TECHNICAL SPECIFICATION

ISO/TS 13399-315

First edition
2018-10

Cutting tool data representation and exchange —

Part 315: Creation and exchange of 3D models — Modelling of machine operated feed out tools

Représentation et échange des données relatives aux outils coupants —

Partie 315: Création et échanges de modèles 3D — Conception d'outils combinés réglables pour le tournage

Reference number
ISO/TS 13399-315:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword v
Introduction vi
1 Scope 1
2 Normative references 1
3 Terms and definitions 1
4 Starting elements, coordinate systems, planes 2
4.1 General 2
4.2 Reference system (PCS — Primary coordinate system) 2
4.3 Coordinate system at the cutting part 3
4.4 Planes 3
4.5 Adjustment coordinate system on workpiece side 4
4.5.1 General 4
4.5.2 Designation of the coordinate system workpiece side 5
5 Design of the model 6
5.1 General 6
5.2 Necessary parameters for the feed out motion of the slides 6
6 Machine operated feed out tool with one linear slide for internal machining 6
6.1 General 6
6.2 Necessary properties 7
6.3 Location of coordinate systems 8
6.4 Assembled feed out tool with one linear slide for internal machining 8
7 Machine operated feed out tool with one linear slide for external machining 9
7.1 General 9
7.2 Necessary properties 10
7.3 Location of coordinate systems 10
7.4 Assembled feed out tool with one linear slide for external machining 10
8 Machine operated feed out tool with two linear slides for internal machining 11
8.1 General 11
8.2 Necessary properties 11
8.3 Location of coordinate systems and assembled feed out tool 11
9 Machine operated feed out tool with two linear slides for external machining 11
9.1 General 11
9.2 Necessary properties 12
9.3 Location of coordinate systems 12
9.4 Assembled feed out tool with two linear slides for external machining 13
10 Machine operated feed out tool with two linear slides for internal pull back machining 14
10.1 General 14
10.2 Necessary properties 15
10.3 Location of coordinate systems and assembled feed out tool 15
11 Machine operated feed out tool with one linear slide for external pull back machining 15
11.1 General 15
11.2 Necessary properties 16
11.3 Location of coordinate systems and assembled feed out tool 16
12 Machine operated feed out tool with one inclined slide 16
12.1 General 16
12.2 Necessary properties 17
12.3 Location of coordinate systems and assembled feed out tool 18
13 Machine operated feed out tool with two inclined slides 18
13.1 General 18

13.2 Necessary properties ... 19
13.3 Location of coordinate systems ... 19
13.4 Assembled feed out tool with two inclined slides for internal machining ... 19

14 Machine operated feed out tool with one rotatory slide ... 20
14.1 General ... 20
14.2 Necessary properties ... 20
14.3 Location of coordinate systems ... 21
14.4 Assembled feed out tool with one rotary slide ... 22

15 Machine operated feed out tool with one swing slide ... 22
15.1 General ... 22
15.2 Necessary properties ... 23
15.3 Location of coordinate systems ... 24
15.4 Assembled feed out tool with one swing slide ... 24

16 Machine operated feed out tool with one peripheral swivelling slide ... 24
16.1 General ... 24
16.2 Necessary properties ... 25
16.3 Location of coordinate systems ... 26
16.4 Assembled feed out tool with one peripheral swivelling slide ... 26

17 Machine operated feed out tool with one central swivelling slide ... 27
17.1 General ... 27
17.2 Necessary properties ... 27
17.3 Location of coordinate systems ... 28
17.4 Assembled feed out tool with one central swivelling slide ... 28

18 Machine operated feed out tool with multiple slides ... 28
18.1 General ... 28
18.2 Necessary properties ... 28
18.3 Location of coordinate systems ... 29
18.4 Example of an assembled feed out tool with three slides ... 31

19 Components of machine operated feed out tools ... 32
19.1 Flange adaptor ... 32
19.1.1 General ... 32
19.1.2 Necessary properties ... 32
19.1.3 Example of a model of a flange adaptor ... 32
19.2 Slide ... 33
19.2.1 General ... 33
19.2.2 Necessary properties ... 33
19.2.3 Example of a model of a slide ... 34
19.3 Cartridge carrier ... 34
19.3.1 General ... 34
19.3.2 Necessary properties ... 35
19.3.3 Example of a model of a cartridge carrier ... 35
19.4 Stator ... 36
19.4.1 General ... 36
19.4.2 Necessary properties ... 36
19.4.3 Example of a model of a stator ... 37

