BS EN ISO 18739:2016

BSI Standards Publication

Dentistry — Vocabulary of process chain for CAD/CAM systems (ISO 18739:2016)

bsi.

National foreword

This British Standard is the UK implementation of EN ISO 18739:2016.

The UK participation in its preparation was entrusted to Technical Committee CH/106, Dentistry.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 82784 6

ICS 11.060.01

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2016.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 18739

April 2016

ICS 11.060.01

English Version

Dentistry - Vocabulary of process chain for CAD/CAM systems (ISO 18739:2016)

Médecine bucco-dentaire - Vocabulaire de la chaîne de procédé applicable aux systèmes de CFAO (ISO 18739:2016)

Zahnheilkunde - Vokabular der Prozesskette für CAD/CAM-Systeme (ISO 18739:2016)

This European Standard was approved by CEN on 20 February 2016.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

This document (EN ISO 18739:2016) 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 October 2016, and conflicting national standards shall be withdrawn at the latest by October 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 18739:2016 has been approved by CEN as EN ISO 18739:2016 without any modification.

Contents

Page

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. www.iso.org/directives

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 106, *Dentistry*, Subcommittee SC 9, *CAD/CAM-Systems*.

Introduction

Terms and designations for individual system parts and process steps used in product descriptions and instructions for use provided by the manufacturers of dental CAD/CAD systems differ from each other, thus creating confusion among dentists and dental technicians. In order to overcome these ambiguities, it was decided to prepare an International Standard for terminology used in the process chain for CAD/CAM systems.

For the purposes of illustrating the logic sequence of the process chain for CAD/CAM systems, a flow chart of this process chain is shown in Annex A.

Dentistry — Vocabulary of process chain for CAD/CAM systems

1 Scope

This International Standard specifies terms, synonyms for terms and definitions used in the process chain for CAD/CAM systems in dentistry.

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 — Vocabulary*

ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*

ISO 16443, *Dentistry — Vocabulary for dental implants systems and related procedure*

ISO/ASTM 52900, *Additive manufacturing — General principles — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942, ISO 5725-1, ISO 16443, ISO/ASTM 52900 and the following apply.

NOTE In the following, first the preferred term and then the synonyms which have been in use so far are given. For the future it is recommended to use the preferred terms instead of the synonyms.

3.1 Process step terms

3.1.1
3D data acquisition
three dimensional data acquisition
3D digitization and generation of a digital data set

3.1.2
3D data acquisition system
three dimensional data acquisition system
hardware and software used for 3D data acquisition

3.1.3
3D scanning
3D digitizing
raw data acquisition
method of acquiring the shape and size of an object as a 3-dimensional representation by recording x,y,z coordinates on the objects surface and through software the collection of points is converted into digital data

Note 1 to entry: This collection of data via the scanning process creates a raw *data set* (3.1.14).

Note 2 to entry: Typical scanning methods use some amount of automation, coupled with a touch probe or an optical sensor, or other device.

[SOURCE: ISO/ASTM 52900:2015, definition 2.4.1, modified]

3.1.4
additive manufacturing
AM
process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies

[SOURCE: ISO/ASTM 52900:2015, definition 2.1.2, modified]

3.1.5
artifact
any undesired alteration of data introduced in a digital process by an involved technique and/or technology

3.1.6
CAD
computer-aided design
hardware and software supporting the designing process

Note 1 to entry: The acronym CAD is commonly used as preferred term.

3.1.7
CAD data
design data set
result of the *CAD process* (3.1.8) gained by manipulating the model data set for the purposes of transfer to the CAM system

3.1.8
CAD process
design process (DEPRECATED)
process of generating design data sets

3.1.9
CAD software
design system
system for the generation of a design data set

3.1.10
CAM
computer-aided manufacturing
hardware and software supporting the manufacturing process

Note 1 to entry: The acronym CAM is commonly used as preferred term.

3.1.11
CAM system
manufacturing system
digitally controlled system for the manufacture of CAD/CAM dental restorations

EXAMPLE Milling machine, CAM software.

