
Cutting tool data representation and exchange —

Part 2: Reference dictionary for the cutting items

iTeh STANDARD PREVIEW
*Représentation et échange des données relatives aux outils
coupants —
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Partie 2: Dictionnaire de référence pour les éléments coupants*

ISO/TS 13399-2:2014

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Contents

	Page
Foreword	iv
Introduction	vi
1 Scope	1
2 Normative references	2
3 Terms and definitions	2
4 Abbreviated terms	5
5 Representation of the ontological concepts as dictionary entries	5
5.1 General	5
5.2 cutting_item_feature	5
5.3 cutting_item_type	7
5.4 Reference systems for cutting items	9
6 Properties for cutting item features and cutting item types	10
Annex A (normative) Information object registration	13
Annex B (informative) Classification tables	14
Annex C (informative) Class definitions	16
Annex D (informative) Cutting item property definitions	34
Annex E (informative) Illustrations of properties	79
Annex F (informative) Illustrations of irregular insert profiles and properties	90
Annex G (informative) Illustrations of reference positions for cutting items	99
Bibliography	104

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).

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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*.

This second edition cancels and replaces the first edition (ISO/TS 13399-2:2005), which has been technically revised.

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 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 accessory and auxiliary 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 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 those portions of a cutting tool that remove material from a workpiece. Cutting items include replaceable inserts, brazed tips, and the cutting portions of solid cutting tools. 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 (e.g. regular and irregular shaped replaceable cutting items), solid tools (e.g. solid drill and solid endmill), assembled tools (e.g. boring bars, indexable drills and indexable milling cutters), adaptors (e.g. milling arbor and drilling chuck), components (e.g. shims, screws and clamps) and their relationships can be represented by ISO 13399 (all parts). 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. 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 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.

An information model is a formal specification of types of ideas, facts, and processes which together describe a portion of interest 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:

- the EXPRESS language defined in ISO 10303-11 for defining the information model in ISO 13399-1;
- the file format for data exchange derived from the model and defined in ISO 10303-21;
- the data dictionary defined in the ISO 1584 series.

The ISO 13399 series is intended for use by, among others, tool producers and vendors, manufacturers, and developers of manufacturing software. ISO 13399 provides a common structure for exchanging data about cutting tools with defined cutting edges. ISO 13399 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 that 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 the information that could be communicated, but does not specify what information shall be communicated.

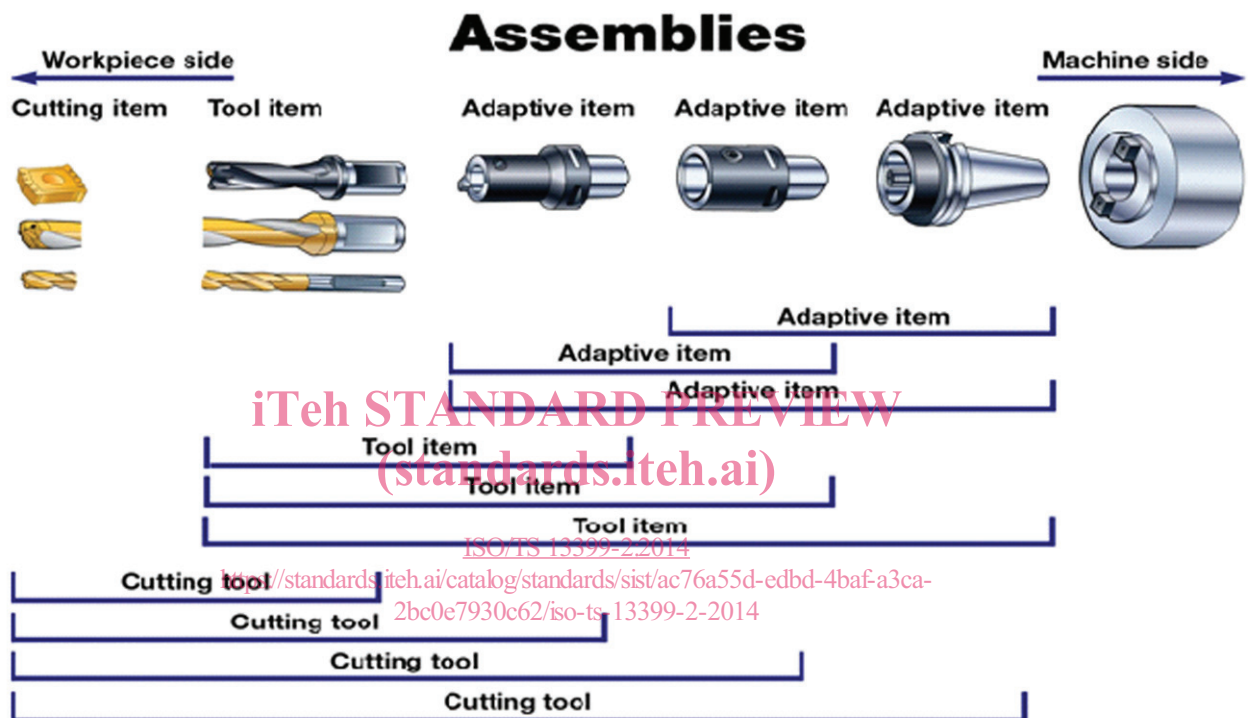


Figure 1 — Possible assemblies of components of a cutting tool

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, and
- migrating the dictionary to subsequent editions of ISO 13399 (all parts).

The secretariat of this Maintenance Agency has been assigned to:

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France

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.

