



# SLOVENSKI STANDARD

## SIST EN 12407:2002

01-maj-2002

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### Preskušanje naravnega kamna – Petrografska preiskava

Natural stone test methods - Petrographic examination

Prüfverfahren für Naturstein - Petrographische Prüfung

Méthodes d'essai pour pierres naturelles - Examen pétrographique

Ta slovenski standard je istoveten z: EN 12407:2000

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#### **ICS:**

73.020	Rudarstvo in kamnolomsko izkopavanje	Mining and quarrying
91.100.15	Mineralni materiali in izdelki	Mineral materials and products

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**en**

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ICS 91.100.20

English version

## Natural stone test methods - Petrographic examination

Méthodes d'essai pour pierres naturelles - Examen  
pétrographique

Prüfverfahren für Naturstein - Petrographische Prüfung

This European Standard was approved by CEN on 20 April 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 246 "Natural stones", the secretariat of which is held by UNI.

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 November 2000, and conflicting national standards shall be withdrawn at the latest by November 2000.

This draft standard is one of the series of draft standards for tests on natural stone. Test methods for natural stone consist of the following parts:

- EN 1925 Natural stone test methods - Determination of water absorption coefficient by capillarity
- EN 1926 Natural stone test methods - Determination of compressive strength
- EN 1936 Natural stone test methods - Determination of real density and apparent density and of total and open porosity
- EN 12370 Natural stone test methods - Determination of resistance to salt crystallisation
- prEN 12371:1996 Natural stone test methods - Determination of frost resistance
- EN 12372 Natural stone test methods - Determination of flexural strength under concentrated load
- prEN 13161:1998 Natural stone test methods - Determination of flexural strength under constant moment
- prEN 13364:1998 Natural stone test methods - Determination of the breaking load at a dowel hole
- prEN 13373:1998 Natural stone test methods - Determination of geometric characteristics on units
- prEN ....(WI 00246011) Natural stone test methods - Determination of thermal dilatation coefficient
- prEN ....(WI 00246012) Natural stone test methods - Determination of sound - speed propagation
- prEN ....(WI 00246014) Natural stone test methods - Determination of abrasion resistance
- prEN ....(WI 00246015) Natural stone test methods - Determination of Knoop hardness
- prEN ....(WI 00246016) Natural stone test methods - Determination of thermal shock resistance
- prEN ....(WI 00246017) Natural stone test methods - Determination of slip coefficient
- prEN ....(WI 00246018) Natural stone test methods - Determination of static elastic modulus
- prEN ....(WI 00246019) Natural stone test methods - Determination of rupture energy
- prEN ....(WI 00246030) Natural stone test methods - Determination of surface finishes (rugosity)
- prEN ....(WI 00246032) Natural stone test methods - Determination of resistance to ageing by salt mist
- prEN ....(WI 00246033) Natural stone test methods - Determination of resistance to ageing by humidity, temperature, SO<sub>2</sub> action
- prEN ....(WI 00246035) Natural stone test methods - Determination of dynamic elastic modulus (by fundamental resonance frequency)
- prEN 13755:1999 Natural stone test methods - Determination of water absorption at atmospheric pressure

It is intended that other ENs should call up this EN 12407 as the basis of evaluation of conformity. (Nevertheless it is not intended that all natural stones products should be subjected regularly to all the listed tests. Specifications in other standards should call up only relevant test methods).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

A petrographic description of natural stone is important not only for the purposes of petrographic classification but also in order to highlight features influencing its chemical, physical and mechanical behaviour. In the same way the determination of the stone's origin could be necessary (e.g. in the case of restoration of historical monuments). It is therefore necessary to characterize the natural stones not only from the point of view of their mineral components and of their fabric and structure but also in terms of any features as: colour, presence of veins, of fossils, of discontinuities, etc.

To ensure that the petrographic classification is objective, the characterization of the material should, as far as possible, be quantitative.

## 1 Scope

This European standard specifies methods for making technical petrographic descriptions of natural stone.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

prEN 12670:1997	Terminology of natural stone
prEN 12440:1997	Denomination of natural stone

## 3 Principle

First a macroscopic description of the sample is undertaken. The macroscopic description may involve a visual inspection aided by a hand lens or a stereoscopic microscope. Then one or more thin sections prepared from the sample are examined using a petrographic microscope in order to give a microscopic description of the sample; where appropriate an additional polished section shall be prepared. In addition, chemical or physical methods of analysis are required for petrographic classification of some stone types (i.e. volcanic rocks), but this will not be described in this standard.

## 4 Apparatus

4.1 Hand lens or stereoscopic microscope (if required)

4.2 Petrographic microscope

4.3 Point counter or image analysis (if required)

4.4 A Rock Color Chart distributed by Geological Society of America, or another colour reference chart (if required).

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## 5 Preparation of thin and polished sections

The sampling is not responsibility of the test laboratory except where specially requested.

