BRITISH STANDARD

BS EN
1217:1998

Materials and articles in contact with foodstuffs — Test methods for water absorption of ceramic articles

The European Standard EN 1217:1997 has the status of a British Standard

ICS 67.250; 81.060.20

National foreword

This British Standard is the English language version of EN 1217:1997.

The UK participation in its preparation was entrusted to Technical Committee CW/29, Tableware, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Summary of pages

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

This British Standard, having been prepared under the direction of the Sector Board for Consumer Products and Services, was published under the authority of the Standards Board and comes into effect on 15 April 1998

ISBN 0 580 29529 X

Amendments issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1217

December 1997

ICS 67.250; 81.060.20

Descriptors: Kitchen utensils, ceramics, food-container contact, tests, water absorption tests

English version

Materials and articles in contact with foodstuffs — Test methods for water absorption of ceramic articles

Matériaux et objets en contact avec les denrées alimentaires — Méthodes d'essai pour l'absorption d'eau par les objets en céramique

Werkstoffe und Gegenstände in Kontakt mit Lebensmitteln — Prüfverfahren für die Wasseraufnahme keramischer Gegenstände

This European Standard was approved by CEN on 15 February 1997.

CEN

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

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

Ref. No. EN 1217:1997 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 194, Utensils in contact with food, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 1998, and conflicting national standards shall be withdrawn at the latest by June 1998.

Further European Standards have been published with the following titles:

EN 1183 *Materials and articles in contact with foodstuffs — Test method for thermal shock and thermal shock endurance*

EN 1184 *Materials and articles in contact with foodstuffs — Test methods for translucency of ceramic articles*

A further standard is being prepared with the following title:

Materials and articles in contact with foodstuffs — Test method for crazing resistance of ceramic articles

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

Introduction

This European Standard specifies three test methods for the determination of the water absorption of ceramic articles. Water absorption is a property of the body, and is related to the volume of interconnected pores which can be filled by water under the immersion conditions of a water absorption test method. The volume of interconnected pores is also known as the open porosity of the body.

Water absorption provides generally an indication of the degree of vitrification of the body of a ceramic article; the lower the water absorption, the higher the degree of vitrification. A high degree of vitrification is necessary for certain categories of ceramic articles to achieve important performance characteristics. Water absorption is one of the properties used to characterize different types of ceramic articles.

Any of the three test methods may be used, as appropriate, but method A is based on European Community Regulation No 679/72, *Customs classification of products to be allied to porcelain: "Vitreous china" or "Semi-vitreous china" type*, and is for use for such classification purposes.

1 Scope

This European Standard specifies test methods for the determination of the water absorption of ceramic articles.

Three test methods are described:

– test method A, based on the increase in mass of test specimens after immersion in boiling water under defined conditions, which requires test specimens with not more than one glazed surface;

– test method B, based on the same principle and general procedure as method A but with a longer period of immersion in boiling water;

– test method C, based on the increase in mass of test specimens after a combination of evacuation of the test specimens to assist water penetration, followed by immersion in water and boiling; the test specimens may be glazed on both surfaces and are taken from different parts of a ceramic article to include possible inhomogeneities of the article.

NOTE Values of very low water absorption should preferably be determined by test method C.

2 Definitions

For the purposes of this standard, the following definitions apply:

2.1

water absorption

quantity of water that can be absorbed by the body of a ceramic ware

2.2

body

ceramic material shaped to constitute the ware, more or less vitrified, which is generally coated with glaze

3 Principle

The increase in mass is determined as a result of immersion in water under controlled conditions and is expressed as a percentage of the mass of the dry test specimen.

4 Water

4.1 *Distilled or de-ionized water*, for test methods A and B.

4.2 *De-gassed distilled or de-gassed de-ionized water*, for test method C.

5 Apparatus

5.1 Test methods A and B

5.1.1 *Oven*, air circulating, capable of maintaining a temperature of 110 °C ± 5 °C.

5.1.2 *Balance*, capable of weighing to an accuracy of 0,05 g.

5.1.3 *Glass vacuum desiccator.*

5.1.4 *Vessel*, suitable for the immersion and boiling of the test specimens.

5.1.5 *Source of heat.*

5.1.6 *Smooth cotton cloth.*

5.1.7 *Fine brush.*

5.1.8 *Saw*, suitable for cutting test specimens from ceramic articles.

NOTE The need for the saw is optional.

5.2 Test method C

5.2.1 *Oven*, air circulating, capable of maintaining a temperature of 110 °C ± 5 °C.

5.2.2 *Desiccator.*

5.2.3 *Balance*, capable of determining masses between 5 g and 20 g to an accuracy of 0,001 g.

