INTERNATIONAL STANDARD

ISO 4708

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2000-03-15

Composition cork — Gasket material — Test methods

Aggloméré composé de liège — Joints pour industries mécaniques — Méthodes d'essai

Reference number
ISO 4708:2000(E)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4708 was prepared by Technical Committee ISO/TC 87, *Cork.* It is based on ASTM F36:1992, ASTM F146:1993 and ASTM F147:1987.

This second edition cancels and replaces the first edition (ISO 4708:1985), which has been technically revised.

Annex A forms a normative part of this International Standard.

Composition cork — Gasket material — Test methods

1 Scope

This International Standard specifies test methods to determine the characteristics of agglomerated composition cork intended to be used as gaskets in mechanical industry. The following characteristics are considered:

— thickness,

— apparent density,

— tensile strength,

— compressibility and recovery,

— flexibility,

— resistance to boiling water,

— behaviour in fluids,

— sealing behaviour.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 633, *Cork — Vocabulary.*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection.*

ISO 7322:2000, *Composition cork — Test methods*.

ISO 9392, *Agglomerated cork discs — Sealing behaviour*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 633 and the following apply.

3.1
failure
appearance of any crack, break or surface separation

3.2
disaggregation
substantial loss of particles and/or splitting open of a test specimen during the test

4 Apparatus

See ISO 7322 and the following items.

4.1 **Series of mandrels**, with diameters ranging from 8 mm to 25 mm, in steps of 1 mm.

4.2 **Oven,** capable of being maintained at (100 ± 2) °C.

4.3 **Open containers.**

4.4 **Oven** or **climatic room,** capable of being maintained at (23 ± 5) °C and (50 ± 5) % relative humidity.

4.5 **Absorbent paper,** of analysis type.[1)]

4.6 **Aluminium foil**

5 Reagents

5.1 **ASTM Oil No. 3**.[2)]

5.2 **ASTM Oil No. 1**.[2)]

5.3 **ASTM Fuel A.**[2)]

6 Sampling and preparation of test specimens

6.1 Sampling

The number of packages taken from each lot (at least three packages) and the quantity of material to be taken from the sample shall be in accordance with ISO 2859-1, for the inspection level agreed between the interested parties.

6.2 Preparation of test specimens

6.2.1 Take the material and use the cutting system to take test specimens at a distance of at least 100 mm from the edges. The number and dimensions of the test specimens shall be as specified in Table 1. Each test specimen shall be squarely cut with the edges perpendicular to its surface, and shall not show any cracks or folds.

6.2.2 The minimum and the maximum thicknesses of the test specimens for testing flexibility are specified in Table 2.

6.2.3 Test specimens to determine the behaviour in fluids shall follow the provisions of 7.7.

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1) Paper Whatman No. 4 has demonstrated proper absorptive properties for oils. This is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and should not be taken as an endorsement by ISO of this product.

2) These are examples of suitable reagents. Other reagents may be used provided that they comply with the requirements specified in annex A, or are reagents chosen by agreement between the interested parties.

6.3 Conditioning

Prior to testing, the test specimens shall be conditioned for 48 h at 23 °C in the oven or climatic room (4.4). In case of dispute, the test specimens shall be conditioned for 48 h at a temperature of (23 ± 2) °C and (50 ± 5) % relative humidity. Unless otherwise specified, all tests shall be carried out under the same temperature and humidity conditions.

Table 1 — Number and dimensions of test specimens

Type of test	Dimensions of test specimens mm	Number of test specimens
Compressibility and recovery	50 × 50	3 (single ply or 3 groups of *n* test specimens)
Flexibility	150 × 15	3
Sealing behaviour	diameter of 28,7	3
Behaviour in oil or in fuel	50 × 50	3 for each reagent

Table 2 — Thicknesses used for testing flexibility

Type of material	Minimum thickness mm	Maximum thickness mm
Agglomerated composition cork	3,2	4,8
Rubbercork	1,6	4,8

7 Tests

7.1 Determination of thickness

See ISO 7322:2000, 6.1.

7.2 Determination of apparent density

See ISO 7322:2000, 6.2.

7.3 Determination of tensile strength

See ISO 7322:2000, 6.3.

7.4 Determination of compressibility and recovery

See ISO 7322:2000, 6.4.

The dimensions of the test specimens are specified in Table 1. Test specimens shall consist of a single ply or a number of superimposed plies to give a minimum test thickness of 3,2 mm.

Results obtained for test specimens outside this test thickness shall be regarded as merely indicative. For specification purposes, agreement on compressibility and recovery values shall be reached between the interested

parties for those materials whose thickness, in a single ply or multiple plies, does not fall within the nominal thickness specified.

7.5 Resistance to boiling water

See ISO 7322:2000, 6.5.

7.6 Flexibility

7.6.1 Method A

7.6.1.1 Procedure

Firmly hold the test specimen at one point on a circular mandrel and slowly but firmly, under finger pressure, force the test specimen to contact 180°of the full mandrel diameter for approximately (5 ± 1) s. Repeat this flexure using decreasing mandrel diameters on new test specimens until failure (3.1) occurs.

7.6.1.2 Calculation and expression of results

The test result is the minimum diameter, expressed in millimetres, on which the test specimen could be flexed without any signs of failure (3.1).

NOTE A flexibility factor may be calculated by dividing this minimum diameter by the nominal thickness of the test specimen.

7.6.2 Method B

7.6.2.1 Procedure

Place the test specimens in the oven (4.2) set at 100 °C, for 70 h. After this period, remove the test specimens, allow them cool for (24 ± 1) h under laboratory ambient conditions. Carry out the test as specified in 7.6.1.1.

7.6.2.2 Calculation and expression of results

The test result is the minimum diameter, expressed in millimetres, on which the test specimen could be flexed without any signs of failure (3.1).

