TECHNICAL SPECIFICATION

ISO/TS 13399-301

First edition
2013-10-15

Cutting tool data representation and exchange —

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

Représentation et échange des données relatives aux outils coupants —

Partie 301: Description des modèles 3D basés sur les propriétés de l'ISO/TS 13399-3: Modélisation des tarauds, tarauds à refouler et filières de filetage

Reference number
ISO/TS 13399-301:2013(E)

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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. 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*.

ISO/TS 13399 consists of the following parts, under the general title *Cutting tool data representation and exchange*:

— *Part 1: Overview, fundamental principles and general information model*

— *Part 2: Reference dictionary for the cutting items* [Technical Specification]

— *Part 3: Reference dictionary for tool items* [Technical Specification]

— *Part 4: Reference dictionary for adaptive items* [Technical Specification]

— *Part 5: Reference dictionary for assembly items* [Technical Specification]

— *Part 50: Reference dictionary for reference systems and common concepts* [Technical Specification]

— *Part 60: Reference dictionary for connection systems* [Technical Specification]

— *Part 100: Definitions, principles and methods for reference dictionaries* [Technical Specification]

— *Part 150: Usage guidelines* [Technical Specification]

— *Part 301: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of thread-cutting taps, thread-forming taps and thread-cutting dies* [Technical Specification]

— *Part 302: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of solid drills and countersinking tools* [Technical Specification]

The following parts are under preparation:

— *Part 51: Designation system for customer solution cutting tools* [Technical Specification]

— *Part 80: Concept for the design of 3D models based on properties according to ISO/TS 13399: Overview and principles* [Technical Specification]

— *Part 201: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of regular inserts* [Technical Specification]

— *Part 202: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of irregular inserts* [Technical Specification]

— *Part 203: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of exchangeable inserts for drilling* [Technical Specification]

— *Part 204: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of inserts for reaming* [Technical Specification]

— *Part 303: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of end mills with solid 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 solid 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 cutters 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: Modelling of 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 concept, terms and definitions for designing simplified 3D models of taps and dies, which can be used for NC programming, simulation of the manufacturing processes and the avoidance of collision within machining processes. It is not intended to standardize the design of the cutting tool itself.

A cutting tool is used in a machine tool 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, solid tools, assembled tools, adaptors, components and their relationships can be represented by ISO 13399 (all parts). The increasing demand by the end user for 3D models for the purposes defined above is the basis for the development of this series of International Standards.

The objective of ISO 13399 (all parts) is to provide the means to represent information describing cutting tools in computer-sensible form, independent of 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 these data in manufacturing planning, cutting operations and the supply of tools. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and for archiving. The methods that are 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.

Dictionary entries are defined and identified by means of standard data that consist of instances of the EXPRESS entity data types defined in the common dictionary schema, resulting from a joint effort between ISO/TC 184/SC 4 and IEC SC3D, and its extensions defined in ISO 13584-24 and ISO 13584-25.

Cutting tool data representation and exchange —

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

1 Scope

This part of ISO 13399 specifies a concept for the design of tool items, limited to any kind of taps and dies, together with the usage of the related properties and domains of values.

This part of ISO 13399 specifies a common way of designing simplified models that contain:

— definitions and identifications of the design features of thread-cutting taps, thread-forming taps and thread-cutting dies with solid cutting edges, with a link to the properties used;

— definitions and identifications of the internal structure of the 3D model that represents the features and properties of thread-cutting taps, thread-forming taps and thread-cutting dies with solid cutting edges.

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

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

— concept of 3D models for cutting tools;

— concept of 3D models for cutting items;

— concept of 3D models for other tool items not described in the scope of this part of ISO 13399;

— concept of 3D models for adaptive items;

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to 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/TS 13399-3, *Cutting tool data representation and exchange — Part 3: Reference dictionary for tool items*

ISO/TS 13399-60, *Cutting tool data representation and exchange — Part 60: Reference dictionary for connection systems*

3 Starting elements, coordinate system, planes

3.1 General

The 3D models shall be modelled by means of nominal dimensions.

WARNING — There is no guarantee that the 3D model, created according to the methods described in this part of ISO 13399, is a true representation of the physical tool supplied by the tool manufacturer. If the model is used for simulation purposes (e.g. CAM simulation), it shall be taken into consideration that real product dimensions may differ from nominal dimensions.

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

3.2 Reference system

The reference system consists of the following standard elements:

— standard coordinate system;

— right-handed rectangular Cartesian system in three-dimensional space, called the “primary coordinate system” (PCS);

— three orthogonal planes;

— planes in the coordinate system that contain the axes of the system, named “XY-plane” (XYP), “XZ-plane” (XZP) and “YZ-plane” (YZP);

— three orthogonal axes;

— axes designated as intersections of the three orthogonal planes lines, named “X-axis” (XA), “Y-axis” (YA) and “Z-axis” (ZA), respectively.

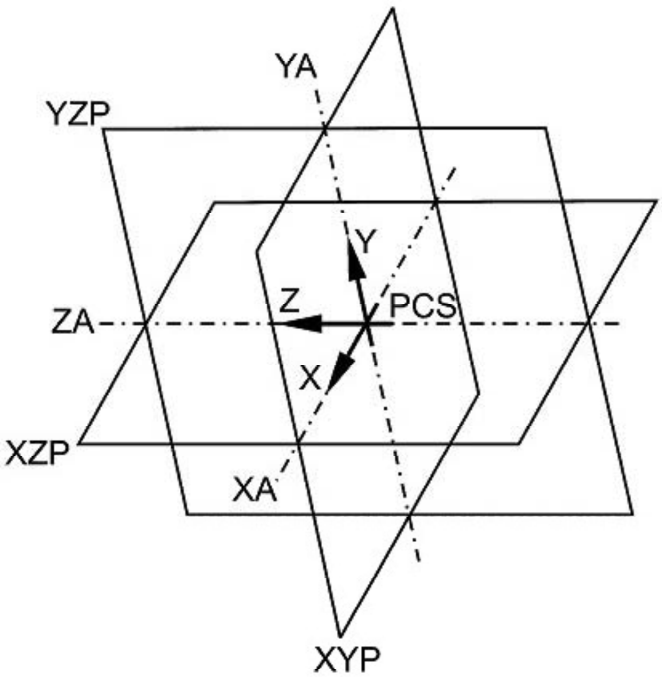


Figure 1 — Reference system

3.3 Coordinate system at the cutting part

The coordinate system at the cutting part, e.g. the planar face, named “coordinate system in process” (CIP), with a defined distance to the PCS shall be defined as indicated in Figure 1 and oriented as indicated in Figure 2 as follows:

— Z-axis of CIP points to the PCS;

— Z-axis of CIP is collinear to the Z-axis of PCS;

— y-axis of CIP is parallel to the y-axis of PCS.

