DRAFT FOR DEVELOPMENT

DD ISO/TS 13399-50:2007

Incorporating corrigendum March 2011

Cutting tool data representation and exchange —

Part 50: Reference dictionary for reference systems and common concepts

ICS 25.100.01; 35.240.50

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British Standards

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National foreword

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This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than 3 years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee MTE/18, Tools tips and inserts for cutting applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

This Draft for Development was published under the authority of the Standards Policy and Strategy Committee on 31 May 2007

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Amendments/corrigenda issued since publication

Date	Comments
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TECHNICAL SPECIFICATION

ISO/TS 13399-50

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Cutting tool data representation and exchange —

Part 50: Reference dictionary for reference systems and common concepts

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 13399-50 was prepared by Technical Committee 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 100: Definitions, principles and methods for reference dictionaries* [Technical Specification]

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Introduction

ISO 13399 provides the means to achieve an electronic representation of cutting tool data by providing the information structure needed to describe various data about cutting tools and cutting tool assemblies. It is intended to facilitate the use, manipulation and exchange of cutting tool data within and between manufacturing, distribution and usage.

This part of ISO 13399 defines the terms, properties and definitions for reference systems and other common concepts that are shared with several components of a cutting tool with defined cutting edges. The purpose of this part 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 tool to remove workpiece material through a shearing action at the cutting edge(s) of the tool. Cutting tool data are characteristics of the cutting tool and its use that must be known and evaluated in order to make manufacturing decisions and to perform manufacturing operations.

ISO 13399 includes the data representation of 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 chucks), components (e.g. shims, screws and clamps) or any combination of the above can be exchanged.

Possible assemblies of the components of a cutting tool are illustrated in Figure 1.

The cutting tool data described include, but are not limited to, geometrical and dimensional data, identification and designation data, miscellaneous and spare part data, cutting material data, and component connectivity.

The use of the tool information model established by ISO 13399 will provide increased productivity for the user in the same way as do the tools. The effective management of tool information will improve the management of the tools themselves. Use of the tool information model will enable the identification of the “right” tool in every operation — from tool purchase, through planning, set-up in machine-tools, maintenance and reuse of the tools — with short lead times and with high reliability and product quality. Tool users will benefit from improved support from the tool vendors who will be able to provide a standard information product to accompany the tool products. Computer interfaces for information exchange will be more efficient.

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 of any particular computer system. Such a 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, *Industrial 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 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 must 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*.

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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 and 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 resources developed by ISO TC 184/SC 4:

a) the EXPRESS language according to 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 ISO 13584.

ISO 13399 is intended for use by manufacturers, tool vendors or producers, and developers of manufacturing software, among others. It provides a common structure for exchanging data about cutting tools (see Figure 1), and is intended to allow or improve several capabilities, including

— provision of a common set of definitions for use in describing cutting tools and cutting tool assemblies,

— the integration and sharing of cutting tool and assembly data between software applications,

— direct import of vendor cutting tool data into customer databases or applications, and

— a reduction in the level of effort required for manufacturers to maintain accurate and current 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 by ISO 13399.

