/IEC 17020 for inspection bodies;
- NEN-EN-ISO/IEC 17021-1 for certification bodies certifying systems;
- NEN-EN-ISO/IEC 17024 for certification bodies certifying persons;
- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17065 for certification bodies certifying products.

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 acceptance has been concluded by the RvA. The accreditation shall refer to the examinations as required in this evaluation guideline. When no certificate of accreditation can be shown, Kiwa shall verify whether the accreditation standard is fulfilled.

1.4 Quality declaration

The quality declaration to be issued by Kiwa is described as a Kiwa product certificate.

A model of the certificate to be issued on the basis of this evaluation guideline has been included for information as Annex.

2 Terms and definitions

2.1 Definitions

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

- **Board of Experts:** the Board of Experts Watercycle (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 requirements.
- **Drinking water:** water intended or partly intended for drinking, cooking or food preparation or other domestic purposes, but does not include hot water, and is made available by pipeline to consumers or other customers.
- **Evaluation Guideline (BRL):** the agreements made within the Board of Experts on the subject of certification.
- **Hot tap water:** water intended or partly intended for drinking, cooking or food preparation or other domestic purposes, which is heated before it is made available for those applications.
- **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.
- **IQC scheme (IQCS):** a description of the quality inspections carried out by the supplier as part of his quality system.
- **Initial investigation:** tests in order to ascertain that all the requirements recorded in the evaluation guideline are met.
- **Private Label Certificate:** A certificate that only pertains to products that are also included in the certificate of a 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, on delivery, be deemed to comply with the product specification recorded in the product certificate.
- **Product requirements:** requirements made specific by means of measures or figures, focussing on (identifiable) characteristics of products and containing a limiting value to be achieved, which can be calculated or measured in an unequivocal manner.
- **Supplier:** the party that is responsible for ensuring that the products meet and continue to meet the requirements on which the certification is based.

3 Procedure for granting a product certificate

3.1 Initial investigation

The initial investigation to be performed are based on the (product) requirements as contained in this evaluation guideline, including the test methods, and comprises the following:

- type testing to determine whether the products comply with the product and/or functional requirements;
- production process assessment;
- assessment of the quality system and the IQC-scheme;
- assessment on the presence and functioning of the remaining procedures.

3.2 Granting the product certificate

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

3.3 Investigation into the product and/or performance requirements

Kiwa will investigate the to be certified products against the certification requirements as stated in the certification requirements.

The necessary 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 also includes at least:

- The quality of raw materials, half-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 for Kiwa, includes at least:

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 and test methods

4.1 General

This chapter 4 contains all the requirements the rubber products have to fulfil.

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 Classification

4.2.1 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.

4.2.2 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 1).
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

4.2.3 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

4.2.4 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.

4.3 Types of rubber seals

4.3.1 Solid rubber products

The rubber shall fulfil the requirements of this Evaluation Guideline in paragraph 4.7 up 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.

4.3.2 O-rings

The rubber shall fulfil the requirements of this Evaluation Guideline in paragraph 4.7 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.

4.3.3 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 paragraph 4.7 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.

4.3.4 Rubber vulcanised or attached to rigid materials

The rubber shall fulfil the requirements of this evaluation guideline in paragraph 4.7 up to and including 4.9. The adhesion between rubber and the other material shall fulfil the requirements of 4.10.3.

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

The rubber shall fulfil the requirements of this evaluation guideline in paragraph 4.7 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.

4.3.6 Products containing voids (not porosity)

The rubber shall fulfil the requirements of this evaluation guideline in paragraph 4.7 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.

4.4 Types of materials

4.4.1 *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.

4.4.2 *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.

4.5 Test pieces

4.5.1 *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.

4.5.2 *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 than those prescribed in the standards. A guideline for this preparation is given in Annex G or Annex H.

4.5.3 *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

4.5.4 *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.

4.6 Sampling of products for testing

4.6.1 *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 the inspection body.

4.7 Regulatory requirements

4.7.1 *Requirements to avoid deterioration of the quality of drinking water*

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. Therefore, 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", (published in the Government Gazette). Consequently, the procedure for obtaining a recognised quality declaration, as specified in the currently effective Regulation, has to be concluded with positive results.

