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**Fine ceramics (advanced ceramics,  
advanced technical ceramics) — Test  
method for plasma resistance of  
ceramic components in semiconductor  
manufacturing equipment**

*Céramiques techniques — Méthode d'essai pour déterminer  
la résistance au plasma des composants céramiques dans les  
équipements de production à semi-conducteurs*

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Published in Switzerland

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 206, *Fine ceramics*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

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# Fine ceramics (advanced ceramics, advanced technical ceramics) — Test method for plasma resistance of ceramic components in semiconductor manufacturing equipment

## 1 Scope

This document specifies a test method for plasma resistance of ceramic components in semiconductor manufacturing equipment. It is applicable to ceramic components of plasma-resistant components in dry etching chambers used in semiconductor manufacturing.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3274, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments*

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 18452, *Fine ceramics (advanced ceramics, advanced technical ceramics) — Determination of thickness of ceramic films by contact-probe profilometer*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1

#### **plasma resistance**

resistance to erosion of the material such as particles which result from corrosion of the materials by erosive plasma source for semiconductor manufacturing

### 3.2

#### **ceramic component**

ceramic part, such as an electrostatic chuck, ring, plate for gas injection, end-point detector, gas injector or viewing port, in a dry etching chamber in semiconductor manufacturing

### 3.3

#### **erosion depth**

difference in height between non-plasma exposure area and plasma exposure area

## 4 Principle of measurement

This document concerns the measurement of erosion depth after a plasma resistance test and the measurement of surface roughness before and after a plasma resistance test.

An erosion depth shall be evaluated from the profile which is obtained by scanning the surface by using a contact probe profilometer. The profile is in proportion to the difference in height between the parts covered by masking and those not covered by masking.

Surface roughness parameters such as  $R_a$  and  $R_z$  shall be evaluated before and after the plasma resistance test by using a surface roughness profilometer.

## **5 Test environment**

The measurement of the erosion depth and surface roughness shall be carried out in an environment free from mechanical vibrations that could affect the measurement.

## **6 Apparatus**

### **6.1 Plasma-etching equipment**

The plasma-etching equipment should be a type of reactive ion etching with two parallel electrodes powered by a radio-frequency generator of 13,56 MHz.

### **6.2 Contact-probe profilometer**

The contact-probe profilometer shall be in accordance with ISO 18452.

### **6.3 Surface roughness profilometer**

The surface roughness profilometer shall be in accordance with ISO 3274.

The surface roughness parameters shall be in accordance with ISO 4287.

The contact-probe profilometer and surface roughness profilometer may be the same instrument.

## **7 Test pieces**

### **7.1 General consideration**

The test pieces shall comprise ceramics or a ceramic coating on the substrate.

The test pieces shall have dimensions sufficient to ensure stability on the test piece stage of the plasma-etching equipment, contact-probe profilometer and surface roughness profilometer.

Clean the test piece, by using an appropriate method for the ceramics or ceramic coating, so that the surface of the test piece is free from dust, oil and any other foreign particle.

### **7.2 Surface conditions**

The test piece shall have smooth surface roughness sufficient to measure the erosion depth by using the plasma resistance test.

## **8 Procedure**

### **8.1 Measurement of surface roughness before a plasma resistance test**

Measure the surface roughness of the test piece by using the surface roughness profiler before a plasma resistance test.