
**Cutting tool data representation and
exchange —**

**Part 203:
Creation and exchange of 3D models
— Replaceable inserts for drilling**

iTeh STANDARD PREVIEW
(standards.iteh.ai)
*Représentation et échange des données relatives aux outils coupants —
Partie 203: Création et échange de modèles 3D — Plaquettes
échangeables pour perçage*

ISO/TS 13399-203:2015

<https://standards.iteh.ai/catalog/standards/sist/40e420e3-179a-42b1-8d3e-51853049f5eb/iso-ts-13399-203-2015>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/TS 13399-203:2015

<https://standards.iteh.ai/catalog/standards/sist/40e420e3-179a-42b1-8d3e-51853049f5eb/iso-ts-13399-203-2015>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	vi
1 Scope	1
2 Normative references	1
3 Starting element, coordinate systems planes	1
3.1 General.....	1
3.2 Reference system.....	2
3.3 Mounting coordinate system ("MCS").....	2
3.4 Coordinate system at the cutting part.....	3
3.5 Planes.....	4
3.6 Cutting reference point (CRP).....	4
4 Design of the model	5
4.1 Necessary parameters for the connection interface feature.....	5
5 Replaceable insert with chip flute	6
5.1 General.....	6
5.2 Necessary properties.....	6
5.3 Structure of the basic geometry.....	6
6 Replaceable insert, flat	8
6.1 General.....	8
6.2 Necessary properties.....	9
6.3 Structure of the basic geometry.....	9
7 Replaceable insert flattened with chip flute	11
7.1 General.....	11
7.2 Necessary properties.....	11
7.3 Structure of the basic geometry.....	11
8 Design of details	13
8.1 Basics for modelling.....	13
8.2 Contact/clamping surfaces — Orientation.....	13
8.3 Chamfers, rounding, others.....	13
9 Attributes of surfaces — Visualization of the model features	14
10 Structure of the design elements (tree of model)	14
11 Data exchange model	15
Bibliography	16

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).

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).

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 \(standards.iteh.ai\)](http://Foreword - Supplementary information (standards.iteh.ai))

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 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 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 70: Graphical data layout — Layer settings for tool designs* [Technical Specification]
- *Part 71: Graphical data layout — Creation of documents for the standardized data exchange — Graphical product information* [Technical Specification]
- *Part 72: Creation of documents for the standardized data exchange — Definition of properties for drawing header and their XML-data exchange* [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 cutters 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]

The designation system for customer solution cutting tools is to form the subject of a future Part 51.

Introduction

This part of ISO 13399 defines the concept, terms and definitions regarding the creation and exchange of simplified 3D models of replaceable inserts for drilling that can be used with 3D models of cutting tools for NC-programming, simulation of manufacturing processes and the collision determination within machining processes. It is not intended to standardize the design of the replaceable insert for drilling itself, nor the cutting tool.

A replaceable insert for drilling is used in combination with a cutting tool in a machine to remove material from a workpiece by a shearing action at the cutting edges of the tool. 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 for providing the end-user with 3D models for the purposes defined above is the basis for the development of this ISO 13399 series.

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/SC 4 for the representation of product 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 and in its extensions defined in ISO 13584-24 and ISO 13584-25.

<https://standards.iteh.ai/catalog/standards/sist/40e420e3-179a-42b1-8d3e-51853049f5eb/iso-ts-13399-203-2015>

Cutting tool data representation and exchange —

Part 203:

Creation and exchange of 3D models — Replaceable inserts for drilling

1 Scope

This part of ISO 13399 specifies a concept for the design of cutting items, limited to any kind of replaceable inserts for drilling, using related properties and domains of values.

This part of ISO 13399 specifies a common way of designing simplified models that contain the following:

- definitions and identification of the design features of replaceable inserts for drilling, with a link to the properties used;
- definitions and identification of the internal structure of the 3D model that represents the features and properties of replaceable inserts for drilling;

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 other cutting items not described in this part of ISO 13399;
- 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 13399-80, *Cutting tool data representation and exchange — Part 80: Creation and exchange of 3D models — Overview and principles*

3 Starting element, coordinate systems planes

3.1 General

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

WARNING — There is no guarantee that the 3D model, created according to the methods described in this part of ISO 13399, is a true representation of the physical tool supplied by the tool

manufacturer. If the models are used for simulation purposes, e.g. CAM simulation, it shall be taken into consideration that the real product dimensions can differ from those nominal dimensions.

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

3.2 Reference system

The reference system consists of the following standard elements:

- **standard coordinate system:** right-handed rectangular Cartesian system in three-dimensional space, called “primary coordinate system” (PCS);
- **three orthogonal planes:** planes in the coordinate system that contain the axes of the system, named “XY plane” (XYP), “XZ plane” (XZP) and “YZ plane” (YZP);
- **three orthogonal axes:** axes built as intersections of the three orthogonal plane lines respectively, named “x-axis” (XA), “y-axis” (YA) and “z-axis” (ZA).