20 Design of details ... 37
20.1 Basics for modelling ... 37
20.2 Fixing threads for inserts ... 37
20.3 Contact/clamping surfaces — Orientation ... 38
20.4 Chamfers and roundings ... 38

21 Data exchange model ... 38

Annex A (informative) **Information about nominal dimensions ... 39**

Bibliography ... 40

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

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

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

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

Introduction

This document defines the concept of how to design simplified 3D models of machine operated feed out tools 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 13399 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 this document. 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 the ISO 13399 series is to provide the means to represent the information that describes cutting tools in a computer sensible form that is independent from any particular computer system. The representation 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, *Automation systems and integration*, SC 4, *Industrial data,* 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, *Product properties and classes and their identification*, and in its extensions defined in ISO 13584-24 and ISO 13584-25.

Cutting tool data representation and exchange —

Part 315:
Creation and exchange of 3D models — Modelling of machine operated feed out tools

1 Scope

This document specifies a concept for the design of machine operated feed out tools, limited to any kind of machine operated feed out tools, together with the usage of the related properties and domains of values.

This document specifies the requirements of simplified 3D models for data exchange of machine operated feed out tools.

The following are outside the scope of this document:

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

— creation and exchange of 3D for cutting tools;

— creation and exchange of 3D for cutting items;

— creation and exchange of 3D for tool items;

— creation and exchange of 3D for other adaptive items not being described in the scope of this document;

— creation and exchange of 3D for assembly items and auxiliary items.

2 Normative references

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

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

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

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Starting elements, coordinate systems, planes

4.1 General

The modelling of the 3D models shall be done by means of nominal dimensions. Deviations within the tolerances are allowed.

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 have been taken from ISO/TS 13399-50.

4.2 Reference system (PCS — Primary coordinate system)

The reference system consists 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);

— **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).

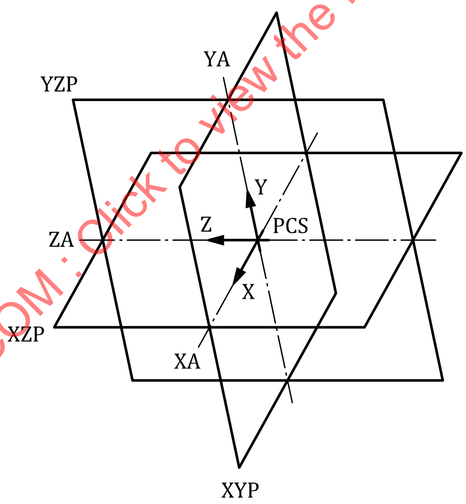


Figure 1 — Primary coordinate system

For virtually mounting of feed out tools onto an adaptive item or directly into the machine tool an additional reference system shall be defined. This reference system shall be 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.

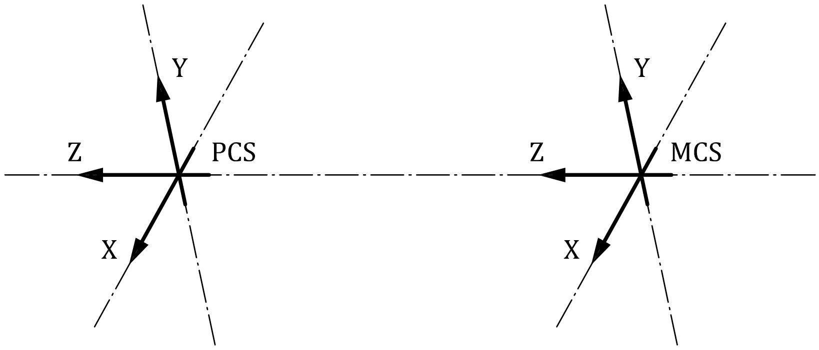


Figure 2 — Orientation of "PCS" and "MCS" reference system (example)

4.3 Coordinate system at the cutting part

For NC-programming, an additional coordinate system called "coordinate system in process — CIP", shall be necessary. This "CIP" has a defined distance from the PCS and shall be oriented as follows:

— the origin is on a plane that is parallel to the XY-pane of PCS and is located on the most front cutting point;

— 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 shows an example about the orientation and location of PCS, MCS and CIP.