7.7 Behaviour in fluids [3)]

NOTE These test methods provide a standardized procedure to measure the effect of immersion in specified fluids under definite conditions of time and temperature. The test results are not intended to give any direct correlation with service conditions, taking into account the wide variations in temperature and special use that may be found in gasket applications. The specific test fluids and test conditions outlined were selected as typical for purposes of comparing different materials and may be used as a routine test when agreed between the interested parties.

7.7.1 Behaviour in ASTM Oil No. 3 (or equivalent)

7.7.1.1 Procedure

The test specimens shall have the dimensions defined in Table 1 and the material thickness defined in Table 2. The test specimens shall be conditioned before the test as specified in 6.3.

Determine the thickness (or mass or volume) of the test specimens as specified in 7.1.

3) This is not applicable to rubbercork.

Place the test specimens in the containers with ASTM Oil No. 3 (or equivalent), for 72 h, at ambient temperature (between 22 °C and 30 °C). At the end of this period, remove the test specimens, clean them with absorbent paper (4.5) and determine the new thickness (or mass or volume) of the test specimens.

7.7.1.2 Calculation and expression of results

The change in thickness (or mass or volume) of the test specimen is given by the formula:

$$\Delta d = \frac{d_2 - d_1}{d_1} \times 100 \ \%$$

where

d_1 is the thickness (or the mass or the volume) of the test specimen before immersion, expressed in millimetres, rounded to the nearest 0,1 mm;

d_2 is the thickness (or the mass or the volume) of the test specimen after immersion, expressed in millimetres, rounded to the nearest 0,1 mm.

The test result is expressed as a percentage, rounded to the nearest integer.

7.7.2 Behaviour in ASTM Oil No. 1 (or equivalent)

7.7.2.1 Procedure

The test specimens shall have the dimensions specified in Table 1 and the material thickness specified in Table 2. The test specimens shall be conditioned before the test as specified in 6.3.

Determine the thickness (or mass or volume) of the test specimen as specified in 7.1.

Place the test specimens in the containers with ASTM Oil No. 1 (or equivalent), ensuring that the test specimens are separated from each other and from the bottom of the container and remain immersed in the test fluid. Cover the containers with aluminium foil and place the containers for (70 ± 2) h in the oven (4.2) set at 100 °C.

After this period, remove the test specimens from the containers and immediately immerse them in a cool fresh portion of the test fluid, for 30 min to 60 min at ambient temperature (between 22 °C and 30 °C). Remove the test specimens from the containers, clean them with absorbent paper (4.5) and determine the new thickness (or mass or volume) of the test specimens.

7.7.2.2 Calculation and expression of results

The change in thickness (or mass or volume) of the test specimen is given by the formula:

$$\Delta d = \frac{d_2 - d_1}{d_1} \times 100 \ \%$$

where

d_1 is the thickness (or mass or volume) of the test specimen before immersion, expressed in millimetres, rounded to the nearest 0,1 mm;

d_2 is the thickness (or mass or volume) of the test specimen after immersion, expressed in millimetres, rounded to the nearest 0,1 mm.

The test result is expressed as a percentage, rounded to the nearest integer.

7.7.3 Behaviour in ASTM Fuel A (or equivalent)

7.7.3.1 Procedure

The test specimens shall have the dimensions specified in Table 1 and the material thickness specified in Table 2. The test specimens shall be conditioned before the test as specified in 6.3.

Determine the volume (or mass or thickness) of the test specimen if test results are to be expressed as the change of this property.

Place the test specimens in the containers with the reagent, for 24 h, at ambient temperature (between 22 °C and 30 °C). At the end of this period, remove the test specimens, clean them with absorbent paper (4.5) and make a visual examination or determine the new volume (or mass or thickness) of the test specimens.

7.7.3.2 Calculation and expression of results

The test result is expressed either by:

— the existence or absence of disaggregation (3.1), or

— the change in volume (or mass or thickness), as a percentage of the initial volume (or mass or thickness), rounded to the nearest 0,1 %, calculated according to the formula:

$$\Delta v = \frac{v_2 - v_1}{v_1} \times 100 \ \%$$

where

v_1 is the volume (or mass or thickness) of the test specimen before immersion, expressed in cubic millimetres (or in grams or millimetres), rounded to the nearest tenth;

v_2 is the volume (or mass or thickness) of the test specimen after immersion, expressed in cubic millimetres (or in grams or millimetres), rounded to the nearest tenth.

7.8 Sealing behaviour

The determination shall be carried out in accordance with ISO 9392 with the following modifications:

a) the load shall be applied at a rate of 6 mm/min;

b) the internal pressure shall be agreed between the client and supplier;

c) the applied load shall be 10 times higher than the internal pressure.

8 Test report

The test report shall include the following information:

a) a reference to this International Standard, i.e. ISO 4708;
b) the complete identification of the product tested, including the type, source and the manufacturer's references;
c) the sampling report;
d) the results obtained;
e) any deviation from this International Standard that may have affected the results.

Annex A
(normative)

Characteristics of the reagents

The reagents used to evaluate the deterioration which has occurred in the material after its immersion, shall have the characteristics shown in Table A.1. This evaluation may be made by visual observation, or by determination of the relative change in mass, thickness or volume.

Table A.1 — Characteristics of reagents

Characteristic	Oil No. 1	Oil No. 3	Fuel A
Aniline point	(124 ± 1) °C	(70 ± 1) °C	—
Saybolt viscosity at 180 °C	(98 ± 5) s	(155 ± 5) s	—
Flashpoint	243 °C min.	(166 ± 3) °C	—
—			Isooctane[a)]

[a)] In accordance with specifications given in *Manual for Rating Motor Fuels by Motor and Research Methods.*

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