The primary coordinate system, which determines the insert position in space is shown in [Figure 1](#).

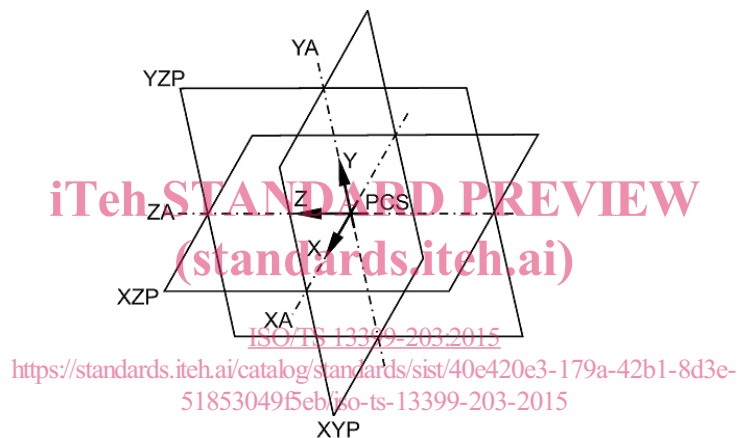


Figure 1 — Reference system “PCS”

3.3 Mounting coordinate system (“MCS”)

For virtually mounting of replaceable inserts for drilling onto a tool item, an additional reference system shall be defined. This reference system is called “mounting coordinate system” (MCS). Its location and orientation are shown in [Figures 2](#) and [3](#) and are defined as follows:

- z-axis of MCS is collinear with the z-axis of PCS;
- x-axis of MCS is parallel to the x-axis of PCS;
- y-axis of MCS is parallel to the y-axis of PCS.

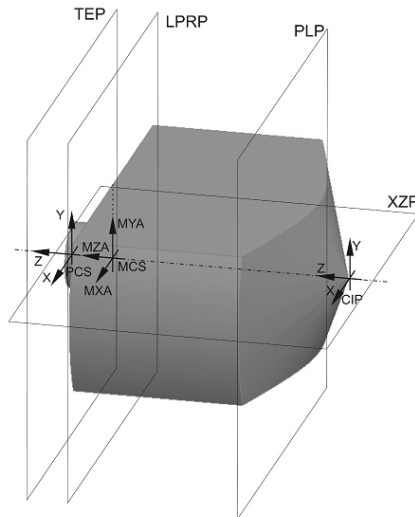


Figure 2 — Incongruent PCS and MCS

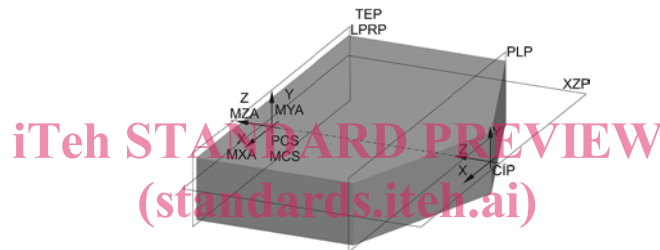


Figure 3 — Congruent PCS and MCS systems

ISO/TS 13399-203:2015

<https://standards.iteh.ai/catalog/standards/sist/43993303-4281-813e-51853049f5eb/iso-ts-13399-203-2015>

3.4 Coordinate system at the cutting part

The coordinate system at the cutting part, i.e. at the drill point, is named “coordinate system in process” (CIP), and is oriented with a defined distance to the PCS as indicated in Figure 4 and as follows:

- z-axis of CIP points to the PCS;
- z-axis of CIP is collinear to z-axis of PCS;
- y-axis of CIP is parallel to the y-axis of PCS.

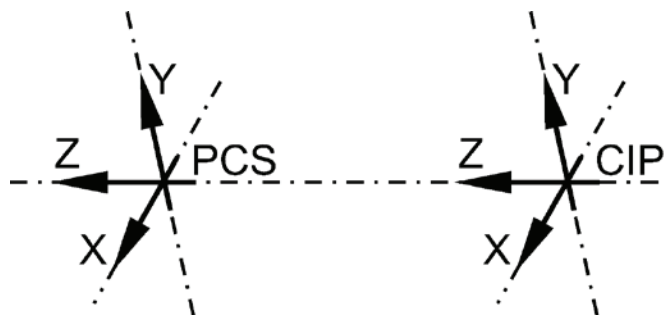


Figure 4 — Orientation of CIP

NOTE If the 3D modelling software gives the possibility to include interfaces for components, e.g. to mount a centre drill onto a complete cutting tool, it is advised to use the coordinate system “CIP”. If necessary, another designation can be given to the interface of the component (dependent on the software). This name is “CSIF” (for “coordinate system interface”) and includes the coordinate system “CIP”.

