TECHNICAL SPECIFICATION

ISO/TS 13399-4

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Cutting tool data representation and exchange —

Part 4:
Reference dictionary for adaptive items

Représentation et échange des données relatives aux outils coupants —

Partie 4: Dictionnaire de référence pour les éléments relatifs aux attachements

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Contents

Page

Foreword

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 29, *Small tools*.

This third edition cancels and replaces the second edition (ISO/TS 13399-4:2014), which has been technically revised.

The main change is as follows:

— update of the classes and properties in line with the modifications in the cutting tool dictionary.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document defines the terms used for adaptive items. The purpose of this document 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 the ISO 13399 series 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 end mill), 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 the ISO 13399 series. The principles of the ISO 13399 series are given in Annex A, and possible assemblies of the components of a cutting tool are illustrated in Figure A.1.

The objective of the ISO 13399 series is to provide the means to represent the information that describes cutting tools in a computer-sensible form that is independent from any particular computer system. The representation facilitates the processing and exchange of cutting tool data within and between different software systems and computer platforms and supports 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 describes 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 document 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 13584 series.

Each class, property, or domain of values of this application domain constitutes an entry of the reference dictionary defined in this document. 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.

Cutting tool data representation and exchange —

Part 4:
Reference dictionary for adaptive items

1 Scope

This document specifies a reference dictionary for adaptive items, together with their descriptive properties and domains of values.

This document specifies a reference dictionary containing:

— definitions and identifications of the classes of adaptive items, with an associated classification scheme;

— definitions and identifications of the data element types that represents the properties of adaptive items;

— definitions and identifications of domains of values for describing the above-mentioned data element types.

The following are within the scope of this document:

— standard data that represent the various classes of adaptive items;

— standard data that represent the various properties of adaptive items;
— standard data that represent domains of values used for properties of adaptive items;

— one implementation method by which the standard data defined in this document can be exchanged.

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

The following are outside the scope of this document:

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

— rules to determine what information should be communicated;

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

— implementation methods other than the one defined in this document by which the standard data can 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;

— definitions of classes and properties for reference systems.

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, and assembly items are provided in ISO/TS 13399-2, ISO/TS 13399-3, and ISO/TS 13399-5.

NOTE 4   The definitions of classes and properties for connection systems and reference systems are provided in ISO/TS 13399-50.

2   Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 13399-50, *Cutting tool data representation and exchange — Part 50: Reference dictionary for reference systems and common concepts*

ISO/TS 13399-100, *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 13399-50, ISO/TS 13399-100 and the following apply.

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

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

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

3.1
applicable property
property (3.17) that is defined for some family of items and that applies to any member of this family

[SOURCE: ISO 13584-24:2003, 3.3, modified — "family of parts" has been replaced by "family of items"; "shall apply" has been replaced by "applies"; "any part" has been replaced by "any member"; the EXAMPLE has been removed.]

3.2
basic semantic unit
entity (3.10) that provides an absolute and universally unique identification of a certain object of the application domain that is represented as a *dictionary* (3.9) element

[SOURCE: ISO 13584-42:2010, 3.4, modified — The 3 EXAMPLEs and note 1 to entry have been removed.]

3.3
chip
material removed from a *workpiece* (3.19) by a cutting process

3.4
cutting tool
device or assembly of items for removing material from a *workpiece* (3.19) through a shearing action at the defined cutting edge or edges of the device

Note 1 to entry: A cutting tool can be the assembly of one or more adaptive items, a tool item, and several cutting items on a tool item. See Figure A.1.

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

3.5
data
representation of *information* (3.13) in a formal manner suitable for communication, interpretation, or processing by human beings or computers

[SOURCE: ISO 10303-1:2021, 3.1.29]

3.6
data element type
unit of *data* (3.5) for which the identification, description, and value representation have been specified

[SOURCE: ISO 13584-42:2010, 3.13, modified — Note 1 to entry has been removed.]

3.7
data exchange
storing, accessing, transferring, and archiving of *data* (3.5)

[SOURCE: ISO 10303-1:2021, 3.1.31]

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

Note 1 to entry: In the ISO 13399 series, a dictionary is a formal and computer-sensible representation of an *ontology* (3.16).

[SOURCE: ISO 13584-511:2006, 3.1.9, modified — The original notes 1 to 3 to entry have been replaced by a new note 1 to entry.]

3.10
entity
class of *information* (3.13) 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* (3.10)

3.12
implementation method
means for computers to exchange *data* (3.5)

3.13
information
facts, concepts, or instructions

[SOURCE: ISO 10303-1:2021, 3.1.41]

3.14
information model
formal model of a bounded set of facts, concepts, or instructions to meet a specific requirement

3.15
machine side
identification of a direction pointing towards the machine

3.16
ontology
explicit and consensual specification of concepts of an application domain independent of any use of these concepts

Note 1 to entry: In the ISO 13399 series, a *dictionary* (3.9) is the formal and computer-sensible representation of ontology.

[SOURCE: ISO 13584-511:2006, 3.1.20, modified — In note 1 to entry, the reference to "ISO 13584" has been replaced by "the ISO 13399 series".]