Products and materials with a quality declaration¹, e.g. issued by a foreign certification institute, are allowed to be used in the Netherlands, provided that the Minister has declared this quality declaration equivalent to the quality declaration as meant in the Regulation.

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.

¹ A quality declaration issued by an independent certification institute in another member state of the European Community or another state party to the agreement to the European Economic Area, is equivalent to a recognized quality declaration, to the extent that, to the judgment of the Minister of the first mentioned quality declaration, is fulfilled the at least equivalent requirements as meant in the Regulation materials and chemicals drinking water- and warm tap water supply.

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 irregularities 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 temperate class, hardness class and specimen type. The requirements are laid down in applicable tables below (table 5 to 6).

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		≥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	≥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	≥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 to 10). 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: 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 (%)	Compression set (%)	Compression Set (%)	
			72h -10 °C	72h 23 °C	24h 70 °C	
			All specimen types	All specimen types	All specimen types	
I	40	A	≤40	≤12	≤20	
	50		≤50			
	60			≤60		≤15
	70					
	80					
	90	B	≤40	≤15	≤20	
	40		≤50			
	50					≤60
	60					
	70					
80						
90						

Table 12: Class II rubbers

Temp. Class	Hardness class	Sealing principal type	Compression set (%)	Compression set (%)	Compression set (%)		
			72h -10 °C	72h 23 °C	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						≤60
	80						
	90						
	50	B	≤40	≤15	≤20	≤25	
	60		≤50				
	70						≤60
	80						
	90						

Table 13: Class III rubbers

Temp. Class	Hardness class	Sealing principal type	Compression set (%)	Compression set (%)	Compression set (%)	
			72h -10 °C	72h 23 °C	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	50	A	≤50	≤15	≤20	
	60		≤50			
	70					

	50	B	≤50	≤15	≤20	≤25
	60		≤50			
	70		≤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		≤18	
	70			
80				
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		≤25		
	90		≤26		
	50	B	≤15	≤30	No requirement
	60				
	70		≤18		
	80				
	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					

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 test conditions 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 $70 \pm 2^\circ\text{C}$ 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**

4.10.3.1 *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

4.10.3.2 *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 Other requirements

4.10.4.1 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 Marking

5.1 General

After concluding a Kiwa certification agreement the certified products shall, beside the marks indicated in the respective standards, be indelible marked with:

- 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.

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.

5.2 Certification mark

After concluding a Kiwa certification agreement, the certified products shall be indelible marked with the certification mark:

For products which come in contact with drinking water:






The Kiwa Water Mark “**KIWA** 

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

6 Requirements in respect of the quality system

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

6.1 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.

6.2 Internal quality control/quality plan

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

The following must be demonstrably recorded in this IQC scheme:

- which aspects are checked 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 E.

6.3 Control 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.

When required the equipment shall be kept calibrated (e.g recalibration at interval). The status of actual calibration of each equipment shall be demonstrated by traceability through an unique ID.

The supplier must keep records of the calibration results.

The supplier shall review the validity of measuring data when it is established at calibration that the equipment is not suitable anymore.

6.4 Procedures and working instructions

The supplier shall be able to submit the following:

- procedures for:
 - dealing with products showing deviations;
 - corrective actions to be taken if non-conformities are found;
 - dealing with complaints about products and/or services delivered;
- the working instructions and inspection forms used.
- The supplier must have a procedure in place that protects the products in such way, that the hygiene is ensured during storage and transport. In addition, the supplier shall inform the customer about the handling of products delivered under the certificate, which come into contact with drinking water and warm tap water, from arriving at the construction site through to the realization and commissioning. The primary reason for providing this the information is to contribute to the awareness of the importance of hygienic work as a 'prevention measure'.

6.5 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 2859-1 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

This chapter contains a summary of the following tests and inspections to be carried out in the event of certification:

- **initial investigation:** tests in order to ascertain that all the requirements recorded in the evaluation guideline are met;
- **inspection test:** 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;
- **inspection of the quality system of the supplier:** monitoring compliance of the IQC scheme and procedures.

7.1 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	4.7.1	X	X	1x year
Functional & 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 strength	4.9.4	X	X	1x year
Elongation at break	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
Certification mark				
Certification mark	5.2	X	X ^{c)}	1x year

a) In case the 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 8.6 of this evaluation guideline.

