TECHNICAL
SPECIFICATION

ISO/TS
13399-405

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Cutting tool data representation and exchange —

Part 405:
Creation and exchange of 3D models — Collets

Représentation et échange des données relatives aux outils coupants —

Partie 405: Création et échange de modèles 3D — Pinces de serrage

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 on how to design simplified 3D models of collets, clamping sleeves, ferrules and expanding sleeves 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/SC 4 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 405:
Creation and exchange of 3D models — Collets

1 Scope

This part of ISO/TS 13399 specifies a concept for the design of adaptive items, limited to any kind of collets, clamping sleeves and ferrules, 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 collets, clamping sleeves, and ferrules, 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 collets, clamping sleeves, and ferrules.

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 tool items;

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

— 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 296, *Machine tools — Self-holding tapers for tool shanks*

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, *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

The 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.

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

3.2 Reference system (PCS — primary coordinate system)

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

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

— **3 orthogonal planes:** planes in the coordinate system that contain the axis of the system, named "xy-plane" (XYP), "xz-plane" (XZP), and "yz-plane" (YZP);

— **3 orthogonal axis:** axes built as intersections of the 3 orthogonal planes lines respectively, named "x-axis" (XA), "y-axis" (YA), and "z-axis" (ZA).
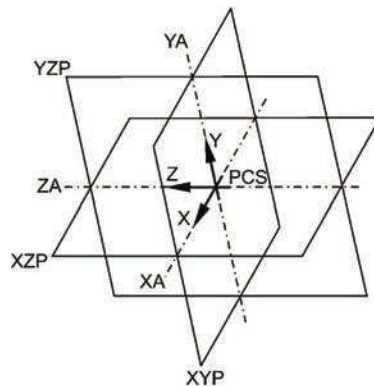
Figure 1 — Primary coordinate system

3.3 Mounting coordinate system

For virtually mounting of collets, clamping sleeves and ferrules onto an adaptive item to create a complete cutting tool, 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 the collet or the other named items. At collets, the MCS is located at that point, where the nominal diameter is referenced.

Figure 2 shows an example of the location of the MCS in relation to the PCS.
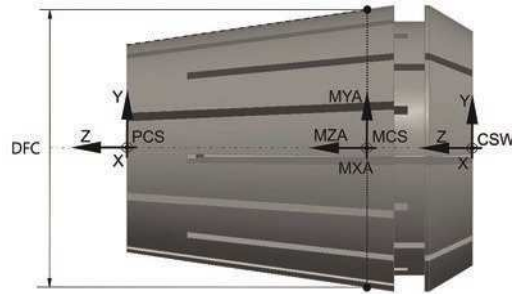
Figure 2 — Example of orientation and location of PCS, MCS, and CSW

3.4 Adjustment coordinate system at workpiece side

3.4.1 General

Additional coordinate systems named "CSWx_y" (coordinate system workpiece side) for mounting other adaptive items or tool items shall be defined according to ISO/TS 13399-50.

3.4.2 Designation of coordinate systems at workpiece side

The designation of the coordinate system workpiece side shall be done as follows.

|	
Case 1	One coordinate system at workpiece side
	A single coordinate system at the workpiece side shall be designated as "CSW".
Case 2	One coordinate system on different levels at workpiece side
	A single coordinate system on different levels shall be designated as "CSWx", e.g. "CSW1", "CSW2". The numbering shall start at the workpiece side and end at the machine side in the direction of the positive z-axis.
Case 3	Multiple coordinate systems on one level and different angles at workpiece side
	Multiple coordinate systems at one level, but different angles and not at the centre of the tool axis shall be designated with "CSWx_y", where the "x" defines the level and the "y" defines the number of the coordinate system itself. The counting shall start at the three o'clock position counting in counter-clockwise direction while looking towards the machine spindle (positive z-axis).
Case 4	Multiple coordinate systems on one level, one angle and different diameters at workpiece side
	The designation shall be the same as defined in Case 3. The counting shall start at the smallest diameter.
Case 5	Multiple coordinate systems on different levels, different angles, and different diameters at workpiece side
	The designation shall be the same as defined in Case 3. The counting shall start at the smallest diameter and at the three o'clock position.

Figure 3 shows an example of the arrangement of coordinate systems on workpiece side.
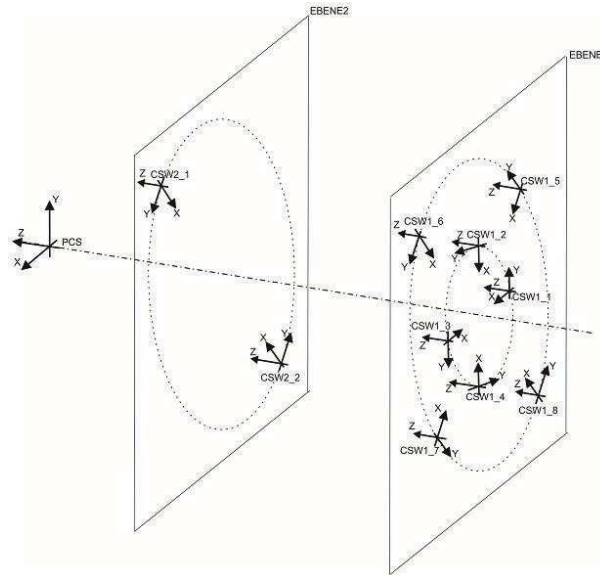
Figure 3 — Adjustment of coordinate system at workpiece side

3.4.3 Arrangement of coordinate system workpiece side

The CSWx_y can be arranged in relation to the PCS by means of using the six degrees of freedom as follows:

— rotation about

— the x-axis by the angle rho ("RHO");

— the y-axis by the angle kappa ("KAP");

— the z-axis by the angle phi ("PHI");

— distance from the PCS origin perpendicular

— to XYW-plane by XYWD;

— to XZW-plane by XZWD;

— to YZW-plane by YZWD.

The orientation and location of CSW is shown in Figure 4.

Figure 4 — Orientation of coordinate system at workpiece side

3.5 Planes

The modelling takes place based on planes according to Figure 5, which is 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 parameters 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. collet length, distance of functional diameter.