5.2.4 *Vessel*, in which the test specimen can be evacuated in a desiccator and which is subsequently used for boiling the test specimen in water.

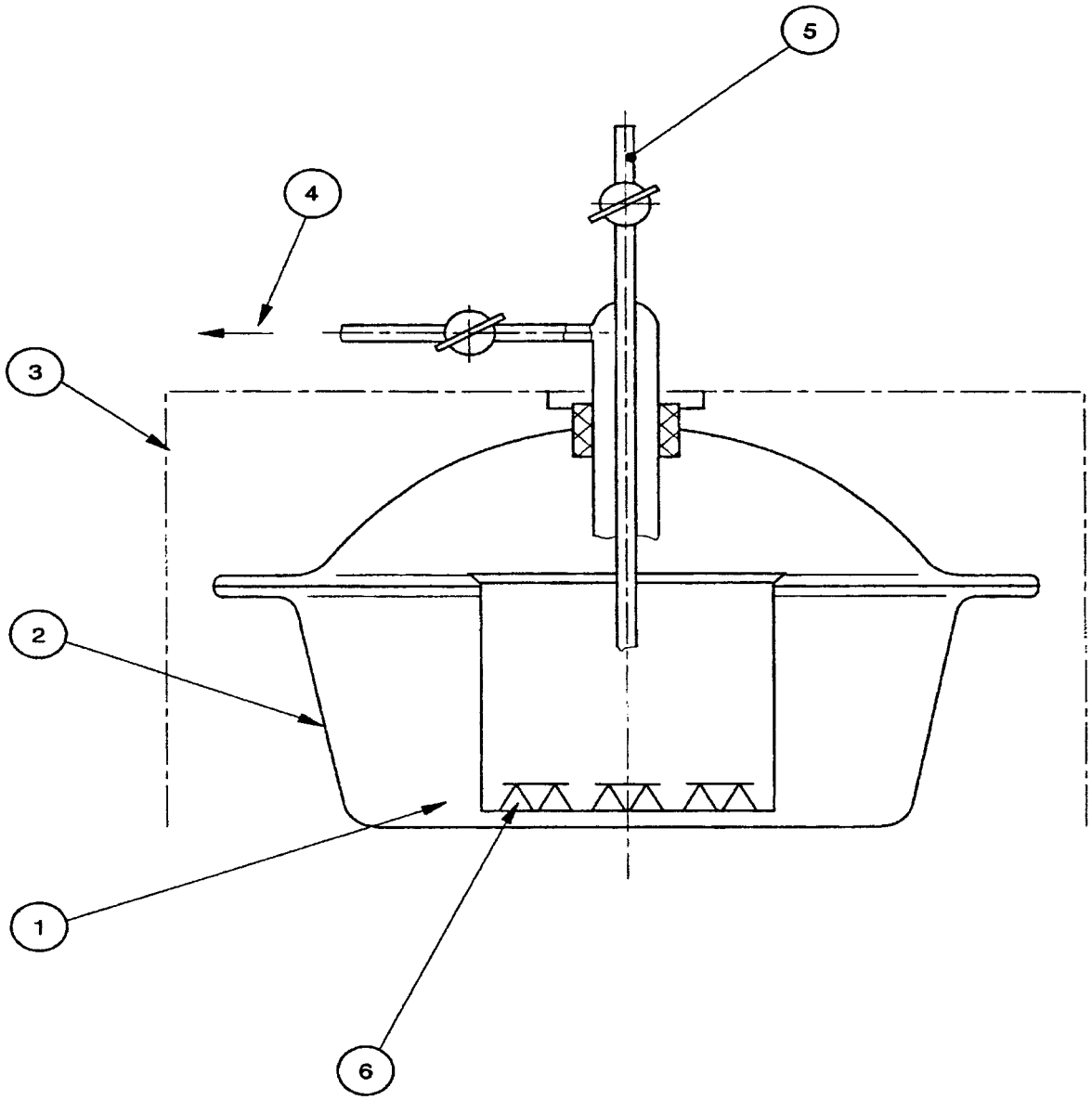
NOTE Suitable equipment for carrying out evacuation and water immersion is shown in Figure 1. The use of setter pins is to prevent the test items from bumping on the bottom of the boiling vessel which at all times should contain sufficient water to cover the test items.

5.2.5 *Laboratory vacuum pump*, capable of maintaining a pressure within the vessel of 2,5 kPa ± 1,5 kPa.

5.2.6 *Manometer*, capable of measuring absolute pressures in the range from 1 kPa to 4 kPa.

