TECHNICAL SPECIFICATION

ISO/TS 13399-311

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Cutting tool data representation and exchange —

Part 311:
Creation and exchange of 3D models — Solid reamers

Représentation et échange des données relatives aux outils coupants —

Partie 311: Création et échange des modèles 3D — Alésoirs à arêtes de coupe non amovibles

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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 80: Creation and exchange of 3D models — Overview and principles* [Technical Specification]

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

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

— *Part 201: Creation and exchange of 3D models — Regular inserts* [Technical Specification]

— *Part 202: Creation and exchange of 3D models — Irregular inserts* [Technical Specification]

— *Part 203: Creation and exchange of 3D models — Replaceable inserts for drilling* [Technical Specification]

— *Part 204: Creation and exchange of 3D models — Inserts for reaming* [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]

— *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: Creation and exchange of 3D models — End mills for indexable inserts* [Technical Specification]

— *Part 308: Creation and exchange of 3D models — Milling cutters with arbor hole for indexable inserts* [Technical Specification]

— *Part 309: Creation and exchange of 3D models — Tool holders for indexable inserts* [Technical Specification]

— *Part 311: Creation and exchange of 3D models — Solid reamers* [Technical Specification]

— *Part 312: Creation and exchange of 3D models — Reamers for indexable inserts* [Technical Specification]

— *Part 401: Creation and exchange of 3D models — Converting, extending and reducing adaptive items* [Technical Specification]

— *Part 405: Creation and exchange of 3D models — Collets* [Technical Specification]

The following parts are under preparation:

— *Part 70: Graphical data layout — Layer settings for tool designs* [Technical Specification]

— *Part 71: Graphical data layout — Creation of documents for the standardized data exchange — Graphical product information* [Technical Specification]

— *Part 72: Creation of documents for the standardized data exchange — Definition of properties for drawing header and their XML-data exchange* [Technical Specification]

— *Part 305: Creation and exchange of 3D models — Modular tooling systems with adjustable cartridges for boring* [Technical Specification]

— *Part 310: Creation and exchange of 3D models — Turning tools with carbide tips* [Technical Specification]

Introduction

This part of ISO/TS 13399 defines the concept, the terms and the definitions how to design simplified 3D models of solid reamers that can be used for NC-programming, simulation of the manufacturing processes and the determination 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 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/TS 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/TS 13399 (all parts). The increasing demand providing the end user with 3D models for the purposes defined above is the basis for the development of this series of International Standards.

The objective of this International Standard is to provide the means to represent the information that describes cutting tools in a computer sensible form that is independent from any particular computer system. The representation will facilitate the processing and exchange of cutting tool data within and between different software systems and computer platforms and support the application of this data in manufacturing planning, cutting operations and the supply of tools. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and for archiving. The methods that are used for these representations are those developed by ISO/TC 184 for the representation of product data by using standardized information models and reference dictionaries.

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/TC 3/SC 3D, and in its extensions defined in ISO 13584-24 and ISO 13584-25.

Cutting tool data representation and exchange —

Part 311:
Creation and exchange of 3D models — Solid reamers

1 Scope

This part of ISO/TS 13399 specifies a concept for the design of tool items, for all kinds of solid reamers, together with the usage of the related properties and domains of values.

This part of ISO/TS 13399 specifies a common way of design simplified models that contain the following:

— definitions and identifications of the design features of solid reamers, with an association to the used properties;

— definitions and identifications of the internal structure of the 3D model that represents the features and the properties of solid reamers.

The following are outside the scope of this part of ISO/TS 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 being described in the scope of this part of ISO/TS 13399;

— concept of 3D models for adaptive items;

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 13399-3, *Cutting tool data representation and exchange — Part 3: Reference dictionary for tool items*

ISO/TS 13399-4, *Cutting tool data representation and exchange — Part 4: Reference dictionary for adaptive items*

ISO/TS 13399-50:2013, *Cutting tool data representation and exchange — Part 50: Reference dictionary for reference systems and common concepts*

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

ISO/TS 13399-80, *Cutting tool data representation and exchange — Part 80: Creation and exchange of 3D models — Overview and principles*

3   Starting elements, coordinate systems, planes

3.1   General

Modelling of the 3D models shall be done by means of nominal dimensions.

WARNING — There is no guarantee that the 3D model, created according to the methods described in this document, is a true representation of the physical tool supplied by the tool manufacturer. If the models are used for simulation purposes, e.g. CAM simulation, it shall be taken into consideration that the real product dimensions can differ from those nominal dimensions. See Annex A.

NOTE   Some definitions are taken from ISO/TS 13399-50.

3.2   Reference system

The reference system shall consist of the following standard elements as shown in Figure 1:

— **standard coordinate system**: right-handed rectangular Cartesian system in three-dimensional space, called "primary coordinate system" (PCS);

— **three orthogonal planes:** planes in the coordinate system that contain the axis of the system, called "XY-plane" (XYP), "XZ-plane" (XZP) and "YZ-plane" (YZP);

— **three orthogonal axis:** axes built as intersections of the three orthogonal planes lines respectively, called "x-axis" (XA), "y-axis" (YA) and "z-axis" (ZA).
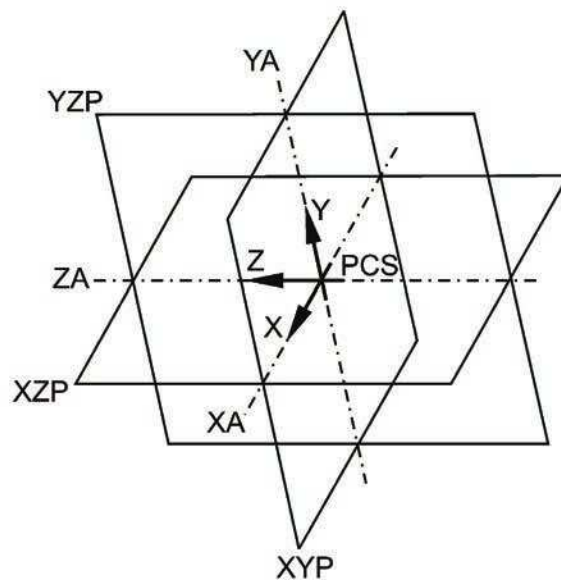

Figure 1 — Reference system

3.3   Primary coordinate system and mounting coordinate system

The location of the primary coordinate system (PCS) within the 3D model shall be defined unambiguously. In accordance with ISO/TS 13399-50:2013, 5.2 and Figures F.4 to F.9, the position of the PCS is given for all connection interfaces. Subsequently, the PCS is located at the gauge line, if connection interfaces with defined gauge line are used, e.g. hollow taper shank, hollow polygonal taper or taper with ball track system. For shanks without defined gauge line, the PCS shall be positioned at the end of the shank.