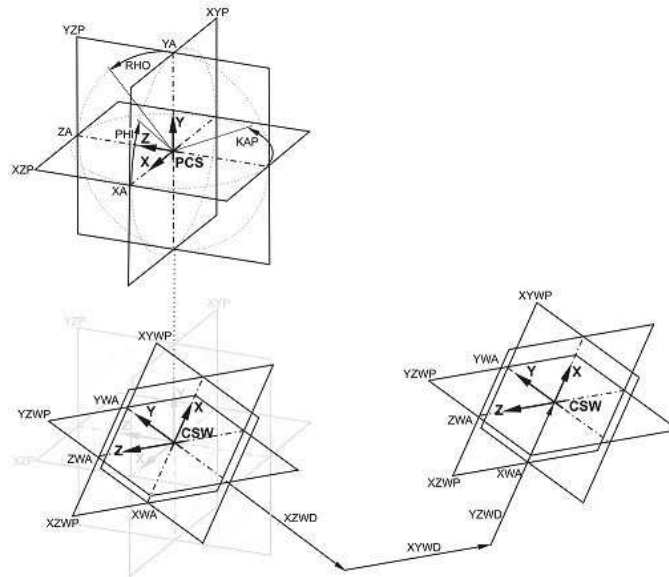For the 3D visualization of this kind of adaptive items defined in the scope, the general planes shall be determined as follows:

— HEP   "head end plane" located with the distance of OAL from "TEP";

— LDGP   "functional diameter distance plane" identical with the XY-plane of MCS;

— LSCP   "clamping length plane" referenced to CSW with the distance LSC;

— TEP   "tool end plane" is located at the end of the item that points away from the workpiece, if the item does not have a contact surface and/or gauge line TEP is coplanar with the XY-plane of the PCS;

— THLGTHP "thread length plane" referenced to TEP with the distance THLGTH.

Other planes are defined in the appropriate clauses, if necessary. Figure 5 shows an example of determined planes for the design.
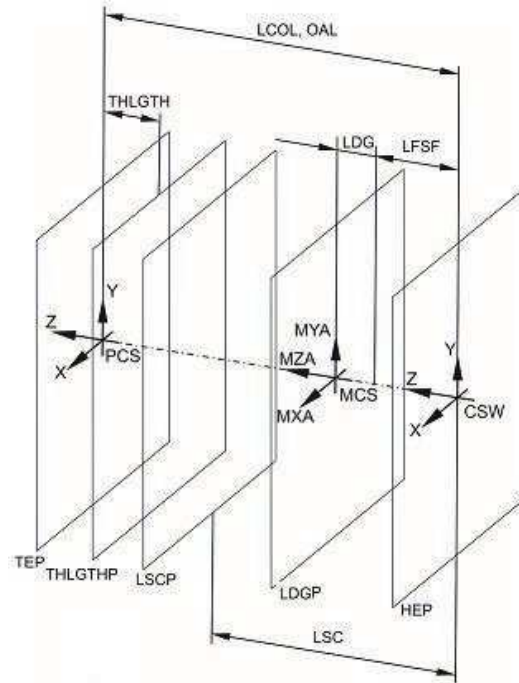
Figure 5 — Example of planes for the design

4 Design of the model

4.1 General

The sketches (outline contour) and contours of the crude geometry do not contain any details, such as grooves, chamfers, rounding. These details are designed as separate design features after the design of the crude geometry and therefore they are named precision geometry and are grouped in the separate group "DETAILS".

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.

The items described in this part of ISO/TS 13399 shall be built as rotational symmetric design elements and be based on properties in accordance with ISO/TS 13399-4:

— geometry of the outer contour;

— geometry of the inner contour;

— geometry and arrangement of the slots.

The entire model shall be grouped in the group "NOCUT".

The part shall be coloured as defined in 16.4.

NOTE   The total amount of design elements is focused on the depth of modelling and the complexity of the item.

In the following clauses, the specific structure of the model of the defined basic shapes of collets, clamping sleeves, ferrules, and expanding sleeves is described.

4.2   Necessary properties for the connection interface feature

Information about the connection interface code shall be filled as properties within the model and 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
CCWS	connection code workpiece side	ISO/TS 13399-3 and ISO/TS 13399-4	71D102AE8A5A9
CCTWS	connection code type workpiece side	ISO/TS 13399-60 short name of subtype of connection_interface_feature	feature_class
CCFWS	connection code form workpiece side	ISO/TS 13399-60 number of the variant of the subtype of connection_interface_feature	feature_class
CZCWS	connection size code workpiece side	connection size code (dependent of side)	71FC193318002

5   Double angle collet

5.1   General

Figure 6 shows the properties used for identification and classification of double angle collets.
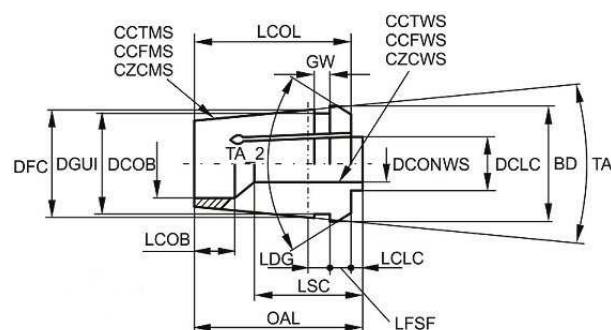

Figure 6 — Determination of properties of double angle collets

5.2   Necessary properties

Table 2 shows the properties needed for modelling of a double angle collet as described in 5.1.

Table 2 — Properties for the modelling of double angle collets

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet length clamp	DCLC
diameter collet offset bore	DCOB
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide diameter	DGUI
groove width	GW
length collet clamp	LCLC
length collet offset bore	LCOB
collet length	LCOL
gauge diameter distance	LDG
distance to face	LFSF
clamping length	LSC
overall length	OAL
taper angle	TA
taper angle 2	TA_2

Parameters necessary for the design which are not defined in Table 2 shall be created temporarily and designated as described in ISO/TS 13399-80.

5.3   Basic geometry

The basis of that part is a rotational design feature which shall contain all elements between the plane "TEP" and the plane "HEP".

The sketch (outline contour) includes the real measure elements above and shall be designed on the XZ-plane of the "PCS".