3.5 Planes

The modelling shall take place based on planes according to [Figure 3](#), which are used as reference, if applicable. Therefore, it is possible to vary the model or to suppress single features of independent design features by means of changing the value of one or more parameter of the model design. Furthermore, the identification of the different areas is simplified in using the plane concept, even if they contact each other with the same size, e.g. chip flute, shank.

The independency of the design features requires a precise check of the single elements, especially on drills with multiple diameters.

For the 3D visualization of drilling and countersinking tools with non-indexable cutting edges, the planes shall be determined as indicated in [Figure 5](#) and as follows:

- “LPRP” plane for the protruding length (LPR); based on “CIP”;
- “LFP” plane for the distance between the MCS and the point that forms the full cutting diameter, measured parallel to the tool axis; based on MCS;
- “TEP” (tool end plane) plane for the overall length (OAL); based on “CIP”.

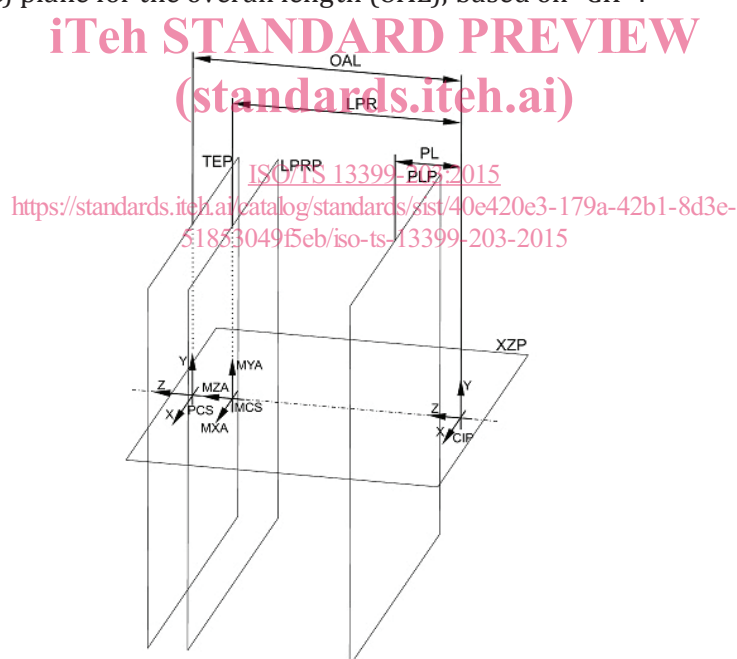


Figure 5 — Planes for design

3.6 Cutting reference point (CRP)

For the design of the point or chisel edge, the cutting reference point shall be defined. The point shall be defined as the theoretical cutting edge in the XZ plane of the “PCS”. Therefore, it shall always be referenced to the cutting diameter, see [Figure 6](#).

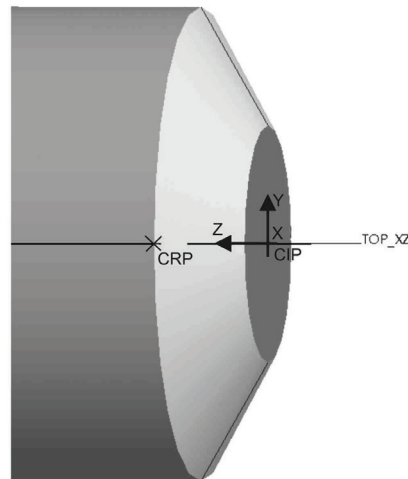


Figure 6 — Position of the cutting reference point “CRP”

4 Design of the model

The sketches and contours of the crude geometry shall not contain any details, such as grooves, chamfers, rounding. These details shall be designed as separate design features after the design of the crude geometry and therefore they shall be named precision geometry.

The order of the structure of the model shall be determined by means of the state of the technology of the CAD systems. It shall be waived on references between the design components of the cutting and non-cutting part.

Replaceable inserts for drilling shall be built as rotational symmetric design elements based on properties in accordance with ISO/TS 13399-2:

- geometry of the cutting part
- geometry of the non-cutting part, including the connection interface, if applicable

NOTE 1 The basic shapes of replaceable inserts for drilling is designed with the PCS.

NOTE 2 The total amount of design elements is focused on the depth of modelling and the complexity of the cutting tool.

Within the following clauses, the specified structure of the model of the defined basic shapes of drilling and countersinking tools shall be described.

4.1 Necessary parameters for the connection interface feature

Information about the connection interface code shall be filed as properties within the model and being named as parameters as indicated in Table 1.

Table 1 — Parameter list for insert interface feature

Preferred symbol	Description	Source of symbol	ISO-ID number
IIC	insert interface code	ISO/TS 13399-2	71CE7A9936610

NOTE The information above and other relevant properties is incorporated into the model as parameters or is taken as a separate file.