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

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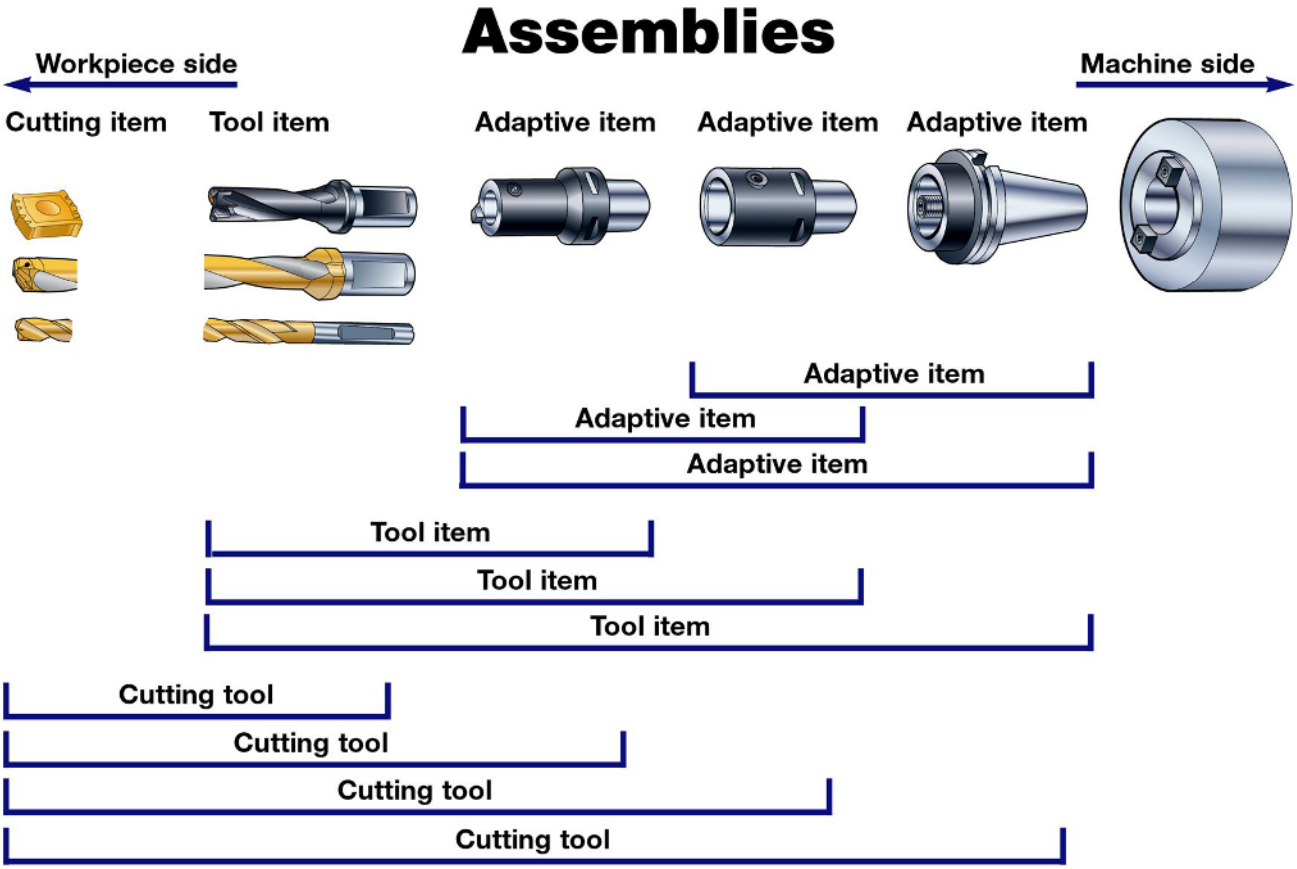

Figure 1 — Examples of different types of assemblies of items

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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F-92038 Paris La Défense CEDEX

France

by the ISO Technical Management Board.

The website of the Maintenance Agency is available at:
http://www.unm.fr/en/general/iso13399/default.htm.

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 Technical Specification; 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 and common concepts for cutting tools, together with their descriptive properties and domains of values.

This part of ISO 13399 specifies a reference dictionary that contains

a) definitions and identifications of the classes of reference systems and common concepts for cutting tools, with an associated classification scheme,

b) definitions and identifications of the data element types that represent the properties of reference systems and common concepts for cutting tools,

c) definitions and identifications of domains of values for describing the above 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.[1)]

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

— standard data that represent the various classes of reference systems and common concepts for cutting tools;

— standard data that represent the various properties of reference systems and common concepts for cutting tools;

— standard data that represent domains of values used for properties of reference systems and common concepts for cutting tools;

— a single implementation method by which the standard data defined in this part ISO 13399 can be exchanged (see ISO 10303-21).

The following is not within its scope:

— specialized or expert knowledge on the design and use of cutting tools;

— rules used to determine the information that should be communicated;

---

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 according to ISO 13584-24 and ISO 13584-25.

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

— implementation methods other that the one defined in this part of ISO 13399 by which the standard data can be exchanged and referenced;

— information models for cutting tools;

— definitions of classes and properties for cutting items, tool items, assembly items, adaptive items, or for connection systems, these being covered by other parts of ISO 13399.