For virtually mounting of reamers onto an adaptive item, an additional reference system shall be defined. This reference system is called "mounting coordinate system" (MCS). It is located at the starting point of the protruding length of a tool item. The orientation is shown in Figure 2.
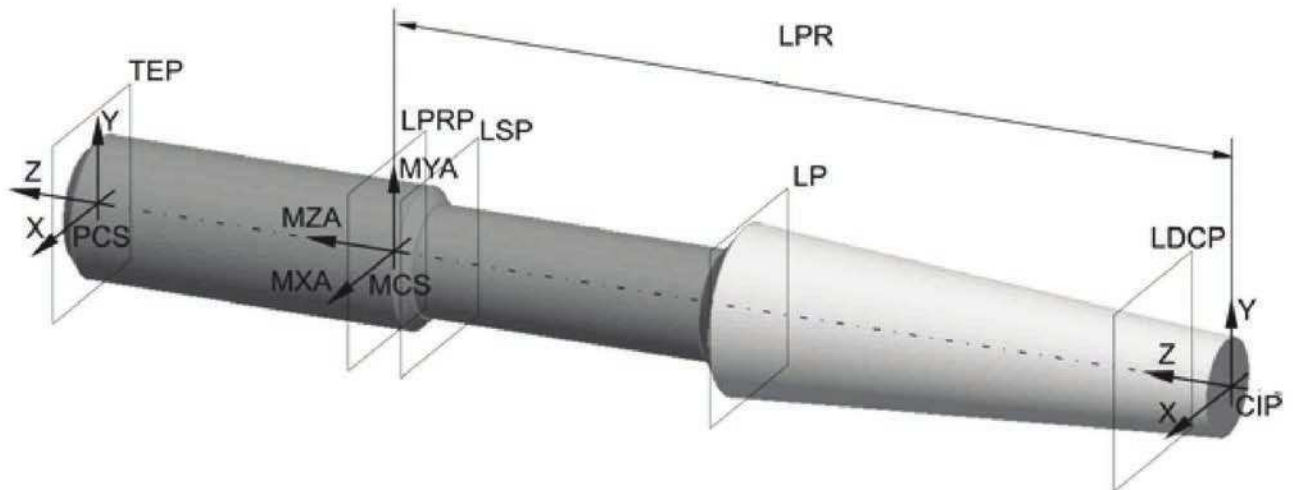

Figure 2 — Example of orientation of "PCS" and "MCS" reference system

3.4   Coordinate system at the cutting part

The coordinate system at the cutting part, e.g. the planar front face, named "coordinate system in process" (CIP), with a defined distance to the PCS shall be oriented as follows and as shown in Figure 3:

— z-axis of CIP points to the PCS;

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

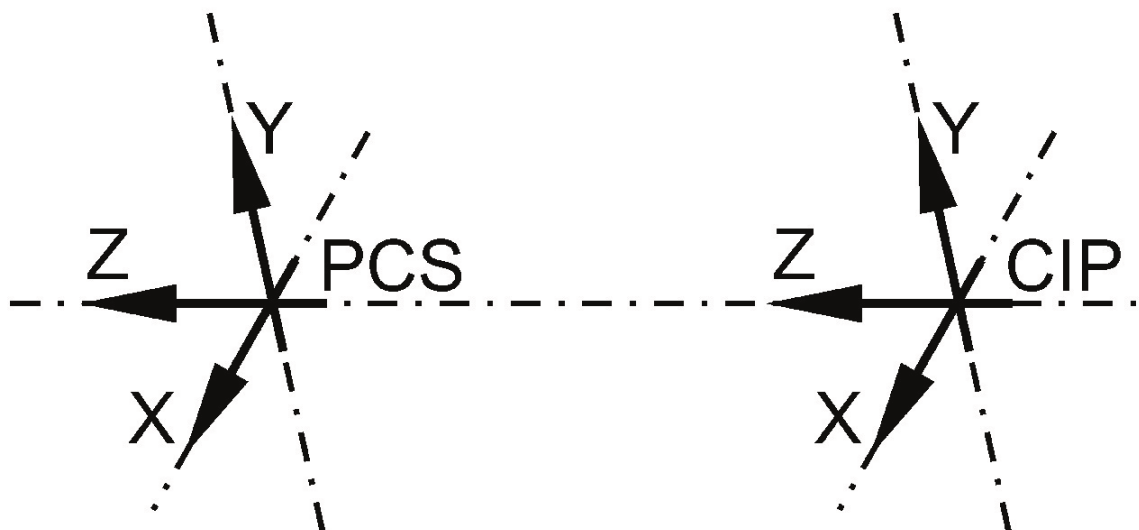— y-axis of CIP is parallel to the y-axis of PCS.

Figure 3 — Orientation of CIP

If the 3D modelling software gives the possibility to include interfaces for components, e.g. to mount a face cutting part onto a complete cutting tool, the coordinate system "CIP" should be used.

3.5 Planes

The modelling shall take place based on planes according to Figure 4, used as reference if applicable. Therefore, the model shall be able to vary or single features of independent design features shall be deleted by means of changing the value of one or more parameter of the model design. Furthermore, the identification of the different areas shall be simplified in using the plane concept, even if they contact each other with the same size, e.g. chip flute, shank, etc.

For the 3D visualization of solid reamers, the planes shall be determined as follows:

— "HEP" plane (head end plane) for the overall length of the tool (OAL); based on PCS;

— "LDCP" plane for the distance of reference point "PK"; based on "CIP";

— "LP" plane for the cutting edge length (L); based on "CIP";

— "LPRP" plane for the protruding length (LPR); based on "CIP";

— "LSP" plane of the shank length (LS); based on "TEP";

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

— "PLGLP" plane for the plug length; based on "CIP";

— "SDLP_x" plane for the step diameter length – indexed by means of "step count"; based on "TCLP" for the first step or "SDP_x" for the next steps – the distance between "SDLP_x" and either "TCLP" or "SDP_x" gives the value of "SDL_x";

— "SDP_x" plane for the step distance, indexed by means of "step count; based on "CIP";

— "TEP" tool end plane for the tool length; the distance between "CIP" and "TEP" is called overall length (OAL).

Figure 4 shows an example of the order and location of defined planes for design.
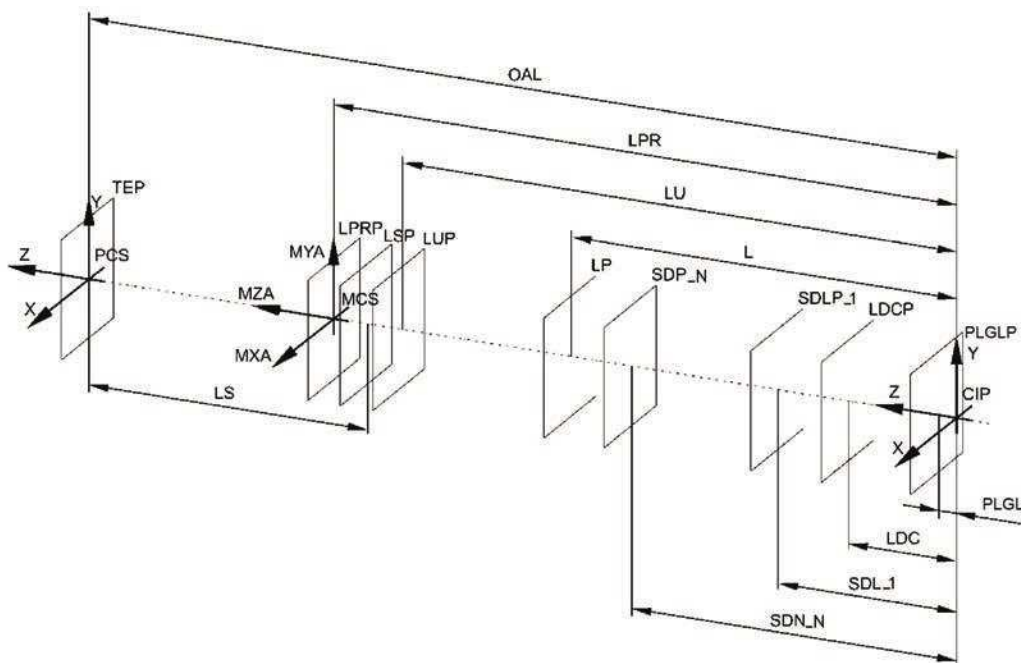

Figure 4 — Planes for design

3.6 Cutting reference point

For the design, the cutting reference point (CRP) shall be defined. The point is defined as the theoretical cutting edge in the XZ plane of the "PCS". Therefore, it is always referenced to the cutting diameter as shown in Figure 5.
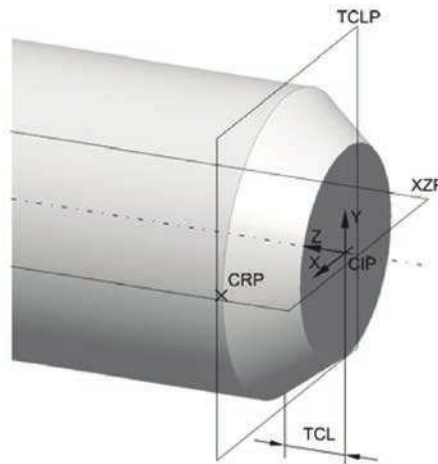

Figure 5 — Position of cutting reference point (CRP)

4 Design of the model

4.1 General

The sketches (outline contour) and contours of the basic geometry do not contain any details, such as grooves, chamfers, rounding. These details shall be designed as separate design features after the design of the basic geometry and therefore are named precision geometry.