- b) These product properties are only visually controlled during the inspection. In case of reasonable 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.

7.2 Inspection of the quality system of the supplier

The quality system of the supplier will be checked by Kiwa on the basis of the IQC scheme.

The inspection contains at least those aspects mentioned in the Kiwa Regulations for Certification.

8 Agreements on the implementation of certification

8.1 General

Beside the requirements included in these evaluation guidelines, the general rules for certification as included in the Kiwa Regulations for Product Certification also apply.

These rules are in particular:

- the general rules for conducting the pre-certification tests, in particular:
 - the way suppliers are to be informed about how an application is being handled;
 - how the test are conducted;
 - the decision to be taken as a result of the pre-certification tests.
- the general rules for conducting inspections and the aspects to be audited,
- the measures to be taken by Kiwa in case of Non-Conformities,
- the measures taken by Kiwa in case of improper use of Certificates, Certification Marks, Pictograms and Logos,
- terms for termination of the certificate,
- the possibility to lodge an appeal against decisions of measures taken by Kiwa.

8.2 Certification staff

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

- Certification assessor (**CAS**): in charge of carrying out the pre-certification tests and assessing the inspectors' reports;
- 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 in connection with the inspections carried out and taking decisions on the need to take corrective actions.

8.2.1 Qualification requirements

The qualification requirements consist of:

- qualification requirements for personnel of a certification body which satisfies the requirements EN ISO / IEC 17065, performing certification activities
- qualification requirements for personnel of a certification body performing certification activities set by the Board of Experts for the subject matter of this evaluation guideline

Education and experience of the concerning certification personnel shall be recorded demonstrably.

Basic requirements	Evaluation criteria
Knowledge of company processes Requirements for conducting professional audits on products, processes, services, installations, design and management systems.	<i>Relevant experience: in the field</i> SAS, CAS : 1 year DM : 5 years inclusive 1 year with respect to certification Relevant technical knowledge and experience on the level of: SAS : High school CAS, DM : Bachelor

Basic requirements	Evaluation criteria
Competence for execution of site assessments. Adequate communication skills (e.g. reports, presentation skills and interviewing technique).	SAS: Kiwa Audit training or similar and 4 site assessments including 1 autonomic under review.
Execution of initial examination	CAS: 3 initial audits under review.
Conducting review	CAS: conducting 3 reviews

Technical competences	Evaluation Criteria
Education	General: Education in one of the following technical areas: <ul style="list-style-type: none"> • Civil Engineering; • Engineering.
Testing skills	General: <ul style="list-style-type: none"> • 1 week laboratory training (general and scheme specific) including measuring techniques and performing tests under supervision ; • Conducting tests (per scheme).
Experience - specific	CAS <ul style="list-style-type: none"> • 4 complete applications (excluding the initial assessment of the production site) under the direction of the PM SAS <ul style="list-style-type: none"> • 4 inspection visits under supervision (with a qualified SAS or PM)
Skills in performing witnessing	PM Internal training witness testing

Legenda:

- Certification assessor (**CAS**)
- Decision maker (**DM**)
- Product manager (**PM**)
- Site assessor (**SAS**)

8.2.2 Qualification

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 to qualify staff rests with the:

- **PM:** qualification of **CAS** and **SAS**;
- management of the certification body: qualification of **DM**.

8.3 Report 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 his decision on the findings included in the report.

8.4 Decision for granting the certificate

The decision for granting the certificate shall be made by a qualified Decision maker which has not been involved in the pre-certification tests. The decision shall be recorded in a traceable manner.

8.5 Layout of quality declaration

The product certificate shall be in accordance with the model included in the Annex.

8.6 Nature and frequency of third party audits

The certification body shall carry out surveillance audits on site at the supplier at regular intervals to check whether the supplier complies with his obligations. The Board of Experts decides on the frequency of audits.

At the time this BRL entered into force, the frequency of audits amounts 2 audit(s) on site per year for suppliers with a quality management system in accordance with ISO 9001 or IATF 16949 for their production, which has been certified by an acknowledged body (in accordance with ISO/IEC 17021) and where the IQC scheme forms an integral part of the quality management system.

