



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 15912:2014**  
**01-oktober-2014**

---

**Zobozdravstvo - Polnila in refrakcijski materiali (ISO/DIS 15912:2014)**

Dentistry - Refractory investment and die material (ISO/DIS 15912:2014)

Zahnheilkunde - Hochtemperaturbeständige Einbettmassen und Stumpfmaterien  
(ISO/DIS 15912:2014)

Art dentaire - Revêtements et matériaux pour modèles réfractaires (ISO/DIS  
15912:2014)

**Ta slovenski standard je istoveten z: prEN ISO 15912 rev**

---

**ICS:**

11.060.10      Zobotehnični materiali      Dental materials

**oSIST prEN ISO 15912:2014      en**



# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 15912

ISO/TC 106/SC 2

Secretariat: ANSI

Voting begins on:  
2014-06-05Voting terminates on:  
2014-11-05

## Dentistry — Refractory investment and die material

*Médecine bucco-dentaire - revêtements refractaires et matériaux pour modèles refractaires*

ICS: 11.060.10

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 15912:2016

<https://standards.iteh.ai/catalog/standards/sist/32dbfbac-1416-4c6e-9abc-38e2306aad08/sist-en-iso-15912-2016>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.



Reference number  
ISO/DIS 15912:2014(E)

© ISO 2014

## iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 15912:2016

<https://standards.iteh.ai/catalog/standards/sist/32dbfbac-1416-4c6e-9abc-38e2306aad08/sist-en-iso-15912-2016>

### Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

# Contents

Page

Foreword .....	iv
Introduction.....	v
1 Scope .....	1
2 Normative references .....	1
3 Terms and definitions .....	1
4 Classification .....	3
5 Requirements.....	3
5.1 General .....	3
5.2 Materials consistency and freedom from contamination.....	3
5.3 Fluidity .....	3
5.4 Initial setting time .....	3
5.5 Compressive strength.....	4
5.6 Linear thermal dimensional change .....	4
5.7 Adequacy of expansion for Type 1 and Type 2 materials .....	4
6 Sampling, test conditions and mixing.....	4
6.1 Sampling .....	4
6.2 Test conditions .....	4
6.3 Mixing .....	4
7 Test methods .....	5
7.1 Material consistency and freedom from contamination.....	5
7.2 Fluidity .....	5
7.3 Initial setting time .....	6
7.4 Compressive strength .....	10
7.5 Linear thermal dimensional change.....	12
7.6 Adequacy of expansion for Type 1 and Type 2 materials .....	16
8 Manufacturer's instructions .....	18
8.1 General .....	18
8.2 Information for use .....	18
8.3 Physical properties .....	19
8.4 Safety labelling and instructions for a product containing silica .....	20
9 Marking.....	20
9.1 General .....	20
9.2 Powder container .....	20
9.3 Liquid container.....	21
10 Packaging.....	21
10.1 Powder .....	21
10.2 Liquid .....	22
Bibliography.....	23
Figure 1 An example of the needle penetrometer.....	7
Figure 2 The sprued disc pattern.....	17
Figure 3 The pictogram to be used for The Specific Targeted Organ Toxicity (STOT) for Repeated Exposure (RE) Level 1, that is relevant to the presence of silica powder at a concentration above 1 % mass fraction.....	20

## 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 15912 *Dentistry —Investment and refractory die materials* was prepared by Technical Committee ISO/TC 106 *Dentistry*, Subcommittee SC2, *Prosthodontic Materials*.

This International Standard contains the requirements and test methods for dental casting investment, dental brazing investment and dental refractory die materials, for which it is the second edition. This International Standard cancels and replaces ISO 15912: 2006 *Dentistry – Casting investment and refractory die materials* and ISO 15912: 2011 *Dentistry – Casting investment and refractory die materials*. Amendment 1 *Requirements and test methods for adequacy of expansion of Type 1 and Type 2 materials*.

The previous edition contained requirements and test methods that had been developed for discontinued composition specific standards. In recent years products have been introduced that have other chemistries (for the binder and the refractory phase), specifically to minimise chemical reaction between the mould and the molten casting metallic material. A number of technical amendments have been made to enable all dental casting investment products, regardless of their composition, to seek compliance with this International Standard. This change maintains the agreed philosophy that this International Standard should be application driven and not limited by composition considerations.

Where appropriate, aspects of the test procedures have been changed to follow the manufacturer's instructions for use. The requirement for thermal dimensional change now takes into account the cooling of some products (after burn-out) to a lower casting temperature. The specification for the dilatometer has been changed for it to be compatible with the heating (and where relevant, the cooling after burn-out) of the product to the casting temperature.

