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Descriptors: Household appliances, gas appliances, seals: stoppers, rubber products, vulcanized rubber, classifications, characteristics, tests, specifications

English version

Rubber seals — Static seals in domestic appliances for
 combustible gas up to 200 mbar —
 Specifications for material

Joints de caoutchouc — Joints statiques
 d'étanchéité destinés aux appareils
 domestiques utilisant les combustibles gazeux
 jusqu' à 200 mbar — Spécifications pour le
 matériau

Gummidichtungen — Statische Dichtungen in
 Haushalts-Geräten für gasförmige Brennstoffe
 bis 200 mbar — Anforderungen an den
 Werkstoff

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
 Comité Européen de Normalisation
 Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard was prepared by CEN/TC 108 "Sealing materials and lubricants for gas appliances and gas equipment".

In accordance with the Common CEN/CENELEC Rules, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

This standard defines only the quality of materials to be used for the manufacture of seals. It specifies tests to be carried out on specified samples taken from sheet and fixes the test values to be met.

There is however, an urgent need for component testing and a standard is in preparation which will implement this in addition to the material testing as such.

It may be necessary to carry out supplementary tests on the seals themselves.

— *Test on seals mounted in the appliance.*

These tests are intended to confirm the functional suitability of the seal and should be performed under the most severe service conditions envisaged in the appropriate standards for gas appliances and/or auxiliary equipment.

— *Tests on the seal itself.*

These tests are intended to confirm that the material from which the seal is manufactured is one that complies with this standard. The fact that most seals are small in size does not, in general, allow for the necessary standard samples for the tests to be prepared from them. The test methods should be chosen from those specified in this standard but the test values will possibly be different due to the dimensional differences of the sample.

1 Scope and field of application

This European Standard specifies requirements and test methods for homogeneous rubbers for static seals used in domestic gas appliances of all categories, and in auxiliary equipment mounted or intended to be mounted on such appliances which are in contact with combustible gases up to 200 mbar (not including LPG in liquid phase).

This standard does not specify the geometrical characteristics of the seals.

The normal range of envisaged operating temperatures covered by this standard is 0 °C to 60 °C. Temperatures outside this range can be proposed by the manufacturer with limits between – 20 °C and + 150 °C.

2 Normative references

- 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 815:1972, *Vulcanized rubbers — Determination of compression set under constant deflection at normal and high temperatures.*
- ISO 1653:1975, *Vulcanized rubbers — Determination of compression set under constant deflection at low temperatures.*
- ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*
- ISO 4648:1978, *Rubber, vulcanized — Determination of dimensions of test pieces and products for test purposes.*

3 Definition

For the purposes of this standard the following definition applies:

static seal

a component which ensures a seal between two components which do not have relative movement

NOTE The term "static seal" in this standard applies also to those seals where the parts of the joint are able to be moved, e.g. by adjustment of the appliance by an expert, who should be able to check the soundness of the joint.

4 Classification of material

Ten classes (A1 up to E2) and two groups (/1 and /2) of material are specified according to Table 1. The classes are related to the working and test temperature. The groups are defined by their physical and chemical characteristics.

The class and group of the material shall be indicated by the manufacturer of the seal.

5 Requirements

5.1 Visual quality

The test sample shall be homogeneous, free from porosity, inclusions, and surface imperfections visible to the naked eye, even after cutting.

Table 1 — Classification of material

Range of operating temperature (°C)	from	0	0	0	0	0	– 20	– 20	– 20	– 20	– 20
	to	60	80	100	125	150	60	80	100	125	150
Class/Group		A1/1	B1/1	C1/1	D1/1	E1/1	A2/1	B2/1	C2/1	D2/1	E2/1
					D2/2	E1/2				D2/2	E2/2

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5.2 Physical and chemical properties

The material shall be in accordance with the requirements laid down in Table 2.

6 Methods of test

In addition to the conditions below reference should be made to Table 3.

6.1 General conditions

Test pieces shall be cut from a sheet of material of $(2^{+0,2}_0)$ mm or $(6,3 \pm 0,3)$ mm thickness according to the test. Measurements of thickness shall be carried out according to ISO 4648.

The material shall be from the same compound formulation used to make the seals, vulcanized under conditions which are comparable to those used in production.

6.2 Hardness

Test the hardness in accordance with either of the methods specified in ISO 48 but, in the event of disagreement the micro-test shall be used. Five measurements shall be carried out on each sample.

6.3 Tensile strength and elongation at break

Test the tensile strength and elongation at break in accordance with the method specified in ISO 37 using six dumb-bell test pieces, type 2 being preferred. In the event of disagreement type 2 shall be used.

6.4 Compression set

6.4.1 Test at high temperature

Test the compression set at high temperature in accordance with the method specified in ISO 815 using three small test pieces.

Place the loaded compression apparatus in an oven for a duration of (168 ± 2) h at a temperature related to the class of the material.

