
Refractories — Test methods for thermal shock resistance

*Matériaux réfractaires — Méthodes d'essai de la résistance aux chocs
thermiques*

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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).

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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.

This document was prepared by Technical Committee ISO/TC 33, *Refractories*.

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.

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Refractories — Test methods for thermal shock resistance

1 Scope

This document specifies the principle, equipment, test pieces, procedures, result expression and test report of test methods for thermal shock resistance of refractories.

Three test methods are included in this document. Each one is applicable to a different product type and their test results are not comparable.

The test method, the test temperature and the test condition are intended to be negotiated by corresponding parties.

This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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 836, *Terminology for refractories*

ISO 1927-2, *Monolithic (unshaped) refractory products — Part 2: Sampling for testing*

ISO 1927-5, *Monolithic (unshaped) refractory products — Part 5: Preparation and treatment of test pieces*

ISO 5014, *Dense and insulating shaped refractory products — Determination of modulus of rupture at ambient temperature*

ISO 5022, *Shaped refractory products — Sampling and acceptance testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 836 and the following 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

water quenching

rapid quenching of the fast-heated test pieces in flowing water of 5 °C to 35 °C

3.2

compressed air quenching

rapid quenching of the fast-heated test pieces in 0,1 MPa compressed air of ambient temperature

3.3

air quenching

quenching of the fast-heated test pieces in natural air of ambient temperature

4 Method 1: water quenching

4.1 General

Method 1 (water quenching) is applicable to dense aluminium silicate refractory products, but not to basic refractory products, silica refractory products, fused cast refractory products, refractory products with apparent porosity higher than 45 % or the refractories whose thermal shock resistance is hard to evaluate for low thermal shock cycles or reactions with water.

4.2 Principle

In the conditions of the specified testing temperature and water medium, the test piece with the specified shape and dimensions suffers thermal shocks. The damage degree of the hot end surface of the test piece is adopted to describe the thermal shock resistance of the refractories.

4.3 Equipment

4.3.1 Experimental furnace

Use an electric furnace whose temperature can be controlled in accordance with the specifications in 4.5. The temperature distribution of the test pieces loading area shall be uniform to ensure the temperature difference between two random points on the hot end surface is not higher than 10 °C. The uniform temperature zone shall be able to hold at least three test pieces simultaneously. One end of the thermocouple for temperature determination shall be sealed and 20 mm ± 5 mm away from the hot end surface of the test pieces. Meanwhile, the temperature record and display devices shall be equipped to control, record and display the furnace temperature continuously. A diagram of the heating device is shown in Figures 1 and 2.

4.3.2 Cooling water channel

The channel shall be able to hold multiple test pieces for rapid quenching simultaneously and ensure the inflow and outflow water temperature rise is not higher than 10 °C. A diagram of the cooling device is shown in Figures 3 and 4.

4.3.3 Test piece clamp

The clamp is used to fix test pieces for heating or cooling.

4.3.4 Drying oven

The drying oven shall be able to control the test temperature at 110 °C ± 5 °C.

4.3.5 Grid, mesh size of 5 mm × 5 mm

The grid is used to determine the hot end area of test pieces [114 mm × 64 (74) mm] in grid number.

4.4 Test pieces

4.4.1 Sampling

Sampling of shaped refractory products and monolithic refractories shall be conducted in accordance with ISO 5022 and ISO 1927-2, respectively, or negotiated by corresponding parties.

4.4.2 Shape, dimensions and preparation of test pieces

Standard bricks with dimensions of 230 mm × 114 mm × 64 (74) mm shall be adopted for testing.