The procedure for determining the initial setting time has been changed to harmonise with that present in the revised standard for dental gypsum products, ISO 6873: 2013 *Dentistry – Gypsum products*. Although most of this change is editorial, there are technical changes.

Information for use now requires a statement of the type of refractory phase(s) that is (are) present.

Labelling requirements for products that contain silica have been revised to comply with current United Nations Globally Harmonized System for Classification and Labelling of Chemicals (UN GHS) recommendations for silica as a hazardous material.

Containers of liquid must be marked to indicate the use to which the liquid is put.

## Introduction

This is the second edition of the ISO Standard for dental casting investment, dental brazing investment and dental refractory die materials that are used in the dental laboratory. It gives the requirements and test methods for determining the compliance of such products with this International Standard, regardless of the composition of the refractory powder, the composition of the binder, or the particular application. It also gives the requirements for the manufacturer's instructions, packaging and marking.

This International Standard classifies such products into Types according to their intended use and Classes according to the recommended burn-out procedure.

A specific quantitative requirement for setting expansion is not included in this International Standard. However, if the setting expansion of gypsum-bonded investment is measured, use of the procedure contained in ISO 6873: 2013 *Dentistry - Gypsum products* should be considered. This procedure is not recommended for investment materials with other binders.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 15912:2016

<https://standards.iteh.ai/catalog/standards/sist/32dbfbac-1416-4c6e-9abc-38e2306aad08/sist-en-iso-15912-2016>





# Dentistry — Refractory investment and die materials

## 1 Scope

This International Standard applies to dental casting investment, dental brazing investment and dental refractory die products without regard to the composition of the binder or the composition of the particulate refractory phase.

This International Standard classifies such products into Types, according to their intended use and Classes according to the burn-out procedure that is recommended by the manufacturer.

This International Standard specifies requirements for the essential physical and mechanical properties of these products and the test methods to be used when determining them. Compliance with all of the requirements listed in 5 may not be necessary for some products. A requirement may not apply to a product with a particular binder chemistry or to a product intended for an application in which that requirement is irrelevant. When this is the case, a clear statement to this effect is given in 5.

This International Standard also includes requirements for marking, labelling and instructions for use.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1942, *Dentistry – terminology*

ISO 3696, *Water for analytical laboratory use – Specification and test methods*

ISO 6344-1, *Coated abrasives - Grain size analysis – Part 1: Grain size distribution test*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

ISO 15854, *Dentistry – Casting and base-plate waxes*

ISO 22674, *Dentistry – Metallic materials for fixed and removable restorations and appliances*

*Globally Harmonized System of Classification and Labelling of Chemicals (GHS)*. 5<sup>th</sup> Revised Edition. United Nations, New York and Geneva, 2013, ISBN 978-92-1-117042-9.

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942 and the following apply.

**3.1****dental casting investment material**

powdered particulate refractory and binder system that is mixed with a specified liquid to produce a pourable fluid that sets around a pattern to form the mould for casting a dental metallic prosthesis

NOTE 1 In some products, the binder may be dispersed in the refractory powder and the product is supplied as a mixed powder. Alternatively, the chemistry of the binder may lead to it being present in a solution (to be used with the powder that is supplied) with part or none of it being dispersed in the refractory powder, as received.

NOTE 2 The specified liquid may be pure water, an aqueous binder solution, or an aqueous solution to enhance expansion.

**3.2****dental refractory die material**

powdered particulate refractory and binder system that is mixed with a specified liquid to produce a fluid that sets (and is designed specifically) to form of a hard die, suitable for the production of a dental ceramic prosthesis using the sintering technique

**3.3****dental brazing investment material**

powdered particulate refractory and binder system that is mixed with a specified liquid to produce a fluid that sets (and is designed specifically) to form a cast upon which metallic components are held, or are partly embedded, accurately in place while they are joined by brazing

NOTE The cast may be referred to as the model, though that is a deprecated term.

**3.4****special liquid**

liquid, other than water, supplied by the manufacturer for mixing with the dental casting investment powder for the purpose of increasing the expansion of the mould

**3.5****slow- or step-heating method**

heating method in which (after a time recommended by the manufacturer) the dental casting investment mould, or dental brazing investment cast or dental refractory die is placed in a burn-out furnace set at room temperature, after which the temperature of the furnace is increased to the end temperature in a series of stages and at a programmed rate recommended by the manufacturer

**3.6****quick-heating method**

heating method in which the burn-out furnace is set and held at the recommended final burn-out temperature and at a time after setting that is recommended by the manufacturer the dental casting investment mould, or dental brazing investment cast, or dental refractory die is placed directly into the hot furnace