Table 2 — Requirements for material

Property	Unit	Group 1	Group 2
Hardness ^a tolerances			
— hardness 40 to 75	IRHD	± 5	± 5
— hardness 76 to 84	IRHD	± 4	± 4
— hardness 85 to 91	IRHD	± 3	± 3
Tensile strength	MPa	≥ 7	≥ 5
Elongation at break	%	≥ 125	≥ 125
Compression set			
— at high temperature ^b	%	≤ 40	≤ 40
— at low temperature	%	≤ 40	≤ 40
0 °C (A1 to E1)	%	≤ 40	≤ 40
– 20 °C (A2 to E2)	%	≤ 50	≤ 50
Resistance to ageing			
— change in hardness, max.	IRHD	± 10	± 10
— change in tensile strength, max.	%	≤ 50	≤ 50
— change in elongation at break, max.	%	≤ 50	≤ 50
Gas resistance			
— change in mass after immersion, max.	%	+ 10	
		– 5	no requirement ^c
— change in mass after drying, max.	%	+ 5	
		– 8	± 5
Lubricant resistance			
— change in hardness, max.	IRHD	± 10	± 15
— change in volume, max.	%	+ 15	+ 10
		– 10	– 10

^a The hardness of the material shall be stated by the manufacturer of the seal.

^b The sample shall not be damaged by adhering to the surfaces of the test apparatus.

^c The swelling after immersion in liquid *n*-pentane by some Group 2 materials may be substantial.

6.4.2 Test at low temperature

Test the compression set at low temperature in accordance with the method specified in ISO 1653 using three small test pieces.

Place the loaded compression apparatus in a low temperature cabinet for a duration of (72_{-2}^0) h at a temperature related to the class of material.

6.5 Resistance to ageing

Test the resistance to ageing in accordance with the method specified in ISO 188, in a normal oven, using six dumb-bell test pieces type 2 (see 6.3) and 3 separate test pieces for the hardness test (see 6.2).

Place the test pieces in the oven for a duration of (168_{-2}^0) h at a temperature related to the class of the material.

6.6 Resistance to gas

Test the resistance to gas in accordance with 8.2 of ISO 1817:1985 and the following conditions.

Use three previously weighed test pieces each of $(50 \times 20 \times 2)$ mm.

Immerse all three samples for (72_{-2}^0) h at (23 ± 2) °C in *n*-pentane (98 % min. *n*-pentane by mass, estimated by gas chromatography).

After removal from the liquid, dry rapidly by wiping and immediately weigh.

Determine the change in mass with reference to the initial mass of the sample.

Dry for a period of (168_{-2}^0) h in an oven at (40 ± 1) °C at atmospheric pressure.

Determine by weighing the new change in mass with reference to the initial mass of the sample.

For the calculation, the arithmetic mean value of the three results both after immersion and after drying is used.

6.7 Resistance to lubricants

Test the resistance to lubricants in accordance with ISO 1817:1985 volumetric method (8.2) and hardness test (11.2) and the following conditions.

Use three test pieces each $(50 \times 20 \times 2)$ mm.

Duration of immersion to be (168_{-2}^0) h in oil No. 2 with maximum envisaged working temperature corresponding to the material classification according to Table 1.

Determine the change in volume and of the change in hardness.

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Table 3 — Test methods

Property	ISO	Test pieces		Test temperature (°C)	Duration of test (h)	Remarks
		Type	Number			
Hardness	48		3	23 ± 2		Micro-hardness test shall be used for reference purposes
Tensile strength and elongation at break	37	dumb-bell type 2	6	23 ± 2		
Compression set — at high temperature	815	small test pieces disc (13,0 ± 0,5) mm (6,3 ± 0,3) mm thickness	3	class A: 70 ± 1 B: 100 ± 1 C: 125 ± 2 D: 150 ± 2 E: 175 ± 2	168 ₋₂ ⁰	
— at low temperature	1653	small test pieces disc (13,0 ± 0,5) mm (6,3 ± 0,3) mm thickness	3	class A1 to E1: 0 ± 1 A2 to E2: - 20 ± 1	72 ₋₂ ⁰	Final measurement after (30 ± 3) min at (0, - 20) °C at the end of the exposure period
Resistance to ageing — hardness	188		3	class A: 70 ± 1 B: 100 ± 1 C: 125 ± 2 D: 150 ± 2 E: 175 ± 2	168 ₋₂ ⁰	Normal oven
— tensile strength and elongation at break		dumb bell type 2	6			
Resistance to gas — immersion in <i>n</i> -pentane	8.2 of 1817:1985	(50 × 20 × 2) mm	3	23 ± 2	72 ₋₂ ⁰	Weigh and determine change in mass. Use the arithmetic mean value, both after immersion and after drying
— drying				40 ± 2	168 ₋₂ ⁰	
Lubricant resistance — immersion in oil No. 2	8.2 and 11.2 of 1817:1985	(50 × 20 × 2) mm	3	class A: 60 ± 1 B: 80 ± 1 C: 100 ± 1 D: 125 ± 2 E: 150 ± 2	168 ₋₂ ⁰	Determine the change in volume and in hardness

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