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

3 Terms and definitions

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

3.1
applicable property
property that is defined for some family of items and that applies to any member of this family

[ISO 13584-24]

3.2
basic semantic unit
entity that provides an absolute and universal identification of classes and data element types in an application domain

[ISO 13584-42]

3.3
chip
material removed from a workpiece by a cutting process

[ISO/TS 13399-2]

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

NOTE A cutting tool could be the assembly of one or more adaptive items, a tool item and several cutting items on a tool item. See Figure 1.

[ISO 13399-1]

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3.5
data
representation of facts concepts or instructions in a formal manner suitable for communication, interpretation or processing by human beings or computers

[ISO 10303-1]

3.6
data element type
unit of data for which the identification, description and value representation have been specified

[ISO 13584-42]

3.7
data exchange
storing, accessing, transferring and archiving of data

[ISO 10303-1]

3.8
data type
domain of values

[ISO 10303-11]

3.9
dictionary
structured set of entries with one and only one meaning corresponding to each entry and one and only one entry identifying a single meaning

[ISO 13584-511]

NOTE In ISO 13399, 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.

NOTE Adapted from ISO 10303-11.

3.11
entity data type
representation of an entity

[ISO 10303-11]

3.12
entity instance
named unit of data that represents a unit of information within the class defined by an entity

NOTE It is a member of the domain established by an entity data type.

[ISO 10303-11]

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3.13
family of items
simple or generic family of items

[ISO 13584-42]

3.14
generic family of items
grouping of simple or generic families of items for the purpose of classification or for associating common information

[ISO 13584-42]

3.15
implementation method
means for computers to process or exchange data

[ISO 10303-1]

3.16
information
facts, concepts or instructions

[ISO 10303-1]

3.17
information model
formal description of a bounded set of information to meet a specific requirement

[ISO 10303-1]

3.18
machine side
identification of a direction pointing towards the machine

3.19
machined surface
surface produced by the action of a cutting tool

[ISO 3002-1]

3.20
ontology
explicit and consensual specification of concepts of an application domain independent of any use of these concepts

[ISO 13584-511]

NOTE In ISO 13399 a dictionary is the formal and computer-sensible representation of an ontology.

3.21
property
characteristic of a product or process that may be represented by a data element type

NOTE Adapted from ISO 13584-42.

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3.22
simple family of items
set of items in which each item may be described by the same group of properties

[ISO 13584-42]

3.23
visible property
property that is defined for some family of items that may or may not be applicable to the different members of the family

[ISO 13584-42]

3.24
workpiece
object on which a cutting action is performed

[ISO 13399-2]

3.25
workpiece side
identification of a direction pointing towards the workpiece

[ISO/TS 13399-2]

4 Abbreviated terms

BSU basic semantic unit

DET data element type

5 Representation of the ontology concepts as dictionary entries

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 "coolant supply" is the name of a concept in the ontology. **coolant_supply** 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, whether a class or a property, is identified with a numerical code (BSU) that is generated at random when the dictionary is compiled. A BSU can be made unique by the addition of a code that 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.

5.1 Common concepts

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

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5.1.1 adjustment

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

adjustment has the following subclasses:

— **adjustment_axial**;

— **adjustment_radial**.

5.1.1.1 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.

5.1.1.2 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.

5.1.2 bolt_hole_circle

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

5.1.3 coolant_supply

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

NOTE The fluid could be a liquid or a gas.

5.1.4 cutting_operation

A **cutting_operation** is a generic family of actions that remove material from a workpiece. The actions included in the generic class are not exclusive and other actions may be possible. The intention of ISO 13399 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**;

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— **milling_face**;

— **milling_profile**;

— **milling_shoulder**;

— **milling_slot**;

— **parting;**

— **reaming_cylindrical**;

— **reaming_profile**;

— **slitting**;

— **threading_external**;

— **threading_internal**;

— **trepanning**;

— **turning_external**;

— **turning_internal**.

5.1.4.1 boring

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

5.1.4.2 broaching_circular

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

5.1.4.3 broaching_linear

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

5.1.4.4 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.

5.1.4.5 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.

5.1.4.6 drilling

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

NOTE Either the cutting tool or the workpiece can rotate.

