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Rubber seals — Joint rings for hot water supply pipelines up to 110 °C — Specification for the material

iTeh STANDARD PREVIEW

(standard in progress)
*Joints étanches en caoutchouc — Garnitures d'étanchéité destinées aux
joints de canalisations pour la fourniture d'eau chaude jusqu'à 110 °C
— Spécifications pour les matériaux*

[ISO 9631:1991](https://standards.iso.org/iso/9631:1991)

<https://standards.iteh.ai/catalog/standards/sist/3d7072b5-ab78-444f-ab52-72129e263087/iso-9631-1991>



Reference number
ISO 9631:1991(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9631 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Sub-Committee SC 4, *Miscellaneous products*.

Annexes A and B of this International Standard are for information only.

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Rubber seals — Joint rings for hot water supply pipelines up to 110 °C — Specification for the material

1 Scope

This International Standard specifies requirements for materials used in vulcanized, solid rubber joint rings for hot water pipelines up to 110°C. Some general requirements for the finished joint rings are also given.

If there are other requirements for the performance of the finished joint rings, particularly functional tests for the actual sealing system and related pipeline materials, they should be specified additionally in national standards.

This International Standard is applicable to joint rings for all pipeline materials suitable for hot water including iron, steel, etc.

Joint rings made from cellular rubber materials or with enclosed voids as part of their design are not covered by this International Standard.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 48:1979, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD).*

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471:1983, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 812:1991, *Rubber, vulcanized — Determination of low-temperature brittleness.*

ISO 815:1991, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures.*

ISO 816:1983, *Rubber, vulcanized — Determination of tear strength of small test pieces (Delft test pieces).*

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 2230:1973, *Vulcanized rubber — Guide to storage.*

ISO 3302:1990, *Rubber — Dimensional tolerances for use with products.*

ISO 3384:1991, *Rubber, vulcanized or thermoplastic — Determination of stress relaxation in compression at ambient and at elevated temperatures.*

ISO 4661-1:1986, *Rubber, vulcanized — Preparation of samples and test pieces — Part 1: Physical tests.*

ISO 9691:—¹⁾, *Rubber — Recommendations for the workmanship of pipe joint rings — Description and classification of imperfections.*

3 Classification

Five classes of material are specified (see tables 1 and 2). These correspond to preferred nominal hardnesses of 50 IRHD, 60 IRHD, 70 IRHD, 80 IRHD and 88 IRHD. If required, an intermediate nominal

1) To be published.

hardness different from those indicated in table 1 may be used.

4 Materials

4.1 The materials shall be free of any substances which may have a deleterious effect on the hot water, or on the life of the sealing ring, or on the pipe or fittings.

4.2 For hot potable water applications, the materials shall not impair the quality of the water under the conditions of use. Moreover, they shall conform to the official regulations of the country in which they are to be used.

4.3 Compression set and stress relaxation requirements for materials of nominal hardness 80 IRHD or 88 IRHD shall apply only when the material is directly participating in the sealing function.

5 General requirements for materials

5.1 Testing and test pieces

Unless otherwise specified, tests shall be carried out at a standard temperature in accordance with ISO 471.

Test pieces shall be cut from the finished product by the method specified in ISO 4661-1 and other corresponding International Standards. If satisfactory test pieces cannot be prepared in accordance with the instructions given for the appropriate test method, they shall be taken from test slabs or sheets, of suitable dimensions, made from the same batch of the rubber mix used to make the rings and vulcanized under conditions which are comparable to those used in production.

Table 1 — General requirements for materials

Property	Unit	Requirement for class				
		50	60	70	80	88
Classification						
Preferred nominal hardness	IRHD	50	60	70	80	88
Range of nominal hardness	IRHD	46 to 55	56 to 65	66 to 75	76 to 84	85 to 91
General requirements						
Permissible tolerance on specified hardness ¹⁾	IRHD	± 5	± 5	± 5	± 4	± 3
Tensile strength, min.	MPa	9	9	9	9	9
Elongation at break, min.	%	300	250	200	100	100
Compression set in air						
After 7 days at standard temperature, max.	%	15	15	15	15 ²⁾	15 ²⁾
After 22 h at 125 °C ± 2 °C, max.	%	18	18	20	20 ²⁾	20 ²⁾
Accelerated ageing in air: change from unaged values after 7 days at 125 °C ± 2 °C						
Hardness, max.	IRHD	± 5	± 5	± 5	± 5	± 5
Tensile strength max.	%	± 20	± 20	± 20	± 20	± 20
Elongation at break, max.	%	± 20	± 20	± 20	± 20	± 20
Immersion in water: change in volume after immersion in distilled or deionized water for 7 days at 100 °C ± 1 °C, max.	%	0/+ 8	0/+ 8	0/+ 8	0/+ 8	0/+ 8
Tear strength, min.	N	20	20	20	30	30
Stress relaxation in compression						
After 7 days at standard temperature, max.	%	15	15	15	15 ²⁾	15 ²⁾
After 7 days at 125 °C ± 2 °C, max.	%	30	30	30	30 ²⁾	30 ²⁾
1) In specific cases, and on agreement between the manufacturer and user, the tolerances on hardness may be fixed at ± 3 IRHD. 2) The requirement applies only when the material is directly participating in the sealing function.						