Design of the sketch shall be 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 "HEP" according to Figure 5. 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°.

The following Figure 7 shows the basic geometry of a collet without a front feature.
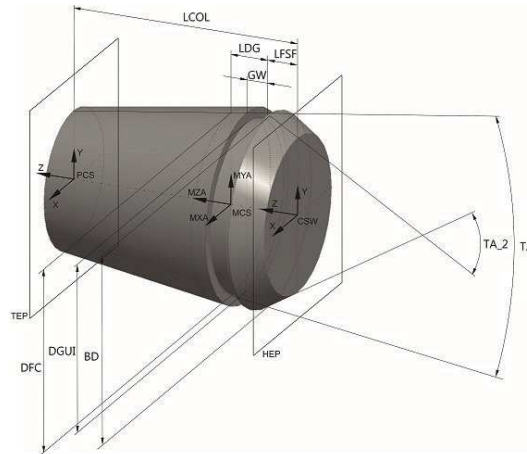
Figure 7 — Basic geometry of a double angle collet

5.4 Double angle collet, complete

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed double angle collet is shown in Figure 8
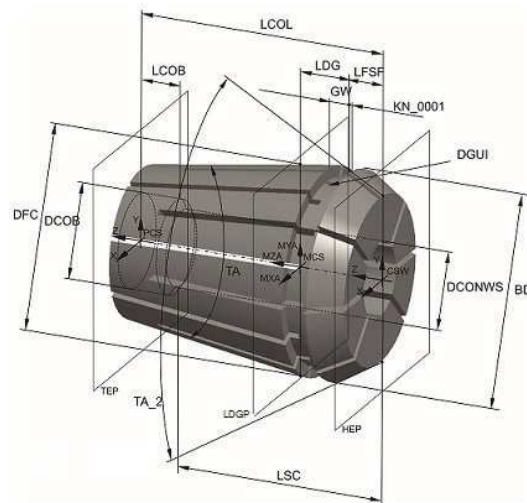

Figure 8 — Completed double angle collet

6 Collet with straight shoulder

6.1 General

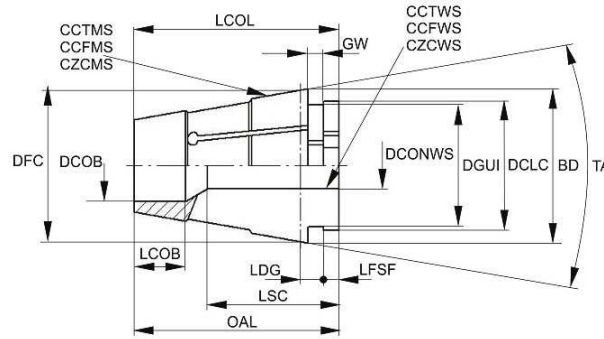Figure 9 shows the properties used for identification and classification of collets with straight shoulder.

Figure 9 — Determination of properties of collets with straight shoulder

6.2   Necessary properties

Table 3 shows the properties needed for modelling of a double angle collet as described in 6.1.

Table 3 — Properties for the modelling of collets with straight shoulder

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet length clamp	DCLC
diameter collet offset bore	DCOB
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide diameter	DGUI
groove width	GW
length collet offset bore	LCOB
collet length	LCOL
gauge diameter distance	LDG
distance to face	LFSF
clamping length	LSC
overall length	OAL
taper angle	TA

6.3   Basic geometry

See 5.3 for the design of the basic geometry. Figure 10 shows the basic geometry without the inner contour of the connection workpiece side.
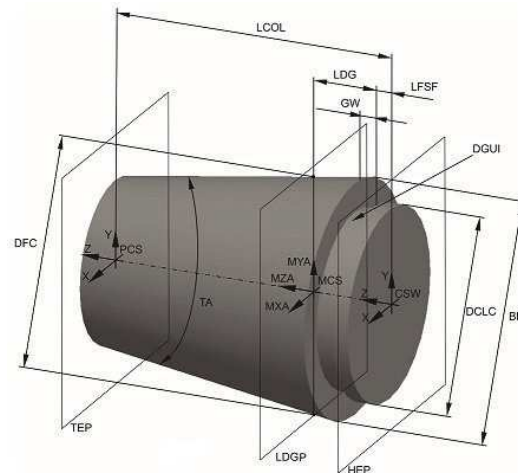
Figure 10 — Basic geometry of a collet with straight shoulder

6.4 Completed collet with straight shoulder

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed collet with straight shoulder is shown in Figure 11.
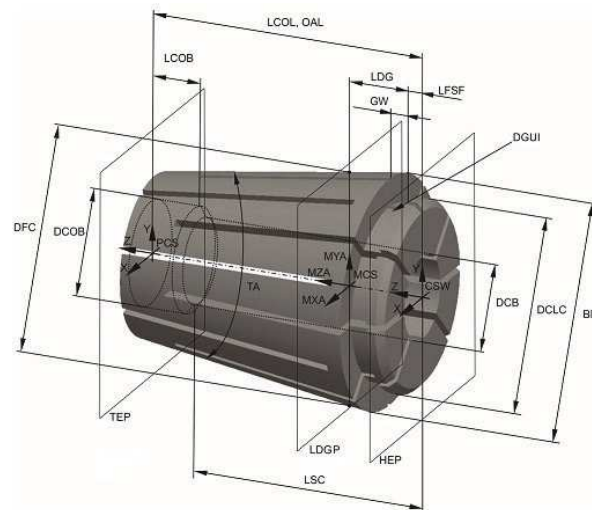
Figure 11 — Completed collet with straight shoulder

7 Short double angle collet

7.1 General

Figure 12 shows the properties used for identification and classification of short double angle collets.
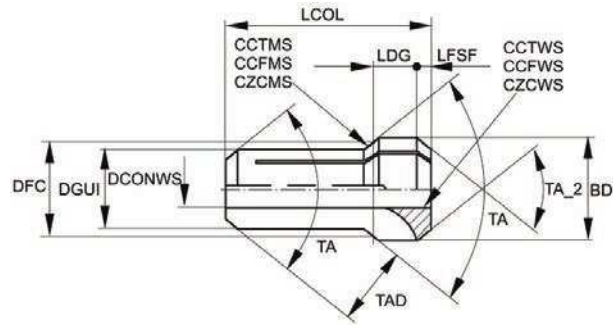
Figure 12 — Determination of properties of short double angle collets

7.2   Necessary properties

Table 4 shows the properties needed for modelling of a double angle collet as described in 7.1.

