
**Cutting tool data representation and
exchange —**

**Part 50:
Reference dictionary for reference
systems and common concepts**

iTeh STANDARD PREVIEW
*Représentation et échange des données relatives aux outils coupants —
Partie 50: Dictionnaire de référence pour les systèmes de coordonnées
et les concepts communs*
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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC 29, *Small Tools*.

This second edition cancels and replaces the first edition (ISO/TS 13399-50:2007), which has been technically revised.

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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 100: Definitions, principles and methods for reference dictionaries* [Technical Specification]
- *Part 150: Usage guidelines* [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*

- Part 80: Concept for the design of 3D models based on properties according to ISO/TS 13399: Overview and principles [Technical Specification]
- Part 201: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of regular inserts [Technical Specification]
- Part 202: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of irregular inserts [Technical Specification]
- Part 203: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of exchangeable inserts for drilling [Technical Specification]
- Part 204: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of inserts for reaming [Technical Specification]
- Part 303: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of end mills with non-indexable cutting edges [Technical Specification]
- Part 304: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of milling cutters with arbor hole and non-indexable cutting edges [Technical Specification]
- Part 307: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of end mills for indexable inserts [Technical Specification]
- Part 308: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of milling cutter with arbor hole for indexable inserts [Technical Specification]
- Part 309: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Tool holders for indexable inserts [Technical Specification]
- Part 311: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of solid reamers [Technical Specification]
- Part 312: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of reamers for indexable inserts [Technical Specification]
- Part 401: Concept for the design of 3D models based on properties according to ISO/TS 13399-4: Modelling of converting, extending and reducing adaptive items [Technical Specification]
- Part 405: Concept for the design of 3D models based on properties according to ISO/TS 13399-4: Modelling of collets [Technical Specification]

Introduction

This part of ISO 13399 defines the terms, properties and definitions for connection systems, coordinate reference systems and other features and characteristics that are shared with several components of a cutting tool with defined cutting edges. The purpose of this part of ISO 13399 is to provide a reference dictionary to support the use of the general information model defined in ISO 13399-1.

A cutting tool with defined cutting edges is used on 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 (all parts) include, but are not limited to, everything between the workpiece and the machine tool. Information about inserts,¹⁾ solid tools,²⁾ assembled tools,³⁾ adaptors,⁴⁾ components⁵⁾ and their relationships can be represented by this part of ISO 13399. Possible assemblies of the components of a cutting tool are illustrated in [Figure 1](#).

The objective of ISO 13399 (all parts) 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. This representation will facilitate the processing and exchange of cutting tool data within and among different software systems and computer platforms and support the application of these 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 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.

An information model is a formal specification of types of ideas, facts and processes, which together describe a portion of interests of the real world and which provides an explicit set of interpretation rules. Information is knowledge of ideas, facts and/or processes. Data are symbols or functions that represent information for processing purposes. Data are interpreted to extract information by using rules for how that should be done and a dictionary to define the terms that identify the data. Everyone in a communication process is expected to use the same information model, the same set of explicit rules and the same dictionary in order to avoid misunderstanding. If an information model and its dictionary are written in a computer-sensible language, then there is the additional benefit that they can be computer processable.

An engineering information model is therefore a specification for data that establishes the meaning of that data in a particular engineering context. A model has to be developed by formal methods to ensure that it meets the needs of the situation that it represents. An engineering information model defines: the information objects that represent the concepts in an engineering application, the attributes of the objects, their relationships and the constraints that add further meaning. An information model is an abstract concept that can be used repeatedly for any example of the real-world situation that it represents. An instance of the model is produced when it is populated with the data items and their values that are applicable to a particular example of that situation.

This part of ISO 13399 uses the following International Standards developed by ISO/TC 184/SC 4:

- a) the EXPRESS language defined in ISO 10303-11 for defining the information model;
- b) the file format for data exchange derived from the model and defined in ISO 10303-21;
- c) the data dictionary defined in the ISO 13584 series.