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

Solid reamers 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;

— additional to the design elements being described as follows, a polyline named "cutter line" shall be generated along the cutting part which can be either open or closed.

Both geometrical parts shall be coloured as described in Clause 11.

The total amount of design elements shall be focused on the depth of modelling and the complexity of the cutting tool.

The specified structure of the model of the defined basic shapes of solid reamers is described in 4.2.

If the CAD software does not support the use of datum planes, the sketches shall be fully parametrically dimensioned. Otherwise the distances shall be in conjunction with the defined datum planes.

4.2 Necessary properties for the connection interface feature

Information about the connection interface code shall be filled as properties within the model and being named as parameters as listed 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 of side)	71FC193318002

The information given in Table 1 and other relevant properties shall be incorporated into the model as parameters or shall be taken as a separate file.

5 Cylindrical reamer

5.1 General

Figure 6 shows the properties to be used for the design of solid cylindrical reamers.
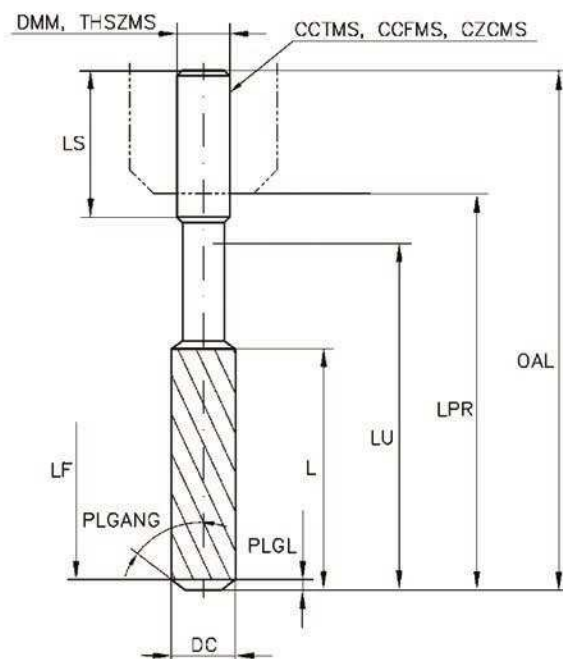
Figure 6 — Determination of properties of cylindrical reamers

5.2   Necessary properties

The properties needed for the modelling of a cylindrical reamer shall comply with Table 2.

Table 2 — Properties for the modelling of a cylindrical reamer

Preferred name	Preferred symbol
Cutting diameter	DC
Shank diameter	DMM
Neck diameter	DN
Protruding length	LPR
Cutting edge length	L
Functional length	LF
Shank length	LS
Usable length	LU
Overall length	OAL
Plug length	PLGL
Plug angle	PLGANG

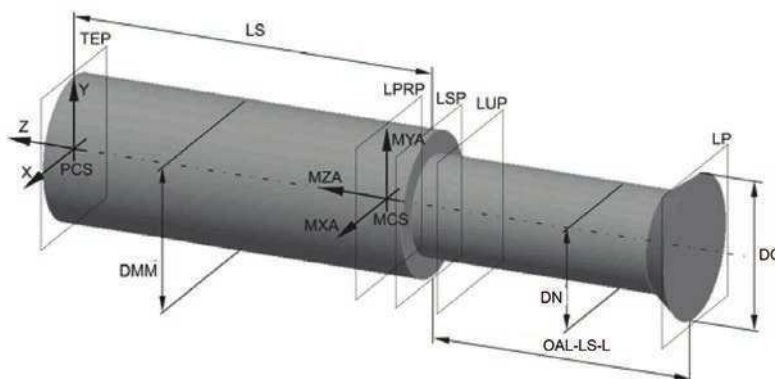## 5.3   Geometry of the non-cutting part including the connection

The basis of the feature is a rotational design feature which contains all elements between the plane "TEP" and the separation plane "LP" to the cutting part.

The sketch (outline contour) includes all the elements above and shall be designed on the YZ plane of the "PCS". The rotational axis is the standard z-axis.

The design of the sketch shall be done as follows:

— the sketch shall be determined as a half section;

— the sketch shall be constrained to the coordinate system "PCS" and to the planes "TEP" and "LP" according to Figure 7. If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned. Otherwise the 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 revolved about the z-axis by 360° as shown in Figure 7.

Figure 7 — Non-cutting part inclusively shank of cylindrical reamer

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 coordinate system "CIP" and the plane "LP".

The rotational axis is the standard z-axis.

The design of the sketch shall be done as follows:

—   the sketch shall be determined as a half section as shown in Figure 8;

—   the sketch shall be constrained to the coordinate system "CIP" and to the plane "LP". If the CAD software does not support the use of datum planes, the sketch shall be fully dimensioned. Otherwise the 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 revolved about the z-axis by 360 as shown in Figure 9.

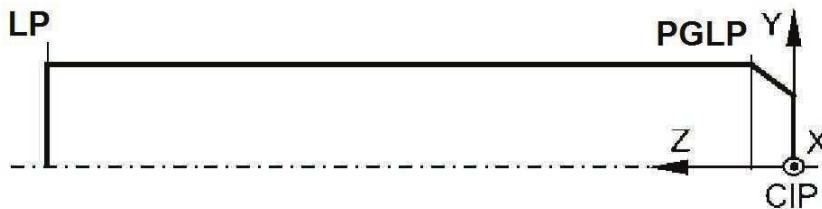See 5.5 and Figure 10 for dimensions of the sketch.

Figure 8 — Sketch of the cutting part of a cylindrical reamer

Figure 9 — Revolved body of the cutting part of a cylindrical reamer

5.5   Complete cylindrical reamer

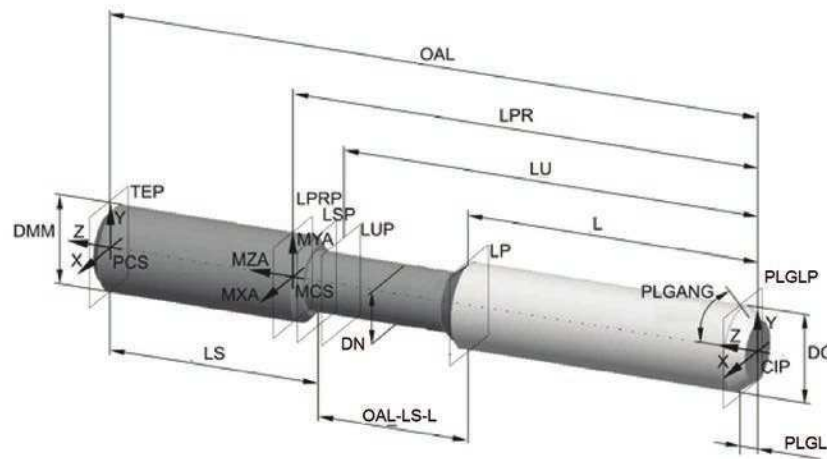The complete cylindrical reamer with cutting and non-cutting part is shown in Figure 10.