In case the supplier is not in possession of any product certificate (issued by Kiwa or any other accredited certification body), the frequency is increased to 4 visits for the duration of one year.

The audit program on site shall cover at least:

- the product requirements;
- the production process;
- the suppliers IQC scheme and the results obtained from inspections carried out by the supplier;
- the correct way of marking certified products;
- compliance with required procedures;
- handling complaints about products delivered.

For suppliers with a private label certificate the frequency of audits amounts to one audit per two years. These audits are conducted at the site of the private label certificate holder. The audits are conducted at the site of private label holder and focussed 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 refer to at least:

- the correct way of marking certified products;
- compliance with required procedures for receiving and final inspection;
- the storage of products and goods;
- handling complaints.

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

8.7 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 Sanctions Policy is available through the “News and Publications” page on the Kiwa website ["Kiwa Regulation for Certification"](#).

8.8 Report to the Board of Experts

De certification body shall report annually about the performed certification activities. In this report the following aspects are included:

- mutations in number of issued certificates (granted/withdrawn);
- number of executed audits in relation to the required minimum;
- results of the inspections;
- required measures for established Non-Conformities;
- received complaints about certified products.

8.9 Interpretation of requirements

The Board of Experts may record the interpretation of requirements of this evaluation guideline in one separate interpretation document.

9 Titles of standards

9.1 Public law rules

BJZ2011048144
29 juni 2011

Regeling van de Staatssecretaris van
Infrastructuur en Milieu¹

9.2 Standards / normative documents

Number	Title	Version*
NEN-EN ISO/IEC 17020	Conformity assessment - General criteria for the operation of various types of bodies performing inspection	
NEN-EN ISO/IEC 17021	Conformity assessment - Requirements for bodies providing audit and certification of management systems	
NEN-EN ISO/IEC 17024	Conformity assessment - General requirements for bodies operating certification of persons	
NEN-EN ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	
NEN-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	Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage applications	
Including amendment sheets: A1, A2, A3 & C1	– Part 1: Vulcanised rubber	
NEN-ISO 4633	Rubber seals - Joint rings for water supply, drainage and sewerage pipelines - Specification for materials.	2023
NEN-ISO 9631	Rubber seals - Joint rings for pipelines for hot-water supply up to 110 °C - Specification for the material	2018
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	

¹ Valid from 1 July 2017

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
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

*) When no date of issue has been indicated, the latest version of the document is applicable.

