
Advanced technical ceramics - Monolithic ceramics - General and textural properties - Part 2: Determination of density and porosity

Advanced technical ceramics - Monolithic ceramics - General and textural properties - Part 2: Determination of density and porosity

Hochleistungskeramik - Monolithische Keramik - Allgemeine und strukturelle Eigenschaften - Teil 2: Bestimmung von Dichte und Porosität

Céramiques techniques avancées - Céramiques monolithiques - Propriétés générales et structurales - Partie 2: Détermination de la masse volumique et de la porosité

<https://standards.iteh.ai/catalog/standards/sist/29073f53-6f27-4531-ab1a-a24c635ddd0a/sist-en-623-2-2000>

Ta slovenski standard je istoveten z: EN 623-2:1993

ICS:

81.060.30

Sodobna keramika

Advanced ceramics

SIST EN 623-2:2000

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 623-2:2000

<https://standards.iteh.ai/catalog/standards/sist/29073f53-6f27-4531-ab1a-a24c635ddd0a/sist-en-623-2-2000>

EUROPEAN STANDARD

EN 623-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 1993

UDC 666.5/.6:620.1:531.75

Descriptors: Ceramics, characteristics, tests, determination, bulk density, porosity, quality

English version

**Advanced technical ceramics - Monolithic
ceramics - General and textural properties - Part 2:
Determination of density and porosity**

Céramiques techniques avancées - Céramiques
monolithiques - Propriétés générales et
structurales - Partie 2: Détermination de la
masse volumique et de la porosité

Hochleistungskeramik - Monolithische Keramik -
Allgemeine und strukturelle Eigenschaften -
Teil 2: Bestimmung von Dichte und Porosität

<https://standards.iteh.ai/catalog/standards/sist/29073f53-6f27-4531-ab1a-a24c635ddd0a/sist-en-623-2-2000>

This European Standard was approved by CEN on 1993-08-30. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

The European Standards exist 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.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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

Page 2
EN 623-2:1993

Contents list		Page
	Foreword	3
1	Scope	4
2	Normative references	4
3	Definitions	5
4	Statement of accuracy and errors	6
5	Evacuation method (Method 1)	7
6	Measurement of dimensions and mass (geometric bulk density) (Method 2)	12
7	Test report	14

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN 623-2:2000

<https://standards.iteh.ai/catalog/standards/sist/29073f53-6f27-4531-ab1a-a24c635ddd0a/sist-en-623-2-2000>



Foreword

This European Standard has been prepared by Technical Committee CEN/TC 184 "Advanced technical ceramics" the secretariat of which is held by BSI.

EN 623 "Advanced technical ceramics - Monolithic ceramics - General and textural properties" consists of four parts:

- Part 1: Determination of the presence of defects by dye penetration tests
- Part 2: Determination of density and porosity
- Part 3: Determination of grain size 1)
- Part 4: Determination of surface roughness 1)

The 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 March 1994, and conflicting national standards shall be withdrawn at the latest by March 1994.

According to the CEN/CENELEC Internal Regulations, 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, United Kingdom.

(standards.iteh.ai)

SIST EN 623-2:2000

<https://standards.iteh.ai/catalog/standards/sist/29073f53-6f27-4531-ab1a-a24c635ddd0a/sist-en-623-2-2000>

**Advanced technical ceramics - Monolithic ceramics - General and textural properties - Part 2:
Determination of density and porosity**

1 Scope

This Part of EN 623 describes methods for determination of the bulk density, apparent solid density, and apparent porosity of advanced technical ceramics.

Two methods are described and are designated as Methods 1 and 2, as follows:

Method 1: Determination of bulk density, apparent solid density and apparent porosity by the evacuation method.

NOTE 1: This method is not suitable for the determination of apparent porosity of less than 1 %. A method for determining the presence of defects and surface porosity in this type of material is given in EN 623 Part 1.

NOTE 2: The method is also not suitable for materials which are known to have an average pore size of greater than 200 μm .

Method 2: Determination of bulk density only, by measurement of dimensions and mass.