3.17
property
defined parameter suitable for the description and differentiation of products

[SOURCE: ISO 13584-42:2010, 3.37, modified — Notes 1 to 5 to entry have been removed.]

3.18
visible property
property (3.17) that has a definition meaningful in the scope of a given characterization class but does not necessarily apply to the various products belonging to this class

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

3.19
workpiece
object on which a cutting action is performed

[SOURCE: ISO/TS 13399-2:2021, 3.21]

3.20
workpiece side
identification of a direction pointing towards the *workpiece* (3.19)

Note 1 to entry: The xzw-plane, the xyw-plane, and the yzw-plane are mutually perpendicular.

4   Abbreviated terms

BSU   basic semantic unit

DET   data element type

5   Representation of the ontology concepts as dictionary entries

5.1   General

The generic family of adaptive items is divided into several simple families and classes determined by their main function.

NOTE   An adaptive item can have one or more than one function.

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 lower-case characters with multiple words joined by an underscore character.

EXAMPLE   "round shape conversion" is the name for a function of an adaptive item. "round_shape_conversion" is the identifier of the class in the dictionary that represents the concept.

Some of the definitions of properties that are applicable to adaptive items are defined in terms of a primary coordinate system. The coordinate system is the same for adaptive items, cutting items, and

tool items and is defined in ISO/TS 13399-50. The applications of this system to adaptive items are described in this document.

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 can be made unique by the addition of a code that is a reference to the supplier of the dictionary. Each classified item in the following subclauses is associated with its definition from the dictionary.

The ISO 13399 series shall follow the principles in Annex A. The structure of the classification is summarized in Annex B. The complete definitions of the adaptive item classes are provided in Annex C. The properties applicable to adaptive items are defined in Annex D.

5.2 adaptive_item_type

5.2.1 General

Family of objects for the assembly of a cutting tool classified by their main function.

NOTE   An adaptive item can have one or more functions.

adaptive_item_type has the following subclasses:

— collet;

— converter;

— driver;

— extender;

— reducer.

5.2.2 collet

A collet is a segmented band that can be expanded or contracted to grip a shaft.

NOTE 1   This class is for general engineering use and is not specific to cutting tools.

NOTE 2   This class can become an item_class_case_of an entry in another dictionary conforming to the ISO 13584 series.

5.2.3 converter

A converter is an adaptive item with a different connection type, style, and size on the machine side from the workpiece side.

5.2.4 driver

A driver is an adaptive item with the capability to rotate a cutting tool for cutting operations not on the main machine spindle axis.

5.2.5 extender

An extender is an adaptive item that increases the length of an assembled cutting tool.

NOTE   The adaptive item has the same connection type, style, and size on both the machine side and workpiece side.

5.2.6   reducer

A reducer is an adaptive item that diminishes the size of a connection in an assembled cutting tool.

NOTE   The adaptive item has the same connection type and style on the machine side and workpiece side.

The connections on either side of an item shall be different in gender, i.e. male and female.

5.3   Reference system for adaptive items

5.3.1   General

The primary coordinate system used for adaptive items in this document is defined in ISO/TS 13399-50. The additional reference entities relevant for adaptive items are:

— prismatic_adaptive_item_position;

— round_adaptive_item_position.

adaptive_item_type has the following simple families of items as subclasses:

— dependency;

— mirror plane;

— mounting coordinate system;

— coordinate system workpiece side;

— primary coordinate system;

— xy-plane;

— xyw-plane;

— xz-plane;

— xzw-plane;

— yz-plane;

— yzw-plane.

5.3.2   prismatic_adaptive_item_position

A prismatic_adaptive_item_position identifies the location of a prismatic adaptive item where:

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

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

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

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

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

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

— if with a bore, then the vector of the bore of the item that points in the Z direction shall also point towards the workpiece side.

NOTE   The condistions listed above apply to right-handed adaptive items. Left-hand items are defined as for right-hand items but mirrored through the YZ-plane.

5.3.3 round_adaptive_item_position

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

— the axis of the adaptive item shall be colinear with the Z axis;

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

— the drive slots or clamping flats if present shall be parallel with the XZ-plane;

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

— if with a bore, then the vector of the bore of the item that point in the Z 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 as for right-handed items but mirrored though the YZ-plane.

5.4 adaptive_item_feature

— torque bracing.

5.5 General feature types

— adjustment:

  — adjustment axial;

  — adjustment radial.

— bolt hole circle;

— coolant supply;

— cutting data association;

— flange;

— keyway;

— locking mechanism;

6 Properties for adaptive items

The properties of adaptive items are defined in Annex D, where the association of a property with a class is 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 can be applicable for adaptive item types, with their identification codes (BSU), are shown in Table 1. The order of names in the table should be read in rows from left to right.

NOTE   The BSU can be made unique by the addition of the supplier of the dictionary as a prefix to the identification code.

EXAMPLE   The unique BSU for adaptor clamp would be: 0112/1///13399__2–71CED04F3300A for version two of the dictionary.