**3.7****burn-out temperature**

for Types 1 and 2 materials: the temperature to which the mould is heated to burn off the pattern material and expand the mould

for a Type 3 material: the temperature to which the cast is heated to burn off any material used for shielding and accurately locating the components to be brazed, and to expand the cast

for a Type 4 material: the temperature to which the die is heated initially to burn off the pattern material

**3.8****casting temperature**

for Types 1 and 2 materials: the temperature of the mould at which the molten metallic material is forced into the mould

**3.9****green state**

condition of the material immediately after setting before structural changes are brought about by aging or burn-out, changes that produce increased strength or further dimensional changes

**4 Classification**

For the purposes of this International Standard dental casting investment, dental brazing investment and dental refractory die materials are categorized by the following types:

- Type 1: For the construction of inlays, crowns and other fixed prostheses;
- Type 2: For the construction of complete or partial dentures or other removable appliances;
- Type 3: For the construction of casts used in brazing procedures;
- Type 4: For the construction of refractory dies.

There are two classes of dental casting investment, dental brazing investment and dental refractory die material:

- Class 1: Recommended for burn-out by a slow-, or step-heating method;
- Class 2: Recommended for burn-out by a quick-heating method.

**5 Requirements****5.1 General**

If a manufacturer claims suitability for both Classes, then the material shall satisfy the requirements when it is subjected to both heating techniques. This applies to requirements 5.5 and 5.6 and, if appropriate, requirement 5.7.

**5.2 Material consistency and freedom from contamination**

When examined in accordance with 7.1, the powder shall be uniform and free of lumps and foreign matter. If a special liquid is supplied, it shall be free of sediment.

**5.3 Fluidity**

When measured in accordance with 7.2, the fluidity shall not vary by more than 30 % from the value stated by the manufacturer [according to 8.3.2 a)].

This requirement does not apply to silica bonded investments (i.e. products in which an alcoholic solution of ethyl silicate is used in the binding system).

**5.4 Initial setting time**

When measured in accordance with 7.3, the initial setting time shall not vary by more than 30 % from the value stated by the manufacturer [according to 8.3.2 b)]. If the manufacturer gives a range for the initial setting time, then the measured initial setting time shall not vary by more than 30 % from the mid-point of this range.

## 5.5 Compressive strength

When measured in accordance with 7.4, the compressive strength of a test-piece shall not be less than 70 % of the value stated by the manufacturer [according to 8.3.2 c)] and in no case shall be lower than 2 MPa.

## 5.6 Linear thermal dimensional change

When measured in accordance with 7.5, the linear thermal expansion, for all four Types, shall not vary by more than 20 % from the value stated by the manufacturer [according to 8.3.2 d)]. If the manufacturer gives a range for the linear thermal expansion, then the measured linear thermal expansion shall not vary by more than 20 % from the mid-point of this range.

When measured in accordance with 7.5, the linear firing shrinkage for a Type 4 material shall not vary by more than 15 % from the value stated by the manufacturer [according to 8.3.2 e)]. If the manufacturer gives a range for the linear firing shrinkage, then the measured linear firing shrinkage shall not vary by more than 15 % from the mid-point of this range.

## 5.7 Adequacy of expansion of Type 1 and Type 2 materials

When cast in accordance with 7.6, the diameter of the cast metallic disc, with respect to the diameter of the pattern from which it was made, shall be:

- a) no smaller than 99,5 % in case of a Type 1 material.
- b) no smaller than 99,0 % in case of a Type 2 material.

This requirement does not apply to both dental brazing investment material, Type 3, and dental refractory die material, Type 4.

## 6 Sampling, test conditions and mixing

### 6.1 Sampling

Use material from a single lot in packages that have been produced for retail. Use only sealed, undamaged packages (i.e. packets and containers) that have not exceeded the “use before” date.

### 6.2 Test conditions

Carry out all testing in a controlled atmosphere:-  $(23 \pm 2) ^\circ\text{C}$ ,  $(50 \pm 10) \%$  relative humidity and free from obvious draughts.

NOTE Holding the material and all test equipment under these controlled conditions for a minimum period of 15 hours prior to testing is recommended.

### 6.3 Mixing

Mix according to the manufacturer's instructions. When a special liquid is supplied, use it at the manufacturer's recommended dilution according to 8.2 d). If water is required, use water that complies with Grade 3 according to ISO 3696.

If a range is given in 8.2 e) for the powder to liquid ratio, or in 8.2 d) for the dilution of the special liquid, use the midpoint of this range to produce a mix for determining compliance with requirements 5.3, 5.4, 5.5 and 5.6.