NOTE 3: Neither of these test methods measures total porosity including open and closed pores. This parameter may be calculated from the test results of Method 1 if the true density of pore-free material is known.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- | | |
|---------------|---|
| EN 623-1 | Advanced technical ceramics - Monolithic ceramics - General and textural properties
Part 1 : Determination of the presence of defects by dye penetration tests |
| EN 45001 | General criteria for the operation of testing laboratories |
| ENV 1006 | Advanced technical ceramics - Methods of testing monolithic ceramics - Guidance on the sampling and selection of test pieces |
| ISO 758:1976 | Liquid chemical products for industrial use - Determination of density at 20 degrees C |
| ISO 3611:1978 | Micrometer callipers for external measurement |
| ISO 4964:1984 | Steel - Hardness conversions |
| ISO 6906:1984 | Vernier callipers reading to 0.02 mm |

3 Definitions

For the purposes of this Part of EN 623 the following definitions apply:

3.1 Open pores: Pores that are penetrated by an immersion liquid in vacuum, or that are connected with the atmosphere, either directly or via one another.

3.2 Closed pores: Pores that are not penetrated by the immersion liquid, or that are not connected with the atmosphere.

3.3 Bulk volume V_b : The sum of the volumes of the solid material, the open pores and the closed pores in a porous body.

3.4 True volume: The volume of a body occupied by solid material, excluding all forms of porosity.

3.5 Apparent solid volume V_s : The sum of the volume of the closed pores and true volume.

3.6 Bulk density: The ratio of the mass of the dry material of a porous body to its bulk volume.

3.7 Geometric bulk density: The mass per unit total volume of a material including all porosity accessible and inaccessible from the surface, the volume being calculated from linear dimensions.

3.8 Apparent solid density ρ_s : The ratio of the mass of the dry material to its apparent solid volume.

3.9 Apparent porosity Π_a : The ratio of the total volume of the open pores in a porous body to its bulk volume.

4 Statement of accuracy and errors

The minimum accuracy of measurement of the parameters used in calculation of densities and porosities is given in table 1.

Table 1: Accuracy and errors of density and porosity measurement

	Method 1: Evacuation method (see clause 5)			Method 2: Geometric bulk density (see clause 6)
Minimum test piece dimension in mm	-			3,0
Accuracy of measurement of dimension ¹⁾	-			0,01 mm or 0,05 % of smallest dimension
Minimum test piece mass in g	1	3	30	2,0
Accuracy of weighing in g	0,0001	0,001	0,01	0,001
Accuracy of measurement of density of immersion liquid, (Mg/m ³); see 5.5 and table 2	0,0001	0,001	0,001	-
Accuracy of density measurement (%)	0,3			1,0

1) The maximum non-uniformity of any dimension should not exceed 1 % of its average value.

5 The evacuation method (Method 1)

5.1 Principle

The mass of dry test piece is determined by weighing, then its apparent mass when immersed in a liquid with which it has been impregnated under vacuum, and then its mass in air while still soaked with the liquid. From these values its bulk density and apparent porosity are determined by calculation.

5.2 Apparatus

5.2.1 Drying oven, capable of maintaining a temperature of $110\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

5.2.2 Balance with accuracy in accordance with clause 4.

5.2.3 A bridge, to be placed over the load-bearing scale pan of the balance (see 5.2.2), if the balance is not equipped for suspension loading.

5.2.4 Evacuating equipment, capable of reducing the pressure to a value less than 2500 Pa (25 mbar), and a means of measuring the pressure used.

NOTE: If a rotary vacuum pump is used, it should be fitted with a moisture trap, to minimize the mixing of water and the pump lubrication system.

5.2.5 Degreased metal wire, of diameter not more than 0,15 mm.

5.2.6 Cradle to contain test piece(s) (optional).

5.2.7 Immersion liquid, which may be either:

a) Cold distilled water, containing a dilute solution of a surface active agent (concentration not more than 0,01 %), the addition of which does not change the densities given in table 2.

or

b) An organic liquid, which shall be used for materials that are sensitive to contact with water or that cannot be fully wetted by water.

NOTE: Some materials may chemically react with water, others such as boron nitride are not wetted by water. Where test pieces of smaller volume (1 cm^3 to 10 cm^3) (see 5.3.1) are used, and the error caused by evaporation of liquids is comparatively high, di-butyl phthalate should be used.

5.2.8 Thermometer, capable of measuring to $\pm 0,1\text{ K}$.

5.2.9 Glass beaker, of a size allowing adequate clearance of its walls by the test piece.

5.2.10 Desiccator, for storage of test pieces.

5.2.11 Manometer.

5.2.12 Absorbent cloth or tissue paper.