



SLOVENSKI STANDARD

SIST ENV 623-4:2000

01-december-2000

Advanced technical ceramics - Monolithic ceramics - General and textural properties - Part 4: Determination of surface roughness

Advanced technical ceramics - Monolithic ceramics - General and textural properties - Part 4: Determination of surface roughness

Hochleistungskeramik - Monolithische Keramik - Allgemeine und strukturelle Eigenschaften - Teil 4: Bestimmung der Oberflächenrauheit

Céramiques techniques avancées - Propriétés générales et texturales des céramiques monolithiques - Partie 4: Détermination de la rugosité de surface

<https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000>

Ta slovenski standard je istoveten z: **ENV 623-4:1993**

ICS:

81.060.30 Sodobna keramika Advanced ceramics

SIST ENV 623-4:2000 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ENV 623-4:2000

<https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000>

EUROPEAN PRESTANDARD

ENV 623-4:

PRÉNORME EUROPÉENNE

EUROPÄISCHE VORNORM

September 1993

UDC 666.5/.6:620.179.118:62-408.8

Descriptors: Ceramics, physical properties, texture, determination, surface condition, roughness

English version

**Advanced technical ceramics - Monolithic
ceramics - General and textural properties - Part 4:
Determination of surface roughness**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Céramiques techniques avancées - Propriétés
générales et texturales des céramiques
monolithiques - Partie 4: Détermination de la
rugosité de surface

Hochleistungskeramik - Monolithische Keramik -
Allgemeine und strukturelle Eigenschaften -
Teil 4: Bestimmung der Oberflächenrauheit

[SIST ENV 623-4:2000](https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000)

<https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000>

This European Prestandard (ENV) was approved by CEN on 1992-09-30 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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
ENV 623-4:1993

Contents list		Page
	Foreword	3
1	Scope	4
2	Normative references	4
3	Definitions	5
4	Introduction to conventional surface roughness measurement	5
5	Issues of concern in the determination of roughness of ceramics	6
6	Test procedure	9
7	Test report	10
Annex A (informative) : Bibliography		12

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST ENV 623-4:2000

<https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000>

Foreword

This European pre-Standard has been approved 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

CEN/TC184 approved this European pre-standard by resolution 2/1992 during its sixth meeting, held in Alkmaar on 1992-09-30.

In accordance with the CEN/CENELEC Internal regulations, the following countries are bound to announce this European pre-standard:

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

SIST ENV 623-4:2000

<https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000>

1) Part 3 of this EN will be published as ENV.

**Advanced technical ceramics - Monolithic ceramics - General and textural properties - Part 4:
Determination of surface roughness****1 Scope**

This part of ENV 623 describes the use of conventional stylus type instruments for the measurement of surface roughness of advanced monolithic technical ceramics, sets the test machine measuring parameters, and recommends the adoption of certain precautions and conditions of measurement.

2 Normative references

This European Pre-Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and in the publications listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Pre-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 technical properties Part 1 : Determination of the presence of defects by dye penetration tests**
SIST ENV 623-4:2000
- EN 45001 **General criteria for the operation of testing laboratories**
<https://standards.iteh.ai/catalog/standards/sist/4675-0-851-43b0-86a1/83/sist-env-623-4-2000>
- ISO 468:1979 **Surface roughness - Parameters, their values and general rules for specifying requirements**
- ISO 1879:1981 **Instruments for the measurement of surface roughness by the profile method - Vocabulary**
- ISO 1880:1979 **Instruments for the measurement of surface roughness by the profile method - Contact (stylus) instruments of progressive profile transformation - Profile recording instruments**
- ISO 3274:1975 **Instruments for the measurement of surface roughness by the profile method - Contact (stylus) instruments of consecutive profile transformation - Contact profile meters, system M**
- ISO 4287-1:1984 **Surface roughness - Terminology - Part 1: Surface and its parameters**
- ISO 4287-2:1984 **Surface roughness - Terminology - Part 2: Measurement of surface roughness parameters**
- ISO 5436:1985 **Calibration specimens - Stylus instruments - Types, calibration and use of specimens**

3 Definitions

For the purposes of this Part of 623 definitions given in ISO 468:1979, ISO 1879:1981, ISO 4287:1984, and ISO 5436:1985 apply.

4 Introduction to conventional surface roughness measurement

The characterisation of roughness of engineering materials generally is conventionally determined by a profile recording stylus drawn across the surface. The profile is amplified and recorded, and the trace is further processed to determine single-valued parameters which may be used to describe it. Typically, parameters such as peak-to-trough roughness R_t ; arithmetic mean deviation of profile R_a , root mean square deviation of profile R_q , ten-point height of irregularities R_z or R_{max} , mean spacing of profile irregularities S_m , and average wavelength of the profile $\lambda(a)$ are calculated.

These parameters are described in ISO 468:1979 and the vocabulary employed is given in ISO 4287:1984.

iTeh STANDARD PREVIEW

(standards.iteh.ai)
Various types of equipment to perform this measurement are commercially available, and the procedures for calibration and measurement should be in accordance with the international standards ISO 1880:1979, ISO 3274:1975 and ISO 5436:1985.