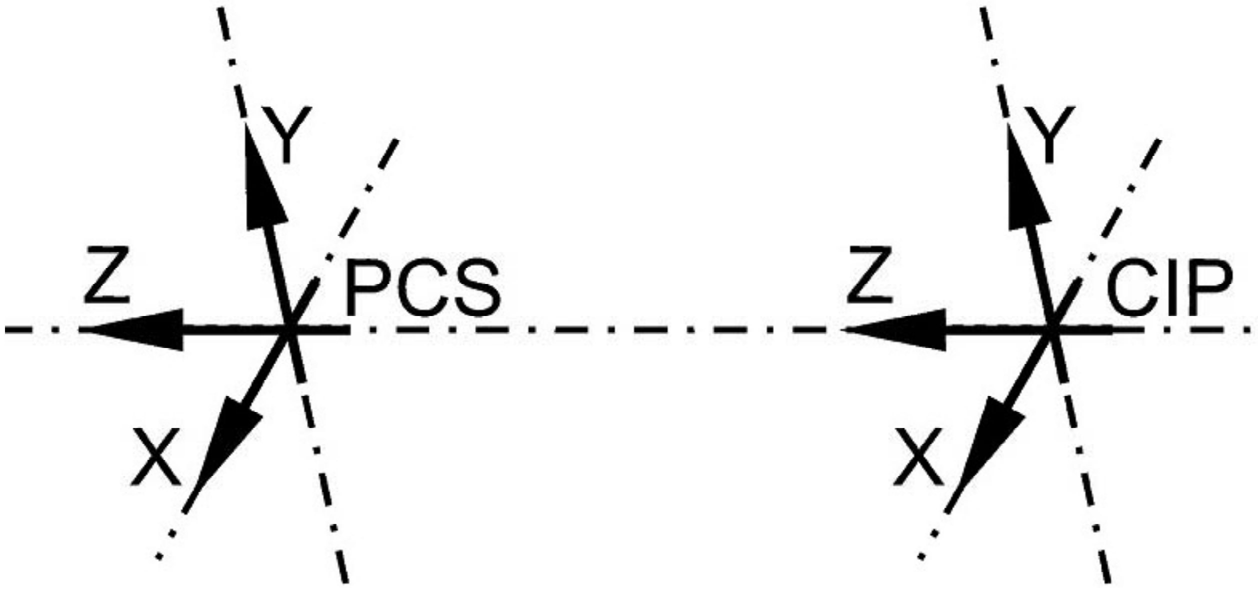


Figure 2 — Orientation of CIP

If the 3D modelling software gives the possibility to include interfaces for components, e.g. to mount a thread-cutting tap on to a complete cutting tool, it is advisable to use the coordinate system CIP.

If necessary, another designation shall be given to the interface of the component (dependent on the software). That name is "CSIF" (for "coordinate system interface") and it includes the coordinate system CIP.

3.4 MCS coordinate system

A "mounting coordinate system" (MCS) shall be inserted within the 3D model to allow mounting with other components, which is congruent to the PCS. Figure 3 shows the orientation of MCS and PCS.

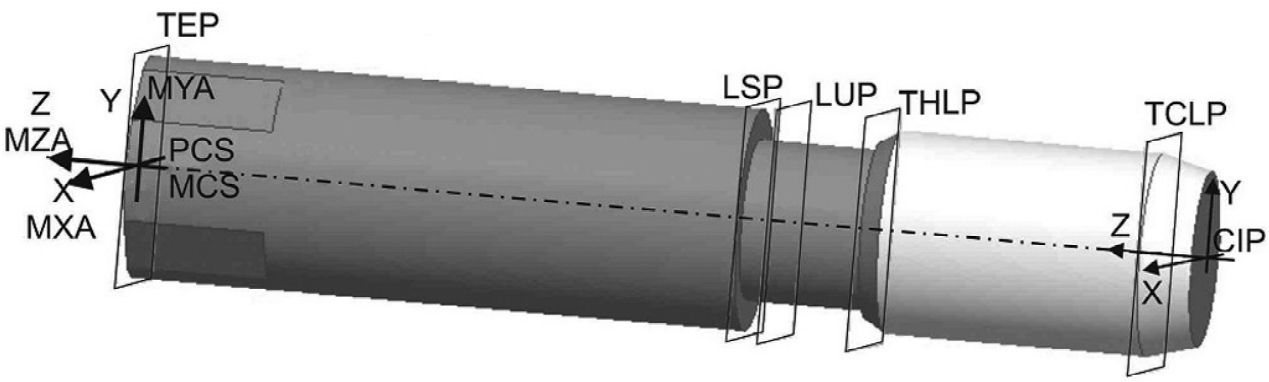


Figure 3 — Orientation of MCS and PCS, reference system (example)

3.5 Planes

Modelling shall be based on planes according to Figure 3, to be used as reference, if applicable. It is therefore possible to vary the model or to suppress single features of independent designs by changing the value of one or more parameter(s) of the model design. Furthermore, identification of different areas shall be simplified by using the plane concept, even if they come into contact with each other with the same size (e.g. chip flute, shank).

The interdependency of design features requires a precise check of single elements.

For 3D visualization of taps and dies, the planes shall be determined as indicated in Figure 4 as follows:

— “LSP” plane for the shank length (LS); based on PCS;

— “LUP” plane for the usable length (LU); based on CIP;

— “THLP” plane for the threading length (THL); based on CIP;

— “TCLP” plane for the tap chamfer length (LCF); based on CIP;

— “TEP” (tool end plane) plane for the overall length (OAL); based on CIP;

— the mounting coordinate system (MCS) is located at the defined tool item position, if gauge lines are defined, or at the start of the protruding length [see LPRP (protruding length plane)].

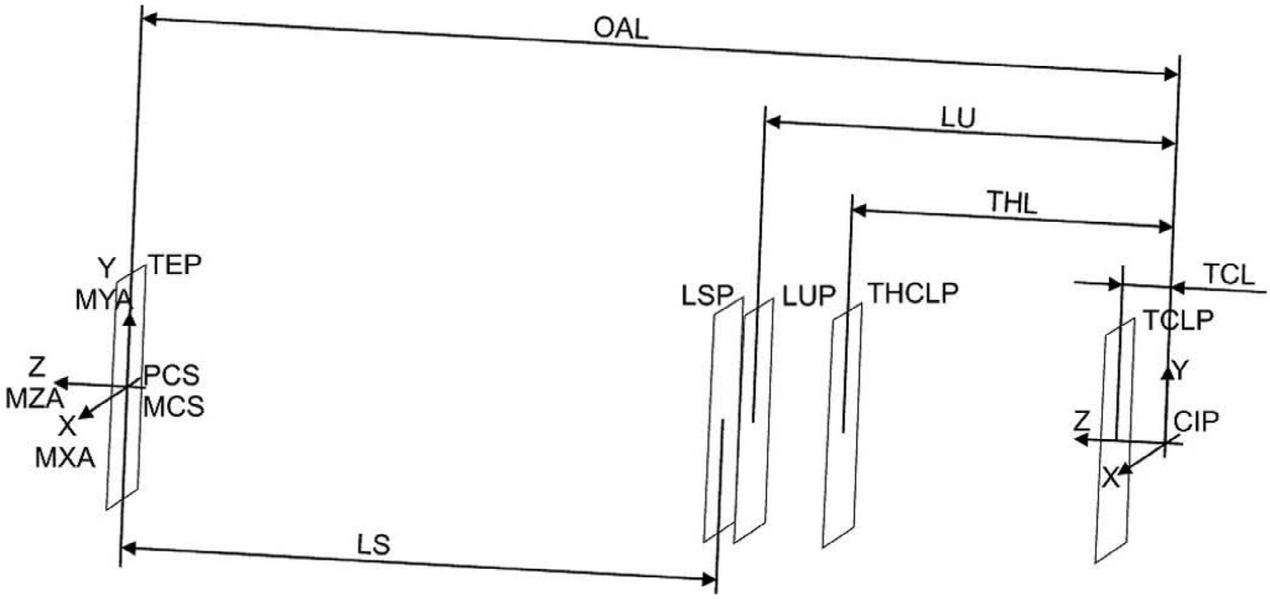


Figure 4 — Planes of modelling

4 Design of the model

4.1 General

Sketches and contours of the crude geometry do not contain any details, such as grooves, chamfers or rounding. These details shall be designed as separate design features, after the design of the crude geometry and are, therefore, named precision geometry.

The order of the structure of the model depends on the state of the technology of the CAD system. It shall be waived on references between the design components of the cutting and non-cutting part.

Thread-cutting taps, thread-forming taps and thread-cutting dies shall be built as rotational symmetric design elements based on properties in accordance with ISO/TS 13399-3:

— geometry of the non-cutting part, including the connection interface, if applicable;

— geometry of the cutting part.

NOTE 1 Both these geometrical parts are coloured as described in Clause 12.

NOTE 2 The total number of design elements is focused on the depth of modelling and the complexity of the cutting tool.

The following subclauses describe the specified structure of the model of the defined basic shapes of thread-cutting taps, thread-forming taps and thread-cutting dies.