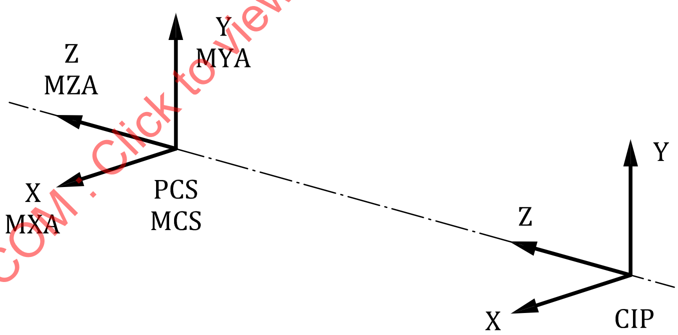


Figure 3 — Orientation of CIP

4.4 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.

For the 3D visualization of drilling and countersinking tools for indexable inserts, the general planes shall be determined as follows:

— “HEP” "head end plane" is located at the most front point of the tool item regardless if this point is in a cutting process of a cutting item or if this point is determined by the tool item and influences the simulation process;

— “DRVLP” "drive length plane" is determined through the dimension of the property "drive length" and starts at the "TEP";

— “LFP” "functional length plane" is determined through the dimension of the property "functional length" and starts at the origin of the mounting coordinate system;

— “LUP” "usable length plane" is determined by the distance of LUX from the "CIP";

— “TEP” "tool end plane" is located at that end of the connection or the driving mechanism of the slides that points away from the workpiece;

— “OAL” "overall length" is the distance between "TEP" and "HEP".

Other planes, if necessary are defined in the appropriate clauses.

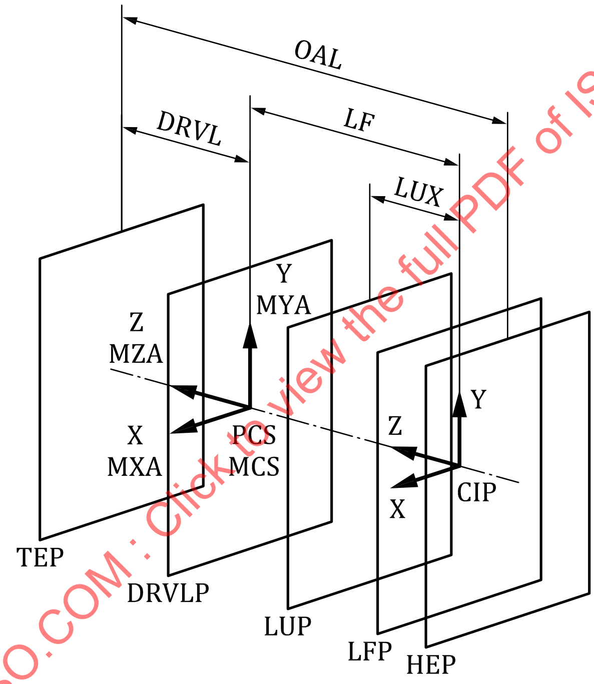


Figure 4 — Planes for design

4.5 Adjustment coordinate system on workpiece side

4.5.1 General

Additional coordinate systems for mounting components the coordinate systems "CSWx_y" (coordinate system workpiece side) shall be defined according to ISO/TS 13399-50.

4.5.2 Designation of the coordinate system workpiece side

Case 1 One coordinate system at the workpiece side shall be designated as "CSW".

Case 2 One coordinate system at workpiece side on different levels shall be designated as "CSWx", e.g. "CSW1", "CSW2". The numbering starts at the workpiece side and ends at the machine side in the direction of the positive Z-axis.

Case 3 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 starts 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 at one level, one angle and different diameters shall be designated as described in Case 3. The counting shall start at the smallest diameter.

