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**Cutting tool data representation and  
exchange —**

**Part 80:  
Creation and exchange of 3D models  
— Overview and principles**

**iTeh STANDARD PREVIEW**  
*Représentation et échange des données relatives aux outils  
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*Partie 80: Création et échange de modèles 3D — Vue d'ensemble et  
principes*

ISO/TS 13399-80:2014

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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](http://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 (see [www.iso.org/patents](http://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 29, *Small tools*.

ISO 13399 consists of the following parts, under the general title *Cutting tool data representation and exchange*:

- *Part 1: Overview, fundamental principles and general information model*
- *Part 2: Reference dictionary for the cutting items* [Technical Specification]
- *Part 3: Reference dictionary for tool items* [Technical Specification]
- *Part 4: Reference dictionary for adaptive items* [Technical Specification]
- *Part 5: Reference dictionary for assembly items* [Technical Specification]
- *Part 50: Reference dictionary for reference systems and common concepts* [Technical Specification]
- *Part 60: Reference dictionary for connection systems* [Technical Specification]
- *Part 80: Creation and exchange of 3D models — Overview and principles* [Technical Specification]
- *Part 100: Definitions, principles and methods for reference dictionaries* [Technical Specification]
- *Part 150: Usage guidelines* [Technical Specification]
- *Part 201: Creation and exchange of 3D models — Regular inserts* [Technical Specification]
- *Part 301: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of thread-cutting taps, thread-forming taps and thread-cutting dies* [Technical Specification]
- *Part 302: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of solid drills and countersinking tools* [Technical Specification]

The following parts are under preparation:

- *Part 51: Designation system for customer solution cutting tools* [Technical Specification]
- *Part 202: Creation and exchange of 3D models — Irregular inserts* [Technical Specification]
- *Part 203: Creation and exchange of 3D models — Replaceable inserts for drilling* [Technical Specification]
- *Part 204: Creation and exchange of 3D models — Inserts for reaming* [Technical Specification]
- *Part 303: Creation and exchange of 3D models — Solid end mills* [Technical Specification]
- *Part 304: Creation and exchange of 3D models — Solid milling cutter with arbor hole* [Technical Specification]
- *Part 307: Creation and exchange of 3D models — End mills for indexable inserts* [Technical Specification]
- *Part 308: Creation and exchange of 3D models — Milling cutter with arbor hole for indexable inserts* [Technical Specification]
- *Part 309: Creation and exchange of 3D models — Tool holders for indexable inserts* [Technical Specification]
- *Part 311: Creation and exchange of 3D models — Solid reamers* [Technical Specification]
- *Part 312: Creation and exchange of 3D models — Reamers for indexable inserts* [Technical Specification]
- *Part 401: Creation and exchange of 3D models — Converting, extending and reducing adaptive items* [Technical Specification]
- *Part 405: Creation and exchange of 3D models — Collets* [Technical Specification]

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## Introduction

This part of ISO 13399 defines the concept, the terms, and the definitions regarding the creation and exchange of simplified 3D of cutting items, tool items, and adaptive items that can be used for NC-programming, simulation of the manufacturing processes and the determination of collision within machining processes. It is not intended to standardize the design of the items themselves.

Cutting tool data that can be described by ISO 13399 include, but are not limited to, everything between the workpiece and the machine tool. Information about inserts, solid tools, assembled tools, adaptors, components, and their relationships can be represented by this part of ISO 13399. The increasing demand providing the end user with 3D models for the purposes defined above is the basis for the development of this series of International Standards.

The objective of ISO 13399 is to provide the means to represent the information that describes cutting tools in a computer sensible form that is independent from any particular computer system. The representation will facilitate the processing and exchange of cutting tool data within and between different software systems and computer platforms and support the application of this data in manufacturing planning, cutting operations, and the supply of tools. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and for archiving. The methods that are used for these representations are those developed by ISO TC 184, *Automation systems and integration for the representation of product data*, SC 4, *Industrial data*, by using standardized information models and reference dictionaries.

Definitions and identifications of dictionary entries are defined by means of standard data that consist of instances of the EXPRESS entity data types defined in the common dictionary schema, resulting from a joint effort between ISO TC/184/SC 4 and IEC/TC 3, *Information structures, documentation and graphical symbols*, SC 3D, *Product properties and classes and their identification*, and in its extensions defined in ISO 13584-24 and ISO 13584-25.

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# Cutting tool data representation and exchange —

## Part 80:

# Creation and exchange of 3D models — Overview and principles

## 1 Scope

This part of ISO 13399 specifies the basic principles for the creation and exchange of simplified 3D models of cutting items, tool items, and adaptive items, using related properties and domains of values.

Simplified 3D models contain the following:

- naming and defining of the basic design features of cutting items, tool items, and adaptive items, with an association to the used properties;
- naming and defining of the internal structure of the 3D model that represents the features and the properties of cutting items, tool items, and adaptive items;
- naming and defining of those elements and features that are not defined in ISO/TS 13399-50, but are necessary to design 3D models.

The following are outside the scope of this part of ISO 13399:

- applications where these standard data may be stored or referenced;
- creation and exchange of simplified 3D models for cutting tools;
- creation and exchange of simplified 3D models for tool items;
- creation and exchange of simplified 3D models for adaptive items;
- creation and exchange of simplified 3D models for assembly items and auxiliary items.

