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# International Standard



# 1562

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Dental casting gold alloys

*Alliages d'or dentaires à couler*

Second edition — 1984-08-15

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**Descriptors** : dentistry, dental materials, casting, gold alloys, classifications, specifications, mechanical properties, tests, mechanical tests, packing, marking.

Price based on 4 pages

## 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 1562 was developed by Technical Committee ISO/TC 106, *Dentistry*, and was circulated to the member bodies in August 1983.

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

Australia	Mexico	United Kingdom
Belgium	Netherlands	USA
France	Norway	USSR
Germany, F. R.	South Africa, Rep. of	
Japan	Switzerland	

The member body of the following country expressed disapproval of the document on technical grounds:

Sweden

This second edition cancels and replaces the first edition (i.e. ISO 1562-1976).

# Dental casting gold alloys

## 1 Scope and field of application

This International Standard establishes the classification of, and specifies requirements for dental casting gold alloys used in the fabrication of dental restorations and appliances. Alloys of precious metals used for ceramo-metallic applications are not covered by this International Standard.

## 2 References

ISO 6507/1, *Metallic materials — Hardness test — Vickers test — Part 1* : HV 5 to HV 100.

ISO 6892, *Metallic materials — Tensile testing*.<sup>1)</sup>

ISO/TR 7405, *Biological evaluation of dental materials*.

## 3 Classification

Dental casting gold alloys shall be classified into the following types according to their physical properties and to the application for which they are recommended :

**Type 1** : soft, for castings subject to very slight stress, for example inlays;

**Type 2** : medium, for castings subject to moderate stress, for example 3/4 crowns, retainers, pontics, full crowns and saddles;

**Type 3** : hard, for castings subject to high stress, for example thin 3/4 crowns, thin cast backings, pontics, full crowns and saddles;

**Type 4** : extra hard, for castings subject to very high stress and thin in cross-section, for example saddles, bars, clasps, crowns, thimbles, unit castings and partial denture frameworks.

## 4 Requirements

### 4.1 Colour

The colour of the alloy, determined visually, shall be as indicated on the package.

### 4.2 Composition

Dental casting gold alloys shall contain at least 75 % by mass of gold and metals of the platinum group.

NOTE — The following metals belong to the platinum group : Pt, Pd, Ir, Rh, Ru, Os.

### 4.3 Toxicity

When used the alloy shall not yield substances considered to have harmful effects to the wearer.

NOTE — When specific toxicity tests are available it is envisaged that these will be included in this International Standard. See ISO/TR 7405.

### 4.4 Mechanical properties

The mechanical properties of the various types of alloys, when tested in accordance with clause 7, shall be as specified in the table.

## 5 Sampling

The method of procurement of the alloy needed for testing should be recorded in the test report.

The amount of testing material shall be sufficient for the preparation of at least six specimens for the alloys of the types 1 to 3 and of at least twelve specimens for alloys of the type 4.

1) At present at the stage of draft.

**6 Test specimens**

Prepare test specimens as shown in figure 1 or 2. The test specimens shall be prepared by the "lost wax" process of investment casting generally employed in a dental laboratory. The manufacturer's instructions relating to the processing of the alloy as well as to the necessary aids and casting equipment shall be followed.

It is suggested that the test specimens should be made out of a casting pattern as shown in figure 3.

The specimens shall be carefully separated from the sprues, cleared of casting beads, fins etc., and then cleaned for example by sandblasting or pickling. The specimens should normally, after the above treatment, require no further finishing. If there are surface defects the specimens may be lathe-cut to achieve a smooth surface, but not less than 2,5 mm in diameter.

Within the gauge length of 15 mm, an exact cylindrical shape is of more importance than a diameter of 3 mm.

Discard and replace any test specimens having visible defects.

**7 Testing**

**7.1 Visual inspection**

Visual inspection shall be used in determining compliance with the requirements specified in 4.1 and 9.2.

**7.2 Mechanical tests**

**7.2.1 Conditioning of the test specimens**

Mechanical properties shall be determined on cast specimens (as described in clause 6) which have been softened, quenched and/or hardened in accordance with the manufacturer's instructions.

**7.2.2 Vickers hardness**

The Vickers hardness shall be determined on 1 mm thick specimens that are either sawn from the cast tensile specimens or separately cast. The test shall be conducted according to ISO 6507/1.

The HV 5 value shall be reported to the nearest 5 HV (see 7.2.5).

**7.2.3 0,2 %-Proof stress**

The 0,2 %-proof stress shall be determined on the cast and heat treated specimens. The specimens shall be loaded in a tensile tester at a crosshead speed of  $1,5 \pm 0,5$  mm/min up to the fracture point of the specimens. The values should be determined from the resultant stress strain curves at the 0,2 % offset level and calculated on the basis of the original cross-sectional area. The test procedure shall be conducted according to ISO 6892.