4.2 Necessary parameters for the connection interface feature

Information about the connection interface code shall be filed as properties within the model and named as parameters as indicated in Table 1:

Table 1 — Parameter list for connection interface feature

Preferred symbol	Description	Source of symbol	ISO ID number
CCMS	connection code machine side	ISO/TS 13399-3 and ISO/TS 13399–4	71D102AE3B252
CCTMS	connection code type machine side	ISO/TS 13399-60 short name of subtype of connection_interface_feature	feature_class
CCFMS	connection code form machine side	ISO/TS 13399-60 number of the variant of the subtype of connection_interface_feature	feature_class
CZCMS	connection size code machine side	connection size code (dependent on side)	71FC193318002

The information above and other relevant properties shall be incorporated into the model as parameters or else recorded as a separate file.

5 Thread-cutting tap with offset shank

5.1 General

Figure 5 shows the properties used for identification and classification of thread-cutting taps with offset shank.

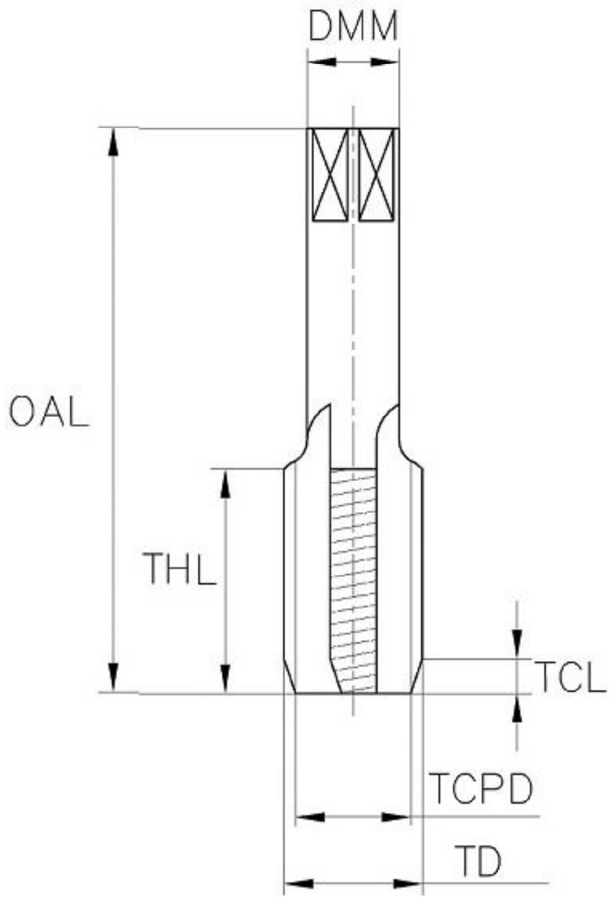


Figure 5 — Thread-cutting tap with offset shank — Determination of properties

5.2 Necessary properties

Table 2 shows the properties needed for the modelling of a thread-cutting tap.

Table 2 — Properties for the modelling of a thread-cutting tap with offset shank

Preferred name	Preferred symbol
tap chamfer plug diameter	TCPD
thread diameter[a]	TD
thread diameter size[b]	TDZ
threading length	THL
overall length	OAL
tap chamfer length	TCL
shank diameter	DMM

[a] Unit of thread diameter may be either metric or Imperial as a decimal number.

[b] Descriptor to identify the diameter of a threaded portion of an item in Imperial units. For the design, the equivalent real measure number shall be taken to the property "thread diameter".

5.3 Geometry of the non-cutting part including the shank

The basis of this part is a rotational design feature, containing all elements between the TEP and the THLP.

The sketch shall include all the elements indicated in Figure 6 and shall be designed on the YZ plane of the PCS. The rotational axis is the standard z-axis.

Design of the sketch:

— the sketch shall be determined as a half section;

— the sketch shall be constrained to coordinate system PCS and to planes TEP and THLP according to Figure 6. If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned; otherwise, distances shall be considered in conjunction with the defined datum planes;

— dimensioning shall be done with the appropriate properties listed in Table 2.

The sketch shall be rotated about the Z-axis through 360°.

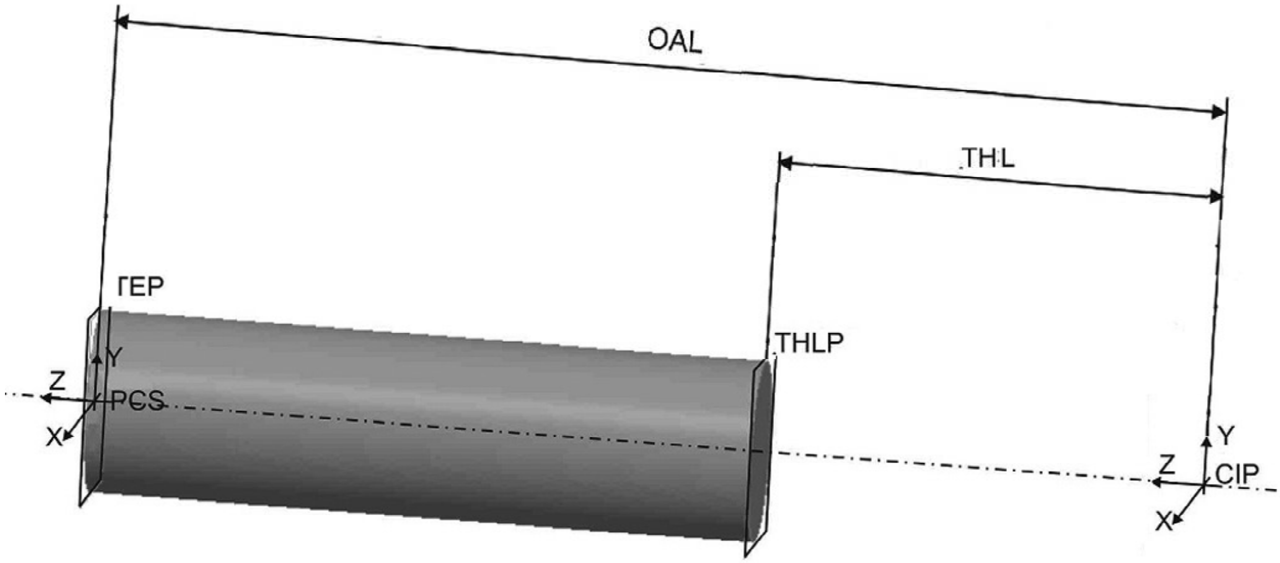


Figure 6 — Thread-cutting tap with offset shank — Non-cutting part

5.4 Geometry of the cutting part

The geometry of the cutting part shall be designed as a sketch in the front view YZ plane of the PCS with reference to the CIP and the TCLP and THLP.

The rotational axis is the standard Z-axis.

Design of the sketch:

— the sketch shall be determined as a half section (see Figure 7: thread-cutting tap with offset shank, rotational contour cutting edge);

— the tap chamfer plug diameter “TCPD” shall be modelled as cutting feature;

— the sketch shall be constrained to the CIP and to the TCLP and THLP planes according to Figure 7 and Figure 8. If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned; otherwise, distances shall be in conjunction with the defined datum planes;

— the dimensioning shall be done with the appropriate properties listed in Table 2.

The sketch shall be rotated about the Z-axis through 360°.