Figure 10 — Complete cylindrical reamer

6   Tapered reamer

6.1   General

Figure 11 shows the properties to be used for the design of solid tapered reamers.
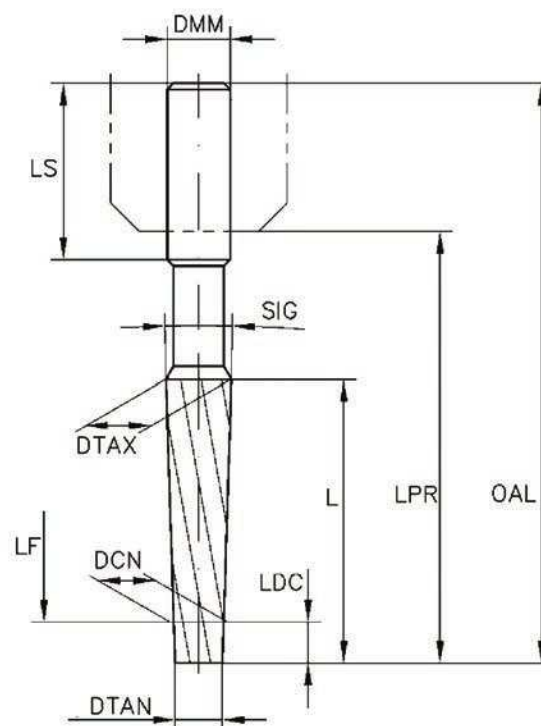

Figure 11 — Determination of properties of tapered reamers

6.2   Necessary properties

The properties needed for the modelling of a tapered reamer shall comply with Table 3.

Table 3 — Properties for the modelling of a tapered reamer

| Preferred name	Preferred symbol
Cutting diameter	DC
Shank diameter	DMM
Neck diameter	DN
Taper diameter smallest	DTAN
Taper diameter largest	DTAX
Protruding length	LPR
Cutting edge length	L
Distance reference point PK	LDC
Functional length	LF
Shank length	LS
Overall length	OAL
Point angle	SIG

6.3   Geometry of the non-cutting part including the connection

The geometry of the non-cutting part is described in 5.3 and shall be in accordance with Figure 7.

6.4   Geometry of the cutting part

The geometry of the cutting part is described in 5.4 and Figure 13 illustrates the solid body of the cutting part.

See 6.5 and Figure 14 for the dimensions of the sketch and Figure 12 for the design of the sketch.
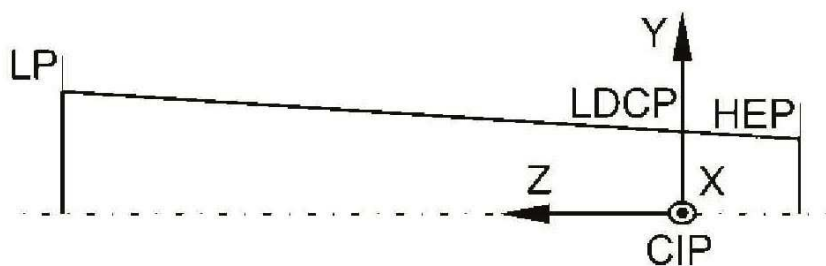
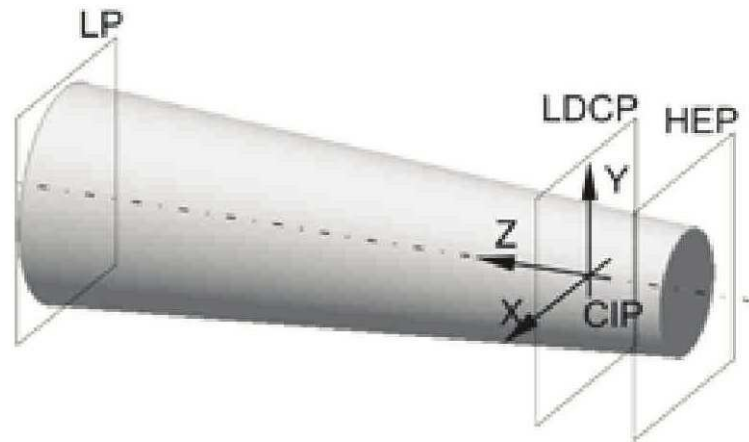**Figure 12 — Sketch of the cutting part of a tapered reamer**

Figure 13 — Revolved body of cutting part of a tapered reamer

6.5 Complete tapered reamer

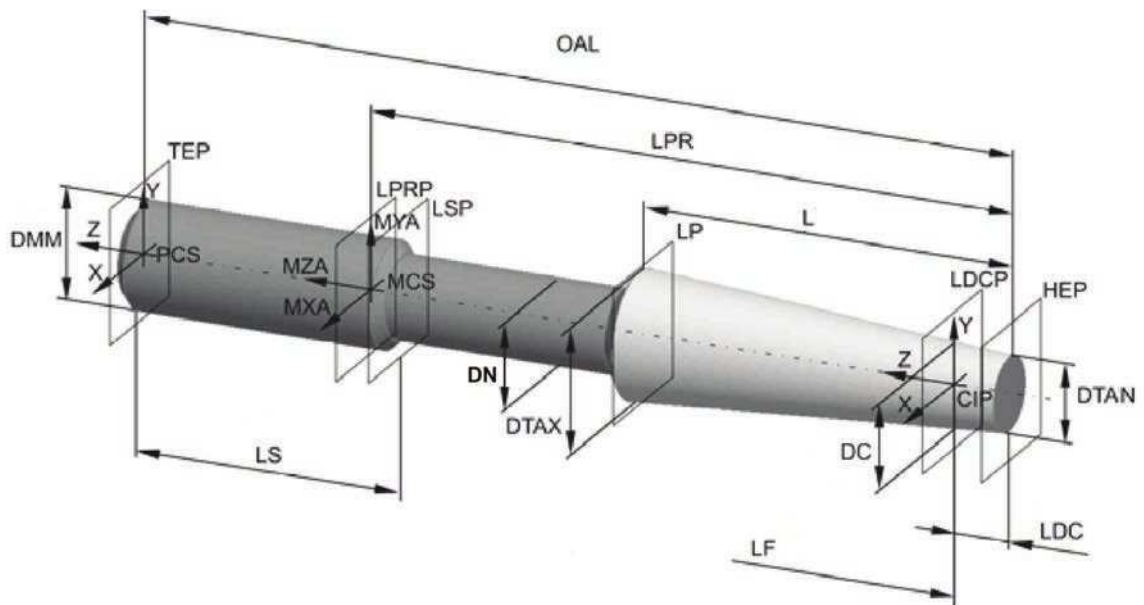The complete tapered reamer with cutting and non-cutting part is shown in Figure 14.