I.1 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	≥9	≥9	≥9	≥9	≥9	•	•
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 - 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 +10/-30	+8/-5 -20 +10/-30	+8/-5 -20 +10/-30	+8/-5 -20 +10/-40	+8/-5 -20 +10/-40	•	•
Compression set tested on std. test pieces ¹ , products ² or test pieces from products - 72 h, -10°C - 72 h, 23°C - 24 h, 70°C	%	ISO 815-2 ISO 815-1 or ISO 2285	4.9.6	≤ 40 ≤ 12 ≤ 20	≤ 40 ≤ 12 ≤ 20	≤ 50 ≤ 12 ≤ 20	≤ 50 ≤ 15 ≤ 20	≤ 60 ≤ 15 ≤ 20	≤ 60 ≤ 15 ≤ 20	• • •	•
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	≤ 13 ≤ 19	≤ 14 ≤ 20	≤ 15 ≤ 22	≤ 16 ≤ 23	≤ 17 ≤ 25	≤ 18 ≤ 26	• •	•
Ozone resistance ³ 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	4.9.8	20%	20%	20%	20%	15%	10%	•	•
No cracks											
20%	20%			20%	20%	15%	10%				
No cracks											
20%	20%			20%	20%	15%	10%				
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	≥9	≥9	≥9	≥9	≥9	•	•
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 - change hardness - change tensile strength maximum - change elongation	IRHD-M	ISO 188	4.9.5							•	•
	%	ISO 48-2		+8/-5	+8/-5	+8/-5	+8/-5	+8/-5	+8/-5		
	%	ISO 37 ²		-20	-20	-20	-20	-20	-20		
Compression set tested on std. test pieces ¹ , products ² , or test pieces from products - 72 h, -10°C - 72 h, 23°C - 24 h, 70°C	%	ISO 815-2	4.9.6							•	•
		ISO 815-1		≤ 40	≤ 40	≤ 50	≤ 50	≤ 60	≤ 60		
		or ISO 2285		≤ 15	≤ 15	≤ 15	≤ 15	≤ 15	≤ 15		
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	4.9.7	≤ 15	≤ 15	≤ 15	≤ 15	≤ 18	≤ 18	•	•
		or 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 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	4.9.8	20%	20%	20%	20%	15%	10%	•	•
				No cracks							
				20%	20%	20%	20%	15%	10%		
				No cracks							
				20%	20%	20%	20%	15%	10%		
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 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 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 - 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 +10/-30	+8/-5 -20 or -25 ³ +10/-30	+8/-5 -20 or -30 ³ +10/-40	+8/-5 -20 or -30 ³ +10/-40	•	•
Compression set tested on std. test pieces ¹ , products, O-rings or test pieces from products - 72 h, -10 °C ⁴ - 72 h, 23 °C - 24 h, 125 °C	%	ISO 815-2 ISO 815-1 or ISO 2285	4.9.6	≤ 40 ⁴ ≤ 15 ≤ 20	≤ 50 ⁴ ≤ 15 ≤ 20	≤ 50 ⁴ ≤ 15 ≤ 20	≤ 60 ⁴ ≤ 15 ≤ 20	≤ 60 ⁴ ≤ 15 ≤ 20	• • •	•
Stress relaxation on std. test pieces ¹ , products or test pieces from products - 168 h at 23 °C - 100 days at 23 °C - 7 days at 125 °C	%	ISO 3384 or ISO 6914	4.9.7	≤ 15 ≤ 20 ≤ 30	≤ 15 ≤ 22 ≤ 30	≤ 15 ≤ 23 ≤ 30	≤ 18 ≤ 25 ≤ 30	≤ 18 ≤ 26 ≤ 30	• • •	•
Ozone resistance ⁵ 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	4.9.8	20%	20%	20%	15%	10%	•	•
				No cracks						
				20%	20%	20%	15%	10%		
				No cracks						
				20%	20%	20%	15%	10%		
				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	•	

¹Testing 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. ³This 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. ⁴Only 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 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 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 - change hardness - change tensile strength maximum - change elongation	IRHD-M % %	ISO 188 ISO 48-2 ISO 37 ²	4.9.5	+8/-5 -20 +10/-30	+8/-5 -20 +10/-30	+8/-5 -20 or -25 ⁴ +10/-30	+8/-5 -20 or -30 ⁴ +10/-40	+8/-5 -20 or -30 ⁴ +10/-40	•	•
Compression set tested on std. test pieces ¹ , products ² or test pieces from products - 72 h, -10 °C ⁴ - 72 h, 23 °C - 24 h, 125 °C	%	ISO 815-2 ISO 815-1 or ISO 2285	4.9.6	≤ 40 ⁴ ≤ 15 ≤ 20 or 25 ³	≤ 50 ⁴ ≤ 15 ≤ 20 or 25 ³	≤ 50 ⁴ ≤ 15 ≤ 20 or 25 ³	≤ 60 ⁴ ≤ 15 ≤ 20 or 25 ³	≤ 60 ⁴ ≤ 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	≤ 15 ≤ 30	≤ 18 ≤ 30	≤ 18 ≤ 30	• •	•
Ozone resistance ⁵ 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	4.9.8	20%	20%	20%	15%	10%	•	•
				No cracks						
				20%	20%	20%	15%	10%		
				No cracks						
				20%	20%	20%	15%	10%		
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	•	

¹Testing 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. ³This 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. ⁴Only applicable if a lowered temperature class should be covered by the certificate (class I). ⁵Ozone 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 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 or ≥8,5 ³	•	•
Elongation at break on sheet test piece ¹ , products ² or std. test piece made out of products	%			≥175 or ≥200 ⁴	≥130 or ≥150 ⁴	≥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 ⁴ +10/-30	+8/-5 -20 or -30 ⁴ +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	≤ 50 ⁵ ≤ 15 ≤ 20	≤ 60 ⁵ ≤ 15 ≤ 20	• • •	•
Stress relaxation on std. test pieces ¹ , products ² or test pieces from products - 168 h at 23 °C - 100 days at 23 °C - 7 days at 125 °C - 4 weeks at 140°C	%	ISO 3384 or ISO 6914	4.9.7	≤ 15 ≤ 22 ≤ 30 ≤ 55	≤ 15 ≤ 22 ≤ 30 ≤ 55	≤ 15 ≤ 22 ≤ 30 ≤ 55	• • • •	•
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	4.9.8	20%	20%	15%	•	•
			No cracks					
			20%	20%	15%			
			No cracks					
			20%	20%	15%			
			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 - 10000h 110 °C ⁷ - 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	•	