3.1.12
CAM software
software used for manipulating design data for manufacturing

EXAMPLE Software for the calculation of milling paths.

3.1.13
data record
one or more data items treated as a unit within a data set

3.1.14
data set
complete numerical description

EXAMPLE Raw data set (dot model), digitization data set (manipulated raw data set), surface model, facet model or volume model.

Note 1 to entry: Raw data set is obtained by processing scanning data.

3.1.15
data structure
defined format interrelating the data (records) in the data set

3.1.16
dental CAD/CAM system
a set of hardware, software, materials, and devices, used to fabricate dental restorations

Note 1 to entry: Hardware and software are used for data acquisition, design and manufacturing.

3.1.17
dental CAD/CAM restoration
dental restoration (3.1.18) produced by a dental CAD/CAM system

3.1.18
dental restoration
any kind of restoration which replaces intra-oral hard and/or soft tissues

3.1.19
design data manipulation process
CAD data manipulation process
process of generating the manufacturing data set

EXAMPLE Tooth path generation process.

3.1.20
digital impression
acquisition of a data set with the numerical 3D-representation of the surfaces from the patient directly

3.1.21
digitizing device
hardware for computer-aided design and manufacturing of custom-made indirect dental restorations used to record the topographical characteristics (e.g. surface) of teeth and surrounding tissues, implant connecting components, dental impressions, dental moulds or stone models by analogue or digital methods

Note 1 to entry: These systems consist of a scanning device, hardware and software.

Note 2 to entry: A surface digitization procedure starts with the generation of actually measured surface points (or their conversion, for example, in STL format), which are the measured digitization data. In most digitizing systems, the measured points are mathematically processed by operations such as:

— matching

— filtering

— weighing

— selective removal

— smoothing, etc.

Note 3 to entry: This results in the processed digitization data (or surface data). These data depend very much on, for example, the digitization protocol (for example the number of passes), the extraction method of a surface from the raw data points and the matching of point clouds.

3.1.22
direct error
error resulting in corrupted set of data values in its intended use

3.1.23
fit
range of tightness or looseness between two or more mating parts

Note 1 to entry: It is relative to a device, process or material in the accurate reproduction of a copy or product that has the accuracy within the tolerance of the device, process, or material used.

3.1.24
indirect data acquisition
data acquisition process performed not directly on the patient

3.1.25
indirect dental restoration
any kind of restoration manufactured extraorally which replaces intra-oral hard and/or soft tissues

EXAMPLE Crowns, bridges, inlays, implant superstructures, prostheses, provisional restorations.

3.1.26
indirect error
error resulting in corrupted set of data values when communicating the data from one device or software to another

3.1.27
IGES
initial graphics exchange specification
platform neutral CAD data exchange format intended for exchange of product geometry and geometry annotation information

Note 1 to entry: The abbreviation IGES is commonly used as preferred term.

[SOURCE: ISO/ASTM 52900:2015, definition 2.4.10, modified]

3.1.28
manufacturing data set
manufacturing process data set
data set, resulting from the manipulation of the design data, used for the manufacturing process

EXAMPLE CAM software output file.

3.1.29
transfer function
relative accuracy between a device's output measurement and the device's returned data value measurement that can be mathematically calculated and independently be measured

3.1.30
laboratory aid
laboratory accessory
tool, prosthetic implement or oral replication not directly applied to the patient

EXAMPLE Master model.

3.1.31
light scanning
structured light scanning method using a narrowband spectrum of various light waves (e.g. blue, white, red) to scan a 3D object with precise measurements independent of environmental lighting conditions

3.1.32
optical scanning
method and process of a scanning device that uses an optical lens to collect raw data from an observed object that can be digitized to a usable form so that a computer can produce an representative image

3.1.33
polygonization
action of creating a surface by means of connecting points to form a multitude of small polygons

3.1.34
reflective surface
surface of a dental model or intraoral dental structure to be digitally scanned and its ability to reflect light waves to provide accurate scan data to create a three dimensional image

3.1.35
rapid prototyping
<in additive manufacturing> application of additive manufacturing intended for reducing the time needed for producing prototypes

Note 1 to entry: Historically, rapid prototyping (RP) was the first commercially significant application for additive manufacturing, and have therefore been commonly used as a general term for this type of technology.

