

BS ISO 21608:2012



BSI Standards Publication

# Corrosion of metals and alloys — Test method for isothermal- exposure oxidation testing under high-temperature corrosion conditions for metallic materials

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**National foreword**

This British Standard is the UK implementation of ISO 21608:2012.

The UK participation in its preparation was entrusted to Technical Committee ISE/NFE/8, Corrosion of metals and alloys.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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**Corrosion of metals and alloys — Test  
method for isothermal-exposure oxidation  
testing under high-temperature corrosion  
conditions for metallic materials**

*Corrosion des métaux et alliages — Méthode d'essai pour les essais  
d'oxydation en exposition isotherme des matériaux métalliques dans  
des environnements corrosifs à haute température*





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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 21608 was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*.

# Corrosion of metals and alloys — Test method for isothermal-exposure oxidation testing under high-temperature corrosion conditions for metallic materials

## 1 Scope

This International Standard specifies the method for continuous (single post-exposure mass measurement on each of a series of specimens without intermediate cooling) and discontinuous (series of mass measurements on a single specimen with intermediate cooling at predetermined times not necessarily regular, and relatively few in number) isothermal-exposure testing under high-temperature corrosion conditions of metallic materials in gaseous environments. In contrast, thermal-cycling oxidation testing (series of mass measurements on a single specimen with frequent regular cooling in order to accelerate high-temperature corrosion) is not included in this International Standard.

## 2 Normative references

The following referenced documents are indispensable for the application 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 3611, *Geometrical product specifications (GPS) — Dimensional measuring equipment: Micrometers for external measurements — Design and metrological characteristics*

ISO 6344-3:1998, *Coated abrasives — Grain size analysis — Part 3: Determination of grain size distribution of microgrits P240 to P2500*

ISO 13385-1, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 1: Callipers; Design and metrological characteristics*

ISO 26146, *Corrosion of metals and alloys — Method for metallographic examination of samples after exposure to high-temperature corrosive environments*

ANSI B74.12-09, *Specifications for the Size of Abrasive Grain — Grinding Wheels, Polishing and General Industrial Uses*

ASTM E3-11, *Standard Guide for Preparation of Metallographic Specimens*

ASTM E220-07a, *Standard Test Method for Calibration of Thermocouples By Comparison Techniques*

ASTM E230/E230M-11e1, *Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples*

ASTM E407-07e1, *Standard Practice for Microetching Metals and Alloys*

ASTM E633-00, *Standard Guide for Use of Thermocouples in Creep and Stress-Rupture Testing to 1 800°F (1 000 °C) in Air*

ASTM E1350-07, *Standard Guide for Testing Sheathed Thermocouples, Thermocouples Assemblies, and Connecting Wires Prior to, and After Installation or Service*

FEPA 43-1984 R:1993, *Grit Sizes for Coated Abrasives*

JIS R6001-98, *Bonded abrasive grain sizes*

### 3 Terms and definitions

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

#### 3.1

##### **scale**

surface film and corrosion products produced on the surface of the test piece by high-temperature corrosion

#### 3.2

##### **adherent scale**

scale adhering to the test piece after cooling

#### 3.3

##### **spalled scale**

scale flaked from the test piece

#### 3.4

##### **gross mass change**

mass change of test piece after cooling including collected spall

#### 3.5

##### **net mass change**

mass change of test piece after cooling without spall

#### 3.6

##### **high-temperature corrosion**

corrosion occurring when the temperature is higher than the dew-point of aqueous phases of the environment but at least 100 °C

#### 3.7

##### **breakaway**

rapid increase in corrosion rate following a change from protective to non-protective scale growth

### 4 Test method

#### 4.1 Principle

Several test pieces exposed for different times are necessary to define oxidation kinetics of the material. It is recommended that duplicate test pieces are used for each time. Data should be measured after at least four times with time intervals that increase progressively (e.g. 10 h, 30 h, 100 h, 300 h, 1 000 h).

#### 4.2 Reagents and materials

##### 4.2.1 Test pieces

The test pieces shall have the form of a rectangular plate, a disc or a cylinder with a minimum surface area of 300 mm<sup>2</sup> and a minimum thickness of 1,5 mm.

If the test pieces cannot be made according to these specifications, the shape and dimensions of the test piece shall be in accordance with the agreement between the parties involved.

The test pieces shall be finished by machining so that the strata affected by cutting do not remain.

The final finishing of the surface of the test pieces shall be performed with abrasives with a mean particle diameter of approximately 15 µm. This can be achieved by the use of abrasives according to Table 1.

If another surface finish is required by the parties involved, the surface finish condition shall be described.