Table 4 — Properties for the modelling of short double angle collets

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide pipe diameter	DGUI
collet length	LCOL
gauge diameter distance	LDG
distance to face	LFSF
taper angle	TA
taper angle 2	TA_2
taper angle distance	TAD

7.3   Basic geometry

See 5.3 for the design of the basic geometry. Figure 13 shows the collet body with the revolved outline contour.

Figure 13 — Basic geometry of a short double angle collet

7.4   Completed short double angle collet

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed short double angle collet is shown in Figure 14.
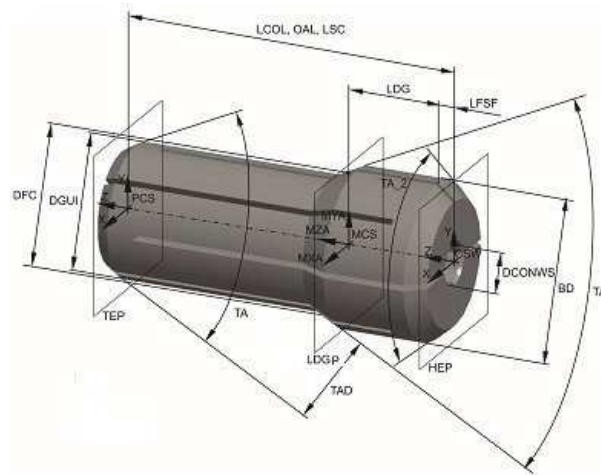
Figure 14 — Complete short double angle collet

8   Collet with elastic segments

8.1   General

Figure 15 shows the properties used for identification and classification of collets with elastic segments.

Figure 15 — Determination of properties of collets with elastic segments

8.2   Necessary properties

Table 5 shows the properties needed for modelling of a collet with elastic segments as described in 7.1.

Table 5 — Properties for the modelling of collets with elastic segments

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
connection diameter workpiece side	DCONWS
functional diameter	DFC
collet length	LCOL

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Table 5 *(continued)*

Preferred name	Preferred symbol
gauge diameter distance	LDG
distance to face	LFSF
clamping length	LSC
overall length	OAL
taper angle	TA

8.3 Basic geometry

See 5.3 for the design of the basic geometry. Figure 16 shows the collet body with the revolved outline contour.
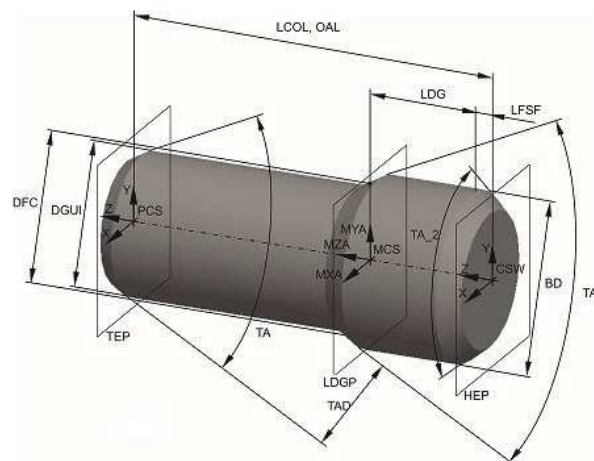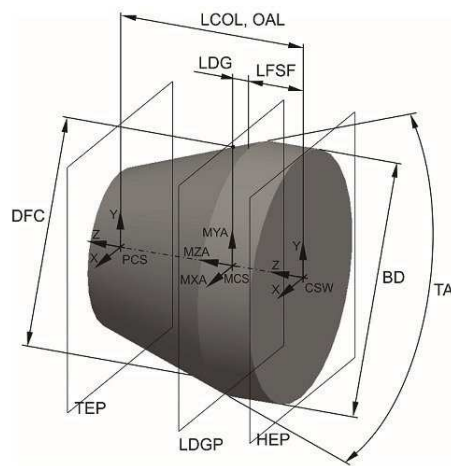

Figure 16 — Basic geometry of a collet with elastic segments

8.4 Completed collet with elastic segments

After subtracting the inner contour from the basic geometry and placing the slots with their elastic segments to the right position, the completed collet with elastic segments is shown in Figure 17.
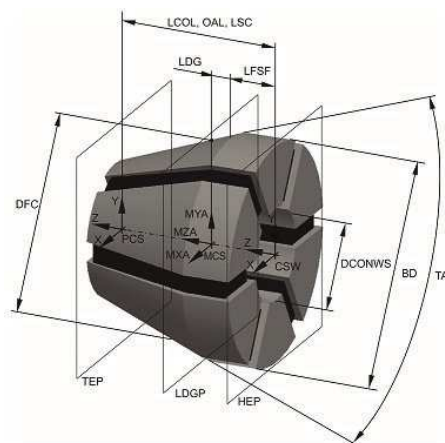
Figure 17 — Completed collet with elastic segments

9   Collet with axial adjustment

9.1   General

Figure 18 shows the properties used for identification and classification of collets with axial adjustment.
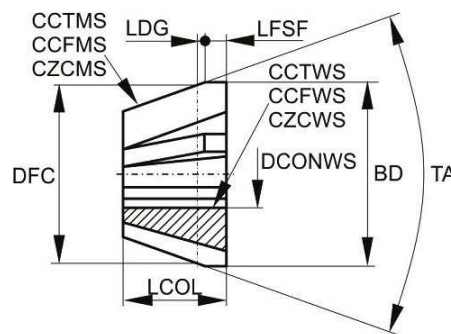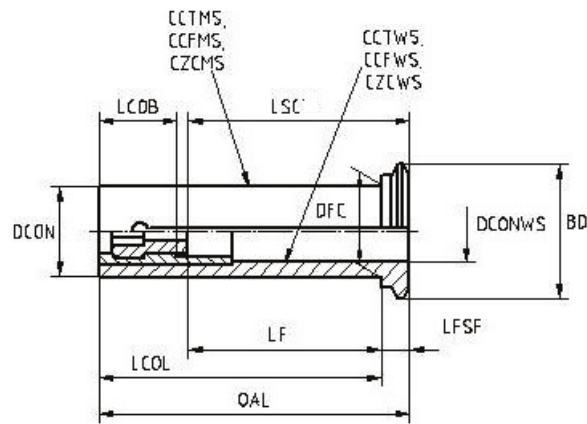

Figure 18 — Determination of properties of collets with axial adjustment

9.2   Necessary properties

Table 6 shows the properties needed for modelling of a collet with axial adjustment as described in 9.1.