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5.1.4.7 drilling_deep_hole

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

5.1.4.8 drilling_step

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

5.1.4.9 grooving

Creating multiple connected surfaces on a circular section of a workpiece.

5.1.4.10 milling_face

Creating a single flat external surface on a workpiece by means of a rotating tool.

NOTE The feed is achieved by the motion of the workpiece or by the motion of the cutting tool or by the combination of both motions.

5.1.4.11 milling_profile

Creating curved surfaces on a workpiece by means of a rotating cutting tool.

NOTE The feed is achieved by the motion of the workpiece or by the motion of the cutting tool or by the combination of both motions.

5.1.4.12 milling_shoulder

Creating perpendicular connected surfaces on a workpiece by means of a rotating cutting tool.

NOTE The feed is achieved by the motion of the workpiece or by the motion of the cutting tool or by the combination of both motions.

5.1.4.13 milling_slot

Creating multiple connected surfaces in the workpiece by means of a rotating cutting tool.

NOTE The feed is achieved by the motion of the workpiece or by the motion of the cutting tool or by the combination of both motions.

5.1.4.14 parting

Separating a rotating workpiece into two parts with a stationary cutting tool.

5.1.4.15 reaming_cylindrical

Changing the diameter of an existing cylindrical hole to achieve a close tolerance on the diameter and the surface finish.

5.1.4.16 reaming_profile

Changing the diameter of an existing profiled hole to achieve a close tolerance on the diameter and the surface finish.

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5.1.4.17 slitting

Separating a stationary workpiece into two parts with a rotating tool.

5.1.4.18 threading_external

Creating a screw thread on the external surface of a workpiece with a cutting tool.

NOTE This operation includes tapping, die threading, thread turning, and thread milling operations.

5.1.4.19 threading_internal

Creating a screw thread on an internal surface of a workpiece with a cutting tool.

NOTE This operation includes tapping, thread turning and thread milling operations.

5.1.4.20 trepanning

Creating a new annular hole that leaves the central portion of the hole intact.

NOTE The central portion can be left attached to the workpiece or can be detached.

5.1.4.21 turning_external

Creation of a new external surface on a rotating workpiece with a stationary cutting tool.

5.1.4.22 turning_internal

Creating a new internal surface on a rotating workpiece by a stationary cutting tool.

5.1.5 cutting_tool

A **cutting_tool** is a device or assembly of items for removing workpiece material through a shearing action at the edge or edges of the device.

NOTE A cutting tool could be an assembly of one or more adaptive items a tool item and several cutting items on a tool item.

5.1.6 flange

A **flange** is a projecting rim or edge on the outside of an object.

NOTE Adapted from the Concise Oxford English Dictionary.

5.1.7 keyway

A **keyway** is a slot in which a shaped piece of metal can be inserted to transfer torque between two connected items.

5.1.8 locking_mechanism

A **locking_mechanism** is a device that can be actuated to secure the coupling together of two items.

5.1.9 regrinding

A **regrinding** is the process of modifying the shape of a component of a cutting tool either to restore the original shape or to create a new shape.

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5.1.10 runout_axial

A **runout_axial** is a variation in the location of the end surface of the cutting reference point of a rotating tool item or the end surface of an adaptive item.

5.1.11 runout_radial

A **runout_radial** is a variation in the location of the circumference of a rotating tool item or adaptive item.

5.1.12 tool thread external

A **tool_thread_external** is a continuous and projecting helical ridge of uniform section on an external cylindrical or conical surface.

tool_thread_external has the following subclasses:

— **thread_metric_external**;

— **thread_inch_external**;

— **thread_trapezoidal_external**.

5.1.13 tool_thread_internal

A **tool_thread_internal** is a continuous and projecting helical ridge of uniform section on an internal cylindrical or conical surface.

tool_thread_internal has the following subclasses:

— **thread_metric_internal**;

— **thread_inch_internal**;

— **thread_trapezoidal_internal**.

