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Zobozdravstvo - Preskusne metode za natančnost obdelave računalniško podprtih strojev za rezkanje (ISO 23298:2023)

Dentistry - Test methods for machining accuracy of computer-aided milling machines (ISO 23298:2023)

Zahnheilkunde - Prüfverfahren zur Bewertung der Genauigkeit von computergesteuerten Fräsmaschinen (ISO 23298:2023)

Médecine bucco-dentaire - Méthodes d'essai pour l'exactitude d'usinage des fraiseuses à commande numérique (ISO 23298:2023)

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Dentistry - Test methods for machining accuracy of computer-aided milling machines (ISO 23298:2023)

Médecine bucco-dentaire - Méthodes d'essai pour l'exactitude d'usinage des fraiseuses à commande numérique (ISO 23298:2023)

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European foreword

This document (EN ISO 23298:2023) has been prepared by Technical Committee ISO/TC 106 "Dentistry" in collaboration with Technical Committee CEN/TC 55 "Dentistry" the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by December 2023, and conflicting national standards shall be withdrawn at the latest by December 2023.

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INTERNATIONAL
STANDARD

ISO
23298

First edition
2023-05

**Dentistry — Test methods for
machining accuracy of computer-
aided milling machines**

*Médecine bucco-dentaire — Méthodes d'essai pour l'exactitude
d'usinage des fraiseuses à commande numérique*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 9, *Dental CAD/CAM systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 55, *Dentistry*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 23298 cancels and replaces ISO/TR 18845:2017, which has been technically revised.

The main changes are as follows:

- the type of document has been changed from Technical Report to International Standard;
- two test methods have been specified using metal dies and software as the normative test methods;
- the selection guidance of test methods has been clarified;
- the details of the procedures of both test methods based on the inter-laboratory test have been revised.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Dental CAD/CAM systems have been successfully used for the fabrication of indirect dental restorations such as inlays, crowns and bridges. The accuracy of these restorations is one of the most important factors for their clinical success. This document provides standardized test methods to evaluate the machining accuracy of computer-aided milling machines which are used as a part of dental CAD/CAM systems and the information to be provided by the manufacturer. Flow charts of the test methods are given in Figures A.1 and A.2.

There are two methods using metal dies or software to evaluate machining accuracy of the target restoration(s). Either or both test methods should be selected to evaluate the machining accuracy.

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Dentistry — Test methods for machining accuracy of computer-aided milling machines

1 Scope

This document specifies the test methods to evaluate the machining accuracy of computer-aided milling machines as a part of dental CAD/CAM systems, which fabricate dental restorations, such as inlays, crowns and bridges.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1942, *Dentistry — Vocabulary*

ISO 18739, *Dentistry — Vocabulary of process chain for CAD/CAM systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942, ISO 18739 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

computer-aided milling machine

computer-aided machining device designed for subtractive manufacturing of dental prostheses using rotary instruments for cutting and grinding

3.2

blank

material to be machined by a *computer-aided milling machine* (3.1)

Note 1 to entry: A blank can be a *block* (3.3) or a *disc* (3.4).

3.3

block

cuboidal material with holding device to be machined by a *computer-aided milling machine* (3.1)

3.4

disc

flat circular-shaped material to be machined by a *computer-aided milling machine* (3.1)

3.5

stock material

material *blanks* (3.2) that are in stock to be machined by a *computer-aided milling machine* (3.1)

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4 General

There are two methods to evaluate accuracy of the target restoration(s). The accuracy of target restoration(s) shall be evaluated using one or both of the test methods described in [Clause 5](#). The test method(s) selected and corresponding results shall be provided in the instructions for use, the technical manual or other means. When the machining accuracy is affected by the material, appropriate material(s) shall be tested. Testing shall be performed on each material type that the manufacturer indicates for use by the device. The metal die method ([5.1](#)) is a measurement method based on the marginal adaptability of a machined restoration to a master die. Measurements obtained using this method can be used to assess the adaptability at restoration margins. The software method ([5.2](#)) is a measurement method based on a comparison of the scanned file of a milled restoration to a master manufacturing file using reverse engineering software. Measurements obtained using this method can be used to assess restoration margin, intaglio and external surface accuracy.

5 Test methods

5.1 Metal die method

5.1.1 Target restorations

Three types of restorations are the targets of this test method:

- a) class II inlay,
- b) crown, and
- c) four-unit bridge.

Choose the restoration type(s) specified in the manufacturer's instructions for use and technical manual. If any of the restoration types are not specified by the manufacturer's technical manual for the equipment being tested, this restoration type shall be eliminated from the test procedure.

NOTE This test method is designed by adopting the same principle as the examination method of clinical marginal adaptation. The clinical adaptation is examined by checking the discrepancy between the restoration and the cavity margin or between it and the shoulder margin of the abutment.

5.1.2 Apparatus

5.1.2.1 Metal dies

Two types of metal dies given in [Figure 1](#) (class II inlay) and [Figure 2](#) (crown and four-unit bridge dies) are used both for the preparation of three-dimensional data (manufacturing data set) and the evaluation of the accuracy of restorations. Dies shall be constructed based on the drawings in [Figure 1](#) and [Figure 2](#). These dies consist of a non-malleable base part and one or more removable structure(s) used for the evaluation of accuracy.

