TECHNICAL SPECIFICATION

ISO/TS 13399-314

First edition
2018-08

Cutting tool data representation and exchange —

Part 314: Creation and exchange of 3D models — Cartridges for indexable inserts

Représentation et échange des données relatives aux outils coupants —

Partie 314: Création et échanges de modèles 3D — Cartouches pour plaquettes amovibles

Reference number
ISO/TS 13399-314:2018(E)

COPYRIGHT PROTECTED DOCUMENT

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

Published in Switzerland

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 (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 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 29, *Small tools*.

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.

A list of all parts in the ISO 13399 series can be found on the ISO website.

Introduction

This document defines the concept of how to design simplified 3D models of cartridges for indexable inserts 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 cutting tool itself.

A cutting tool is used 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 the ISO 13399 series 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 document. The increasing demand providing the end user with 3D models for the purposes defined above is the basis for the development of the ISO 13399 series.

The objective of the ISO 13399 series 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*, SC 4 *Industrial data,* 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/SC 3D *Product properties and classes and their identification*, and in its extensions defined in ISO 13584-24 and ISO 13584-25.

Cutting tool data representation and exchange —

Part 314: Creation and exchange of 3D models — Cartridges for indexable inserts

1 Scope

This document specifies a concept for the design of tool items, limited to any kind of cartridges for indexable inserts, together with the usage of the related properties and domains of values.

This document specifies the requirements of simplified 3D models for data exchange of cartridges for indexable inserts.

The following are outside the scope of this document:

— applications where these standard data may be stored or referenced;

— concept of 3D models for cutting tools;

— concept of 3D models for cutting items;

— concept of 3D models for other tool items not described in the scope of this document;

— concept of 3D models for adaptive items;

— concept of 3D models for assembly items and auxiliary items.

2 Normative references

The following referenced documents are indispensable for the application 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/TS 13399-50, *Cutting tool data representation and exchange — Part 50: Reference dictionary for reference systems and common concepts*

ISO/TS 13399-80, *Cutting tool data representation and exchange — Part 80: Creation and exchange of 3D models — Overview and principles*

ISO/TS 13399-201, *Cutting tool data representation and exchange — Part 201: Creation and exchange of 3D models — Regular inserts*

3 Terms and definitions

No terms and definitions are listed in this document.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Starting elements, coordinate systems, planes

4.1 General

The modelling of the 3D models shall be done by means of nominal dimensions. Some examples of nominal dimensions are given in Annex B. Deviations within the tolerances are allowed.

WARNING — There is no guarantee that the 3D model, created according to the methods described in this document, 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.

4.2 Reference system (PCS — Primary coordinate system)

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

The reference system consists of the following standard elements as shown in Figure 1:

— **standard coordinate system:** right-handed rectangular Cartesian system in three dimensional space, called "primary coordinate system" (PCS);

— **3 orthogonal planes:** planes in the coordinate system that contain the axis of the system, named "xy-plane" (XYP), "xz-plane" (XZP) and "yz-plane" (YZP);

— **3 orthogonal axis:** axes built as intersections of the 3 orthogonal planes lines respectively, named "x-axis" (XA), "y-axis" (YA) and "z-axis" (ZA).

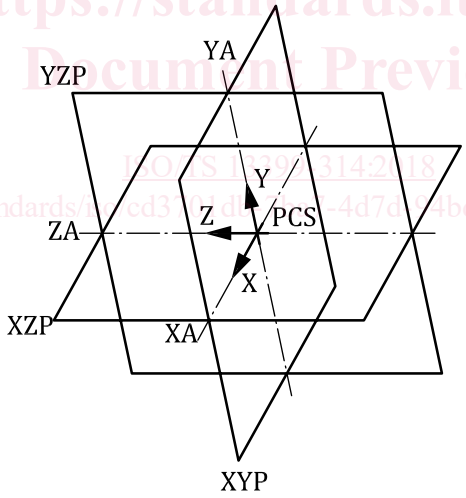

Figure 1 — Primary coordinate system

4.3 Tool item position

4.3.1 General

The definition of the tool position in 4.3.2 applies to right-handed tools. Left-hand items are as defined for right-hand items but mirrored through the YZ-plane, as specified in Annex A.

4.3.2 Prismatic tool position

A prismatic tool position identifies the location on the coordinate reference system of a turning tool with planar sides and a rectangular cross-section as illustrated in Figure 2:

— the base of the tool item shall be coplanar with the XZ-plane;

— the normal for the base of the item shall be in the -Y direction;

— the rear backing surface shall be coplanar with the YZ-plane;

— the normal for the rear backing surface shall be in the X direction;

— the end of the item shall be coplanar with the XY-plane;

— the normal for the end of the item shall be in the Z direction;

— the rake face of the primary cutting item shall be completely visible in the -X-Z quadrant;

— for cartridges, the top of the axial adjustment screw shall be coincident with XY-plane.