-
- 1) For example regular and irregular shaped replaceable cutting items.
 - 2) For example solid drill and endmill.
 - 3) For example boring bars, indexable drills and indexable milling cutters.
 - 4) For example milling arbor and drilling chuck.
 - 5) For example shims, screws and clamps.

The ISO 13399 series is intended for use by tool producers and vendors, manufacturers, and developers of manufacturing software, among others. ISO 13399 provides a common structure for exchanging data about cutting tools with defined cutting edges. The ISO 13399 series is intended to provide for, or improve, several manufacturing activities, including

- the integration and sharing of data for cutting tools and assemblies between different stages for the manufacturing cycle and between different software applications,
- the direct import of data from cutting tool suppliers into a customer's database, and
- the management of cutting tool information from multiple sources and for multiple applications.

Different companies use different business models to determine their need for the communication of information about their products. For example, one cutting tool manufacturer could regrind its customers' tools while another could allow its customers to do the regrinding and provide the information to enable them to do so. Therefore, the two cutting tool manufacturers could have a different set of cutting tool properties to communicate using the information model and dictionaries provided in ISO 13399.

ISO 13399 defines only that information which could be communicated; it does not specify what information shall be communicated.

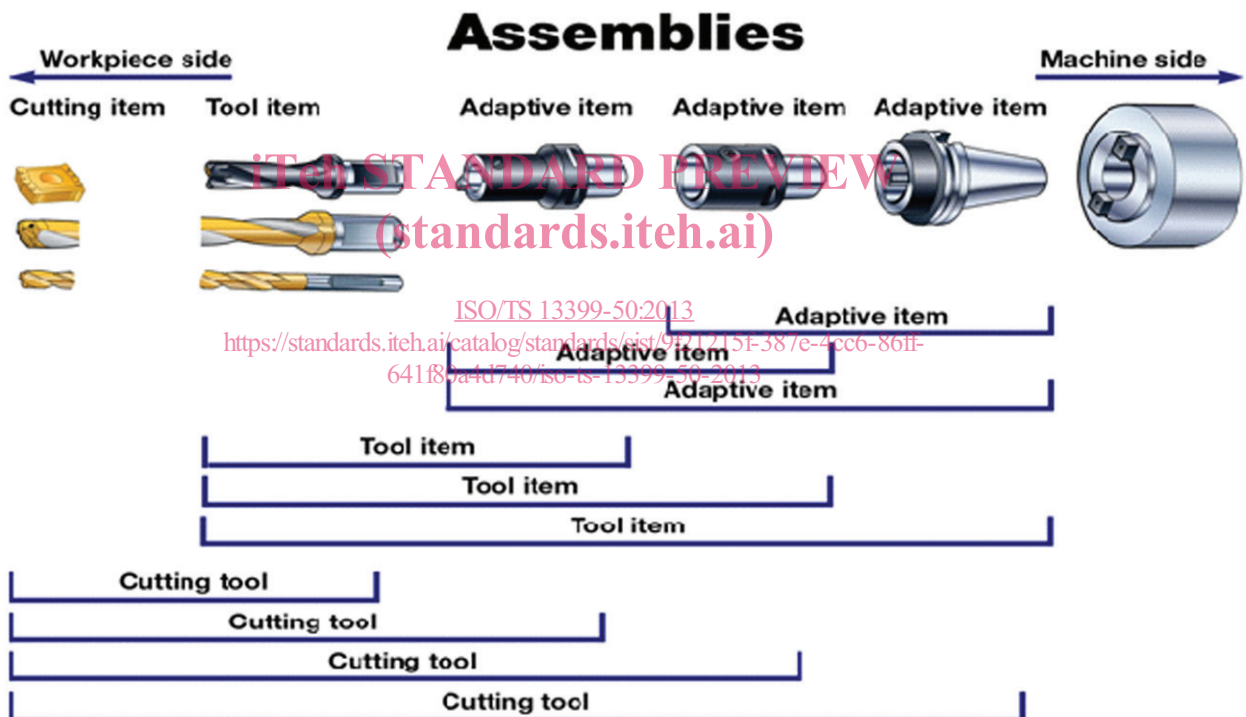


Figure 1 — Possible assemblies of components of a cutting tool

Since the content of those dictionaries evolves according to industrial innovations and constant improvement of technology in cutting tools, a Maintenance Agency has been established for the purposes of:

- correcting errors in the entries of existing classes and properties;
- adding new properties to existing classes;
- adding new classes and their properties;
- managing the status of those properties and classes;
- migrating the dictionary to subsequent editions of ISO 13399 (all parts).

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The secretariat of this Maintenance Agency has been assigned to

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by the ISO Technical Management Board.

The website of the Maintenance Agency is available at: http://www.unm.fr/main/core.php?pag_id=135

The reference dictionaries are available in the form of EXPRESS files on the website of the Maintenance Agency. These files are considered complementary to this part of ISO 13399; they can be freely downloaded and used for cutting tool data representation and exchange.

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Cutting tool data representation and exchange —

Part 50:

Reference dictionary for reference systems and common concepts

1 Scope

This part of ISO 13399 specifies a reference dictionary for reference systems for cutting tools, together with their descriptive properties and domains of values.

This part of ISO 13399 specifies a reference dictionary containing:

- definitions and identifications of the classes of reference systems for cutting tools, with an associated classification scheme;
- definitions and identifications of the data element types that represent the properties of reference systems for cutting tools;
- definitions and identifications of domains of values for describing the above-mentioned data element types.

Each class, property or domain of values of this application domain constitutes an entry of the reference dictionary defined in this part of ISO 13399. It is associated with a computer-sensible and human-readable definition, and with a computer-sensible identification. Identification of a dictionary entry allows unambiguous reference to it from any application that implements the information model defined in ISO 13399-1.

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 SC3D, and in its extensions defined in ISO 13584-24 and ISO 13584-25.

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

- standard data that represent the various classes of connection systems for cutting tools;
- standard data that represent the various properties of connection systems for cutting tools;
- standard data that represent domains of values used for properties of connection systems for cutting tools;
- standard data that represent the various classes of reference systems for cutting tools;
- standard data that represent the various properties of reference systems for cutting tools;
- standard data that represent domains of values used for properties of reference systems for cutting tools;
- one implementation method by which the standard data defined in this part of ISO 13399 can be exchanged.

NOTE 1 The implementation method by which the standard data defined in this part of ISO 13399 can be exchanged is specified in ISO 10303-21.

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

- applications where these standard data might be stored or referenced;
- implementation methods other than the one defined in this part of ISO 13399 by which the standard data might be exchanged and referenced;
- information model for cutting tools;
- definitions of classes and properties for cutting items;
- definitions of classes and properties for tool items;
- definitions of classes and properties for assembly items.
- definitions of classes and properties for connection systems for cutting tools.

NOTE 2 The information model for cutting tools is defined in ISO 13399-1.

NOTE 3 The definitions of classes and properties for cutting items, tool items, adaptive items, assembly items and connection systems are provided in ISO/TS 13399-2, ISO/TS 13399-3, ISO/TS 13399-4, ISO/TS 13399-5 and ISO/TS 13399-60, respectively.

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 1832:2012, *Indexable inserts for cutting tools — Designation*

ISO 3002-1, *Basic quantities in cutting and grinding — Part 1: Geometry of the active part of cutting tools — General terms, reference systems, tool and working angles, chip breakers*

ISO 13399-1:2006, *Cutting tool data representation and exchange — Part 1: Overview, fundamental principles and general information model*

ISO/TS 13399-2:2014, *Cutting tool data representation and exchange — Part 2: Reference dictionary for cutting items*

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

ISO 13584-1, *Industrial automation systems and integration — Parts library — Part 1: Overview and fundamental principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 13399-100 (structure and contents of the dictionary) and the following apply.