Table 6 — Properties for the modelling of collets with axial adjustment

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet offset bore	DCOB
connection diameter workpiece side	DCONWS
functional diameter	DFC
collet length	LCOL
gauge diameter distance	LDG
distance to face	LFSF
clamping length	LSC
overall length	OAL

9.3   Basic geometry

See 5.3 for the design of the basic geometry. Figure 19 shows the collet body with the revolved outline contour.

Figure 19 — Basic geometry of a collet with axial adjustment

9.4   Completed collet with axial adjustment

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed collet with axial adjustment is shown in Figure 20 and Figure 21. For better visualizing of the inner contour, only single-sided slots from the front side are shown.
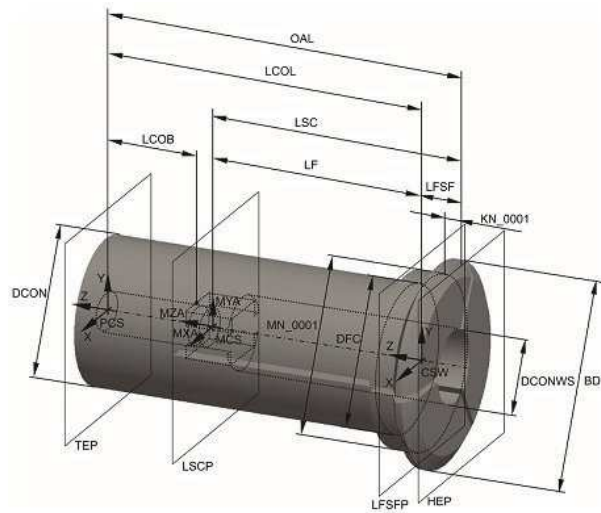
Figure 20 — Completed collet with axial adjustment used for cylindrical shanks with square drive

Figure 21 — Completed collet with axial adjustment without drive feature

10 Draw-in collet with retaining thread and spanner flats

10.1 General

Figure 22 shows the properties used for identification and classification of draw-in collets with retaining thread and spanner flats.

Figure 22 — Determination of properties of draw-in collets with retaining thread and spanner flats

10.2 Necessary properties

Table 7 shows the properties needed for modelling of a draw-in collet with retaining thread and spanner flats as described in 10.1.

Table 7 — Properties for the modelling of draw-in collets with retaining thread and spanner flats

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet length clamp	DCLC
connection diameter workpiece side	DCONWS
functional diameter	DFC

Table 7 *(continued)*

Preferred name	Preferred symbol
guide diameter	DGUI
neck diameter	DN
drive size	DRVS
collet length	LCOL
guide length	LGUI
clamping length	LSC
overall length	OAL
spanner flat length	SFL
taper angle	TA
taper angle 2	TA_2
thread size internal thread	THID
thread length	THLGTH
thread size external thread	THOD
taper length	TL

10.3 Basic geometry

See 5.3 for the design of the basic geometry. Figure 23 shows the collet body with the revolved outline contour.
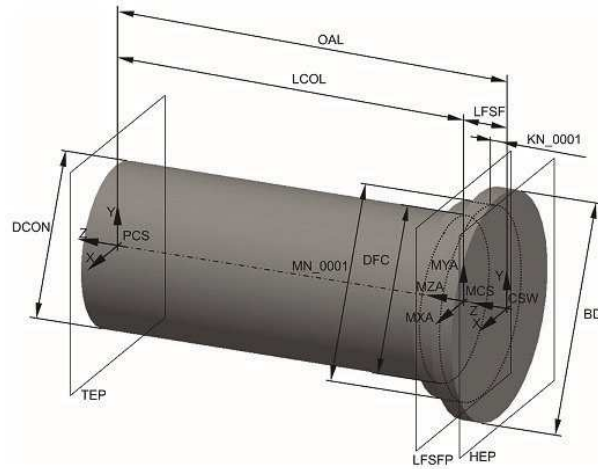

Figure 23 — Basic geometry of a draw-in collet with retaining thread and spanner flats

10.4 Completed draw-in collet with retaining thread and spanner flats

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed draw-in collet with retaining thread and spanner flats is shown in Figure 24.
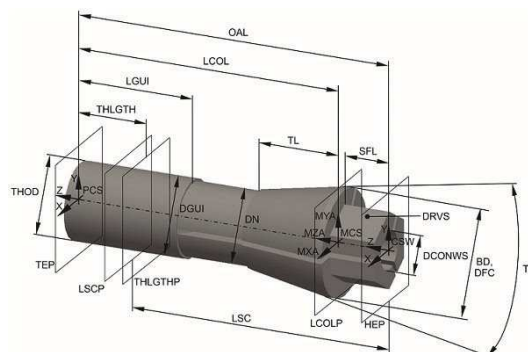
Figure 24 — Completed draw-in collet with retaining thread and spanner flats

11 Draw in collet with retaining thread

11.1 General

Figure 25 shows the properties used for identification and classification of draw-in collets with retaining thread.
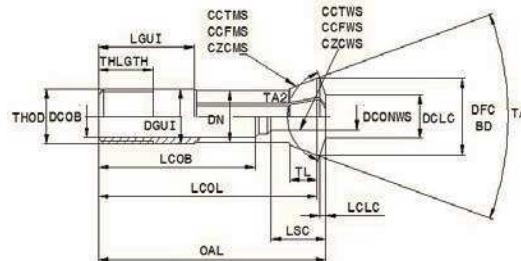
Figure 25 — Determination of properties of draw-in collets with retaining thread

11.2 Necessary properties

Table 8 shows the properties needed for modelling of a draw-in collet with retaining thread as described in 11.1.