Figure 14 — Complete tapered reamer

7 Stepped reamer

7.1 General

The properties shown in Figure 15 shall be used for the design of solid stepped reamers.
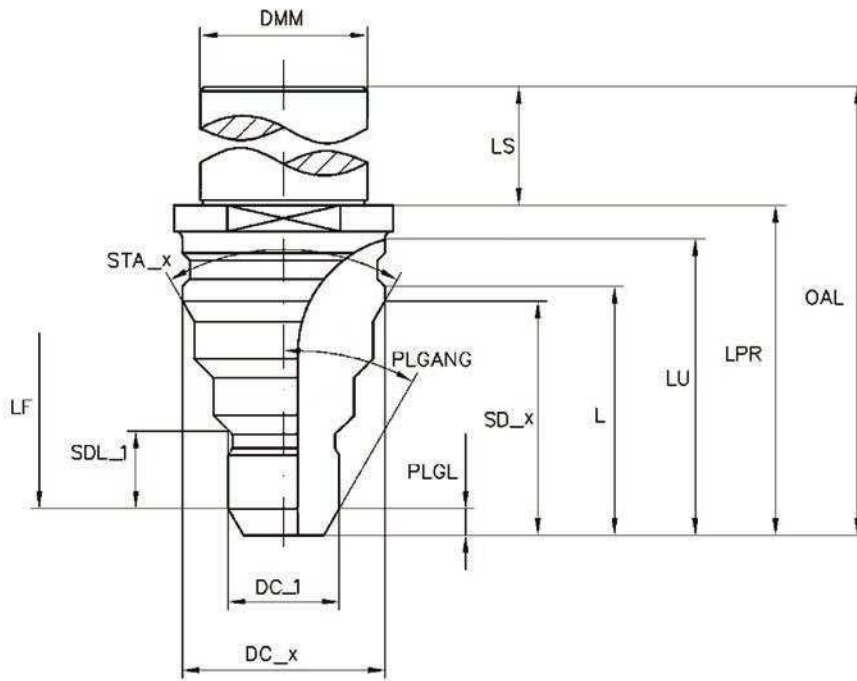
Figure 15 — Determination of properties of stepped reamer

7.2 Necessary properties

The properties needed for the modelling of a stepped reamer shall comply with Table 4.

Table 4 — Properties for the modelling of a stepped reamer

| Preferred name	Preferred symbol
Cutting diameter[a]	DC
Shank diameter	DMM
Neck diameter	DN
Cutting edge length	L
Functional length	LF
Protruding length	LPR
Shank length	LS
Usable length	LU
Step count	NOS
Overall length	OAL
Plug angle[b]	PLGANG
Plug length[b]	PLGL
Step distance[a]	SD
Step diameter length[a]	SDL
Step included angle[a]	STA
[a] These properties are indexed by means of the value of the property "step count". The properties "step distance" and "step included angle" are only applicable starting with index number "2".	
[b] "Plug angle" and "plug length" are only allowed to be used on the most front step pointing to the workpiece.	

7.3 Geometry of the non-cutting part including the connection

The geometry of the non-cutting part is described in 5.3 and shall be in accordance with Figure 7.

7.4 Geometry of the cutting part

The geometry of the cutting part is described in 5.4 and Figure 16 illustrates the design of the sketch.

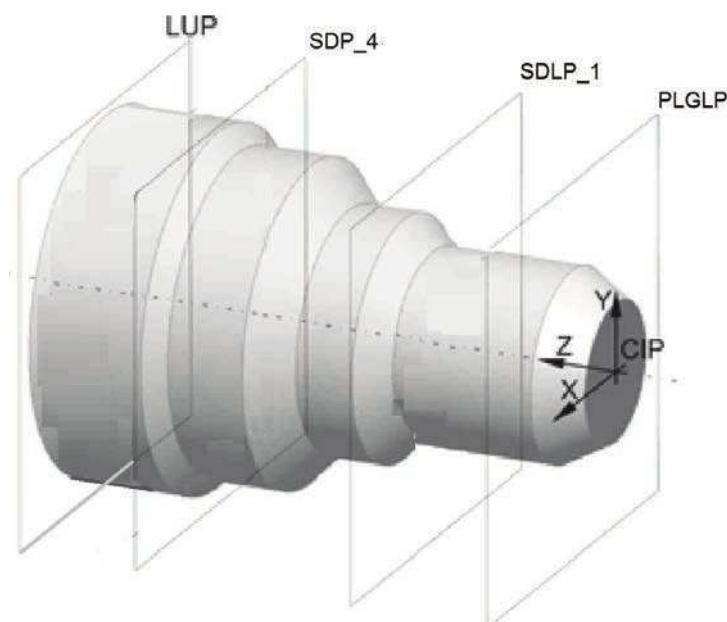See 7.5 and Figure 18 for the dimensions of the sketch.
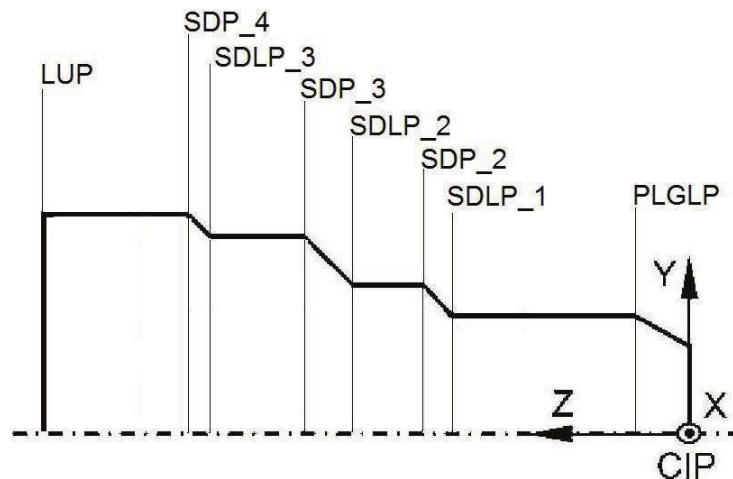
NOTE   To keep the clearness of the image, a few planes are only shown.

Figure 16 — Example of the sketch of cutting part of a stepped reamer

Figure 17 shows the revolved body of the cutting part of a stepped reamer.

NOTE   To keep the clearness of the image, a few planes are only shown.

Figure 17 — Revolved body of the cutting part of a stepped reamer

7.5   Complete stepped reamer

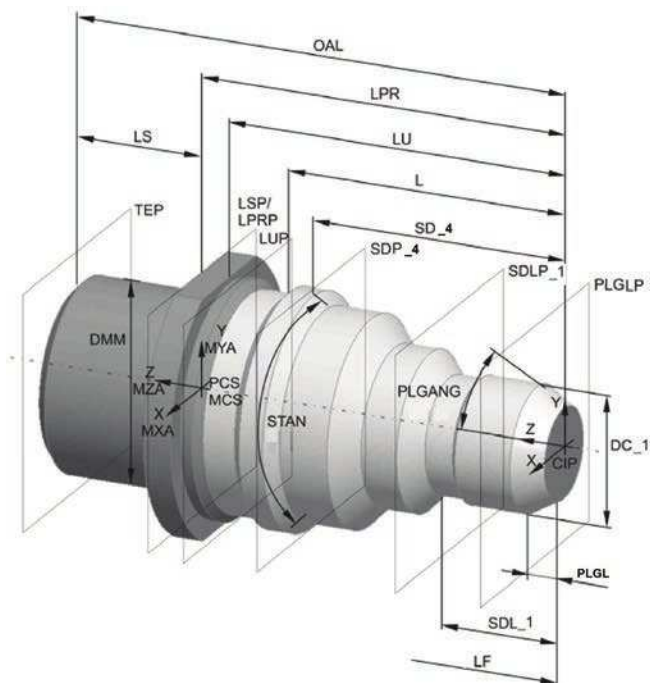The complete stepped reamer with cutting and non-cutting part is shown in Figure 18.