NOTE The main collection of the terms and their definitions, which relate to adaptive items and their properties, is provided in [Annexes B](#) to [D](#).

3.1 applicable property

property that is defined for some family of items and that shall apply to any member of this family

[SOURCE: ISO 13584-24:2003, 3.3]

3.2**basic semantic unit**

entity that provides an absolute and universally unique identification of a certain object of the application domain that is represented as a dictionary element

[SOURCE: ISO 13584-42:2010, 3.4]

3.3**chip**

material removed from a workpiece by a cutting process

[SOURCE: ISO/TS 13399-2:2014, 3.3]

3.4**cutting tool**

device or assembly of items for removing workpiece material through a shearing action at the defined cutting edge or edges of the device

Note 1 to entry: A cutting tool could be an assembly of one or more adaptive items a tool item and several cutting items on a tool item. See [Figure 1](#).

[SOURCE: ISO 13399-1:2006, 3.1]

3.5**data**

formal representation of facts, concepts or instructions suitable for communication, interpretation or processing by human beings or by computers

[SOURCE: ISO 10303-1:1994, 3.2.14, modified — The definition has been amended.]

3.6**data element type**

unit of data for which the identification, description and value representation have been specified

[SOURCE: ISO 13584-42:2010, 3.13]

3.7**data exchange**

storing, accessing, transferring and archiving of data

[SOURCE: ISO 10303-1:1994, 3.2.15]

3.8**data type**

domain of values

[SOURCE: ISO 10303-11:2004, 3.3.5]

3.9**dictionary**

table consisting of a series of entries with one meaning corresponding to each entry in the dictionary and one dictionary entry identifying a single meaning

[SOURCE: ISO 13584-511:2006, 3.1.9, modified — The definition has been amended from two sentences to one.]

Note 1 to entry: In the ISO 13399 series, a dictionary is a formal and computer-sensible representation of an ontology.

**3.10
entity**

class of information defined by its attributes that establishes a domain of values defined by common attributes and constraints

[SOURCE: ISO/TS 13399-2:2014, 3.10]

**3.11
entity data type**

representation of an entity

[SOURCE: ISO 13399-2:2014, 3.11]

**3.12
entity instance**

named unit of data that represents a unit of information within the class defined by an entity

Note 1 to entry: An entity instance is a member of the domain established by an entity data type.

[SOURCE: ISO/TS 13399-2:2014, 3.12]

**3.13
family of products**

set of products represented by the same characterization class

[SOURCE: ISO 13584-42:2010, 3.16]

**3.14
implementation method**

means for computers to exchange data

[SOURCE: ISO 13399-2:2014, 3.15]

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**3.15
information**

facts, concepts or instructions

[SOURCE: ISO 10303-1:1994, 3.2.20]

**3.16
information model**

formal model of a bounded set of facts, concepts or instructions to meet a specific requirement

[SOURCE: ISO 10303-1:1994, 3.2.21]

**3.17
machine side**

identification of a direction pointing towards the machine

**3.18
machined surface**

desired surface produced by the action of the cutting tool

[SOURCE: ISO 3002-1:1982, 3.1.2]

**3.19
ontology**

explicit and consensual specification of concepts of an application domain independent of any use of these concepts

[SOURCE: ISO 13584-511, 2006, 3.1.20]

Note 1 to entry: In the ISO 13399 series, a dictionary is the formal and computer-sensible representation of an ontology.

3.20**property**

defined parameter suitable for the description and differentiation of products

[SOURCE: ISO 13584-42:2010, 3.37]

3.21**visible property**

property that has a definition meaningful in the scope of a given characterization class, but that does not necessarily apply to the various products belonging to this class

[SOURCE: ISO 13584-42:2010, 3.46]

3.22**workpiece**

object on which a cutting action is performed

[SOURCE: ISO/TS 13399-2:2014, 3.24]

3.23**workpiece side**

identification of a direction pointing towards the workpiece

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

BSU basic semantic unit

DET data element type

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5 Representation of the ontology concepts as dictionary entries**5.1 General**

In the following subclauses, a concept in the ontology is identified by a name in lower-case characters. The name of a class that represents the concept in the dictionary is identified by bold, lower-case characters with multiple words linked by an underscore character.