5.2.7 *Source of heat.*

5.2.8 *Smooth cotton cloth.*



1) Glass beaker containing test specimens supported on ceramic setter pins
2) Glass vacuum desiccator
3) Perforated metal safety screen
4) To vacuum pump and manometer
5) Connection to de-gassed distilled or de-gassed de-ionized water
6) Test specimens and setter pins

Figure 1 — Suitable equipment for carrying out evacuation and water immersion (for method C)

6 Preparation of test specimens

6.1 Test methods A and B

Break or cut the ceramic article to obtain three test specimens, each with a surface area of one of the major surfaces of approximately 30 cm^2. The test specimens shall not have more than one major glazed surface, and shall not be thicker than 8 mm. If the test specimens are glazed on both major surfaces, as is normally the case with commercial tableware articles, remove the glaze from one of the surfaces using suitable grinding equipment, leaving an unglazed surface of approximately 30 cm^2.

6.2 Test method C

Immediately before commencement of the test procedure, break the ceramic article by impact, and take two test specimens between 5 g and 20 g in mass from areas of the broken sample as follows:

a) for flatware, take one test specimen from the central area and the second test specimen from the rim area of the sample;

b) for hollow-ware, take one test specimen from the top section and the second test specimen from the base area of the sample.

NOTE The test specimens obtained in this way may be unglazed, glazed on one major surface, or glazed on both major surfaces.

7 Procedures

7.1 Test method A

Dry the test specimens to constant mass in the oven (**5.1.1**) at 110 °C ± 5 °C.

NOTE As a guide, a 3 h period will suffice for test specimens obtained by breaking an article of tableware. If the test specimens are obtained by cutting an article of tableware using a saw (**5.1.8**) and are wet, then a longer drying time may be necessary.

Place the test specimens in the desiccator (**5.1.3**) and allow them to cool to ambient temperature. Weigh each test specimen and record the final mass, m_1, to the nearest 0,05 g.

Immediately after weighing immerse the test specimens in distilled or de-ionized water (**4.1**). To avoid bumping during subsequent boiling ensure that the test specimens are not in contact with the bottom of the vessel (**5.1.4**). Boil for 2 h ± 5 min and then leave the test specimens to soak in the cooling water for a further period of not less than 24 h.

Remove the test specimens from the water and wipe with a clean and slightly moist smooth cotton cloth (**5.1.6**) to remove surface water. Completely dry the glazed surface and dry any cavities or holes using a slim, slightly damp brush (**5.1.7**).

Weigh each test specimen and record the masses after immersion, m_2, to the nearest 0,05 g.

7.2 Test method B

Carry out the test procedure as described for method A in **7.1**, except that the period of immersion in boiling water is extended to 4 h ± 10 min.

7.3 Test method C

Dry the test specimens to constant mass in the oven (**5.2.1**) at 110 °C ± 5 °C. Place the test specimens in the desiccator (**5.2.2**) and allow them to cool to ambient temperature. Weigh each test specimen and record the mass, m_1, to the nearest 0,01 g.

Place the dry test specimens on setter pins into a suitable vessel (**5.2.4**), reduce the pressure therein to 2,5 kPa ± 1,5 kPa and maintain at this pressure for 60 min ± 5 min.

Without admitting air, admit de-gassed distilled or de-gassed de-ionized water (**4.2**) at ambient temperature to the vessel, until the test specimens are fully covered. Then admit air to the vessel, returning it to atmospheric pressure, and boil the water and test specimens for 60 min ± 5 min. To avoid bumping during the boiling ensure that the test specimens remain fully submerged but do not touch the bottom of the vessel. Allow the test specimens to cool for not less than 24 h whilst remaining submerged in the boiled water.

Remove the test specimens from the water and wipe them with a moistened smooth cotton cloth (**5.2.8**) such that glazed surfaces are completely dry and broken surfaces retain a thin film of moisture appearing as a sheen.

Weigh each test specimen and record the masses after immersion, m_2, to the nearest 0,01 g.

8 Expression of results

For each test specimen, calculate the water absorption as a percentage of the dry mass of the test specimen using the following equation:

$$\text{water absorption} = \frac{m_2 - m_1}{m_1} \times 100\,\%$$

where:

m_1 is the mass of the test specimen after drying to constant mass, in grams;

m_2 is the mass of the test specimen after immersion, in grams.

Calculate the arithmetic mean of the results obtained for all test specimens to the first decimal place.

9 Test report

The test report shall include the following details:

a) a reference to this European Standard;

b) an identification of the article tested;

c) the test method used, i.e. A, B or C;

d) water absorption for each test specimen calculated in accordance with the equation given in clause **8** and the arithmetic mean of the results obtained for the test specimens.

Annex A (informative)

Bibliography

European Community Regulation No. 679/72 — *Customs classification of products to be allied to porcelain: "Vitreous china" or "Semi-vitreous china" type.*

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