The equipment usually incorporates proprietary signal processing routines designed to produce single-valued parameters from an appropriate length of trace. The calibration of the vertical height measurement is normally determined by drawing the stylus over steps of calibrated height in a reference specimen (ISO 5436:1985 type A). Horizontal movement calibration is less critical, and may be determined from the horizontal spacing of the steps in the type A reference specimen. Checking the condition of the stylus tip is normally performed using a type B reference specimen, which has sensitive and insensitive grooves, the former being typically a profile of an isosceles triangle. Checking of meters or other indicators of roughness parameters is performed with type C reference specimens with a variety of profiles either of isosceles triangles, sine waves or simulated sine waves of regular shape. Checking overall behaviour of meters or other indicators of roughness parameters is performed with type D reference specimens with an irregular profile repeated every 4 mm.

In the absence of a suitable certified ceramic roughness reference material, it is recommended that these procedures are adopted for calibration of stylus machines to be used for measuring roughness of advanced monolithic technical ceramics.

NOTE: If appropriate, it is suggested that disagreements between parties may be avoided by exchanging agreed marked and measured ceramic "reference" surfaces, preferably of a type similar to that causing the disagreement, for measurement in the respective test machines in order to identify differences in intrinsic machine performance.

5 Issues of concern in the determination of roughness of ceramics

5.1 Microstructural influences

5.1.1 Advanced monolithic technical ceramics which do not possess open porosity may contain isolated pores as a result of their incomplete elimination during fabrication. Pores produce large occasional depressions in the recorded surface roughness trace which can bias the roughness parameters in a manner which:

- a) may not be relevant to the application of the surface;
- b) may give a misleadingly high value of roughness parameter;
- c) may depend on their frequency along the path of the stylus.

If the roughness of the non-porous regions of the ceramic surface is required, lengths of the stylus trace which avoid obvious pores should be chosen.

5.1.2 As-fired surfaces of advanced technical ceramics are frequently free from significant pores typical of bulk material, but may contain occasional pits and/or surface debris (adherent dust, kiln furniture fragments or granular material used to separate components in firing).

NOTE : A glossary of terms for surface defects is given in Reference A 1

<https://standards.iteh.ai/catalog/standards/sist/d96c75e9-851c-43b0-86a1-2b81da00bf83/sist-env-623-4-2000>

Surface debris should be removed before making roughness measurements, and lengths of trace which avoid obvious pits shall be chosen to characterise the surface.

5.1.3 Damage introduced during surface preparation of the ceramic component is dependent on the machining procedure adopted, and influences the apparent roughness. Single grains or groups of grains may be fractured from the surface, and the resulting pits may be indistinguishable from pre-existing internal pores intercepted by the new surface. Plastically deformed grooving may occur which is particularly noticeable in unidirectional grinding operations. Grinding debris may be compacted onto the surface, or into pores or pits. All these factors may influence the apparent roughness determined.

It is recommended that, where possible, machining procedures are closely defined and reported together with the apparent roughness parameters. Further, in the case of unidirectional grinding, the directions on the test-piece in which surface roughness is determined shall be agreed and shall be recorded in the report.

Heavy grinding with coarse grit sizes may introduce a significant depth of sub-surface damage in the form of microcracks which may influence the performance of the product in end-use. The extent of this damage is not directly related to the apparent roughness, especially in cases where further finishing processes have been employed to smooth the surface. Under such conditions, roughness measurements have little value for determining the extent of damage.

NOTE : It is recommended that dye penetration tests as described in EN 623-1, followed if necessary by fracturing the component, should be used to reveal extensive sub-surface damage if its existence is suspected.

5.2 Special surface profiles

For some applications, especially those related to seals and bearings, a special surface profile may be required in which the peaks of the profile are flattened while the troughs remain, for example to retain lubricating or sealing fluids. A roughness profile from such a surface is normally asymmetric about the average height, and the normal machine signal processing procedure may produce inappropriate and/or inaccurate roughness parameters.

It is recommended that an agreed non-automatic procedure is defined and adopted between parties, especially as far as specifications of bearing area are concerned.

It may be required that the area of flattening should be determined as a percentage of the total. In such a case it is recommended that an agreed procedure is defined and adopted between parties.

NOTE : Advances in surface profilometry by area scanning techniques, especially non-contact methods, are being made, but have not yet reached a position of standardisation. Such techniques may prove more useful and accurate for determining surface area/height distributions than linear stylus techniques.

5.3 Influences of form

Advanced technical ceramics in the as-fired condition tend to lose flatness, straightness or roundness which they may have possessed as "green" components before firing. A similar problem may exist with some machining procedures. As far as surface roughness measurements are concerned, a short-range waviness in a surface may produce a bias in the derived surface roughness parameters.

For the purpose of measuring roughness, this bias shall be removed from measurements by employing a flat or gently rounded skid adjacent to the stylus.

NOTE : The source of this recommendation is Reference A2 which deals with ceramic substrates for electronic purposes.

If it is desired that longer-range variations in surface height are determined, then a skid should not be used, and the stylus distance employed should be as large as practical.