The following permission notice and disclaimer shall be included in all copies of this EXPRESS schema ("the Schema"), and derivations of the Schema:

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Cutting tool data representation and exchange —

Part 2: Reference dictionary for the cutting items

1 Scope

This part of ISO 13399 specifies a reference dictionary for cutting items, 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 cutting items and their features, with an associated classification scheme;
- definitions and identifications of the data element types that represent the properties of cutting items and their features;
- 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 SC 3D, 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 cutting items and cutting item features;
- standard data that represent the various properties of cutting items and cutting item features;
- standard data that represent domains of values used for properties of cutting items and cutting item features;
- definitions of reference systems for cutting items and their properties;
- 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 can be stored or referenced;
- implementation methods other than the one defined in this part of ISO 13399 by which the standard data can be exchanged and referenced;
- information model for cutting tools;

- definitions of classes and properties for tool items;
- definitions of classes and properties for adaptive items;
- definitions of classes and properties for assembly items and auxiliary items.

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

NOTE 3 The definitions of classes and properties for tool items, adaptive items, assembly items, and auxiliary items are provided in ISO/TS 13399-3, ISO/TS 13399-4, and ISO/TS 13399-5, 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, *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/TS 13399-100:2008, *Cutting tool data representation and exchange — Part 100: Definitions, principles and methods for reference dictionaries*

ISO 13584-1:2001, *Industrial automation systems and integration — Parts library — Part 1: Overview and fundamental principles*

ISO/IEC 8824-1, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

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 in the reference dictionary 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]

3.2 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

3.4**cutting tool**

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

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

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.

3.5**data**

representation of information in a formal manner suitable for communication, interpretation, or processing by human beings or computers

[SOURCE: ISO 10303-1:1994, 3.2.14]

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]

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 which establishes a domain of values defined by common attributes and constraints

3.11**entity data type**

representation of an entity

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.

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

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

irregular insert

replaceable cutting item that cannot be described by a regular geometric shape

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 ontology.

3.20

property

defined parameter suitable for the description and differentiation of products

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

3.21

regular insert

replaceable cutting item that can be described by a regular geometric shape

3.22

transient surface

part of the surface which is formed on the workpiece by the cutting edge and removed during the following cutting stroke, during the following revolution of the tool or workpiece, or by the following cutting edge

[SOURCE: ISO 3002-1:1982, 3.1.3]

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3.23**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]

3.24**workpiece**

object on which a cutting action is performed

3.25**work surface**

surface on the workpiece that is to be removed by machining

[SOURCE: ISO 3002-1:1982, 3.1.1]

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 (ontological concepts as) dictionary entries**5.1 General**

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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 letters with multiple words joined by an underscore character.

EXAMPLE cutting item type is the name of a concept in the ontology. **cutting_item_type** is the identifier of the class in the dictionary that represents the concept.

Cutting items are represented by two main classes: **cutting_item_feature** and **cutting_item_type**. The structure of the classification is provided in [Annex B](#). The definitions of the cutting item classes are provided in [Annex C](#).

5.2 cutting_item_feature

Characteristic of a cutting item that cannot exist independently of the cutting item.

cutting_item_feature has the following subclasses:

- **chip_breaker**;
- **cutting_corner**;
- **cutting_edge**;
- **cutting_item_coating**;
- **cutting_item_material**;
- **cutting_item_profile**;
- **fixing_hole**;

- **flank;**
- **gauge_circle;**
- **inscribed_circle.**

5.2.1 chip_breaker

Modification of the face of a cutting item to control or break the chip.

NOTE A chip breaker is either an integral groove or an obstruction attached to the face.

5.2.2 cutting_corner

Transition between two cutting edges.

cutting_corner has the following subclasses:

- **chamfered_corner;**
- **rounded_corner.**

5.2.3 cutting_edge

Junction between two surfaces that performs the cutting operation.

cutting_edge has the following subclasses:

- **cutting_edge_conditioned;**
- **cutting_edge_interrupted;**
- **cutting_edge_major;**
- **cutting_edge_minor;**
- **wiper_edge.**

5.2.4 cutting_item_coating

Additional material deposited on the surface of a cutting item.

NOTE A cutting item coating can consist of layers of several materials.

5.2.5 cutting_item_material

Substance from which a cutting item is made.

5.2.6 cutting_item_profile

Shape traced out by the cutting edges of a cutting item.

cutting_item_profile has the following subclasses:

- **ball_nosed_profile;**
- **drilling_profile;**
- **grooving_parting profile;**
- **threading_profile.**

5.2.7 fixing_hole

Hole through the body of a replaceable cutting item that is used for attaching the cutting item to a tool item.

5.2.8 flank

Surface or surfaces of a cutting item that pass over the transient surface of the workpiece.

flank has the following subclasses:

- **flank_major;**
- **flank_minor;**
- **flank_wiper_edge.**

5.2.9 gauge_circle

Circle established by a measurement device on a cutting item that does not have an inscribed circle.

5.2.9.1 inscribed_circle

Circle to which all edges of an equilateral and round regular insert are tangential.

5.3 cutting_item_type

Family of items that can be held by a tool item or be part of a solid tool.

NOTE The cutting item is the part of the cutting tool that is in contact with the workpiece during the cutting operation.

REMARKS The names of items in this class are not intended to refer to the use of the item in a particular cutting operation.

cutting_item_type has the following simple families of items as subclasses:

- **equilateral_equiangular;**
- **equilateral_nonequiangular;**
- **non replaceable_cutting_item;**
- **nonequilateral_equiangular;**
- **nonequilateral_nonequiangular;**
- **round_insert;**
- **specific_profile_insert.**

5.3.1 equilateral_equiangular

Type of cutting item of regular geometric shape with sides of equal length and equal included angles.

NOTE The class contains inserts with the ISO shape codes H, O, P, S, and T.

equilateral_equiangular has the following items as subclasses:

- **hexagonal_insert;**
- **octagonal_insert;**