
**Dental gypsum-bonded casting
investments**

Revêtements à couler dentaires à liant-plâtre

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Contents

Page

Foreword.....	iv
Introduction.....	v
1 Scope	1
2 Term and definition	1
3 Classification.....	1
4 Requirements	1
4.1 Appearance of powder	1
4.2 Fluidity at working time.....	1
4.3 Setting time	1
4.4 Compressive strength.....	2
4.5 Linear setting expansion	2
4.6 Linear thermal expansion	2
5 Sampling, test conditions and mixing.....	2
5.1 Sampling.....	2
5.2 Test conditions	2
5.3 Mixing.....	2
6 Test methods.....	3
6.1 Visual examination	3
6.2 Fluidity at work time	3
6.3 Setting time	3
6.4 Compressive strength.....	5
6.5 Linear setting expansion	6
6.6 Linear thermal expansion	6
7 Manufacturer's instructions.....	8
8 Packaging	8
8.1 Packaging	8
8.2 Mould lining.....	8
9 Marking	8

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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 7490 was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 2, *Prosthetic materials*.

This second edition cancels and replaces the first edition (ISO 7490:1990), which has been technically revised.

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Introduction

The original name of this International Standard was “Dental gypsum-bonded casting investment for gold alloys”. In this revision the limitation to gold alloys has been removed and the title has been changed to reflect this.

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Dental gypsum-bonded casting investments

1 Scope

This International Standard establishes a classification of, and specifies requirements for, gypsum-bonded casting investments. It also specifies test methods to be used to determine compliance with these requirements.

2 Term and definition

For the purposes of this International Standard, the following term and definition applies.

2.1

dental gypsum-bonded casting investment

powder mixture of calcium sulfate hemihydrate and silica and/or other refractory materials

NOTE The powder may also contain small quantities of modifying agents.

3 Classification

Dental gypsum-bonded casting investments are classified as follows:

- **Type 1:** For casting inlays and crowns.
- **Type 2:** For casting complete and partial denture bases.

In its classification, a particular material need not be restricted to only one type.

4 Requirements

4.1 Appearance of powder

When examined visually (6.1), the powder shall be of uniform appearance and free from foreign matter and lumps.

4.2 Fluidity at working time

When tested in accordance with 6.2, the diameter of the set material shall be at least 60 mm for Type 1 and 40 mm for Type 2 materials.

4.3 Setting time

When tested in accordance with 6.3, the Vicat time shall not vary by more than 20 % from the manufacturer's claimed setting time. If the manufacturer claims a range, then the setting time shall not vary by more than 20 % from the midpoint of this range.

4.4 Compressive strength

When tested in accordance with 6.4, Type 1 materials shall have a minimum compressive strength of 2,3 MPa and Type 2 materials shall have a minimum compressive strength of 2,6 MPa.

4.5 Linear setting expansion

When determined in accordance with 6.5, the linear setting expansion shall not differ by more than 20 % from the value claimed by the manufacturer. If the manufacturer claims a range then the value determined shall not differ from the midpoint of this range by more than 20 %.

4.6 Linear thermal expansion

When determined in accordance with 6.6, the linear thermal expansion of the material shall not differ by more than 20 % from the value claimed by the manufacturer. If the manufacturer claims a range then the value determined shall not differ from the midpoint of this range by more than 20 %.

5 Sampling, test conditions and mixing

5.1 Sampling

Sufficient retail packages of the material of one batch shall be obtained to provide at least 5 kg of material. Any packages that are not sealed shall be discarded.

When the powder is supplied in bulk, it shall be thoroughly blended and stored in a moisture-proof container prior to testing.

5.2 Test conditions

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All testing of the investment shall be carried out at (23 ± 2) °C and (50 ± 10) % relative humidity and in a room free from obvious drafts.

All test equipment shall be clean and dry. The bowls used for mixing shall be clean, shall be moistened and excess water shall be shaken off. Before testing begins, equipment and material shall be allowed to equilibrate with the specified test temperature and humidity at least for 5 h to 6 h.

Some components of the mixing and testing equipment are cleaned between tests. These items should be allowed to return to the specified test temperature before being reused.

5.3 Mixing

5.3.1 Apparatus

5.3.1.1 **Clean apparatus** for mixing as recommended by the manufacturer in the instructions [item 7 d)].

5.3.1.2 **Timing device** such as a stop watch.

5.3.2 Procedure

Measure, to an accuracy of ± 1 %, 300 g of powder and the required volume of water as given by the manufacturer's instructions in accordance with item 7 c). If the manufacturer specifies a range of volume for the water, use the midpoint of the range. Pour the water into the mixing bowl and sift the investment powder into the water within 10 s, minimizing entrapment of air. Begin timing from the moment the investment powder and the water first make contact. Hand spatulate for 15 s at a speed of about two turns per second. Mechanically mix in accordance with item 7 d) for the time specified by the manufacturer.

6 Test methods

6.1 Visual examination

The material shall be examined without magnification under normal acuity.

6.2 Fluidity at work time

6.2.1 Apparatus

6.2.1.1 Clean, dry cylindrical mould having a length of (50 ± 1) mm and an inside diameter of (35 ± 1) mm, constructed from a corrosion-resistant, non-absorbent material.

6.2.1.2 Flat, square glass plate at least 150 mm by 150 mm.

6.2.1.3 Dental vibrator operating on 50 Hz or 60 Hz power supply.

6.2.1.4 Scale graduated in millimetres to measure the major and minor diameters of the slumped mix.

6.2.1.5 Non-reactive mould release agent, such as dry silicone spray or silicone grease.

6.2.2 Procedure

Coat the inside surface of the mould with mould release agent. Mix the investment as described in 5.3 using 200 g of powder. Centre the mould base on the glass plate and place it on the dental vibrator platform. Vibrate the investment mix into the mould until it is slightly overfilled. Do not vibrate for more than 20 s. Level the mix flush with the top of the mould. Lift the mould vertically from the plate 2 min after the first contact of powder and water at a speed of approximately 10 mm/s. If the manufacturer claims a range of setting time then the mould shall be lifted at 1 min before the midpoint of this range. As soon as the mixed investment has set, measure the largest and the smallest diameters of the set investment base, and report the average value.

6.2.3 Evaluation

Make two such tests as described in 6.2.2. If both meet the requirement (4.2), the product complies with this requirement of this International Standard. If one test meets the requirement and one fails the requirement, then the test shall be repeated three more times. If all three tests meet the requirement (4.2) then the product complies with this requirement of this International Standard. Otherwise it fails to comply.

6.3 Setting time

6.3.1 Apparatus

6.3.1.1 Needle apparatus, as shown in Figure 1, meeting the following requirements.

- a) Total mass of the rod and needle (A, B and C in figure 1) shall be (300 ± 1) g.
- b) Scale (D) graduated in millimetres,
- c) Clean, dry conical mould constructed from a corrosion resistant, non absorbent material (G),
- d) Baseplate (H) of glass and about 100 mm square,
- e) Vicat needle (C) of circular cross-section with a diameter of $(1 \pm 0,05)$ mm and flat end.