The diameter of the removable occlusal part, measured at the transition between the occlusal part and the abutment, shall be not less than the diameter of the abutment at this transition and the difference of diameter shall be not more than 10 μm .

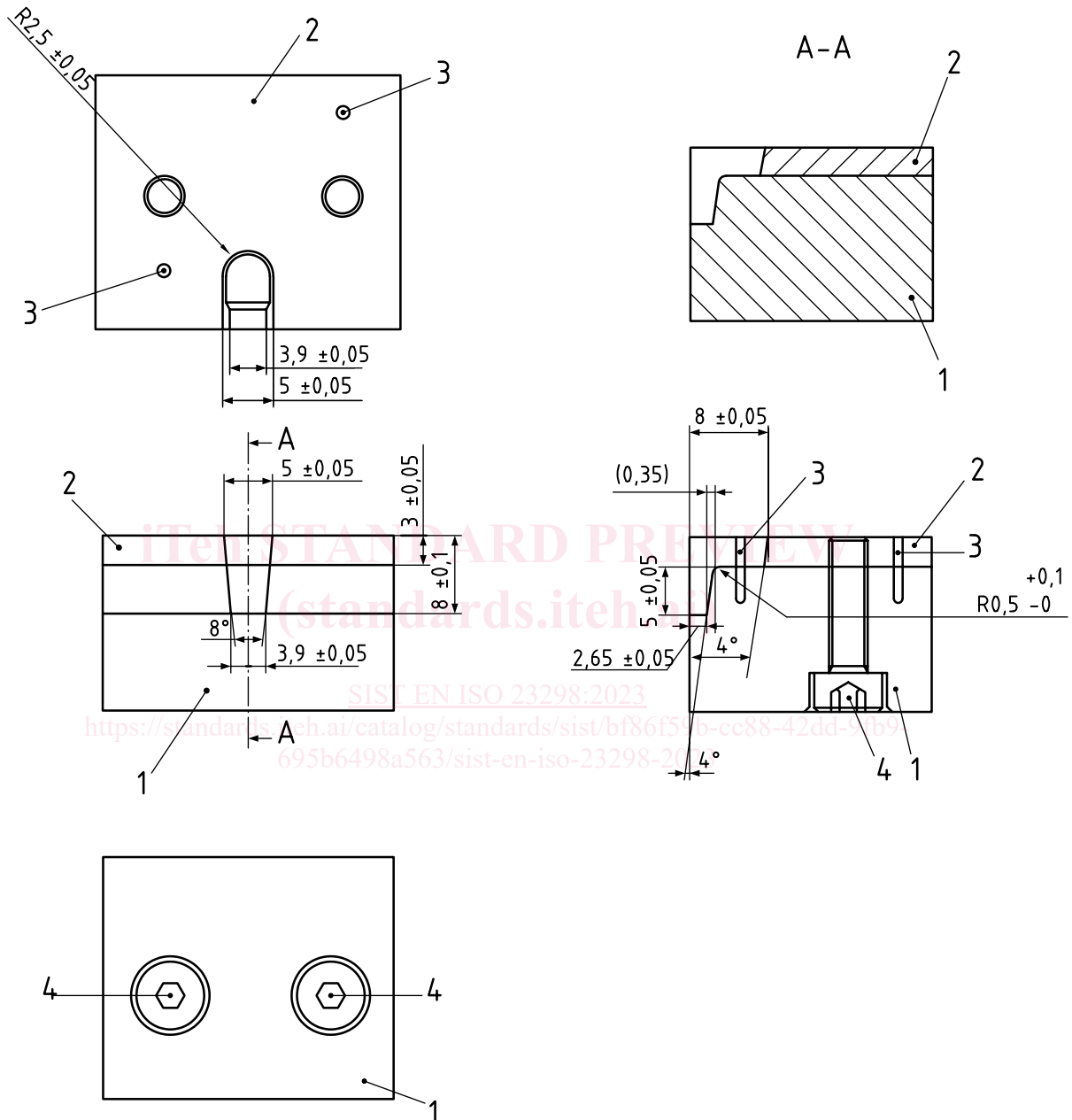
The surface roughness (S_a) of the die, excepting the surfaces which do not come in contact with the test specimens/machined restorations, shall be less than 2 μm . Refer to ISO 25178-2 and other parts for test methods.

If a mark for reference point is necessary, either a groove or a ridge, or both, may be placed on the part, but shall be placed so as to not influence the evaluation of the results.

The removable occlusal part and removable shoulder are used for preparation of three-dimensional data, but not used for evaluation of accuracy.

NOTE An example of the machining device to fabricate the dies is VERTICAL CENTER NEXUS 410B¹⁾.

Dimensions in millimetres



Key

- 1 base part
- 2 removable part
- 3 positioning pin
- 4 fixing screw

Figure 1 — Die for class II inlay specimen

1) VERTICAL CENTER NEXUS 410B is the trade name of a product supplied by Yamazaki Mazak. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.