¹Testing 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. ³This 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. ⁴Only applicable for test specimen cut from std. test sheets. ⁵Only 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	4.5.2	± 5	± 5	± 5	•	•
Tear resistance on standard sheets or on test pieces made out of products ²	N	ISO 34-2	4.5.3	≥20	≥20	≥20	•	
Tensile strength on std sheets ¹ , products ² or std. test pieces made out of products	MPa	ISO 37 ²	4.5.3	≥9 or ≥8,5 ³	≥9 or ≥8,5 ³	≥9 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	4.5.3	≥175 or ≥200 ⁴	≥130 or ≥150 ⁴	≥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	4.5.3	+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	4.5.4	≤ 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	4.5.6	≤ 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	4.5.7	20% No cracks 20% No cracks 20% No cracks	20% No cracks 20% No cracks 20% No cracks	15% No cracks 15% No cracks 15% 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	4.5.8	≥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	•	

¹Testing 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. ³This 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. ⁴Only applicable for test specimen cut from std. test sheets. ⁵Only 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. ⁷If 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	4.7	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 elongate 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

I.2 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	-

I.3 Annex C: explanations (informative)

I.3.1 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.

I.3.2 Recommendations of a general nature

I.3.2.1 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.

I.3.2.2 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.

I.3.2.3 Application

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

I.3.3 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.

I.3.3.1 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.

1.3.3.2 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.

1.3.4 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 or 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.

1.3.5 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

I.4 Annex D - Model certificate (example)

Product certificate K12345

Issued

Replaces

Page *x of y*

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

Company

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 [dd-mm-yyyy] inclusive amendment sheet dated dd-mm-yyyy.



Luc Leroy
Kiwa

Kiwa Nederland B.V.

Sir Winston Churchilllaan 273

Postbus 70

2280 AB RIJSWIJK

The Netherlands

Tel. +31 88 998 44 00

Fax +31 88 998 44 20

info@kiwa.nl

www.kiwa.nl

Publication of this certificate is allowed.

Advice: consult www.kiwa.nl in order to ensure that this certificate is still valid.

Company

Tel.

Fax



Certification process consists of initial and regular assessment of:

- quality system
- product

Kiwa[®] Product certificate K12345

Page x of y

Vulcanised rubber products for cold and hot drinking water applications

PRODUCT SPECIFICATION

The products as specified in the table below fulfill 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	Nominal Hardness [IRHD]	Ozone class ¹ :	Field of application class ²	Cross Section [mm]	Nominal Dimensions [mm]	Product	Remarks or Drawings
Type Code	xx	I	I - WA	xx-xx	xx-xx	O-ring of naam van product	
Type Code	xx	I	I - WA	xx-xx	xx-xx	O-ring of naam van product	
Type Code	xx	I	I - WA	xx-xx	xx-xx	O-ring of naam van product	

1 Ozone resistance class according to BRL-K17504:
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.
2 For products for which a normal resistance to ozone is required.
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.

2 Field of application class according to BRL -K17504:
I Water supply at temperatures up to 50 °C;
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.
III Hot water circulation systems based on the classification class 2 in ISO 10508 (continuous high temperature of 70°C).

3 Field of application class according to EN 681-1:
WA As in BRL-K17504 class I;
WB As in BRL-K17504 class II;
WE As in BRL-K17504 class II, for IIR-copolymer (Type B seals Class III).

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"; 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 following marks and indications must be provided on each product[#] and product packaging in a clear, legible and indelible way:

- the name of manufacturer or the deposited trade mark;
- The Kiwa[®]-mark products are marked with the word mark "KIWA" / "KIWA" 
- the nominal dimension or dimensions;
- the nominal hardness;
- the year of manufacturing and preferably the quarter;
- type of rubber applied by means of the letter codes of the nomenclature according to ISO 1629;
- the application class (I, II or III);
- on products from blends, the letter B ("blend") shall be placed behind the first letter code;

- the ozone resistance class ("Ozone I, II or III"). For rubber rings made from two compounds the compound with the lowest class is valid.