Table 8 — Properties for the modelling of draw-in collets with retaining thread

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet length clamp	DCLC
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide diameter	DGUI
neck diameter	DN
drive size	DRVS
collet length	LCOL
guide length	LGUI
clamping length	LSC
overall length	OAL
spanner flat lenght	SFL
taper angle	TA
taper angle 2	TA_2
thread size internal thread	THID
thread length	THLGTH
thread size external thread	THOD
taper length	TL

11.3 Basic geometry

See 5.3 for the design of the basic geometry. Figure 26 shows the collet body with the revolved outline contour.
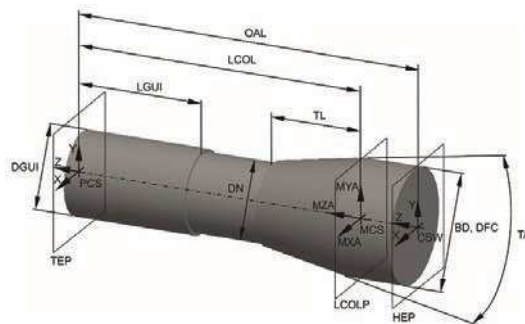
Figure 26 — Basic geometry of a draw-in collet with retaining thread

11.4 Completed draw-in collet with retaining thread

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed draw-in collet with retaining thread is shown in Figure 27.
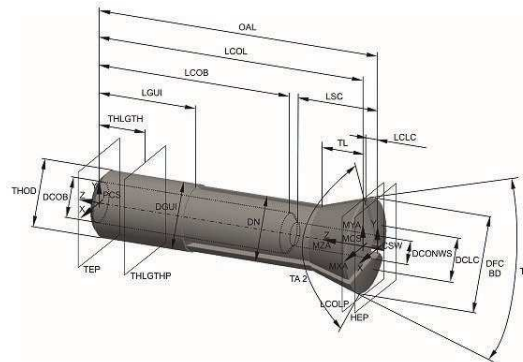
Figure 27 — Completed draw-in collet with retaining thread

12 Cylindrical clamping sleeve

12.1 General

Figure 28 shows the properties used for identification and classification of cylindrical clamping sleeves.
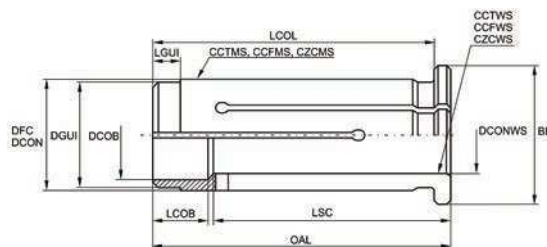
Figure 28 — Determination of properties of cylindrical clamping sleeves

12.2 Necessary properties

Table 9 shows the properties needed for modelling of a cylindrical clamping sleeve as described in 12.1.

Table 9 — Properties for the modelling of cylindrical clamping sleeves

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet offset bore	DCOB
connection diameter	DCON
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide diameter	DGUI
length collet offset bore	LCOB
collet length	LCOL
guide length	LGUI
clamping length	LSC
overall length	OAL

12.3 Basic geometry

See 5.3 for the design of the basic geometry. Figure 29 shows the sleeve body with the revolved outline contour.
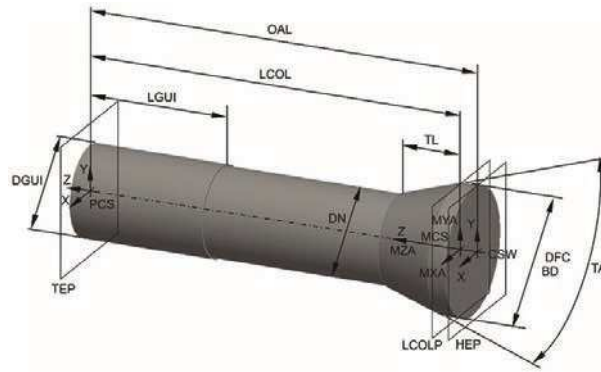

Figure 29 — Basic geometry of a cylindrical clamping sleeve

12.4 Completed cylindrical clamping sleeve

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed cylindrical clamping sleeve is shown in Figure 30.

Figure 30 — Example of a completed single slotted cylindrical clamping sleeve

13 Conical clamping sleeve with retaining thread

13.1 General

Figure 31 shows the properties used for identification and classification of conical clamping sleeves with retaining thread.
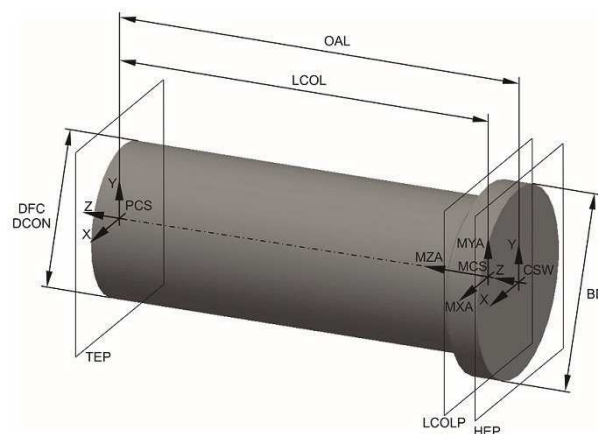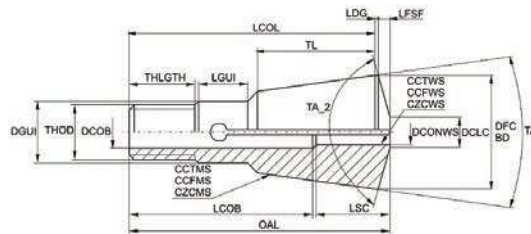

Figure 31 — Determination of properties of conical clamping sleeves with retaining thread

13.2 Necessary properties

Table 10 shows the properties needed for modelling of a draw-in collet with retaining thread as described in 13.1.