Figure 7 — Thread-cutting tap with offset shank — Sketch of cutting part

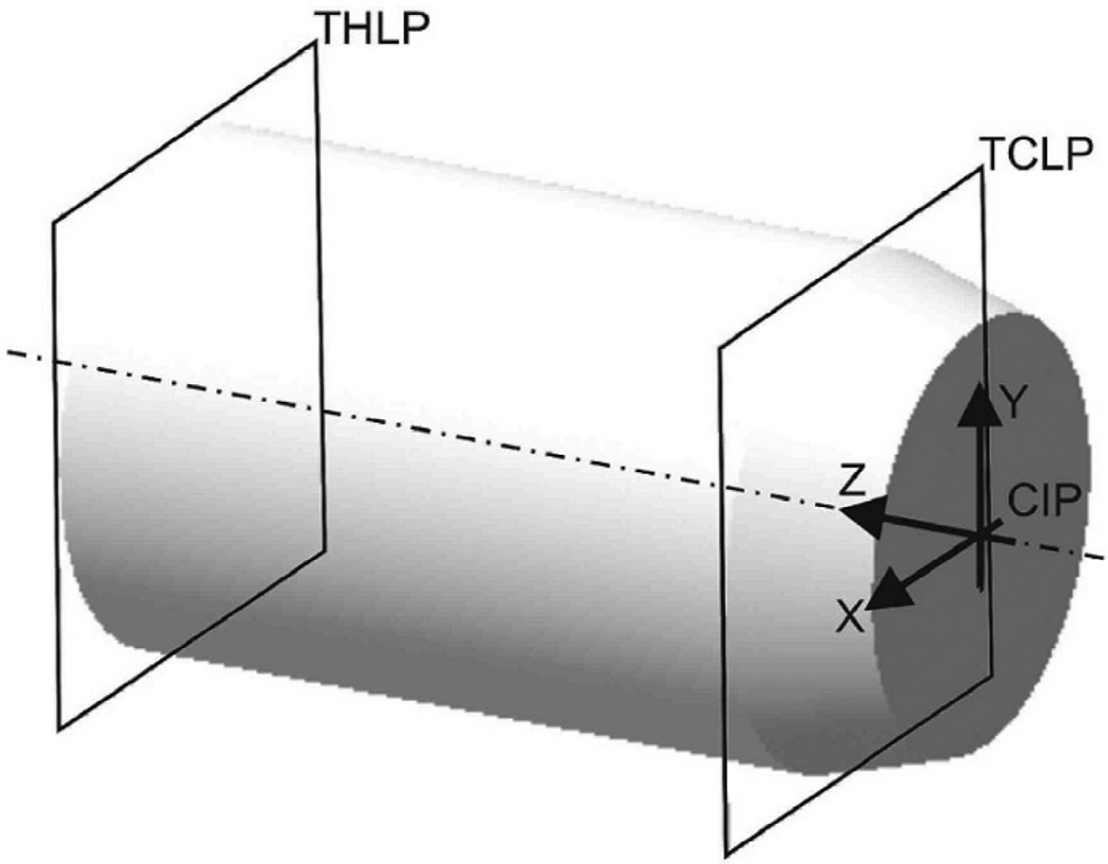


Figure 8 — Thread-cutting tap with offset shank — Revolved body of cutting part

5.5 Thread-cutting tap with offset shank — Complete

Figure 9 shows the complete thread-cutting tap with cutting and non-cutting parts.

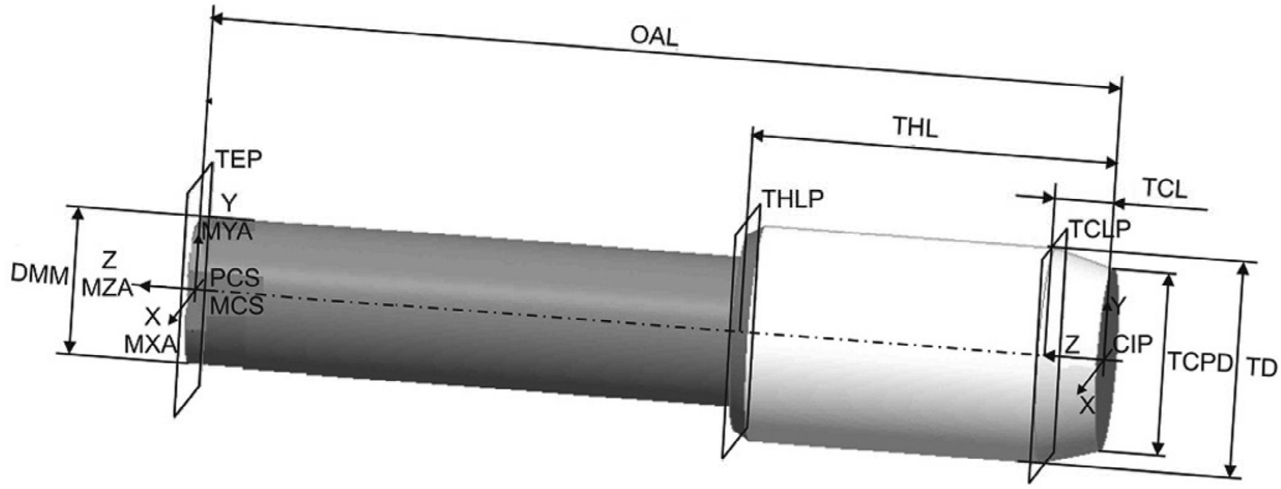


Figure 9 — Thread-cutting tap with offset shank — Complete

6 Thread-cutting tap with reinforced shank

6.1 General

Figure 10 shows the properties used for identification and classification of thread-cutting taps with reinforced shank.

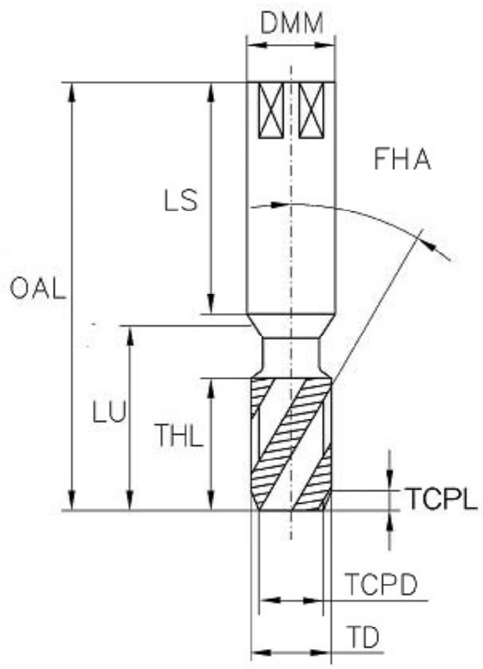


Figure 10 — Thread-cutting tap with reinforced shank — Determination of properties

6.2 Necessary properties

In addition to the properties listed in Table 2, the properties listed in Table 3 shall be used for modelling of a thread-cutting tap with reinforced shank.

Table 3 — Properties for modelling of a thread-cutting tap with reinforced shank

Preferred name	Preferred symbol
usable length	LU
shank length	LS

6.3 Geometry of the non-cutting part including the shank

The basis of this part is a rotational design feature, containing all elements between the PCS, the LSP (plane of the shank length) and the THLP.

The sketch includes all of the elements named above and shall be designed on the YZ plane of the PCS. The rotational axis is the standard z-axis.

Design of the sketch:

— the sketch shall be determined as a half section.

— the sketch shall be constrained to the PCS and to the THLP according to Figure 11. If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned; otherwise, distances shall be in conjunction with the defined datum planes;

— dimensioning shall be done with the appropriate properties listed in Tables 2 and 3.

The sketch shall be rotated about the Z-axis through 360°.

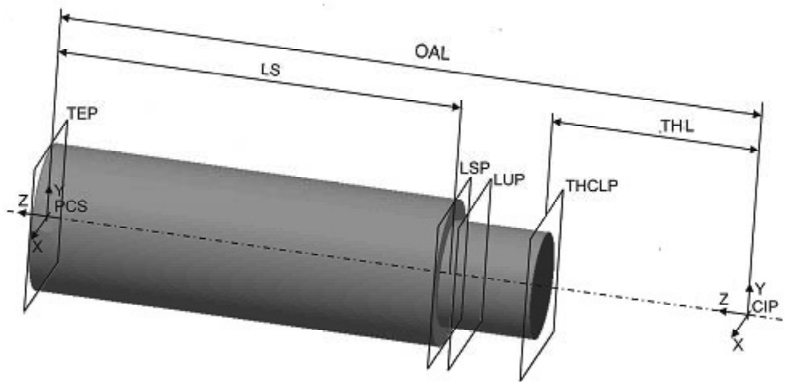


Figure 11 — Thread-cutting tap with reinforced shank — Non-cutting part

6.4 Geometry of the cutting part

The structure of the model is described in 5.4.

6.5 Thread-cutting tap with reinforced shank complete

The Figure 12 shows the complete thread-cutting tap with cutting and non-cutting part.