Case 5 Multiple coordinate systems at one level, different angles and different diameters shall be designated as described in Case 3. The counting shall start at the smallest diameter and at the three o'clock position counting in counter-clockwise direction while looking towards the machine spindle (positive Z-axis).

An example is shown in Figure 5.

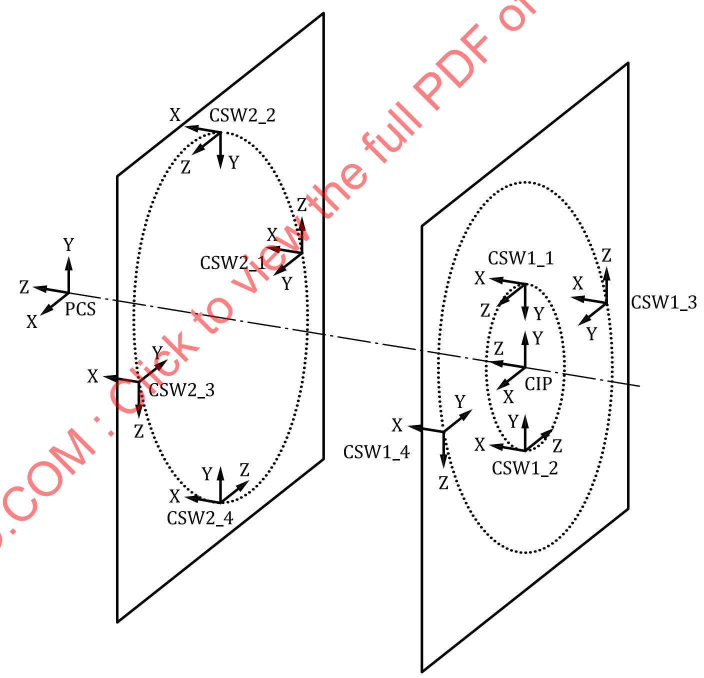


Figure 5 — Adjustment coordinate system on workpiece side

The MCS_INSERT shall be placed onto the CSWx_y of the tool with determinations as follows:

— the X-axis of CSWx_y is parallel to the X-axis of CRP;

— the Y-axis of CSWx_y is parallel to the Y-axis of CRP;

— the Z-axis of CSWx_y is parallel to the Z-axis of CRP.

An example is shown in Figure 6.

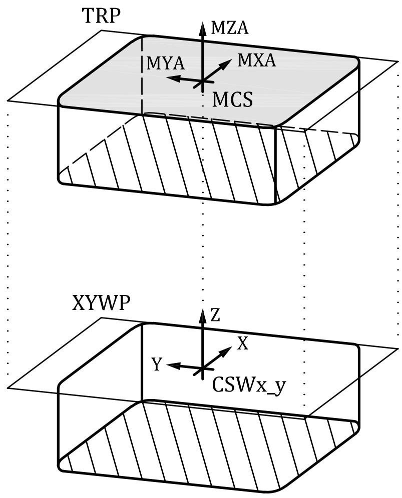


Figure 6 — Mounting of insert onto pocket seat

5 Design of the model

5.1 General

The design of the model shall be according to ISO/TS 13399-80.

5.2 Necessary parameters for the feed out motion of the slides

Information about the connection interface code for the feed out drive system shall be filed as described in Table 1.

Table 1 — Parameter list for connection interface for the drive system

Preferred symbol	Description	Source of symbol	ISO-ID number
DRVSC	drive size code	open	open
DRVTY	drive type	open	open

6 Machine operated feed out tool with one linear slide for internal machining

6.1 General

Figure 7 shows the properties used for identification and classification of motion tools with one linear slide for internal machining operations.