[SOURCE: ISO/ASTM 52900:2015, definition 2.6.4]

3.1.36
STL
stereolithography
file format for model data describing the surface geometry of an object as a tessellation of triangles used to communicate 3D geometries to machines in order to build physical parts

Note 1 to entry: The STL file format was originally developed as part of the CAD package for the early STereoLithography Apparatus, thus referring to that process. It is sometimes also described as “Standard Triangulation Language” or “Standard Tessellation Language”, though it has never been recognized as an official standard by any standardization organization.

Note 2 to entry: STL is an interchange file format used to save computer-aided design files in a standard format that can be read by multiple computer-aided design and computer-aided manufacturing applications.

Note 3 to entry: The abbreviation STL is commonly used as preferred term.

[SOURCE: ISO/ASTM 52900:2015, definition 2.4.16, modified]

3.1.37
subtractive manufacturing process
process of machining, grinding, or reducing a larger bulk object to create a smaller detailed three dimensional object using computer aided design software and computer aided manufacturing methods

3.1.38
surface reverse engineering
production of a virtual surface model (positive model) using the data set resulting from a digital impression (negative model)

Note 1 to entry: A dot model is a suitable data set.

3.1.39
triangulation
method of determining the distance of a third object or point by measuring the distance between two separated points and the angles between the line joining them and the lines to the distant object or point

3.1.40
virtual model
a representative model of a three-dimensional object displayed through the use of computer aided design software

3.1.41
virtual model data set
manipulated digital data set

3.1.42
volume data acquisition
acquisition of a volume in a 3D space

Note 1 to entry: The description can be performed on the basis of density differences inside the three-dimensional space.

3.2 Measurement and calibration terms

3.2.1
accuracy
closeness of agreement between an individual result and an accepted reference value

Note 1 to entry: This definition was described earlier in ISO 5725-1 as: Closeness of agreement between the result of a measurement and the true value of the measurand.

Note 2 to entry: Accuracy is a qualitative concept. Its quantitative counterpart is error of measurement.

[SOURCE: ISO/ASTM 52900:2015, definition 2.7.1, modified]

3.2.2
calibration
set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument system, or values represented by a material measure or a reference material and the corresponding values realized by standards

3.2.3
drift
slow change of a metrological characteristic of a measuring instrument

3.2.4
error of measurement
result of a measurement minus a true value of the measurand

Note 1 to entry: When it is necessary to distinguish “error” from “relative error”, the former is sometimes called ‘absolute error of measurement’.

Note 2 to entry: In many instances the error of measurement is called ‘total error’.

3.2.5
measurand
particular quantity subject to measurement

3.2.6
measurement procedure
set of operations, described specifically, used in the performance of particular measurements according to a given method

Note 1 to entry: In a quality system a measurement procedure is recorded as a working instructions document, and should be described in sufficient detail to enable an operator to carry out a measurement without additional information.

Note 2 to entry: Metrological characteristics such as a repeatability, systematic error or minimum detectable value can be assessed in measurement procedures, not in methods of measurement.

3.2.7
precision
closeness of agreement between independent results of measurement obtained under stipulated conditions

Note 1 to entry: Precision is a qualitative concept. The operational definition that applies in this standard is the standard deviation.

[SOURCE: ISO 5725-1:1994, definition 3.12, modified]

3.2.8
random error
result of a measurement minus the mean that would result from an infinite number of measurements of the same measurand carried out under repeatability conditions

Note 1 to entry: Random error is equal to trueness minus systematic error.

Note 2 to entry: In practice, random error may be estimated from 20 or more repeated measurements of a measurand under specified conditions.