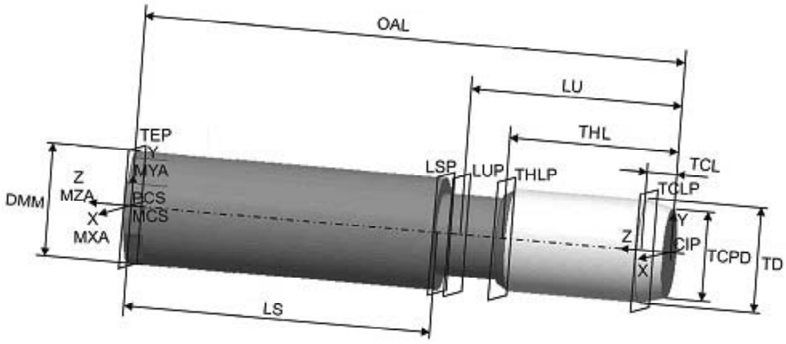


Figure 12 — Thread-cutting tap with reinforced shank — Complete

7 Thread-forming tap with offset shank

7.1 General

Figure 13 shows the properties used for identification and classification of thread-forming taps with offset shank.

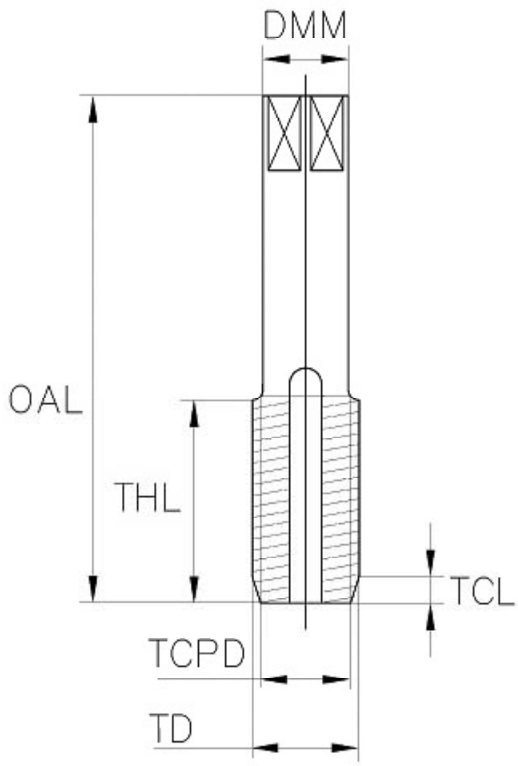


Figure 13 — Thread-forming tap with offset shank — Determination of properties

7.2 Necessary properties

Table 2 (see 5.2) gives the necessary properties.

7.3 Geometry of the non-cutting part including the shank

The structure of the model is described in 5.3 and is in accordance with Figure 6.

7.4 Geometry of the cutting part

The structure of the model is described in 5.4 and is in accordance with Figures 7 and 8.

7.5 Thread-forming tap with offset shank — Complete

Figure 14 shows the properties used for identification and classification of thread-forming taps with offset shank complete.

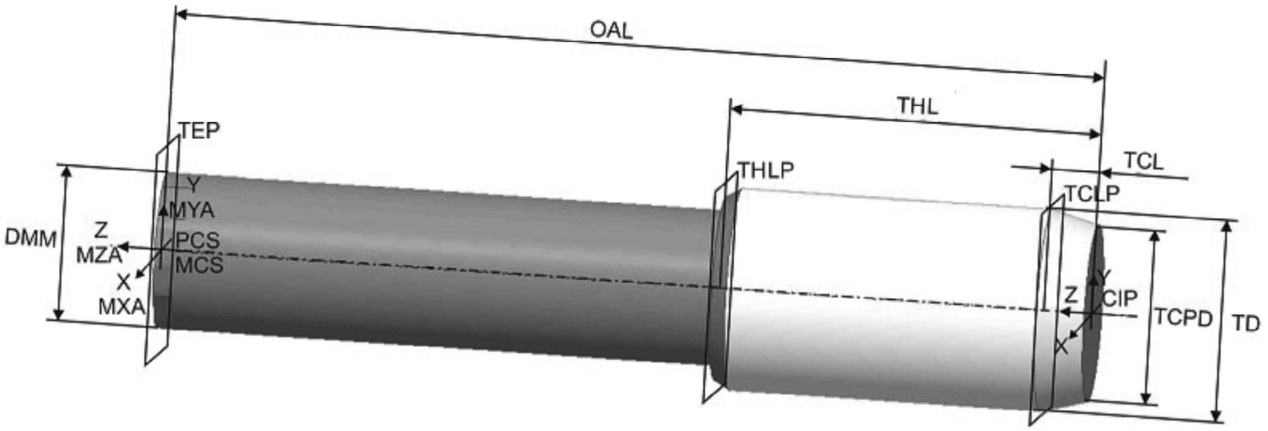


Figure 14 — Thread-forming tap with offset shank — Complete

8 Thread-forming tap with reinforced shank

8.1 General

Figure 15 shows the properties used for identification and classification of thread-forming taps with reinforced shank.

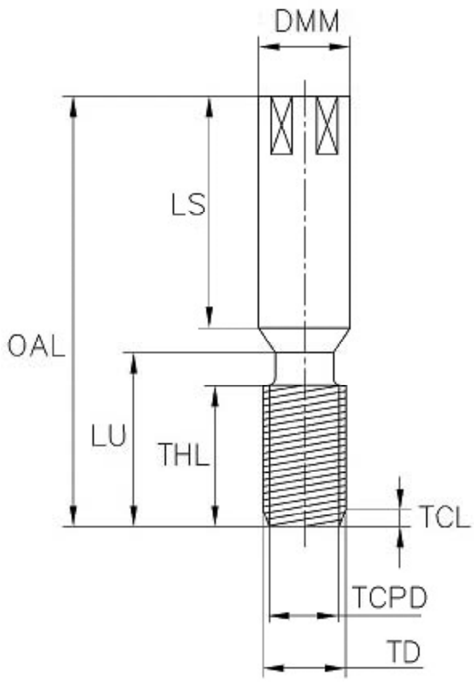


Figure 15 — Thread-forming tap with reinforced shank — Determination of properties

8.2 Necessary properties

Table 2 (see 5.2), 6.2 and Table 3 give the necessary properties.

8.3 Geometry of the non-cutting part including the shank

The structure of the model is described in 6.3 and is in accordance with Figure 11.

8.4 Geometry of the cutting part

The structure of the model is described in 5.4.

8.5 Thread-forming tap with reinforced shank — Complete

Figure 16 shows the properties used for identification and classification of thread-forming taps with reinforced shank complete.

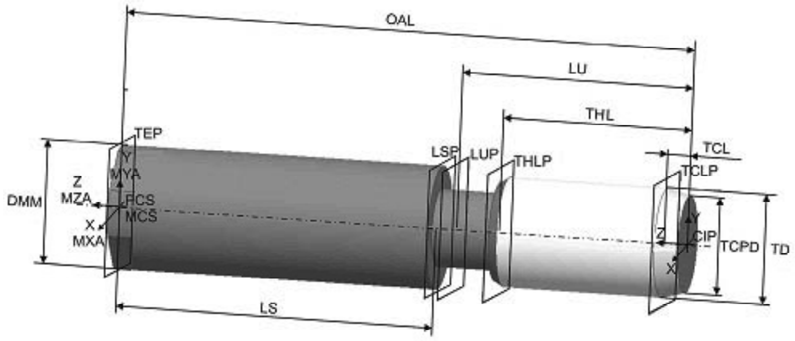


Figure 16 — Thread-forming tap with reinforced shank — Complete

9 Thread-cutting die round shape

9.1 General

Figure 17 shows the properties used for identification and classification of round shaped thread-cutting dies.