EXAMPLE “chamfer” is the name of a concept in the ontology. Therefore, “chamfer” is the identifier of the class in the dictionary that represents the concept.

Each classified item in the following subclauses is associated with its definition from the dictionary.

Each entry in the dictionary, either a class or a property, is identified with a numerical code (BSU) that is generated at random when the dictionary is compiled. A BSU may be made unique by the addition of a code, which is a reference to the supplier of the dictionary.

The structure of the classification is summarized in [Annex B](#). The complete definitions of the classes in this part of ISO 13399 are provided in [Annex C](#). The properties applicable to these classes are defined in [Annex D](#).

5.2 Common concepts

The following subclauses identify and define features of cutting tools shared between several types of components of the cutting tool.

5.2.1 adjustment

An **adjustment** is a device for making an alteration to achieve a different position.

adjustment has the following subclasses:

- adjustment axial;
- adjustment radial.

5.2.1.1 adjustment_axial

An **adjustment_axial** is a device for making an alteration to achieve a different position in a direction parallel to the longitudinal axis of a component.

5.2.1.2 adjustment_radial

An **adjustment_radial** is a device for making an alteration to achieve a different position in a direction perpendicular to the longitudinal axis of the component.

5.2.1.3 bolt_hole_circle

A **bolt_hole_circle** is an arrangement of holes in a circle to enable a bolted connection.

5.2.2 Coolant_supply

A **coolant_supply** is a system of channels to supply a fluid to reduce the temperature of the cutting operation.

NOTE The fluid could be a liquid or a gas.

5.2.3 Cutting_operation <https://standards.iteh.ai/catalog/standards/sist/9f21215f-387e-4cc6-86ff-641f80a4d740/iso-ts-13399-50-2013>

A **cutting_operation** is a generic family of actions, which remove material from a workpiece. The actions included in the generic class are not exclusive and other actions are possible. The intention of the ISO 13399 series is to avoid, if possible, the association of a particular type of tool with a particular cutting operation. These concepts are included in the dictionary so that they can be referenced from the information model defined in ISO 13399-1. **Cutting_operation** has the following simple subclasses:

- Boring;
- broaching circular;
- broaching linear;
- counterboring;
- countersinking;
- drilling;
- drilling deep hole;
- drilling step;
- grooving;
- milling face;
- milling profile;
- milling shoulder;

- milling slot;
- parting;
- reaming cylindrical;
- reaming profile;
- slitting;
- threading external;
- threading internal;
- trepanning;
- turning external;
- turning internal.

5.2.3.1 boring

Changing the diameter of an existing hole in a workpiece with one or more passes of a cutting tool.

5.2.3.2 broaching_circular

Changing the dimensions of an existing surface profile by a single circular motion of a cutting tool.

5.2.3.3 broaching_linear (standards.iteh.ai)

Changing the dimensions of an existing surface profile by a single linear motion of a cutting tool.

5.2.3.4 counterboring

Creating an enlarged section of a hole to provide concentric holes with the transitory shoulder between the holes at 90° to the axis of the holes.

5.2.3.5 countersinking

Creating an enlarged section of a hole to provide concentric holes with the transitory shoulder between the holes at an angle to the axis of the holes.

5.2.3.6 drilling

Creating a new cylindrical hole in a workpiece where the depth of the hole is normally less than 10 times the diameter of the hole.

NOTE Either the cutting tool or the workpiece can rotate.

5.2.3.7 drilling_deep_hole

Creating a new cylindrical hole in a workpiece where the depth of the hole is normally more than 10 times the diameter of the hole.

5.2.3.8 drilling_step

Creating a new hole with more than one diameter by a single operation.