Figure 18 — Complete stepped reamer

8   Bell-style reamer

8.1   General

The properties shown in Figure 19 shall be used for the design of solid bell-style reamers.
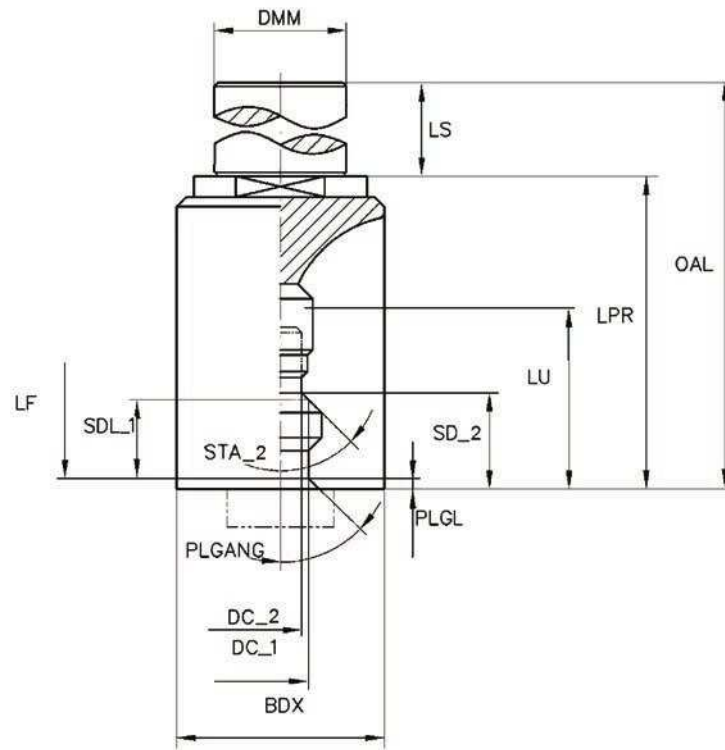
Figure 19 — Determination of properties of bell-style reamer

8.2 Necessary properties

The properties needed for the modelling of a bell-style reamer shall comply with Table 5.

Table 5 — Properties for modelling of a bell-style reamer

Preferred name	Preferred symbol
Body diameter max	BDX
Cutting diameter[a]	DC
Shank diameter	DMM
Neck diameter	DN
Cutting edge length	L
Functional length	LF
Protruding length	LPR
Shank length	LS
Usable length	LU
Step count	NOS
Overall length	OAL
Plug angle[b]	PLGANG
Plug length[b]	PLGL
[a] These properties are indexed by means of the value of the property "step count". The properties "step distance" and "step included angle" are only applicable starting with index number "2".	
[b] "Plug angle" and "plug length" are only allowed to be used on the most front step pointing to the workpiece	

Table 5 *(continued)*

| Preferred name	Preferred symbol
Step distance ᵃ	SD
Step diameter length ᵃ	SDL
Step included angle ᵃ	STA
ᵃ These properties are indexed by means of the value of the property "step count". The properties "step distance" and "step included angle" are only applicable starting with index number "2". b "Plug angle" and "plug length" are only allowed to be used on the most front step pointing to the workpiece	

8.3   Geometry of the non-cutting part including the connection

The geometry of the non-cutting part is described in 5.3 and shall be in accordance with Figure 7.

8.4   Geometry of the cutting part

The geometry of the cutting part is described in 5.4. Figure 20 illustrates the design of the sketch, while Figure 21 shows the revolved cutting part.

See 8.5 and Figure 21 for the dimensions of the sketch.
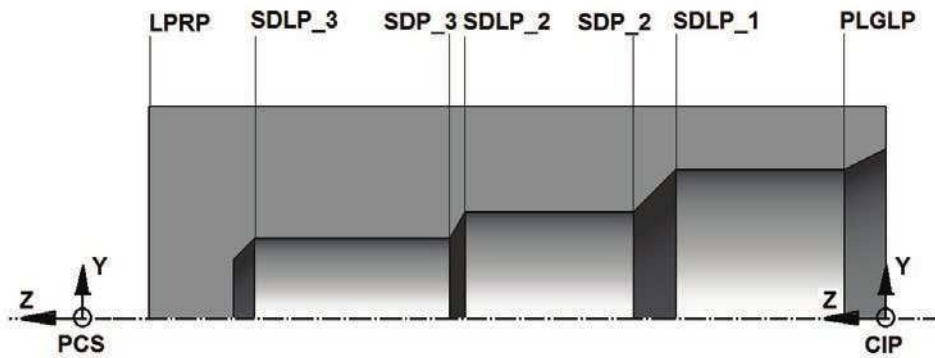
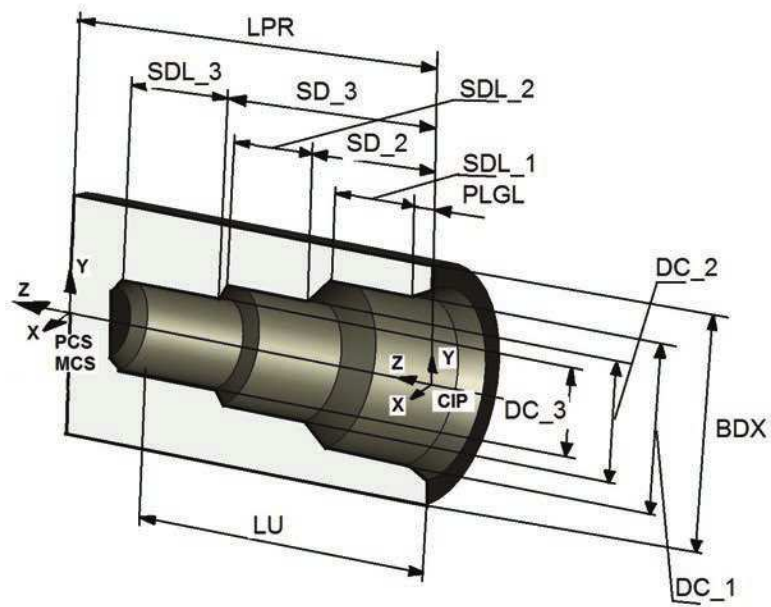**Figure 20 — Sketch of cutting part of a bell-style reamer**

Figure 21 — Revolved body of the cutting part of a bell-style reamer

8.5 Complete bell-style reamer

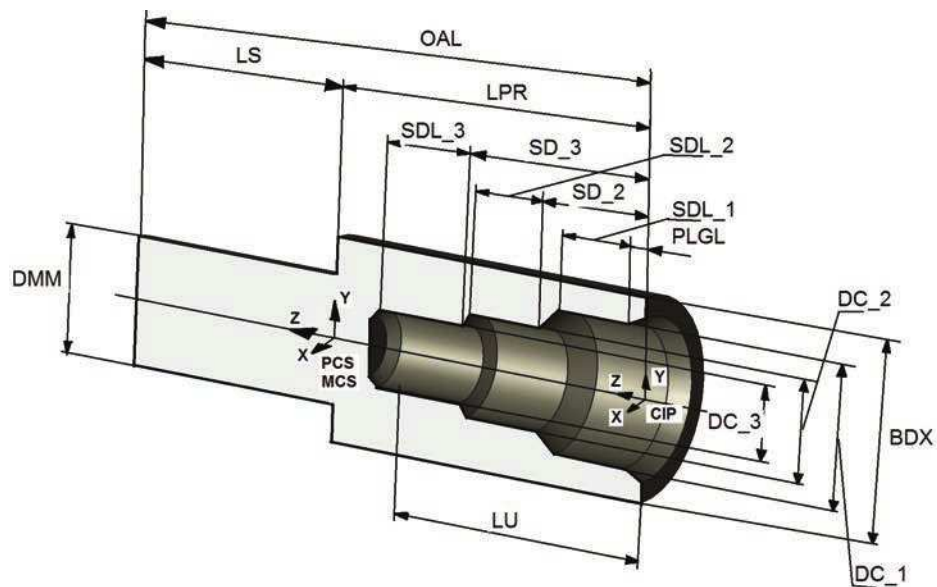The complete bell-style reamer with cutting and non-cutting part is shown in Figure 22.

