BRITISH STANDARD

BS EN
291:1992

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

The European Standard EN 291:1992 has the status of a British Standard

Cooperating organizations

The European Committee for Standardization (CEN), under whose supervision this European Standard was prepared, comprises the national standards organizations of the following countries.

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Belgium	Institut belge de normalisation
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Germany	Deutsches Institut für Normung e.V.
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United Kingdom	British Standards Institution

This British Standard, having been prepared under the direction of the Gas Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 1 May 1992

The following BSI references relate to the work on this standard:
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Contents

National foreword

This British Standard has been prepared under the direction of the Gas Standards Policy Committee and is the English language version of EN 291 "*Rubber seals — Static seals in domestic appliances for combustible gas up to 200 mbar — Specifications for material*" published by the European Committee for Standardization (CEN). It partially supersedes BS 6505.

EN 291 was produced as a result of international discussion in which the UK took an active part.

National appendix NA gives the constitution of the committees for UK participation in the preparation of this standard.

National appendix NB gives details of International Standards quoted in this standard for which there is an identical or technically equivalent British Standard.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 6, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 291

February 1992

UDC: 62-762-036.4:64.06-843:620.1

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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CEN

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

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

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.

Contents

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 D2/2	E1/1 E1/2	A2/1	B2/1	C2/1	D2/1 D2/2	E2/1 E2/2

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 $(168\ ^{0}_{-2})$ 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 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 $(72 \, {}^{0}_{-2})$ 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 $(168 \, {}^{0}_{-2})$ 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 × 20 × 2) min.

Immerse all three samples for $(72 \, {}^{0}_{-2})$ 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 $(168 \, {}^{0}_{-2})$ 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 × 20 × 2) mm.

Duration of immersion to be $(168 \, {}^{0}_{-2})$ 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.

Table 3 — Test methods

Property	ISO	Test pieces Type	Number	Test temperature (°C)	Duration of test (h)	Remarks
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^{0}_{-2}	
— 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^{0}_{-2}	Final measurement after (30 ± 3) min at (0, – 20) °C at the end of the exposure period
Resistance to ageing	188					
— hardness		dumb bell type 2	3	class A: 70 ± 1 B: 100 ± 1 C: 125 ± 2 D:150 ± 2 E: 175 ± 2	168^{0}_{-2}	Normal oven
— tensile strength and elongation at break			6			
Resistance to gas						
— immersion in *n*-pentane	**8.2** of 1817:1985	(50 × 20 × 2) mm	3	23 ± 2	72^{0}_{-2}	Weigh and determine change in mass. Use the arithmetic mean value, both after immersion and after drying
— drying				40 ±2	168^{0}_{-2}	
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^{0}_{-2}	Determine the change in volume and in hardness

National appendix NA

The United Kingdom participation in the preparation of this European Standard was entrusted by the Gas Standards Policy Committee (GSE/-) to Technical Committee GSE/22 upon which the following bodies were represented:

Association of Control Manufacturers [TACMA (BEAMA Ltd.)]
British Combustion Equipment Manufacturers' Association
British Gas plc
Chief and Assistant Chief Fire Officers' Association
Department of Trade and Industry (Consumer Safety Unit, CA Division)
Health and Safety Executive
Liquefied Petroleum Gas Industry Technical Association (UK)
Society of British Gas Industries

National appendix NB

The British Standards corresponding to the International Standards referred to in the text are as follows:

International Standard	**British Standard**
	BS 903 *Physical testing of rubber*
ISO 48:1979	Part A26:1969 *Determination of hardness* (Technically equivalent)
ISO 188:1982	Part A19:1986 *Heat resistance and accelerated ageing tests* (Identical)
ISO 815:1972	Part A6:1969 *Determination of compression set after constant strain* (Technically equivalent)
ISO 1653:1975	Part A39:1980 *Determination of compression set under constant deflection at low temperatures* (Identical)
ISO 1817:1985	Part A16:1987 *Determination of the effect of liquids* (Identical)
ISO 4648:1978	Part A38:1978 *Determination of dimensions of test pieces and products for test purposes* (Identical)

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