Table 10 — Properties for the modelling of conical clamping sleeves with retaining thread

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet length clamp	DCLC
diameter collet offset bore	DCOB
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide diameter	DGUI
length collet offset bore	LCOB
collet length	LCOL
gauge diameter distance	LDG

Table 10 *(continued)*

Preferred name	Preferred symbol
distance to face	LFSF
guide length	LGUI
clamping length	LSC
overall length	OAL
taper angle	TA
taper angle 2	TA_2
thread length	THLGTH
thread size external thread	THOD
taper length	TL

13.3 Basic geometry

See 5.3 for the design of the basic geometry. Figure 32 shows the sleeve body with the revolved outline contour. The properties needed for the transition between the individual diameters shall be upon the designer's discretion.

Figure 32 — Basic geometry of a conical clamping sleeve with retaining thread

13.4 Completed conical clamping sleeve with retaining thread

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed conical clamping sleeve with retaining thread is shown in Figure 33.
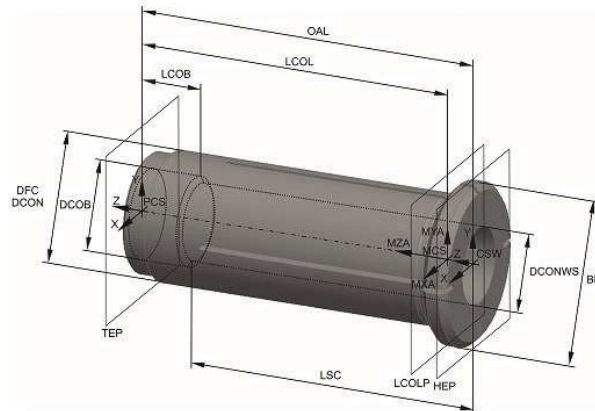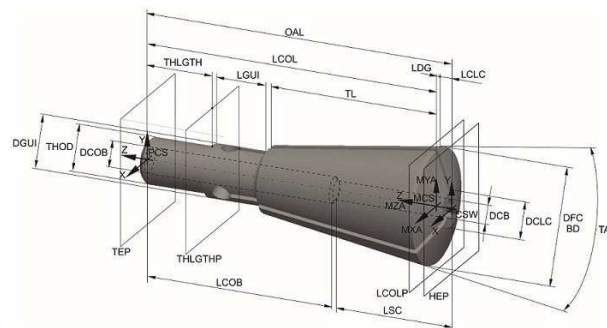

Figure 33 — Completed conical clamping sleeve with retaining thread

14 Ferrule

14.1 General

Figure 34 shows the properties used for identification and classification of ferrules.

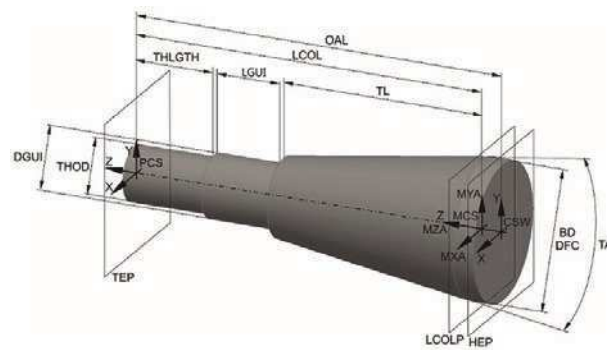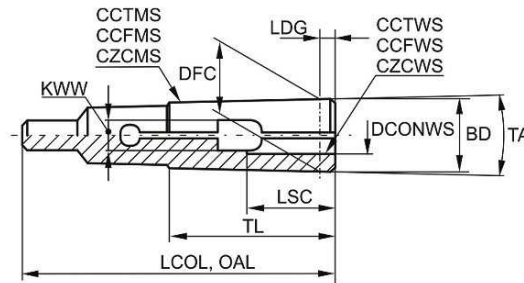**Figure 34 — Determination of properties of ferrules**

14.2 Necessary properties

Table 11 shows the properties needed for modelling of a ferrule as described in 14.1.

Table 11 — Properties for the modelling of ferrules

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
connection diameter workpiece side	DCONWS
functional diameter	DFC
keyway width	KWW
collet length	LCOL
gauge diameter distance	LDG
clamping length	LSC
overall length	OAL
taper angle	TA
taper length	TL

14.3 Basic model

Figure 34 shows details which shall not be part of the crude model. The relief of the taper at the end of the taper of the ferrule shall not be modelled. The end of the ferrule illustrating the tenon shall be modelled in accordance with ISO 296.

See 5.3 for the design of the basic geometry. Figure 35 shows the ferrule body with the revolved outline contour. The properties needed for the tenon shall be taken from ISO 296.
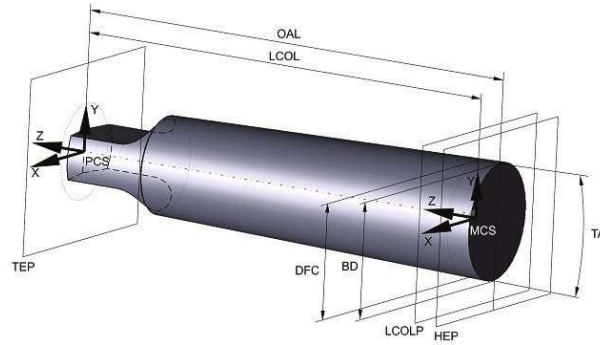
Figure 35 — Basic geometry of a ferrule

14.4 Completed ferrule

After subtracting the inner contour and the keyway from the basic geometry and placing the slots to the right position, the completed ferrule is shown in Figure 36.
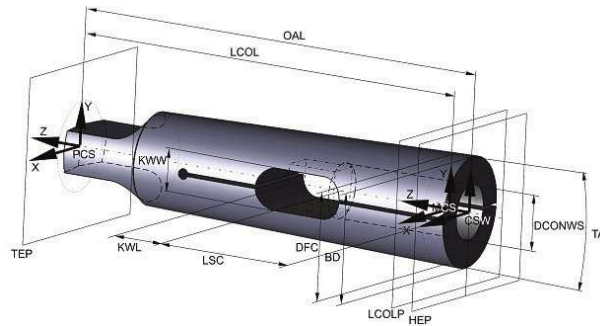
Figure 36 — Completed ferrule

15 Dead length type collet

15.1 General

Figure 37 shows the properties used for identification and classification of dead length type collets.
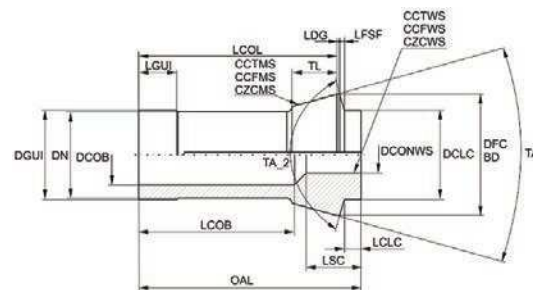
Figure 37 — Determination of properties of dead length type collets

15.2 Necessary properties

Table 12 shows the properties needed for modelling of a dead length type collet as described in 15.1.