Figure 22 — Complete bell-style reamer

9 Shell reamer

9.1 General

The properties used for the design of solid shell reamers shall comply with Figure 23.
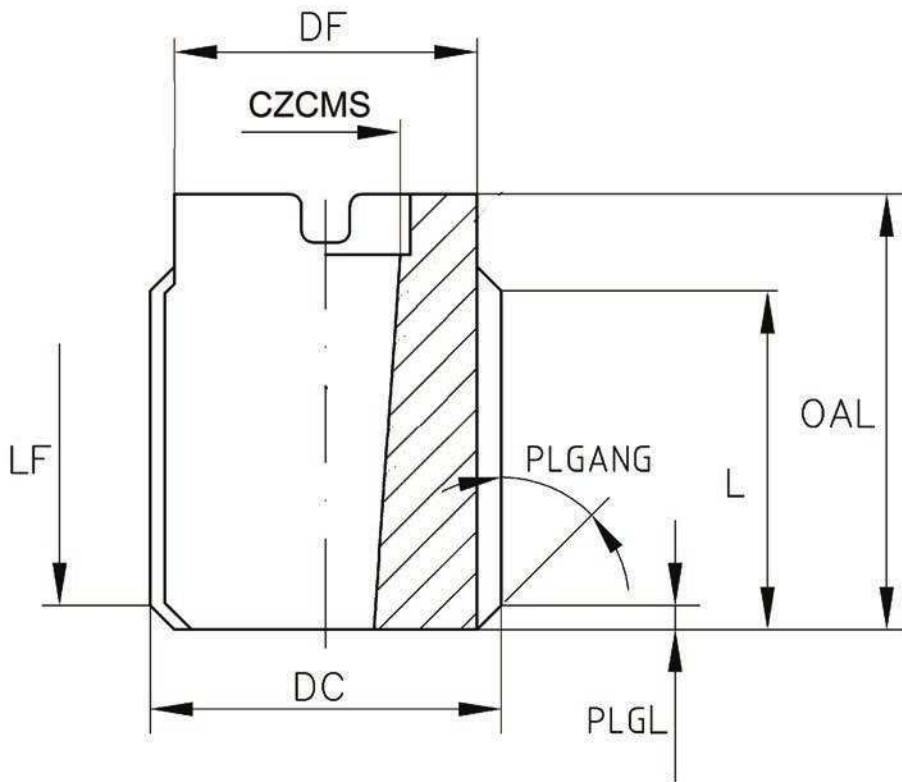
Figure 23 — Determination of properties of a shell reamer

9.2 Necessary properties

The properties needed for the modelling of a shell reamer shall comply with Table 6.

Table 6 — Properties for modelling of a shell reamer

Preferred name	Preferred symbol
Body clearance depth[a]	BCDP
Connection size code machine side[b]	CZCMS
Cutting diameter	DC
Flange diameter	DF
Protruding length	LPR
Cutting edge length	L
Functional length	LF
Shank length	LS
Usable length	LU
Overall length	OAL
Plug length	PLGL
Plug angle	PLGANG
[a] New property, see ISO/TS 13399-304.	
[b] Property taken from Table 1 only for visualization of the connection interface.	

9.3 Geometry of the non-cutting part including the connection

The geometry of the non-cutting part is described in 5.3 and shall be in accordance with Figure 24.
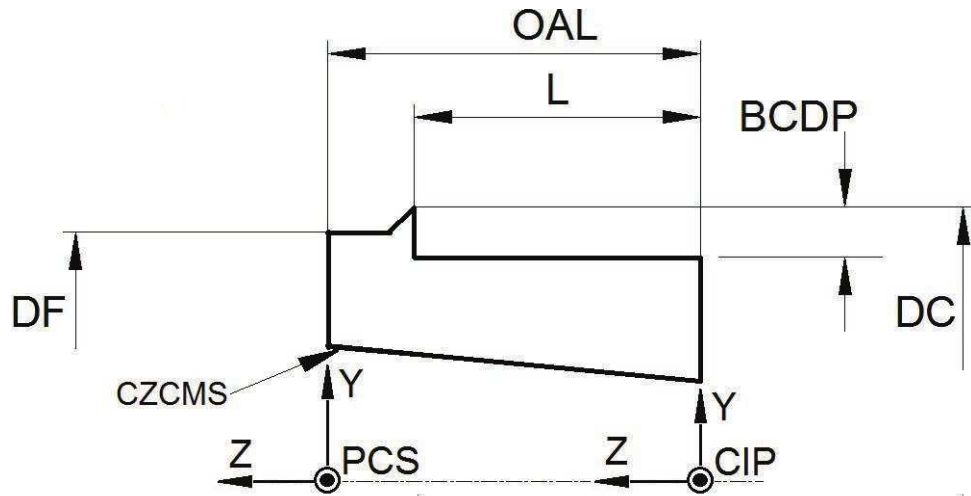
Figure 24 — Sketch of non-cutting part including the connection bore of a shell reamer

9.4 Geometry of the cutting part

The geometry of the cutting part is described in 5.4. The design of the sketch is shown in Figure 25 and the revolved body of the cutting part is shown in Figure 26.

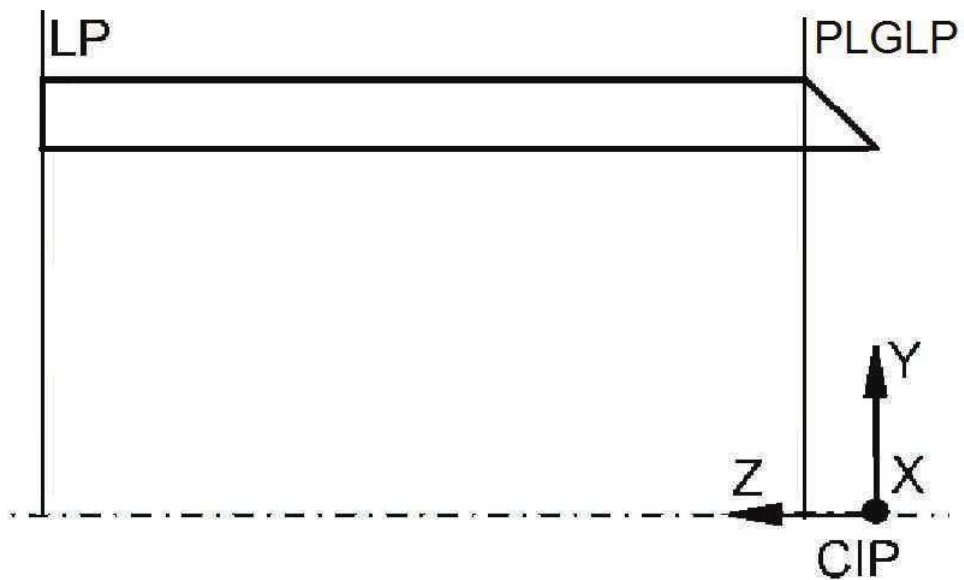See 9.5 and Figure 27 for the dimensions of the sketch.