## 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/TS 13399-2, *Cutting tool data representation and exchange — Part 2: Reference dictionary for the cutting items*

ISO/TS 13399-3, *Cutting tool data representation and exchange — Part 3: Reference dictionary for tool items*

ISO/TS 13399-4, *Cutting tool data representation and exchange — Part 4: Reference dictionary for adaptive items*

ISO/TS 13399-5, *Cutting tool data representation and exchange — Part 5: Reference dictionary for assembly items*

ISO/TS 13399-50, *Cutting tool data representation and exchange — Part 50: Reference dictionary for reference systems and common concepts*

ISO/TS 13399-60, *Cutting tool data representation and exchange — Part 60: Reference dictionary for connection systems*

ISO/TS 13399-100, *Cutting tool data representation and exchange — Part 100: Definitions, principles and methods for reference dictionaries*

### 3 Designation of design elements

#### 3.1 General

The creation of 3D models shall be by means of nominal dimensions.

NOTE Some of the definitions are taken from ISO/TS 13399-50.

All designations of 3D design elements (coordinate systems, planes, axes, points, solid design elements) shall be based on the designations and preferred symbols of ISO/TS 13399-2 to ISO/TS 13399-60.

If additional properties are required, they shall be requested through the ISO 13399 Maintenance Agency as defined in ISO/TS 13399-100:2008, Annex D.

#### 3.2 Reference system

##### 3.2.1 Primary coordinate system “PCS”

The primary coordinate system, as shown in [Figure 1](#), shall consist of the following standard elements:

- right-handed rectangular Cartesian system in three-dimensional space with three principal axes labelled X, Y, and Z;
- three orthogonal planes built from the three principal axes and named “XYP”, “XZP”, and “YZP”;
- three orthogonal axes built from the planes and named “XA”, “YA”, and “ZA”.

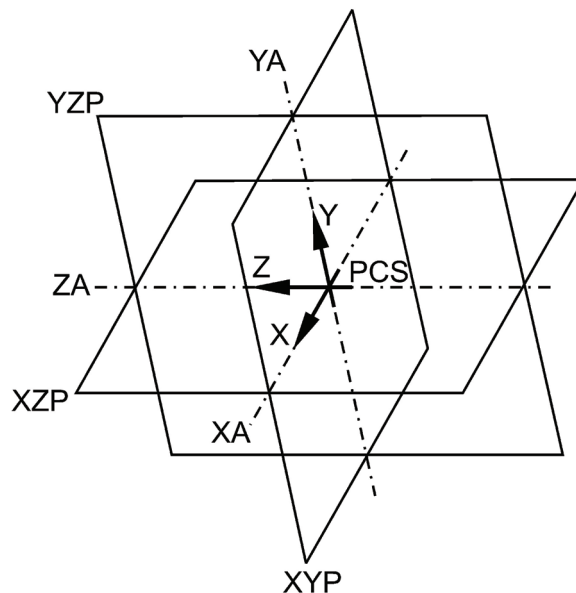


Figure 1 — Primary coordinate system “PCS”



### 3.2.2 Coordinate system workpiece side “CSW”

A single coordinate system at the workpiece side is named “coordinate system workpiece side” (CSW) and is used for the mounting of cutting tool components to build a complete cutting tool. If more than one CSW is used to assemble a complete cutting tool, the CSWs shall be indexed.

CSW is a right-handed rectangular Cartesian system in three-dimensional space with three principal axes labelled “XW”, “YW”, and “ZW”. [Figure 2](#) shows an example of CSW orientation.

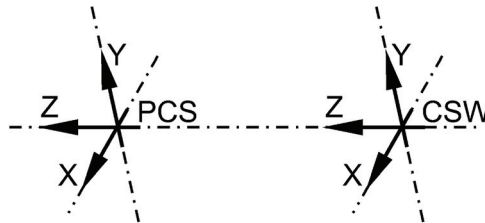


Figure 2 — Example of CSW orientation

#### Case 1: One coordinate system at the workpiece side

A single coordinate system at the workpiece side shall be designated “CSW”.

#### Case 2: One coordinate system at workpiece side on different levels

A single coordinate system on different levels shall be designated “CSW<sub>n</sub>”, e.g. “CSW1”, “CSW2”. The numbering starts at the workpiece side and ends at the machine side in the direction of the positive Z-axis. On a stepped tool, the CSW closest to the workpiece shall be on level 1, the CSW on the next stepped diameter shall be on the next level.

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#### Case 3: Multiple coordinate systems at one level and different angles

Multiple coordinate systems at one level, but different angles and not at the centre of the tool axis shall be designated “CSW<sub>n\_m</sub>”, where the “n” defines the level and the “m” defines the number of the coordinate system itself. The counting starts at the three o’clock position counting in counterclockwise direction while looking towards the machine spindle (positive Z-axis).

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#### Case 4: Multiple coordinate systems at one level, one angle and different diameters

The designation is the same as described in case 3. The counting starts at the smallest diameter.

#### Case 5: Multiple coordinate systems at multiple levels, different angles and different diameters

The designation is the same as described in case 3. The counting starts at the smallest diameter and at the three o’clock position counting in counterclockwise direction while looking towards the machine spindle (positive Z-axis).

All cases defined above are applicable to tool items, adaptive items, and cutting tools.