3.2.9
relative error
error of measurement divided by the true value of the measurement

3.2.10
repeatability
degree of alignment of two or more measurements of the same property using the same equipment and in the same environment

Note 1 to entry: Also described as: Precision under repeatability conditions or closeness of the agreement between the results of successive measurements of the same measurand carried out under the same conditions of measurement.

Note 2 to entry: Repeatability is a qualitative concept. Its quantitative counterpart is standard deviation of repeatability or coefficient of variation of repeatability of the measurement results.

[SOURCE: ISO/ASTM 52900:2015, definition 2.7.6, modified]

3.2.11
repeatability conditions
conditions where independent results of measurements are obtained with the same measurement procedure in the same laboratory by the same operator using the same equipment within short intervals of time

3.2.12
reproducibility
precision under reproducibility conditions

Note 1 to entry: Reproducibility is a qualitative concept. Its quantitative counterpart is standard deviation of reproducibility or coefficient of variation of reproducibility of the measurement results.

Note 2 to entry: Also described as: Closeness of the agreement between the results of measurements of the same measurand carried out under changed conditions of measurement.

Note 3 to entry: The set of specified condition is termed 'reproducibility conditions'.

Note 4 to entry: The changed conditions may include: principle of measurement, method of measurement, observer, measuring instrument, reference standard, location, conditions of use, time.

[SOURCE: ISO 5725-1:1994, definition 3.17, added NOTES]

3.2.13
reproducibility conditions
conditions where results of measurements are obtained on the same measurand in different laboratories with different conditions

Note 1 to entry: The different conditions should be specified.

[SOURCE: ISO 5725-1:1994, definition 3.18, modified]

3.2.14
systematic error
mean that would result from an infinite number of measurements of the same measurand carried out under repeatability conditions minus a true value of the measurand

Note 1 to entry: Systematic error is equal to trueness minus random error.

Note 2 to entry: Systematic error may be constant or proportional to the value of the measurand.

Note 3 to entry: In practice systematic error is estimated from 30 or more repeated measurements of a measurand under specified conditions.

Note 4 to entry: In many instances the systematic error is called 'bias', but the International Vocabulary of Basic and General Terms in Metrology only uses this term as a characteristic of a measuring instrument.

3.2.15
true value (of a quantity)
value consistent with the definition of a given particular quantity

Note 1 to entry: This is a value that would be obtained by a perfect measurement. True values are by nature indeterminate.

Note 2 to entry: The indefinite article 'a', rather than the definite article 'the' is used in conjunction with 'true value' because there may be many values consistent with the definition of a given particular quantity.

3.2.16
trueness
closeness of agreement between the mean obtained from a large series of results of measurement and a true value or a conventional true value

Note 1 to entry: Trueness is a qualitative concept. Its quantitative counterpart is systematic error.

3.2.17
uncertainty of measurement
parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

Note 1 to entry: The parameter may be, for example, a standard deviation (or given multiple of it), or the half-width of an interval having a stated level of confidence.

Annex A
(informative)

Flow chart of process chain for CAD/CAM-systems

Table A.1 — Flowchart of process chain for CAD/CAM-systems

Tasks	Process steps
Acquisition, measuring, filtering	Objects ↓ Scanning ↓ Digitization of raw data ↓ Data processing ↓ Scanning output
Designing	CAD input ↓ CAD data processing ↓ CAD output
Manufacturing	CAM input ↓ Data processing using CAM software ↓ Manufacturing data set ↓ Additive manufacturing process Subtractive manufacturing process ↓ CAD/CAM dental restoration

Index

systematic error 3.2.14

three dimensional data acquisition 3.1.1

three dimensional data acquisition system 3.1.2

transfer function 3.1.29

triangulation 3.1.39

true value (of a quantity) 3.2.15

trueness 3.2.16

uncertainty of measurement 3.2.17

virtual model 3.1.40

virtual model data set 3.1.41

volume data acquisition 3.1.42

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.