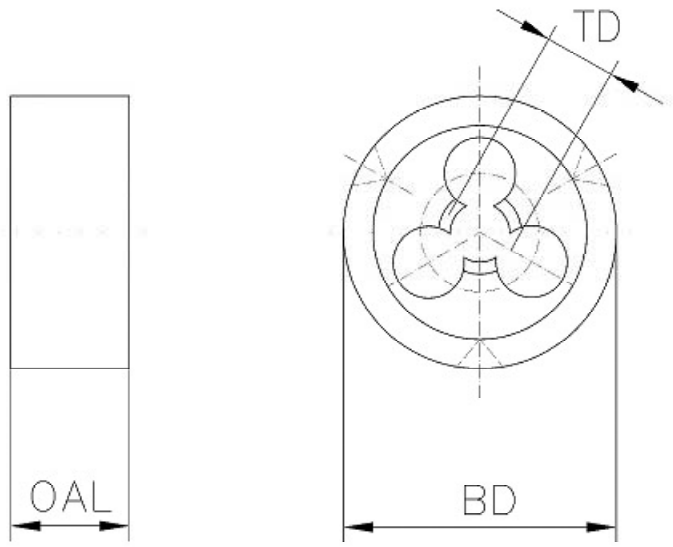


Figure 17 — Thread-cutting die, round shape — Determination of properties

9.2 Necessary properties

Table 4 shows the properties needed for modelling a thread-cutting die.

Table 4 — Properties for the modelling of a thread-cutting die — Round shape

Preferred name	Preferred symbol
body diameter	BD
thread diameter [a]	TD
thread diameter minor [a]	TDN
thread diameter size [b]	TDZ
overall length	OAL
die chip hole diameter	DDCH
die chip hole circle diameter	DDCHC
die chip hole count	DCHC

[a] Unit of thread diameters may be either metric or Imperial units in a decimal number.

[b] Descriptor to identify the diameter of a threaded portion of an item, in Imperial units. For the design, the equivalent real measure number shall be taken to the property "thread diameter".

9.3 Geometry of the non-cutting part

The basis of this part is a rotational design feature, containing all elements between the PCS and the CIP.

The sketch includes all of the elements named above and shall be designed on the YZ plane of the PCS. The rotational axis is the standard Z-axis.

Design of the sketch:

— the sketch shall be determined as a half section;

— the sketch shall be constrained to the PCS and the CIP in accordance with Figure 18. If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned; otherwise, distances shall be in conjunction with the defined datum planes;

— The dimensioning shall be done with the appropriate properties listed in Tables 2 and 3.

The sketch shall be rotated about the Z-axis through 360°.

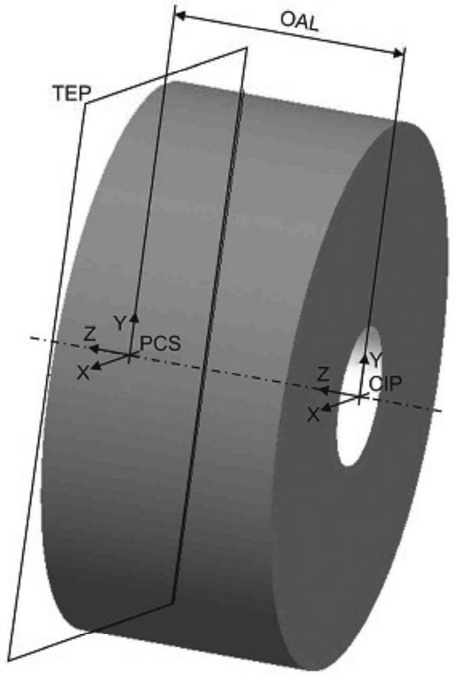


Figure 18 — Thread-cutting die, round shape — Revolved body

9.4 Geometry of the cutting part

The geometry of the cutting part shall be designed as a sketch in the front view YZ plane of the PCS with reference to the CIP; see Figure 19.

Only the minor thread diameter shall be designed.

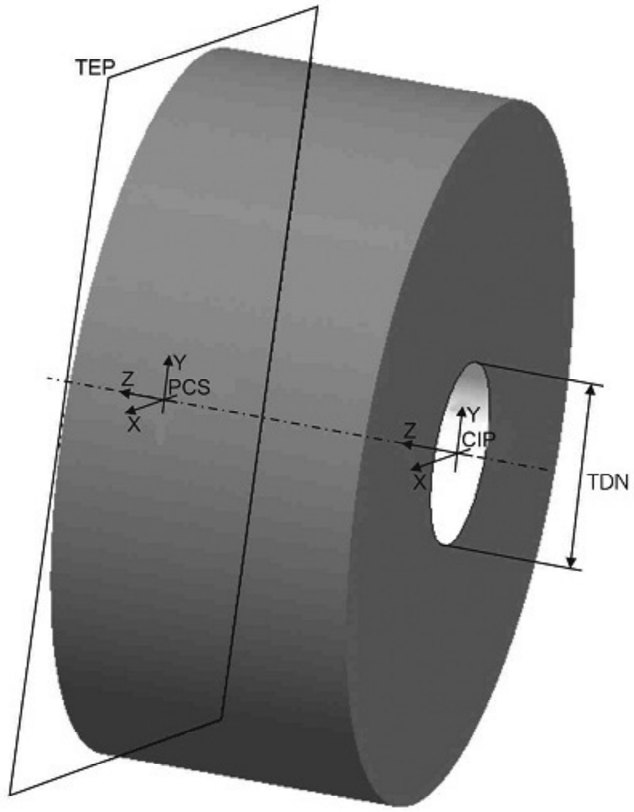


Figure 19 — Thread-cutting die, round shape — Revolved cutting part

9.5 Thread-cutting die, round shape — Complete

After inserting the detailed geometry [features grouped in item class “DETAILS” (see Clause 11)] into the crude geometry, Figures 20 and 21 represent a thread-cutting die with a round shape.

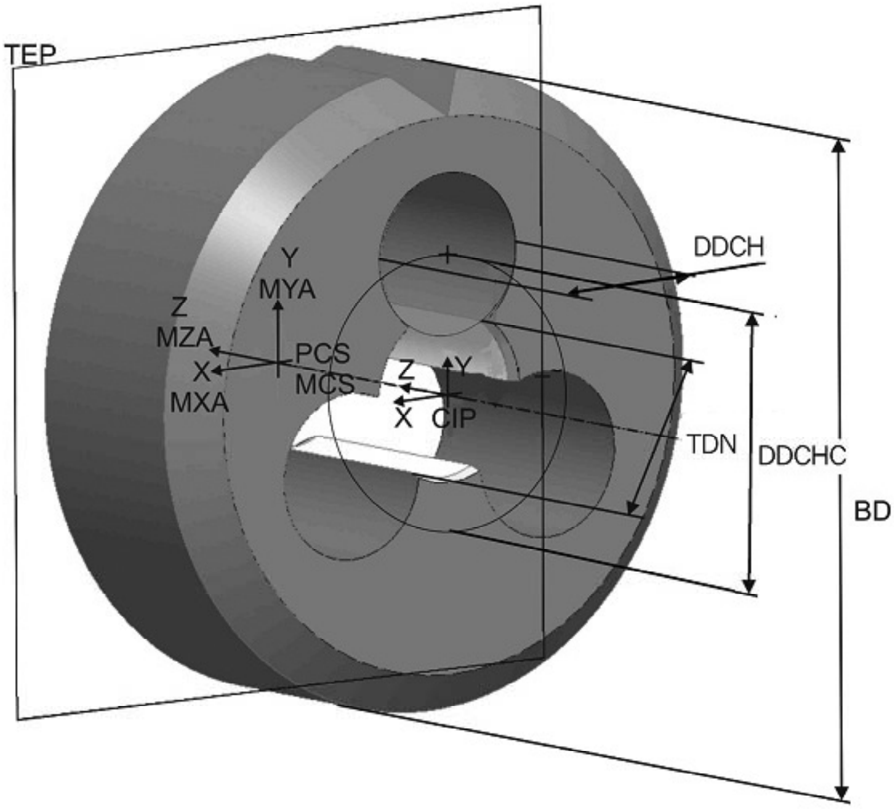


Figure 20 — Thread-cutting die, round shape — Complete

10 Thread-cutting die, hexagonal shape

10.1 General

Figure 21 shows the properties used for identification and classification of hexagonal shaped thread-cutting dies.