5.2 reference_system

reference_system is a generic family of items that provides a basis for the definitions of properties.

reference_system has the following subclasses:

— **coordinate_axis_system**;

— **coordinate_axis_system_workpiece_side**;

— **cutting_reference_point**;

— **feed_direction_primary**;

— **irregular_insert_position**;

— **master_insert**;

— **mirror_plane**;

— **prismatic_adaptive_item_position**;

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— **prismatic_tool_item_position**;

— **regrinding**;

— **regular_insert_position**;

— **round_adaptive_item_position**;

— **round_tool_item_position**;

— **theoretical_sharp_point**;

— **tool_cutting_edge_plane**;

— **tool_feed_plane**;

— **tool_rake_plane**;

— **xy_plane**;

— **xyw_plane**;

— **xz_plane**;

— **xzw_plane**;

— **yz_plane**;

— **yzw_plane**.

NOTE **coordinate_axis_system**, **mirror_plane**, **irregular_insert_position, regular_insert_position, round_insert_position, xy_plane**, **xz_plane**, **yz_plane** are identified and defined in ISO/TS 13399-2. The entities and their definitions are repeated here with the expectation that they will be removed from future editions of ISO 13399-2.

5.2.1 coordinate_axis_system

The **coordinate_axis_system** is a right-handed rectangular Cartesian coordinate system in three-dimensional space with three principle axes labelled X, Y and Z.

5.2.2 coordinate_axis_system_workpiece_side

The **coordinate_axis_system_workpiece_side** is a right-handed Cartesian coordinate system in three dimensional space with three axes labelled XW, YW, and ZW that are the intersections of the xyw plane, the xzw plane and the yzw plane, respectively.

5.2.3 cutting_reference_point

The **cutting_reference_point** is the theoretical sharp 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: the **tool_cutting_edge_plane**, the **tool_feed_plane,** and the **tool_rake_plane**.

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— Case 2: For a tool cutting edge angle greater than 90°, the point is the intersection of: the **tool_feed_plane**, a plane perpendicular to the **tool_feed_plane** and tangential to the cutting corner, and the **tool_rake_plane**.

— Case 3: For ISO tool styles D and V with only axial rake, the point is the intersection of: a plane perpendicular to the primary feed direction and tangential to the cutting edge (tangential point), a plane parallel to the feed direction through the tangential point, and the **tool_rake_plane**.

NOTE In Case 3, the **theoretical_sharp_corner** of the insert and the **cutting_reference_point** are on the plane that is perpendicular to the **tool_feed_plane**.

— Case 4 a): For round inserts with one feed direction parallel to the tool axis, primarily used for turning tools, the point is the intersection of: a plane perpendicular to the primary feed direction and tangential to the cutting edge (tangential point), a plane parallel to the feed direction through the tangential point, and the **tool_rake_plane**.

— Case 4 b):For round inserts with one feed direction perpendicular to the tool axis, primarily used for milling cutters, the point is the intersection of: a plane perpendicular to the primary feed direction and tangential to the cutting edge (tangential point), a plane parallel to the feed direction though the tangential point and the **tool_ rake_plane**.

— Case 4 c): For round inserts with two feed directions, one parallel to the tool axis and one perpendicular to the tool axis with two **cutting_reference_point**, each point is the intersection of a plane perpendicular to its feed direction and tangential to the cutting edge (tangential point), a plane parallel to the feed direction through the tangential point, and the **tool_rake_plane**.

5.2.4 feed_direction_primary

A **feed_direction_primary** is the direction of movement of a cutting tool to achieve the main cutting function of the tool.

5.2.5 irregular_insert_position

The **irregular_insert_position** identifes the location of an irregular cutting item on the coordinate axis system where:

— the cutting edges are in the xy plane with the insert located in the XY quadrant;

— the cutting profile is pointing in the negative Y direction;

— the physical extremity of the cutting profile is on the positive X axis;

— the extreme physical point of the insert is on the Y axis.

NOTE The definition applies to right-hand inserts. The position of left-hand inserts is as mirrored through the xz plane.

5.2.6 master_insert

A **master_insert** is a nominal, replaceable cutting item that is used for defining the dimensions of a cutting tool.

NOTE 1 A master insert can substitute for either a regular or an irregular insert and uses the position of the item that it replaces.

NOTE 2 Definitions making use of a master insert also apply to solid or brazed tools.