Table 1 — Names of properties for adaptive items

Property name	Symbol	Identification code (BSU)
adaptor clamp	ADC	71CED04F3300A

Table 1 *(continued)*

Property name	Symbol	Identification code (BSU)
adaptor tool clamp	ATC	71CED04F920EC
adjusting screw protrusion	ASP	71EAC0F0EFDB6
balance device	BLDEV	726E3E971B954
balance quality code	BLQ	71DF151EA5CF1
balancing method code	BLMC	71EAC0CAB861F
body angle workpiece side	BAWS	72C4A71D1B94B
body diameter	BD	71ED6A9AF7D1D
body diameter maximum	BDX	71D08462F8185
body half taper angle	BHTA	71EAC472BD116
body height	HTB	71EBB332C60EB
body length	LB	71ED6AA478A3D
body length maximum	LBX	71DCD3B16750B
body material code	BMX	71DF1523224D8
body section count	BSC	72C5C9C07963B
body taper end diameter	BTED	726E3E85D4D0A
body taper end length	BTEL	71EADEA2BF8DF
body width	WB	71EBB33230236
bracing	BRC	728C565985774
brand	BRAND	728ECFD658014
cartridge size code	CASC	71DF1523EE184
clamping force maximum	MXC	71CED05149532
clamping length machine side	LSCMS	71EBAF896BE9A
clamping length maximum machine side	LSCXMS	71ED6E54B15C4
clamping length minimum machine side	LCSNMS	71EBB339ED2BD
clamping length minimum workpiece side	LSCNWS	72E33DEACC133
clamping length workpiece side	LSCWS	72996F3DC8E8A
clamping method connection interface	CMCS	72C96D143532C
clamping width	WSC	71EBAF85006BD
collet length	LCOL	72724DF38CB41
collet slope type	COLST	726E4223BA018
connection arrangement workpiece side	CONARWS	728C565E652E2
connection code form output side	CCFOP	727212846FDA5
connection code form type machine side	CCFMS	726E3E84DD902
connection code form type workpiece side	CCFWS	726E3E8558953
connection code input side	CCIP	728C565EDCACD
connection code machine side	CCMS	71D102AE3B252
connection code output side	CCOP	7272128615A59
connection code type machine side	CCTMS	726E3E82E53A6
connection code type output side	CCTOS	727212869DDE2
connection code type workpiece side	CCTWS	726E3E83D7357
connection code workpiece side	CCWS	71D102AE8A5A9
connection count workpiece side	CCONWS	71EDD2C17746F
connection depth	CBDP	71EAC48CAD407
connection diameter machine side	DCONMS	71EBDBF5060E6

Table 1 *(continued)*

Property name	Symbol	Identification code (BSU)
connection diameter maximum workpiece side	DCONXWS	72807E35DE582
connection diameter minimum workpiece side	DCONNWS	72807E3576AAE
connection diameter workpiece side	DCONWS	7272379A5F325
connection protruding length	LPCON	726E3E863255C
connection retention knob thread size	CRKS	71CF298A76B66
connection size code (deprecated)	CZC	71FC193318002
connection size code machine side	CZCMS	727C2BCCC5596
connection size code maximum workpiece side	CZCXWS	72807E36B6C92
connection size code minimum workpiece side	CZCNWS	72807E366B041
connection size code ouput side	CZCOP	727233FBAC835
connection thread nominal size machine side	THSZMS	727BE508AAB46
connection thread nominal size workpiece side	THSZWS	727BE5090F9AA
connection unit base precision machine side	CUBPMS	7280553C9A894
connection unit base precision maximum workpiece side	CUBPXWS	729A91AC5433F
connection unit base precision minimum workpiece side	CUBPNWS	729A91ABE3690
connection unit base precision workpiece side	CUBPWS	7280605902AD1
connection unit basis	CUB	71ED6E16D5978
contact surface diameter machine side	DCSFMS	71D087D97FCE3
contact surface diameter workpiece side	DCSFWS	71EAC0DD5D650
coolant supply property	CSP	71EBB342CC751
cutting diameter cutting tool maximum	DCCTX	727237959C51F
damping property	DPC	71CED03D70452
data chip provision	DCP	71CF29869CA0F
designation	DES	728ECFD4A0629
diameter access hole	DAH	71EBB2F865924
diameter collet length clamp	DCLC	7272379935018
diameter collet offset bore	DCOB	7272379998737
distance to face	LFSF	727BE4DF9AF4A
drive method	DRVMETH	72807E232B06B
drive size	DRVSC	71E03063ABD6E
driver slot width	DRVSLW	728C5662F4DC6
driving key type	DKTY	71EC5E1ECC776
functional diameter	DFC	7272379AD9C85
functional height	HF	71CF29994E737
functional length	LF	71DCD39338974
functional length minimum	LFN	71EBC1EB8456A
functional width	WF	71CF29984CDA7
gauge diameter distance	LDG	727BA921CDF0C
groove width	GW	72724DEA4CF84
guide diameter	DGUI	726E3EB45D478
guide length	LGUI	726E3EB54F909
height adjustability	ADJHT	726E3E95EEC5D
interlocking capability	ILC	727C2F58CB275
item style code	ISYC	726E424FE9EC2