5.2 Hardness

When determined by the micro-test method specified in ISO 48, the hardness shall comply with the requirements given in table 1. If the dimensions of the ring are appropriate, the normal test method specified in ISO 48 may be used, provided that the micro-test method is used for referee purposes.

For the same ring, or along the greatest length of an extruded profile cut to make a ring, hardness values shall not vary by more than 4 IRHD. Each value shall be within the specified tolerances.

NOTE 1 For the purpose of this International Standard, which requires hardness measurements of up to 91 IRHD, the micro-test method specified in ISO 48 is considered satisfactory.

5.3 Tensile strength and elongation at break

The tensile strength and elongation at break shall be determined by the method specified in ISO 37, using type 2 dumb-bell shaped test pieces.

Other types of test piece may be used, if agreement is reached upon the relationship between the values obtained on type 2 dumb-bell shaped test pieces and those obtained on the proposed test pieces.

The tensile strength and the elongation at break shall comply with the requirements given in table 1.

5.4 Compression set in air

When determined by the method specified in ISO 815, using the small test piece, the compression set shall comply with the requirements given in table 1.

The test piece shall be cut as far as possible in the direction of compression of the ring in service.

5.5 Accelerated ageing in air

When the test pieces required by 5.2 for the determination of hardness and by 5.3 for the determination of tensile strength and elongation at break are aged in air at $125\text{ °C} \pm 2\text{ °C}$ for 7 days, by the oven method specified in ISO 188, the changes in hardness, tensile strength and elongation at break shall comply with the requirements given in table 1.

5.6 Immersion in water

When determined by the method specified in ISO 1817, the change in volume after 7 days immersion in distilled or deionized water at $100\text{ °C} \pm 1\text{ °C}$ shall comply with the requirements given in table 1.

5.7 Tear strength

When determined by the method specified in ISO 816, the tear strength shall comply with the requirements given in table 1.

5.8 Stress relaxation in compression

When determined by method A specified in ISO 3384, and after applying mechanical and thermal conditioning, the stress relaxation in compression shall comply with the requirements given in table 1.

The test piece shall be cut as far as possible in the direction of compression of the ring in service.

6 Optional low-temperature brittleness requirement for materials

When tested by the method specified in ISO 812, using type A test pieces, at -25 °C , the results shall comply with the requirement given in table 2.

Table 2 — Optional requirement for materials

Property	Requirement for class				
	50	60	70	80	88
Low-temperature brittleness at -25 °C	No test piece shall break				

7 General requirements for finished joint rings

7.1 Workmanship

Workmanship shall be in accordance with good commercial practice.

The rings shall be free from porosity and shall not have surface defects or irregularities which could affect their function. Flash shall be reduced to a reasonable minimum (see ISO 9691).

7.2 Dimensions and tolerances

Dimensions and tolerances shall be the subject of agreement between the interested parties. Tolerances shall be chosen from the appropriate classes in ISO 3302.

7.3 Storage and handling of rings

At all stages between manufacture and use, the rings shall be stored in accordance with the recommendations of ISO 2230.

The attention of users is drawn to the need to avoid cracking during storage and handling. If it is considered that risks of cracking exist, additional tests, appropriate to the situation involved, shall be specified.

7.4 Marking

Marking shall identify the manufacturer and also the use of the ring in terms of the fluid (hot water) conveyed.

7.5 Quality assurance

Procedures for quality assurance shall be agreed between the interested parties to validate compliance with this International Standard. Guidance on quality assurance is given in annex A.

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Annex A (informative)

Quality assurance

A.1 Type tests

All tests for the appropriate designation of ring should be carried out at least annually and whenever the manufacturing technique is changed. All tests, without exception, should also be carried out whenever the elastomer formulation is changed. All of these should either be carried out using test pieces cut from the finished ring or, and only if the shape of the ring does not permit test pieces to be produced, on laboratory samples of the same formulation, state of cure and method of preparation as the finished rings.

For tests in which different sizes of test piece are permissible, the same size of test piece should be used for each batch and for any comparative purposes.

A.2 Product control tests

The following tests should be carried out to check compliance with the requirements specified in tables 1 and 2, using test pieces obtained as specified in 5.1:

- a) tensile strength;
- b) elongation at break;
- c) compression set;
- d) hardness.

A.3 Sampling for product control tests

The product control test should be carried out on batches of finished components using sampling procedures in accordance with either:

- a) ISO 2859-1[1] with a specified inspection level of S-2 and an AQL of for instance 2,5 % for attributes or
- b) ISO 3951[2] with a specified inspection level of S-3 and an AQL of for instance 2,5 % for variables.

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

Annex B
(informative)

Bibliography

[1] ISO 2859-1:1989, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

[2] ISO 3951:1989, *Sampling procedures and charts for inspection by variables for percent nonconforming.*

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