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5.2.7 mirror_plane

The **mirror_plane** is the **xz_plane** in the **coordinate_axis_system**.

5.2.8 prismatic_adaptive_item_position

A **prismatic_adaptive_item_position** identifies the location of an adaptive item with planar sides where:

— the base of the adaptive item shall be coplanar with the xy plane;

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

— the rear backing surface shall be coplanar with the xz plane;

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

— the end of the item shall be coplanar with the yz plane;

— the normal for the end of the adaptive item shall be in the +X direction;

If the item has a bore, then the vector of the bore of the item that points in the –X direction shall also point towards the workpiece side.

NOTE This definition applies to right-handed adaptive items. Left-handed adaptive items are defined for right-handed items but mirrored through the xz plane.

5.2.9 prismatic_tool_item_position

A **prismatic_tool_item_position** identifies the location of a tool item with planar sides where:

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

— the normal for the base of the tool shall be in the –Z direction;

— the rear backing surface shall be coplanar with the xz plane;

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

— the end of the tool shall be coplanar with the yz plane;

— the normal for the end of the tool shall be in the +X direction;

— the rake face of the primary cutting item shall be completely visible in the –XY quadrant of the coordinate axis system;

NOTE This definition applies to right-handed tool items. Left-handed tool items are as defined for right-handed items but mirrored through the xz plane.

For cartridges, the top of the axial adjustment screw shall be coincident with the yz plane.

5.2.10 regrinding

A **regrinding** is a modifying of the shape of a component of a cutting tool to restore the original shape or to create a new shape.

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5.2.11 regular_insert_position

A **regular_insert_position** identifies the location of a regular insert on the coordinate system where:

— the cutting edges are placed on the XY plane;

— the insert is located in the XY quadrant;

— the major cutting edges is on the +X axis

— the extreme **theoretical_sharp_point** is on the Y axis.

NOTE This definition applies to right-handed inserts. The location of left-handed inserts is as mirrored through the xz plane.

5.2.12 round_adaptive_item_position

A round_adaptive_item_position identifies the location of a round adaptive item on the coordinate system where:

— the axis of the adaptive item shall be collinear with the X axis;

— the vector of the shank that points in the –X direction shall also point towards the workpiece side;

— the cutting height shall be measured from the xy plane;

— the drive slots or clamping flats, if present, shall be parallel with the xy plane;

— the contact surface of the coupling and the gauge plane or the end of the cylindrical shank;

— if there is a bore, then the vector of the bore that points in the –X direction shall also point towards the workpiece side.

NOTE The conditions listed above apply to right-handed adaptive items. Left-handed adaptive items are defined for right-handed items but mirrored though the xz plane.

5.2.13 round_tool_item_position

A round_tool_item_position identifies the location on the coordinate reference system of a tool item with non-planar sided cross section where:

— the axis of the tool item shall be collinear with the X axis;

— the vector of the shank that points in the –X direction shall also point to the workpiece side;

— the cutting height shall be measured from the xy plane;

— the drive slots or clamping flats, if present, shall be parallel with the xy plane;

— the contact surface of the coupling, the gauge plane or the end of the cylindrical shank shall be coplanar with the yz plane;

— the rake face of the primary cutting item shall be visible in the –XY quadrant of the coordinate axis system.

NOTE This definition applies to right-handed tool items. Left-handed tool items are as defined for right-handed tool items but mirrored through the xz plane.

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If a bore is present, the vector of the bore of the item that points in the –X direction shall also point towards the workpiece side.

5.2.14 theoretical_sharp_point

The **theoretical_sharp_point** is the intersection in the tool rake plane of the two planes that are perpendicular to the xy_plane through the major and the minor cutting edges of a cutting item.

5.2.15 tool_cutting_edge_plane

The **tool_cutting_edge_**plane is the plane perpendicular to the xy plane through the major cutting edge of a master insert or of a solid tool.

5.2.16 tool_feed_plane

The **tool_feed_plane** is the plane perpendicular to the xy plane that is parallel to the primary feed direction of the tool item and that is tangential to the cutting corner of the master insert or of a solid tool.

5.2.17 tool_rake_plane

The **tool_rake_plane** is the plane that contains the cutting edges of a master insert or of a solid tool.