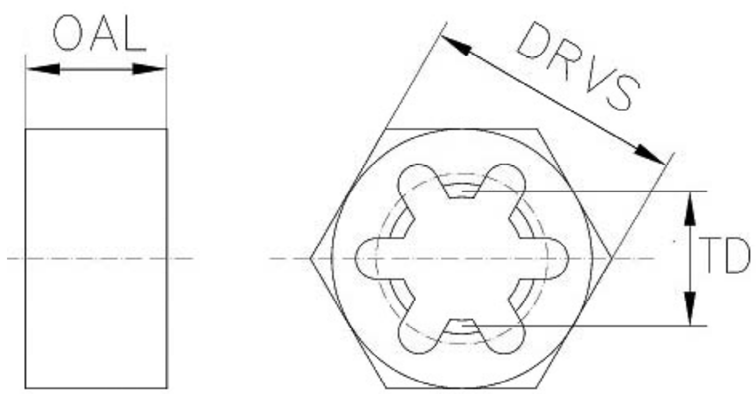


Figure 21 — Thread-cutting die, hexagonal shape — Determination of properties

10.2 Necessary properties

Table 4 gives the necessary properties.

Table 5 — Drive size property for the modelling of a thread-cutting die — Hexagonal shape

Preferred name	Preferred symbol
drive size[a]	DRVS
[a] The drive size property shall supersede the body diameter property from Table 4 to design a hexagonal shape.	

10.3 Geometry of the non-cutting part

The basis of this part is a 2D design feature, containing all of the elements of a hexagonal shape.

The feature shall be constrained to the PCS and located on the TEP.

The sketch shall be extruded along the negative Z-axis of the PCS.

Design of the sketch:

— the sketch shall be constrained to the PCS with the only dimension DRVS in accordance with Figures 21 and 22. Dimensioning shall be done with the appropriate properties listed in Tables 4 and 5.

— The sketch shall be extruded from plane TEP to the CIP. If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned; otherwise, distances shall be in conjunction with the defined datum planes.

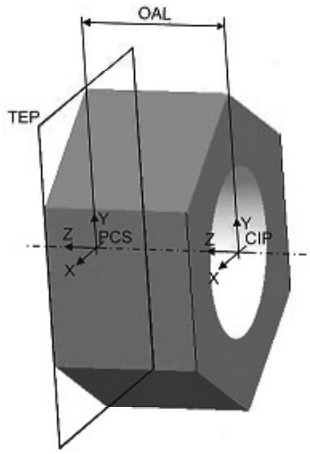


Figure 22 — Thread-cutting die, hexagonal shape — Extruded non-cutting part

10.4 Geometry of the cutting part

The structure of the model is described in 9.4.

10.5 Thread-cutting tap, hexagonal shape — Complete

After inserting the detailed geometry [features grouped in item class "DETAILS" (see Clause 11)] into the crude geometry, Figures 23 and 24 represent a thread-cutting die with hexagonal shape. The missing dimensions shall be in accordance with Figure 20.

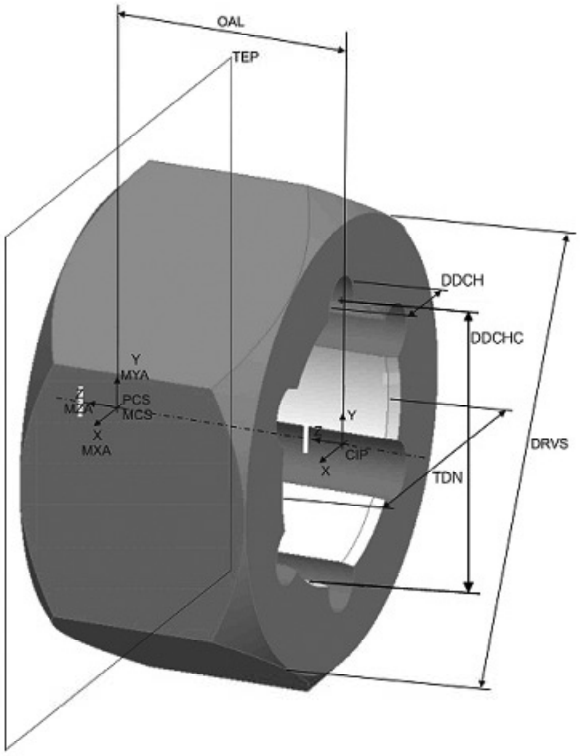


Figure 23 — Thread-cutting die, hexagonal shape — Complete

11 Design of details

11.1 Basis for modelling

All details shall be designed as separate design features and shall not be incorporated into either the revolved or the extruded body of the crude geometry.

11.2 Contact/clamping surfaces — Orientation

Clamping surfaces visualized within the tool model shall be uniquely positioned. The normal of the face shall be parallel with the +Y-axis of the PCS as illustrated in Figure 24.

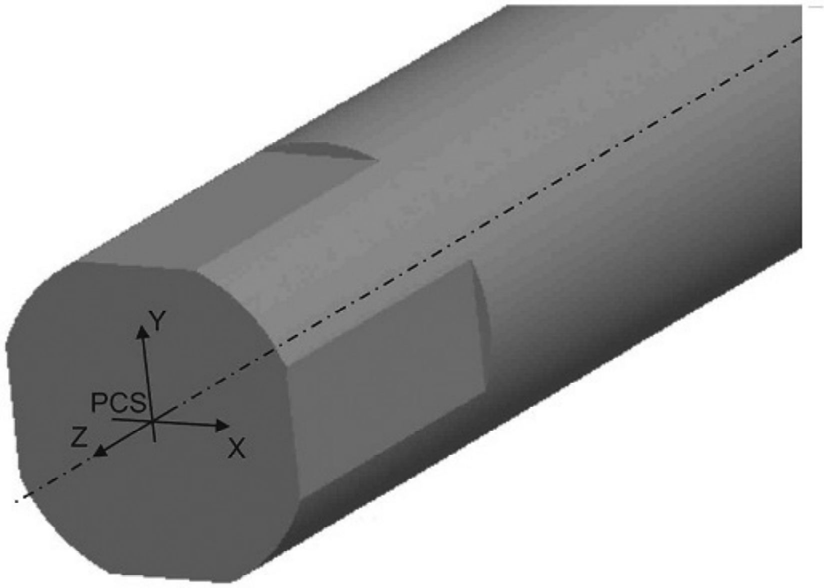


Figure 24 — Orientation of planar/clamping surfaces

11.3 Chamfers, rounding, others

Necessary chamfers and rounding shall be created within the according function of the 3D CAD system.

11.4 External centring at the face

External centring at the face shall be designed as a feature of the group "DETAILS" (see Table 6 and Figure 25).

Table 6 — Necessary properties for a centring tip

Preferred name	Preferred symbol
tap centre tip diameter	DTCT
tap centre tip angle	ANGTCT

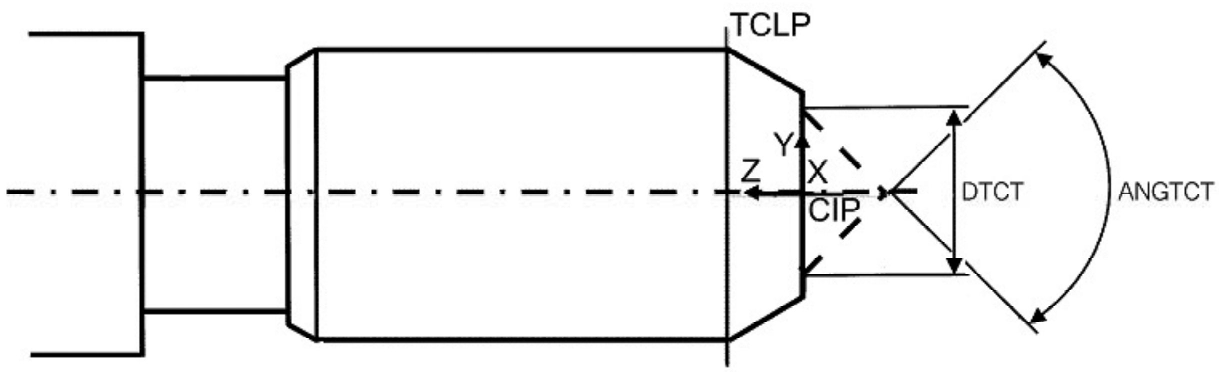


Figure 25 — Detail feature — Centring tip, offset

12 Attributes of surfaces — Visualization of model features

For a printed version of this part of ISO 13399 as well as for the 3D model itself, colour settings as part of the attributes of the surfaces should be according to ISO/TS 13399-80.

