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# Monolithic (unshaped) refractory products - Part 1: Introduction and classification (ISO 1927-1:2012)

## I.S. EN ISO 1927-1:2012

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## Monolithic (unshaped) refractory products - Part 1: Introduction and classification (ISO 1927-1:2012)

Produits réfractaires (non façonnés) monolithiques - Partie  
1: Introduction et classification (ISO 1927-1:2012)

Ungeformte (monolithische) feuerfeste Erzeugnisse - Teil 1:  
Einführung und Klassifizierung (ISO 1927-1:2012)

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## **Foreword**

This document (EN ISO 1927-1:2012) has been prepared by Technical Committee ISO/TC 33 "Refractories" in collaboration with Technical Committee CEN/TC 187 "Refractory products and materials" the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2013, and conflicting national standards shall be withdrawn at the latest by February 2013.

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**Monolithic (unshaped) refractory  
products —**

**Part 1:  
Introduction and classification**

*Produits réfractaires (non façonnés) monolithiques —*

*Partie 1: Introduction et classification*



Reference number  
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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.

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ISO 1927-1 was prepared by Technical Committee ISO/TC 33, *Refractories*.

ISO 1927-1 cancels and replaces ISO 1927:1984, which has been technically revised.

ISO 1927 consists of the following parts, under the general title *Monolithic (unshaped) refractory products* — :

- *Part 1: Introduction and classification*
- *Part 2: Sampling for testing*
- *Part 3: Characterization as received*
- *Part 4: Determination of consistency of castables*
- *Part 5: Preparation and treatment of test pieces*
- *Part 6: Measurement of physical properties*
- *Part 7: Tests on pre-formed shapes*
- *Part 8: Determination of complementary properties*

## Introduction

The general objective of this part of ISO 1927 is to define, with as much accuracy as possible, the control of monolithic (unshaped) refractory products with special reference to the following:

- a) quality control;
- b) checking the conformity of the delivery as compared with claimed properties;
- c) the control of batch homogeneity;
- d) the final control of linings.

Properties are unavoidably influenced by industrial placing as a result of the equipment, environmental conditions and often by specific site conditions (target date, location). Quality control and final control of lining should not be considered in the same documents, since the former requires accuracy and clean operative methods while the latter requires the control of the placing.

Monolithic (unshaped) refractory products used in industrial linings are generally not fired, so that the high temperatures which result from use create firing which results from use creates complicated conditions that make control difficult. The main points to be mentioned are:

- 1) the temperature gradient, the consequence of which is a property gradient;
- 2) the level of maximum temperature reached on the hot face directly depends on the working temperature of the equipment;
- 3) the life of the equipment may be numbered in hours or in years.

NOTE Properties measured in the laboratory frequently do not reflect the properties of the material when installed.



# Monolithic (unshaped) refractory products —

## Part 1: Introduction and classification

### 1 Scope

This part of ISO 1927 defines terms relating to monolithic (unshaped) refractory products and establishes a classification for the various types of product.

Raw materials and crushed or granulated refractory materials, which do not contain any binder, are excluded.

### 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 565, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

### 3 Terms and definitions

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

#### 3.1

##### **monolithic (unshaped) refractory materials**

mixtures which consist of an aggregate and a bond or bonds, prepared ready for use either directly in the condition in which they are supplied or after the addition of one or more suitable liquids

NOTE 1 They can contain metallic, organic or ceramic fibre material.

NOTE 2 These mixtures are either dense or insulating. Insulating mixtures are those whose true porosity is not less than 45 % when determined in accordance with ISO 5016, using a test piece fired to specified conditions.

#### 3.2

##### **pre-formed shapes**

shapes made from monolithic (unshaped) refractory materials, cast or moulded and pre-treated by the manufacturer, so that they can be directly placed in service

NOTE They may have a thermal pre-treatment.

#### 3.3

##### **nature of the bond**

bond depending on the hardening process of the different materials

NOTE 1 The bond may be

- a hydraulic bond with setting and hydraulic hardening at ambient temperature,
- a ceramic bond with hardening by sintering during firing,
- a chemical bond (inorganic or organic-inorganic) with hardening by chemical, but not hydraulic, reaction at ambient temperature or at a temperature lower than that of a ceramic bond, or
- an organic bond with binding or hardening at ambient temperature or at higher temperatures.

NOTE 2 When several bonds are used together, the bond is designated according to the nature of that bond which plays the principal part during the hardening.

### 3.4

#### granulometric class

mesh width of the finest sieve (ISO 565) through which at least 95 % by mass of the material passes

### 3.5

#### yield by volume

mass of material as delivered which is necessary to place one cubic metre of material, expressed in tonnes to the nearest 1 %

### 3.6

#### deflocculating agent

soluble compound (usually an electrolyte) which, when added even in very small quantities, will reduce the water content to form dispersed suspensions of solid powders in liquid media

## 4 Product types and methods of placement

### 4.1 Refractory castables

#### 4.1.1 General

These are mixtures of refractory aggregates and bond(s), mainly supplied dry and used after the addition and mixing with water or another liquid. They are placed by casting with vibration, by casting without vibration (self-flowing), by rodding, by shotcreting or when necessary by tamping. The bond is formed and hardening takes place without heating.

#### 4.1.2 Regular castable

Hydraulically bonded refractory castable containing cement but without deflocculant.

#### 4.1.3 Deflocculated castable

Hydraulically bonded refractory castable containing cement or other hydraulic binder, a minimum of 2 % by mass of ultra-fine particles (less than one micron) and at least one deflocculating agent.

This type is in turn subdivided into the four categories given in Table 1.

NOTE If significant lime content is introduced by other raw materials, this may be marked in the data sheet separately and has to be neglected when the type of deflocculated castable is defined.

**Table 1 — Categories of deflocculated castable**

Category	Content (%) CaO	
	Min	Max
Medium cement castable (MCC)	> 2,5	-
Low cement castable (LCC)	> 1,0	≤ 2,5
Ultra-low cement castable (ULCC)	> 0,2	≤ 1,0
No cement castable (NCC)	0	≤ 0,2

By definition, deflocculated cement castables contain at least one deflocculant and ultra-fine particles.

#### 4.1.4 Chemically bonded castable

Refractory castable containing one or more chemical bonds (see 3.3), which cause hardening at ambient temperature.

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