5.2.18 xy_plane

The **xy_plane** is the plane in the **coordinate_axis_system** that contains the X and Y axes with the normal of the plane in the positive Z direction.

5.2.19 xyw_plane

The **xyw_plane** is the plane in the **coordinate_axis_system** that is related to the **xy_plane** by a rotation angle PHI about the X axis in an anticlockwise (counter-clockwise) direction and by a distance XYWD from the origin of the **coordinate_axis_system.**

NOTE The **xzw_plane**, the **xyw_plane** and the **yzw_plane** are mutually perpendicular.

5.2.20 xz_plane

The **xz_plane** is the plane in the **coordinate_axis_system** that contains the X and Z axes with the normal of the plane in the positive Y direction.

5.2.21 xzw_plane

The **xzw_plane** is the plane in the **coordinate_axis_system** that is related to the **xz_plane** by a rotation angle KAPPA about the Z axis in an anticlockwise (counter-clockwise) direction and by a distance XZWD from the origin of the **coordinate_axis_system.**

NOTE The **xzw_plane**, the **xyw_plane** and the **yzw_plane** are mutually perpendicular.

5.2.22 yz_plane

The **yz_plane** is the plane in the **coordinate_axis_system** that contains the Y and Z axes with the normal of the plane in the positive X direction.

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5.2.23 yzw_plane

The **yzw_plane** is the plane in the **coordinate_axis_system** that is related to the **yz_plane** by a rotation angle RHO about the Y axis in an anticlockwise (counter-clockwise) direction and by a distance YZWD from the origin of the **coordinate_axis_system.**

NOTE The **xzw_plane**, the **xyw_plane** and the **yzw_plane** are mutually perpendicular.

6 Properties for reference systems and common concepts

The properties that are applicable to items defined in Clause 5 are defined in Annex D, where the association of a property with a class is also specified. In the compilation of the dictionary all properties are visible properties at the root class of the dictionary and are made applicable properties at the class level where they apply. The names of properties that may be applicable to reference systems and common concepts, with their identification codes (BSU), are shown in Table 1. The order of the names in the table should be read in rows from left to right.

NOTE The value domains for properties are specified in ISO/TS 13399-100.

Table 1 — Property names and identification codes

Property name	Identification code (BSU)	Property name	Identification code (BSU)
actuation force	71EBBA9B56D06	actuation method	71EBBA9BCB5F2
adjustment datum	71EBBE66AA8A3	adjustment deviation lower	71EBBE67E4BD6
adjustment deviation upper	71EBBE682E490	adjustment direction	71EBBE6A5BF09
adjustment increment	71EBBE7266DA2	adjustment limit maximum	71EBBE664BCBD
adjustment limit minimum	71EBBE668A8F3	adjustment range	71EBBE72A6287
body clearance depth	71EAC81F88336	bolt hole circle count	71ED6E58E5A62
chamfer corner property	71DD700D27A8A	chisel edge angle	71EAC82B2A50E
chisel edge length	71EAC82ADE5EA	clearance angle axial	71EAC83CD450B
clearance angle radial	71EAC83B73825	coolant entry centre line distance	71EBDBF22CF58
coolant entry diameter	71CF2985AA87C	coolant entry inclination angle	71EBDBF2CEE6A
coolant entry rotation angle	71EBDBF289BB9	coolant entry style code	71CF2985DCED3
coolant entry thread size	71D07558CEF8A	coolant exit diameter	71CF298AA8D1F
coolant exit style code	71CF2985FC5FC	coolant exit thread size	71D075633189D
coolant pressure	71EAC478A4164	coolant radial entry thread size	71CF298963036
coolant ring seat width	71CF298EB6D72	cutting point translation X direction	71FD1E2EDD973
cutting point translation Y direction	71FD1E2F66B38	diameter access hole	71EBB2F865924
diameter bolt circle	71EAC0DECE78F	drill back taper	71EAC81AD9AE1
flange diameter	71EC61D8A1771	flange height	71EEF5384E141
flange location	71F90EA1ED67E	flange thickness	71EEF53809764
flange width	71EEF5387E914	fluted land width	71EAC8210DF36
hand	71CF29872F0AB	inscribed circle property	71D1C82A5036D
insert included angle	71CE7A96BC122	insert interface code	71CE7A9936610
insert length	71CE7A9DFA23A	insert mounting style code	71CE7A97711B8

