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# International Standard 5018

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**ANSI Internat Doc Sect**

## **Refractory materials — Determination of true density**

*Produits réfractaires — Détermination de la masse volumique absolue*

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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 developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5018 was developed by Technical Committee ISO/TC 33, *Refractories*, and was circulated to the member bodies in May 1982.

It has been approved by the member bodies of the following countries :

Australia	Germany, F. R.	Portugal
Austria	Hungary	Romania
Brazil	India	South Africa, Rep. of
Canada	Italy	Spain
China	Korea, Rep. of	Sweden
Czechoslovakia	Mexico	United Kingdom
Egypt, Arab Rep. of	Netherlands	USA
France	Poland	USSR

No member body expressed disapproval of the document.

# Refractory materials — Determination of true density

## 1 Scope and field of application

This International Standard establishes a method for measuring the true density of refractory products and raw materials.

## 2 References

ISO 565, *Test sieves — Woven metal wire cloth and perforated plate — Nominal sizes of apertures.*

ISO/R 836, *Vocabulary for the refractories industry.*

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

## 3 Definitions

For the purpose of this International Standard, the following definitions apply.

**3.1 true density** : The ratio of the mass of a quantity of dried material to its true volume.

**3.2 true volume** : The volume of the solid material in a porous body.

## 4 Principle

**4.1** The true density is determined by measuring the dry mass and the true volume of a sample of the material after it has been crushed and ground to such a particle size that as far as possible no closed pores remain. The volume of the ground material is determined using a pycnometer and a liquid of known density, the temperature of the liquid being controlled or carefully measured.

**4.2** Unfired refractory products and basic products may require pre-treatment, the conditions of which shall be agreed between the parties concerned.

## 5 Apparatus

**5.1 Pycnometer**, of capacity from 25, 50 or 100 ml, fitted with a ground stopper having a capillary bore.

**5.2 Balance**, with an accuracy of  $\pm 0,1$  mg.

**5.3 Vacuum equipment**, capable of reducing the pressure to a value not greater than 25 mbar<sup>1)</sup>, with a means of measuring the pressure.

**5.4 Thermostatically controlled bath**, capable of being maintained at a temperature from 2 to 5 °C above the ambient temperature with an accuracy<sup>2)</sup> of  $\pm 0,2$  K.

**5.5 Test sieve**, 63  $\mu\text{m}$  aperture complying with the requirements of ISO 565.

**5.6 Drying oven.**

**5.7 Desiccator.**

## 6 Test material

**6.1** The samples to be measured shall be selected in accordance with ISO 5022<sup>3)</sup> or another standard sampling plan agreed by the interested parties.

**6.2** In the case of a shaped refractory product, the number of test pieces to be tested for each item shall be agreed between the interested parties and shall be stated in the test report. To facilitate statistical evaluation when several bricks are tested, the same number of test pieces shall be taken from each brick.

**6.3** The test material (test piece) shall be crushed and ground to pass completely through the test sieve (5.5).

1) 1 bar =  $10^5$  Pa

2) This accuracy of temperature control is necessary because the method is very sensitive to variations in temperature. Because of the different coefficients of thermal expansion of the vessel and of the liquid, significant errors arise if there are variations in the temperature.

3) Sampling of unshaped refractory products and primary materials will form the object of a future International Standard.