NOTE 1 Some CAD systems identify only one surface of the same diameter even if these surfaces are mated by means of two solid design features. Therefore, to be able to address the surface attributes to each of these features a revolved design feature is created over the cutting part feature. In the tree of elements and features, this element is called "CUTTING_SURFACE". This design feature is created with the sketch elements of the cutting and non-cutting part and is placed at the end of the tree.

NOTE 2 Some CAD systems make it possible to use the available lines of the main sketches for the creation of the "CUTTING_SURFACE". Thus, the THLP datum planes and any others are used as references. With the suppression of the main design elements, all referenced design elements can also be suppressed.

13 Structure of design elements (tree of model)

With tapping tools, cutting design feature "CUT" shall be distinguished from non-cutting feature "NOCUT". This shall be ensured by means of building groups. It is necessary that both groups may be suppressed or deactivated separately, without mutual interaction.

The detailed design features shall be put together in a separate group named "DETAILS". This group shall be the last element of the tree. It is dependent on the "CUT" and "NOCUT" groups and shall be suppressed if either of these two groups shall be suppressed (see Figure 26).

Such grouping shall be built only if the containing design features are arranged consecutively. Care should be taken, therefore, to ensure correct sequencing of the design features, and avoid incorrect referencing.

The structure shall look similar to Figure 26, using the example of a thread-forming tap, and shall be similar in other CAD systems:

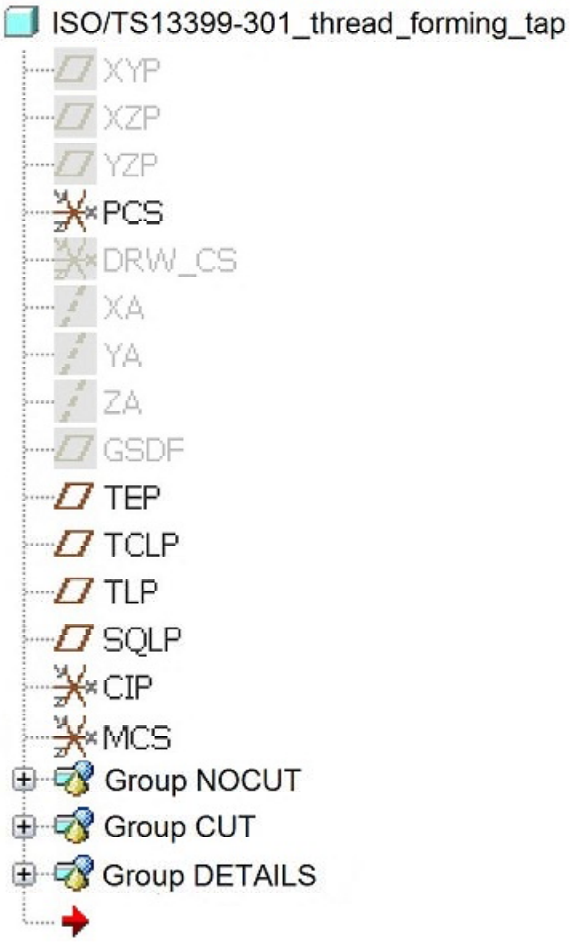


Figure 26 — Thread-forming tap — Example of the struture of design features

The same structure shall also be used for dies, but with fewer necessary datum planes (see Figure 27).

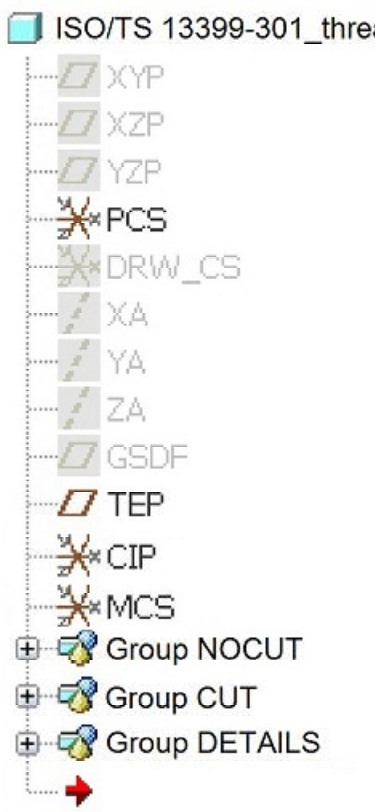
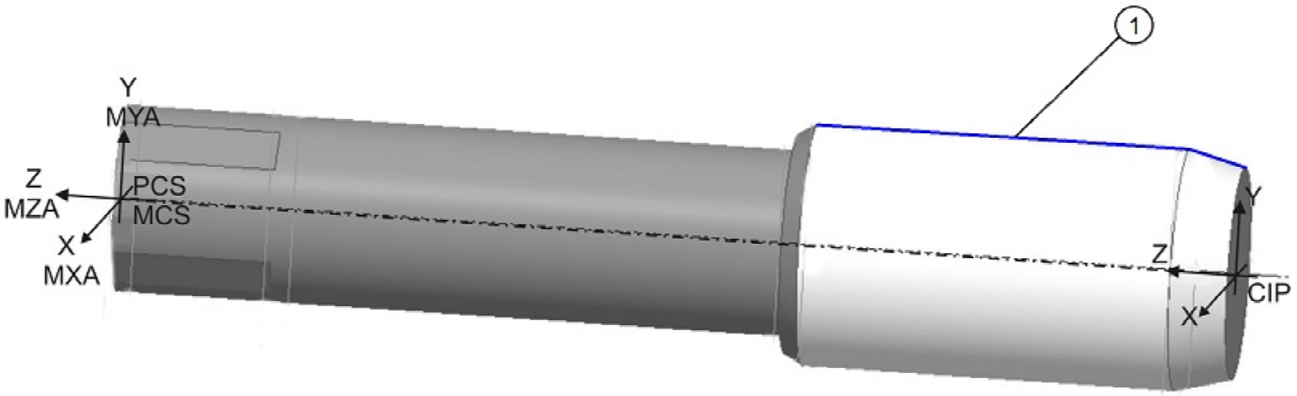


Figure 27 — Thread-cutting die — Example of the structure of design features

14 Data exchange model

The model for data exchange is illustrated in Figure 28 using the example of a thread-forming tap. All models shall contain the geometrical features (collision contour), the PCS, the MCS, the CIP and cutting line relevant to collision avoidance.



Key

1 cutting line

Figure 28 — Thread-forming tap with offset shank

Annex A
(informative)

Information about nominal dimensions

A nominal dimension, nominal size or trade size is a size "in name only" used for identification. The nominal size may not match any dimension of the product, but within the domain of that product the nominal size may correspond to a large number of highly standardized dimensions and tolerances. A nominal size might not even carry any unit of measurement. A nominal value is often a value existing in name only, assigned as a convenient designation rather than calculated by data analysis or following usual rounding methods. The use of nominal values can be based on *de facto* standards or some technical standards.

All real measurements have some variation depending on the accuracy and precision of the production method and the measurement uncertainty. The use of reported values often involves engineering tolerances. See Table A.1.

Table A.1 — Examples of nominal dimensions/sizes

Description	Value	Tolerance	Lower limit	Upper limit	Nominal
Morse taper size 5	MT5	–	–	–	5
internal diameter	⌀ 25	H6	25,000	25,013	25,000
external diameter	⌀ 25	g7	24,972	24,993	25,000
square shank size hxb	32 × 25	h13	31,61 × 24,67	32 × 25	32 × 25

Bibliography

[1] ISO 13584-24, *Industrial automation systems and integration — Parts library — Part 24: Logical resource: Logical model of supplier library*

[2] ISO 13584-25, *Industrial automation systems and integration — Parts library — Part 25: Logical resource: Logical model of supplier library with aggregate values and explicit content*

ICS 25.100.01;35.240.50

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