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Table 1 *(continued)*

Property name	Identification code (BSU)	Property name	Identification code (BSU)
insert seat size code	71CEAEBF2A69F	insert shape code	71CE7A9F0C79F
insert thickness	71CE7A9F5308C	insert width	71CE7A9FB11C3
kappa	71ED6E4A7EFBA	keyway width	71D0841ADC9E0
margin width	71EAC828C8308	overall length minimum	71EBC1E8857BE
phi	71ED6E4AE850B	rho	71ED6E4B254E5
rounded corner property	71DD7011A3D86	runout axial	71ED6A70807F7
runout axial adjustment	71D0845C77193	runout radial	71DF8C660035E
runout radial adjustment	71D0846298D19	thread diameter	71E02C5C2EED3
thread hand	71E033FCBB61C	thread length	71FC209CD4A91
thread pitch	71CEAEC08D4B0	thread starts	71FC06ABEA7D3
threads per inch	71D1A6AAC8707	torque	71DF153B14F02
web taper	71EAC823D95A7	web thickness	71EAC82313165
wiper edge property	71CED022114EC	xyw plane distance	71ED6E4F42626
xzw plane distance	71ED6E4F7A8CF	yzw plane distance	71ED6E4FA83F6

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Annex A
(normative)

Information object registration

A.1 Document identification

In order to provide for unambiguous identification of an information object in an open system, the object identifier:

{ISO technical specification 13399 part (50) version (1)}

is assigned to this part of ISO 13399.

The meaning of this value is as defined in ISO/IEC 8824-1 and described in ISO 13584-1.

A.2 Dictionary identification

The dictionary defined in this part of ISO 13399 is assigned the object identifier:

{ISO technical specification 13399 part (50) version (1) object (1) reference systems (1)}

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Annex B
(informative)

Classification structure

Table B.1 shows the classification structure of the generic families in the dictionary with an expanded structure for the classes of reference systems and other common concepts. The purpose of the table is to show the relationships between the classes related to reference systems, common concepts and the other classes in ISO 13399.

NOTE Annex C contains the full definition of all the classes that are relevant to reference systems and common concepts.

Table B.1 — Classification structure

Classes	Parent class	Class BSU
cutting tool library	Root class	71CE7A72B6DA7
adaptive item type	71CE7A72B6DA7	71EAD37F18F34
adjustment	71CE7A72B6DA7	71ED884159C90
adjustment axial	71ED884159C90	71ED88419A97C
adjustment radial	71ED884159C90	71ED8841BA543
assembly item type	71CE7A72B6DA7	71CE7A795C05C
bolt hole circle	71CE7A72B6DA7	71E02520881F1
connection interface feature	71CE7A72B6DA7	71DF8C37D9115
coolant supply	71CE7A72B6DA7	71DF8C3C065EB
cutting item feature	71CE7A72B6DA7	71DD6C82F72DA
cutting item type	71CE7A72B6DA7	71D1AA6C8FC75
cutting operation	71CE7A72B6DA7	71DFF83D21D50
boring	71DFF83D21D50	71DFF83D3B0A4
broaching circular	71DFF83D21D50	71DFF83D551E3
broaching linear	71DFF83D21D50	71DFF83D6FA17
counterboring	71DFF83D21D50	71DFF83D897BB
countersinking	71DFF83D21D50	71DFF83DB5E40
drilling	71DFF83D21D50	71DFF83DD3EAA
drilling deep hole	71DFF83D21D50	71DFF83E498D2
drilling step	71DFF83D21D50	71DFF83E67286
grooving	71DFF83D21D50	71DFF83E92592
milling face	71DFF83D21D50	71DFF83EA9476
milling profile	71DFF83D21D50	71DFF83EE1225
milling shoulder	71DFF83D21D50	71DFF83EF5A57
milling slot	71DFF83D21D50	71DFF83F249B1
parting	71DFF83D21D50	71DFF83F56124
reaming cylindrical	71DFF83D21D50	71DFF83F6CC6E

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