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.

RECOMMENDATIONS FOR 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:

Company

and, if necessary,

Kiwa Nederland B.V.

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

I.5 Annex E - Model IQC-scheme (example)

See next pages

<p><u>IQC-schedule</u></p> <p><u>INTERNAL QUALITY PLAN</u></p>	<p>Manufacturer / supplier :</p> <p>Production location address :</p>	<p>Number of appendices:</p>
<p><u>Field(s) of application</u></p> <p><u>According Evaluation Guideline(s)</u></p>		
<p><u>Number of production shifts:</u></p>	<p><u>Quality manual, procedures and working instructions</u></p> <p>Is the Quality Management System (QMS) certified according to ISO 9001¹⁾?</p> <p>If yes, by which certification body:</p> <p>If yes, is the certification body accredited for the particular scope of certification?</p> <p>In case the QMS is not certified according to ISO 9001:</p> <ul style="list-style-type: none"> • 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: 	
<p><u>Quality Control</u></p> <p>Total number of employees in QC department :</p> <p>Number of QC-operators per shift :</p> <p>If no QC-inspections are carried out during night shifts, state the QC procedure(s)/instruction(s) to be followed: , documented in:</p>		
<p><u>Inspection and test records</u></p> <p>All records shall be maintained for a minimum of years.</p>		
<p><u>Specific agreements/comments/explanations</u></p>	<p>Signature of the manufacturer/supplier:</p> <p>Date :</p>	

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	<p>The product is built-up of the following raw materials:</p> <p>a) In case of products made from ready-made raw materials: listing of name and/or unique code of the raw material(s);</p> <p>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);</p> <p>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).</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p>	

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

I.6 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 <u>and</u> 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 - 24 h at 70 °C - 72 h at -10 °C	X X ³⁾ X	X ³⁾
Compression set in air (Class II and III rubbers - hot) - 72 h at 23°C - 24 h at 125°C	X X ³⁾	X ³⁾
Compression set in water (Class III rubbers only) - 3000 h at 110 °C - 10000 h at 110 °C	2) 2)	X X
Swelling in water - 168 h in water at 70 °C (Class I rubbers, Type A) - 168 h in water at 95 °C (Class II and III rubbers, Type A) - 10 weeks in water at 150 °C (Class I, II, III rubbers, Type B)	X X X	
Stress relaxation - 168 h at 23 °C (Class I rubbers, Type A and B) - 100 days at 23 °C - 168 h at 125 °C (Class II, III rubbers, Type A) - 672 h at 140 °C (Class III rubbers, Type A)	X ³⁾ X X ³⁾ X	X ³⁾ X ³⁾
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.

I.7 Annex G - Test pieces from products

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
- 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.

I.8 Annex H Testing in case the products are O-rings

How to test depends on the size of the rings.

I.8.1 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.

I.8.2 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.
- 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.
- 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.

I.8.3 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 $\leq 4,0$ 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	4.5.3	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤ 4 mm	%	ISO 37 ²	4.5.3	≥ 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	4.5.3	-20	-20	-25	-30	-30

Table 28B: extended requirements for O-rings with a cross section of $\leq 4,0$ 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	4.5.3	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤ 4 mm	%	ISO 37 ²	4.5.3	≥ 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	4.5.3	-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	4.5.4	≤ 25	≤ 25	≤ 25	≤ 25	≤ 25

Table 29A: extended requirements for O-rings with a cross section of $\leq 4,0$ 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	4.5.3	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤ 4 mm	%	ISO 37 ²	4.5.3	≥ 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	4.5.3	-20	-25	-30

Table 29B: extended requirements for O-rings with a cross section of $\leq 4,0$ 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	4.5.3	$\geq 8,5$	$\geq 8,5$	$\geq 8,5$
Elongation at break for O-rings or press-fit rings with a cross-section that is ≤ 4 mm	%	ISO 37 ²	4.5.3	≥ 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	4.5.3	-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	4.5.4	≤ 25	≤ 25	≤ 25