Table 12 — Properties for the modelling of dead length type collets

Preferred name	Preferred symbol
body diameter	BD
collet slot type	COLST
diameter collet length clamp	DCLC
diameter collet offset bore	DCOB
connection diameter workpiece side	DCONWS
functional diameter	DFC
guide diameter	DGUI
neck diameter	DN
length collet clamp	LCLC
length collet offset bore	LCOB
collet length	LCOL
gauge diameter distance	LDG
distance to face	LFSF
guide length	LGUI
clamping length	LSC
overall length	OAL
taper angle	TA
taper angle 2	TA_2
taper length	TL

15.3 Basic geometry

See 5.3 for the design of the basic geometry. Figure 38 shows the collet body with the revolved outline contour.
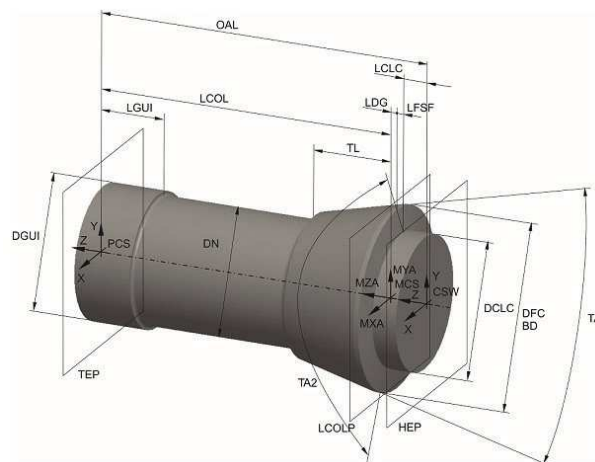
Figure 38 — Basic geometry of a dead length type collet

15.4 Completed dead length type collet

After subtracting the inner contour from the basic geometry and placing the slots to the right position, the completed dead length type collet is shown in Figure 39.

Figure 39 — Completed dead length type collet

16 Design of details

16.1 Basics for modelling

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

16.2 Contact surfaces, driving features — Orientation

Clamping surfaces which shall be visualized within the tool model shall be orientated by means of a unique orientation. The normal of the face shall be parallel with the "+Y"-axis of the primary coordinate system "PCS" as shown in Figure 40.

Figure 40 — Orientation of planar/driving surfaces

16.3 Chamfers and roundings

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

16.4 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.

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 give the possibility to use the available lines of the main sketches for the creation of the "CUTTING_SURFACE". Hereby, the datum planes "LCFP" and other are used as references. With the deletion of the main design elements, all referenced design elements are supressed either.

17 Structure of the design elements (tree of model)

The basic body of object defined in the scope shall be defined as "NOCUT" design feature. The design features of the basic body shall be grouped also within the group "NOCUT". The connection features shall be placed in the group either "MACHINE SIDE" or "WORKPIECE SIDE". Hereby, it is necessary that all groups can be suppressed or deactivated separately, without mutual impact.

All the detailed design features shall be put together to a separate group named "DETAILS". This group shall be the last element of the tree. It is dependent on the groups "NOCUT", "MACHINE SIDE" and "WORKPIECE SIDE" and shall be suppressed either, if one of these groups is suppressed. See Figure 41.

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 reference.

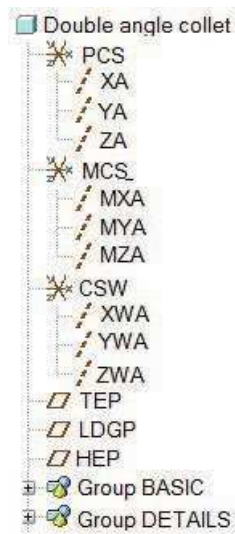The structure shall be as shown in Figure 41. It shall be similar in other CAD systems.

Figure 41 — Double angle collet: Example of the structure of design features

18 Data exchange model

Example of the data exchange model of a double angle collet is shown in Figure 42. All of those models shall contain the geometrical features (collision contour), primary coordinate system "PCS", the mounting coordinate system "MCS" and the coordinate system workpiece side "CSW" that are relevant for the collision examination.

For the data exchange, it shall not be necessary to show the slots of the collet, but for the identification of the type of the slots, "double slotted", it is recommended to show them in the model.
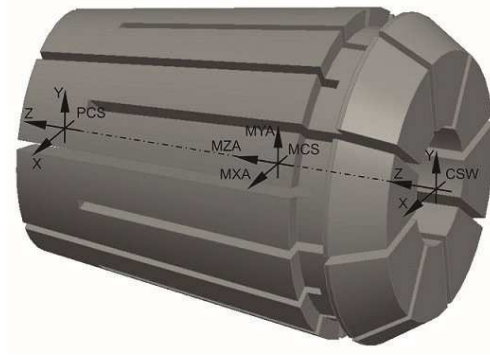
Figure 42 — Data exchange model of a double angle collet

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 dimen-sion/size
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 h × b	32 × 25	h13	31,61 × 24,67	32 × 25	32 × 25

Bibliography

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

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

[3]   ISO/TS 13399-70, *Cutting tool data representation and exchange — Part 70: Graphical data layout — Layer settings for tooldesigns*

[4]   ISO/TS 13399-100, *Cutting tool data representation and exchange — Part 100: Definitions, principles and methods for reference dictionaries*

[5]   ISO/TS 13399-150, *Cutting tool data representation and exchange — Part 150: Usage guidelines*

[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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