The dimensions of the sample shall be large enough to be representative of the petrographic characteristics of the stone being examined.

One or more thin sections are then prepared. A thin section is a portion of material mounted on a slide and mechanically reduced to a thin sheet measuring  $(0,030 \pm 0,005)$  mm in thickness, and then mounted on a slide (normally protected by a slide cover). For special purposes (observations with reflected light microscope for the determination of opaque minerals or microprobe analysis) polished sections or polished thin sections shall be prepared. Polished sections and polished thin sections have one side polished with alumina polishing paste ( $5 \mu\text{m}$  to  $12 \mu\text{m}$  grade) and diamond paste ( $6 \mu\text{m}$ ,  $3 \mu\text{m}$  and  $1 \mu\text{m}$ ). The polished side remains uncovered.

The section normally measures about 33 mm x 20 mm, but in the case of larger grainsize stones, larger dimensions may be used (e.g. 75 mm x 50 mm) or several sections of normal dimensions can be prepared. If the rock is anisotropic it is necessary to prepare at least two sections with different orientation with respect to the anisotropy (e.g. parallel and perpendicular to bedding planes, cleavage planes).

The sample shall be sufficiently coherent so as not to disintegrate when cut. If the stone is brittle or fragile, it will be necessary to strengthen it by means of impregnation, preferably in a vacuum, with resins with an index of refraction approximately 1,54 (e.g. epoxy resins).

## 6 Macroscopic description

The following items shall be included in the macroscopic description.

6.1 The general colour or range of colours of the hand specimen. The colour can be estimated by visual impression or defined using a colour reference chart (Rock Color Chart is recommended).

6.2 Fabric

6.3 Grainsize (e.g. coarse, medium or fine)

6.4 Open and refilled macroscopic cracks, pores and cavities (when relevant)

6.5 Evidence of weathering and alteration: staining by sulphide alteration, diffusion of iron hydroxides, alteration of feldspars etc. (when relevant)

6.6 Presence of macrofossils (when relevant)

6.7 Presence of xenolithic and mafic intrusions (when relevant)

## 7 Microscopic description

The following items shall be included in the microscopic description

7.1 Fabric

7.2 Constituents

7.2.1 Minerals/Grains

NOTE: For the determination of the opaque minerals polished sections shall be used

For each mineral or grain identified, the characteristics listed below shall be specified (when relevant).

7.2.1.1 Percentage by volume, specifying the method used (e.g. estimate, point counter).

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7.2.1.2 Dimensions: mean value and range of variation (if necessary for the groundmass and also for the larger crystals or grains).

Degree of sorting (in clastic rocks): very well sorted, well sorted, moderately sorted, poorly sorted, very poorly sorted.

7.2.1.3 Habit (e.g. idiomorphic, anhedral).

7.2.1.4 Shape (e.g. isometric, anisometric, flattened, elongated). Detrital grains in sedimentary rocks shall be described in terms of sphericity and roundness.

7.2.1.5 Boundaries (e.g. straight, lobate, dentate).

7.2.1.6 Distribution (e.g. Homogeneous, heterogeneous, in layers, in patches).

7.2.1.7 Orientation (e.g. isotropic, shape preferred orientation, dimensional preferred orientation, isorientation of lamellar or tabular grains, isorientation of elongated, prismatic grains).

7.2.1.8 Evidence of weathering and alteration: staining by sulphide alteration diffusion of iron hydroxides, chloritization of biotite; sericitization of feldspars, radioactive decay of minerals such as zircon or allanite etc.

## 7.2.2 Groundmass:

7.2.2.1 In volcanic rocks mesostasis which can be glassy, ipocrystalline, microcrystalline, devitrified

7.2.2.2 In sedimentary rocks have to be distinguished matrix (microcrystalline pelitic, carbonatic or silicic mud which includes grains when present, or fills the interstices) and cement (amorphous to crystalline materials partially or completely filling cavities)

7.2.3 Organogenic remains: e.g. organic or replaced (pyrite, apatite etc.) organogenic remains

## 7.3 Discontinuities

7.3.1 Pores, microcavities (size, shape, relative abundance and filling material if present)

7.3.2 Cracks and open fractures

7.3.2.1 Width (most frequent value, minimum and maximum)

7.3.2.2 Length (most frequent value, minimum and maximum)

7.3.2.3 Type (intergranular, intragranular, transgranular)

7.3.2.4 Orientation

7.3.2.5 Distribution

7.3.3 Filled fractures and veins

7.3.3.1 Width (most frequent value, minimum and maximum)

7.3.3.2 Length (most frequent value, minimum and maximum)

7.3.3.3 Type (intergranular, intragranular, transgranular)

7.3.3.4 Orientation

7.3.3.5 Distribution

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