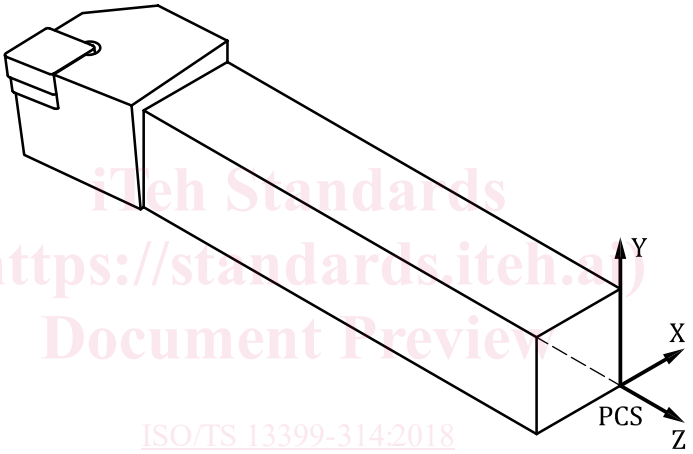

Figure 2 — Prismatic tool position

4.4 Planes

The modelling shall take place based on planes according to Figure 3, if applicable. Therefore, the model shall be able to vary, or single features of independent design features shall be deleted by means of changing the value of one or more parameter of the model design. Furthermore, the identification of the different areas shall be simplified in using the plane concept, even if they contact each other with the same size, e.g. chip flute, shank.

For the 3D visualization of cartridges for indexable inserts, the general planes shall be determined as follows:

— "CDP" — cutting depth plane: plane for the maximum cutting depth (CDX); based on "HEP";

— "HEP" — head end plane: plane for most front point of the tool; based on either LPR for tools with gauge line or contact surface or OAL for tools without gauge plane or contact surface;

— "HFP" — functional height plane: plane for the functional height (HF); based on XZ plane of PCS;

— "LSP" — shank length plane: plane for the shank length (LS); based on XY plane of PCS;

— "LFP" — functional length plane: plane for the functional length (LF); based on XY plane of PCS;

— "LHP" — head length plane: plane for the head length (LH); based on "HEP";

— "TCEP" — tool cutting edge plane: plane perpendicular to the XY plane of a master insert through its major cutting edge;

— "TEP" — tool end plane: the tool end plane is located at that end of the connection that points away from the workpiece – if the tool does not have a contact surface and/or a gauge line the TEP is coplanar with the XY-plane of the PCS. The overall length (OAL) is the distance between HEP and TEP;

— "TFP" — tool feed plane: plane perpendicular to the XZ plane that is parallel to the primary feed direction of the tool and that is tangential to the cutting corner of the master insert;

— "TRP" — tool rake plane: plane that contains the cutting edges of a master insert;

— "TSP" — theoretical sharp point: the intersection in the tool rake plane of the two planes that are perpendicular to the XY plane of the master insert through the major and minor cutting edges of the master insert;

— "WFP" — plane for the functional width (WF); based on YZ plane of PCS.