The 0,2 %-proof stress value shall be reported to the nearest 5 N/mm<sup>2</sup> (see 7.2.5).

**7.2.4 Elongation**

Elongation shall be determined according to ISO 6892 in conjunction with the test for proof stress.

The elongation value shall be reported to the nearest 1 % (see 7.2.5).

**7.2.5 Evaluation**

The values for hardness, proof stress and elongation shall be reported as the mean of the values obtained on four, five or six specimens which are found to comply with 4.4.

If more than two specimens need to be replaced because of extended defects or do not meet the requirements, the alloy shall be rejected.

**Table — Mechanical properties**

Type	State	Vickers hardness HV 5		0,2 %-Proof stress N/mm <sup>2</sup> min.	Elongation % min.
		min.	max.		
1	softened	50	90	80	18
2	softened	90	120	180	12
3	softened	120	150	240	12
4	softened	150	—	300	10
	hardened	220	—	450	2

Dimensions in millimetres

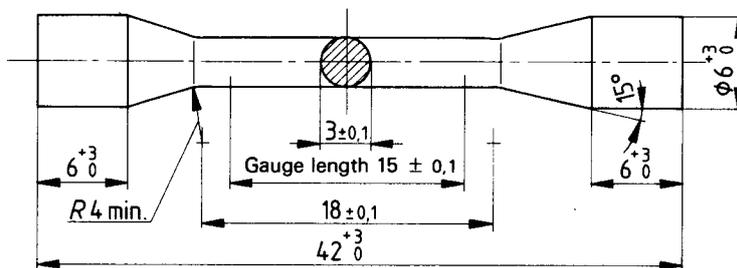


Figure 1 — Test specimen with cylindrical ends

Dimensions in millimetres

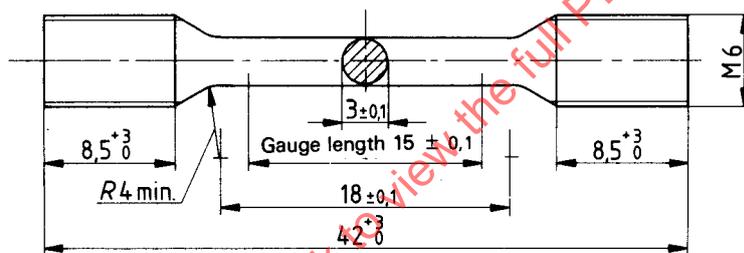
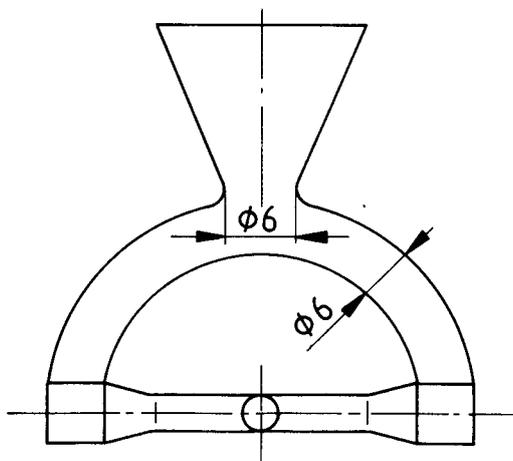


Figure 2 — Test specimen with threaded ends

Dimensions in millimetres

Tolerances on all dimensions  $\pm 1$  mm



NOTE — The sprues can have the shape of a bow or a triangle or a "U".

Figure 3 — Test specimen with suggested sprues and sprue button

## 8 Manufacturer's instructions

Information about the type, the total percentage by mass of gold and metals of the platinum group, the mechanical properties, the melting range, the heat treatment for softening and in the case of type 4, on heat treatment for hardening, shall be included in the packets or accompanying literature.

Exact instructions for the processing shall be available to the purchaser.

If the alloy contains constituents potentially hazardous to workers during casting and finishing, the manufacturer shall clearly state this on the packets and give adequately detailed instructions regarding precautions.

## 9 Packaging and marking

### 9.1 Packaging

The alloy shall be offered and packaged in accordance with normal commercial practice.

### 9.2 Marking

#### 9.2.1 Ingots

The ingots shall be clearly marked to identify the manufacturer or supplier and the alloy.

#### 9.2.2 Packets

The packets shall be marked with the following information :

- a) manufacturer's name and trademark;
- b) designation or trade name of the alloy;
- c) colour of the alloy;
- d) lot or batch number : a serial number or combination of letters or numbers which refer to the manufacturer's records for that particular lot or batch of alloy;
- e) type : the type of casting gold alloy, as classified in clause 3;
- f) net mass : the minimum net mass in grams;
- g) the total percentage by mass of gold and metals of the platinum group,
- h) hazardous constituents : if an alloy contains constituents which are bound to be potentially hazardous, the manufacturer or supplier shall include a clearly visible warning on the packet identifying by name the constituent(s) concerned and the amount(s) used.

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