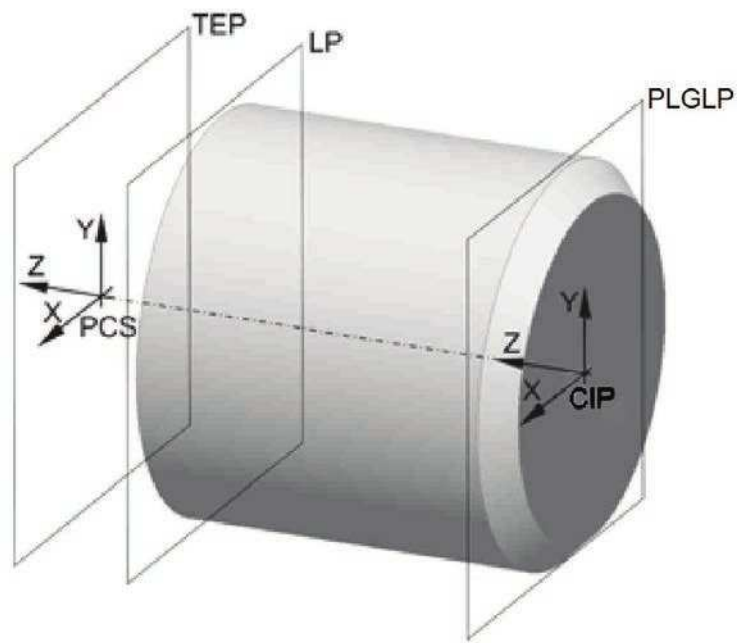**Figure 25 — Sketch of cutting part of a shell reamer**

Figure 26 — Revolved body of the cutting part of a shell reamer

9.5 Complete shell reamer

The complete bell-style reamer with cutting and non-cutting part is shown in Figure 27.
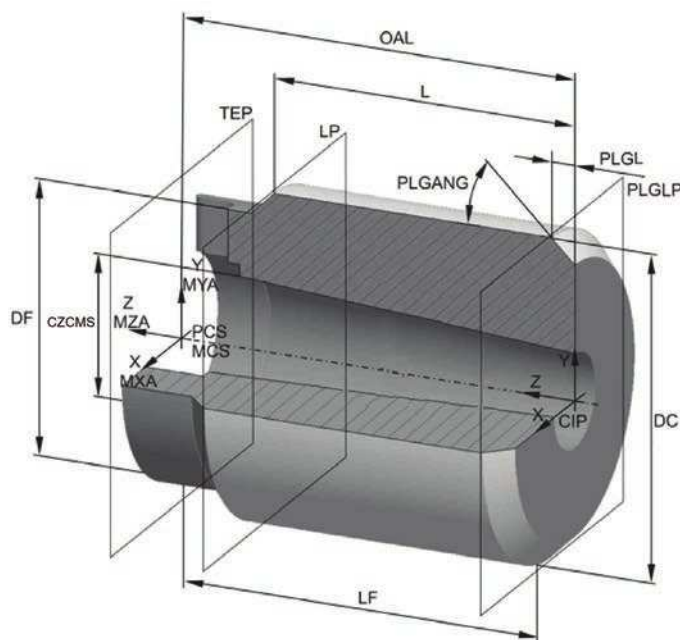

Figure 27 — Complete shell reamer

10 Design of details

10.1 Basics for modelling

All details shall be designed as separate design features and shall not be incorporated into the revolved body of the basic geometry.

10.2 Contact/clamping surfaces — Orientation

Clamping surfaces shall be visualized within the tool model and shall be orientated by means of a unique orientation. The normal of the face shall be parallel to the y-axis of the primary coordinate system "PCS".

10.3 Chamfers and roundings

Necessary chamfers and roundings shall be created within the corresponding function of the 3D CAD system.

11 Attributes of surfaces — Visualization of the model features

For a printed version of this part of ISO/TS 13399, the colour settings as part of the attributes of the surfaces shall be taken according to ISO/TS 13399-80.

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 shall be created over the cutting part feature. In the tree of elements and features, this element is called "CUTTING_SURFACE". This design feature shall be created with the sketch elements of the cutting and non-cutting part and shall be placed at the end of the tree.

Some CAD systems give the possibility to use the available lines of the main sketches for the creation of the "CUTTING_SURFACE". Hence, the datum planes "LCFP" and others shall be used as references. With the suppression of the main design elements, all referenced design elements shall be suppressed either.

12 Structure of the design elements (tree of model)

For solid reamers, cutting "CUT" and non-cutting "NOCUT" design features shall be distinguished. It shall be done by means of building groups. Hereby, both groups can be suppressed or deactivated separately, without mutual impact.

All the detailed design features shall be put together in a separate group named "DETAIL". This group shall be the last element of the tree. It is dependent on the groups "CUT" and "NOCUT" and shall be suppressed either, if one of these two groups is suppressed; see Figure 28.

Such kind of grouping shall be built only if the containing design features are arranged consecutively. Therefore, care shall be taken for the correct sequence of the design features with notice to avoid references.

The structure shall comply with Figure 28. It shall be similar in other CAD systems.
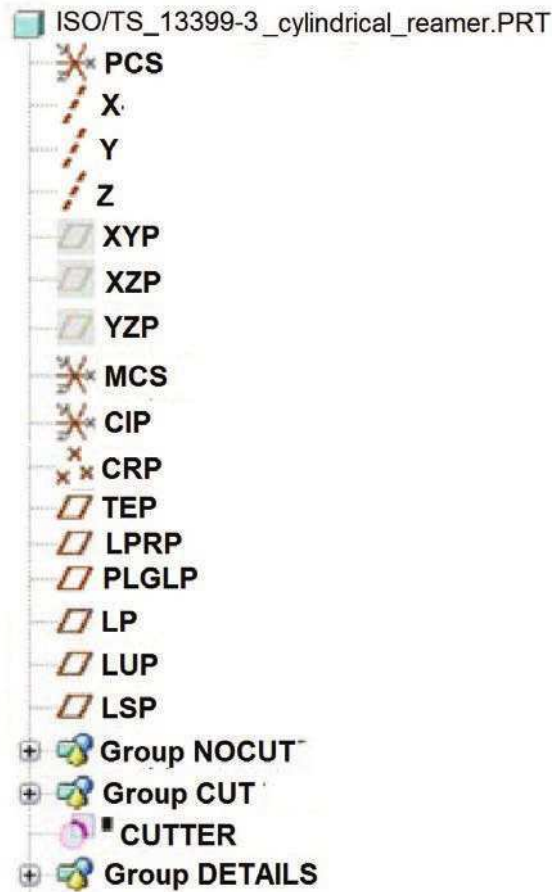
Figure 28 — Example of the structure of design features of a cylindrical reamer

13 Data exchange model

An example of the data exchange model of a cylindrical reamer is shown in Figure 29. All these models shall contain the geometrical features (collision contour), primary coordinate system "PCS", the mounting coordinate system "MCS" and the coordinate system in process "CIP" that are relevant for the collision examination. Also, the cutter line shall be part of the data exchange model.
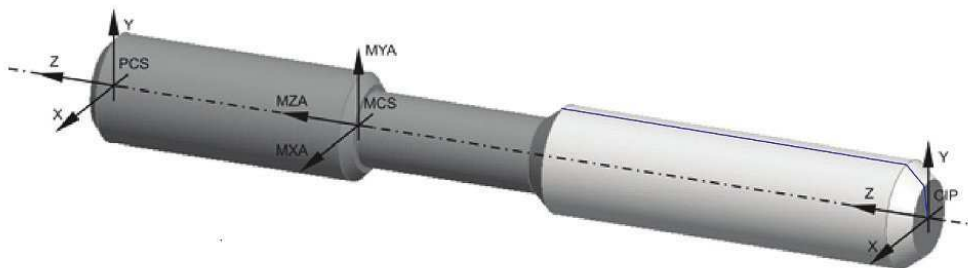

Figure 29 — Data exchange model of a cylindrical reamer

Annex A
(informative)

Information about nominal dimensions

A nominal dimension, nominal size or trade size is a size "in name only" used for identification (see Table A.1). 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 may not even carry any unit of measure.

In measurement, a nominal value is often a value existing in name only. It is 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.

Table A.1 — Examples of nominal dimensions/sizes

Description	Value	Tolerance	Lower limit	Upper limit	Nominal dimension/size
Morse taper size 5	MT5	—	—	—	5
internal diameter	Ø 25	H6	25,000	25,013	25,000
external diameter	Ø 25	g7	24,972	24,993	25,000
square shank size h×b	32×25	h13	31,61×24,67	32×25	32×25

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

[3]   ISO/TS 13399-5, *Cutting tool data representation and exchange — Part 5: Reference dictionary for assembly items*

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[5]   ISO/TS 13399-304, *Cutting tool data representation and exchange — 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*

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

[7]   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*

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