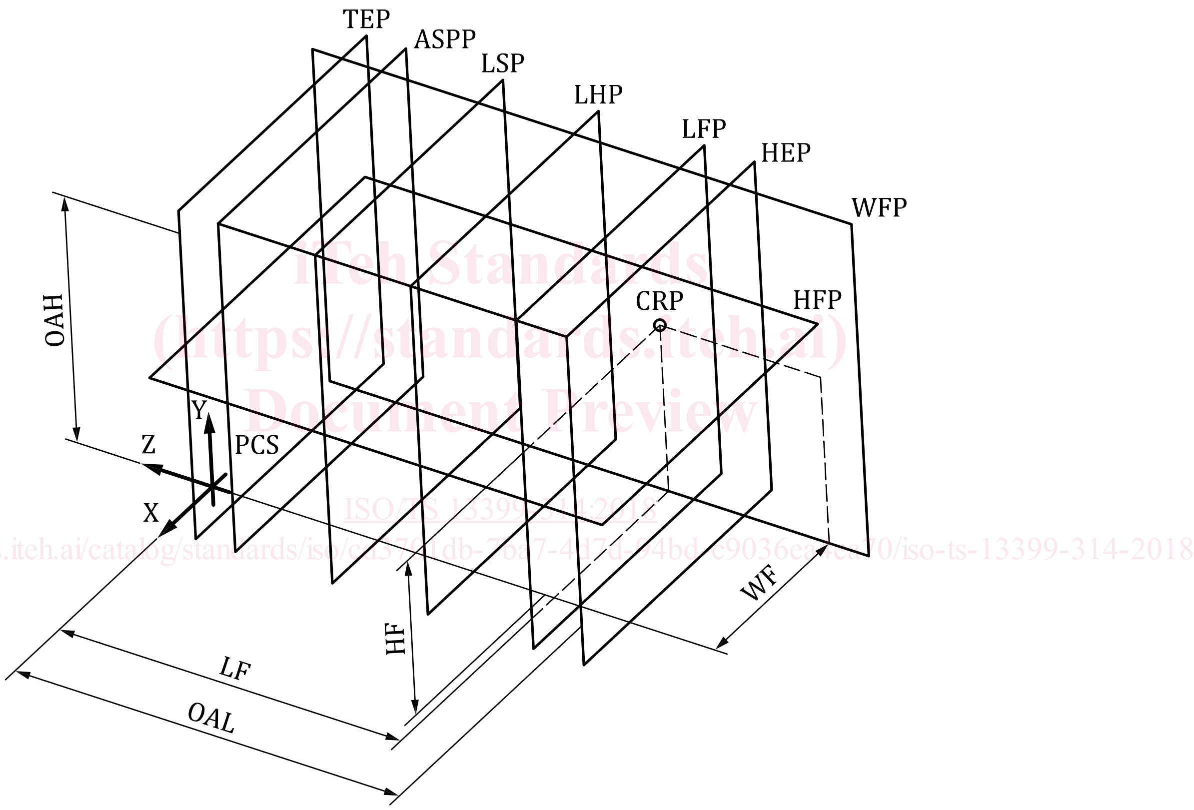

Figure 3 — Determination of the planes

4.5 Cutting reference point (CRP)

The cutting reference point is the theoretical point of the cutting tool from which the major functional dimensions are taken.

For the calculation of this point, the following cases apply.

Case 1: For a tool cutting edge angle less than or equal to 90°, the point is the intersection of **TCEP**, **TFP** and **TRP**. See Figures 4 and 5.

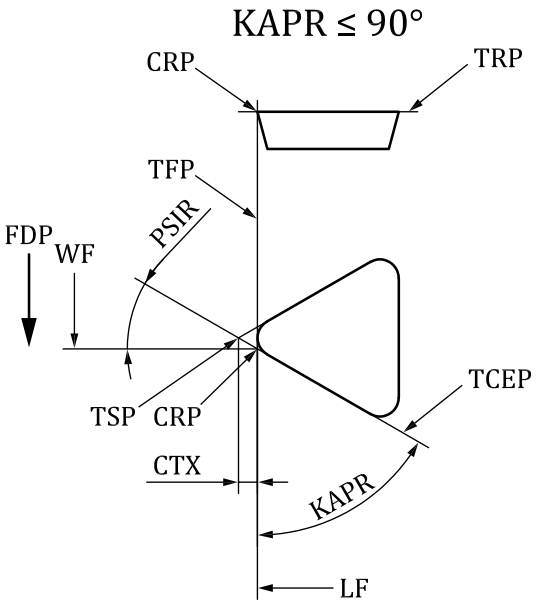

Figure 4 — Feed direction perpendicular to tool axis — KAPR ≤ 90°

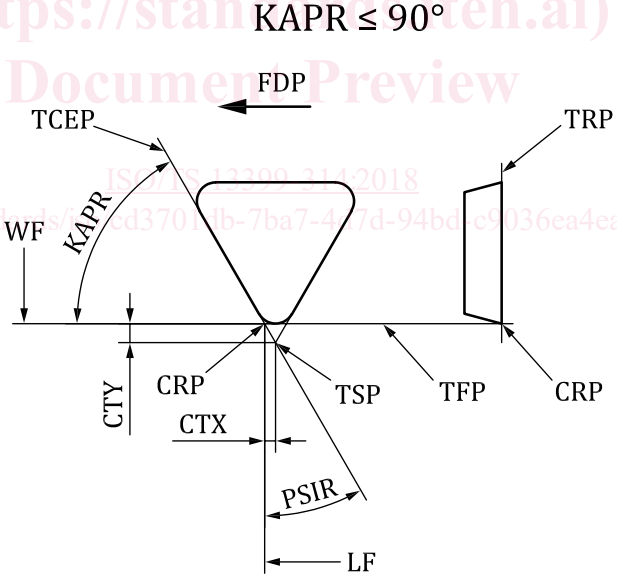

Figure 5 — Feed direction parallel to tool axis — KAPR ≤ 90°