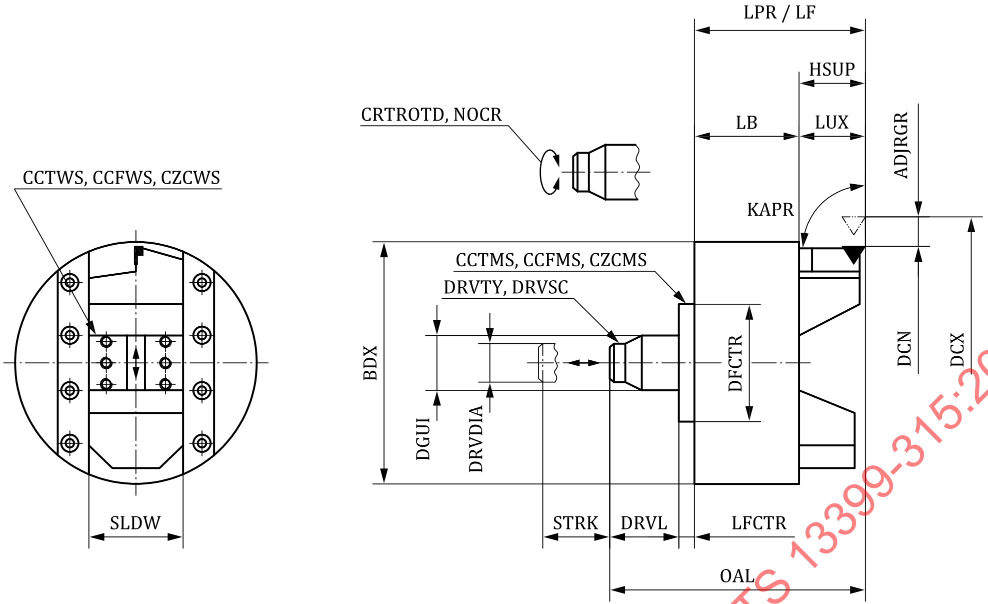


Figure 7 — Determination of properties for feed out tools with one linear slide for internal machining

6.2 Necessary properties

Table 2 lists the properties for the modelling of a feed out tool with one linear slide. For the position of the cutting edge the property "cutting diameter, maximum" shall be used. The properties describing the other values of the cutting diameter shall be listed for information only.

Table 2 — Properties for the modelling of feed out tools with one linear slide for internal machining

Preferred name	Preferred symbol
adjustment range radial	ADJRGR
body diameter, maximum	BDX
collision diameter	CDIA
cutting edge angle type code	CEATC
control rotation direction	CRTROTD
cutting diameter , minimum	DCN
cutting diameter, maximum	DCX
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code	IIC
tool cutting edge angle	KAPR
inclination angle	LAMS
body length	LB
functional length	LF

Table 2 *(continued)*

Preferred name	Preferred symbol
protruding length	LPR
usable length, maximum	LUX
master insert identification	MIID
control revolutions count	NOCR
overall length	OAL
slide travel direction	SLDDIR
slide width	SLDW
stroke	STRK

6.3 Location of coordinate systems

Figure 8 shows the positions and orientations of the coordinate systems to be used for mounting.

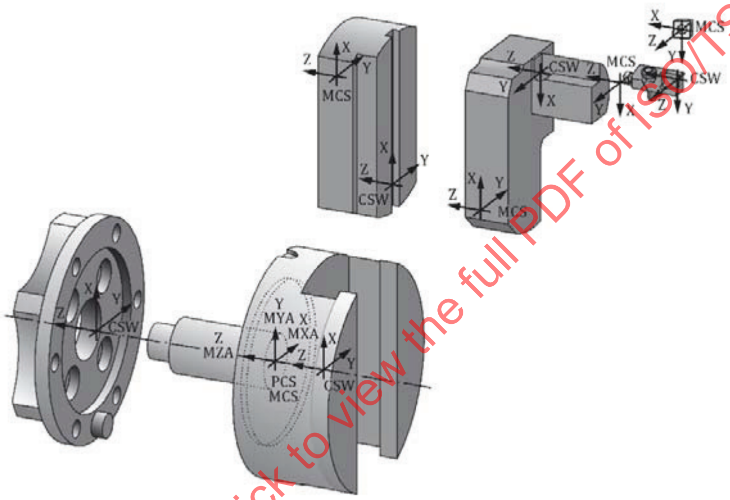


Figure 8 — Location and orientation of coordinate systems on a feed out tool with one linear slide

6.4 Assembled feed out tool with one linear slide for internal machining

Figure 9 shows the assembled machine operated feed out tool with one linear slide. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

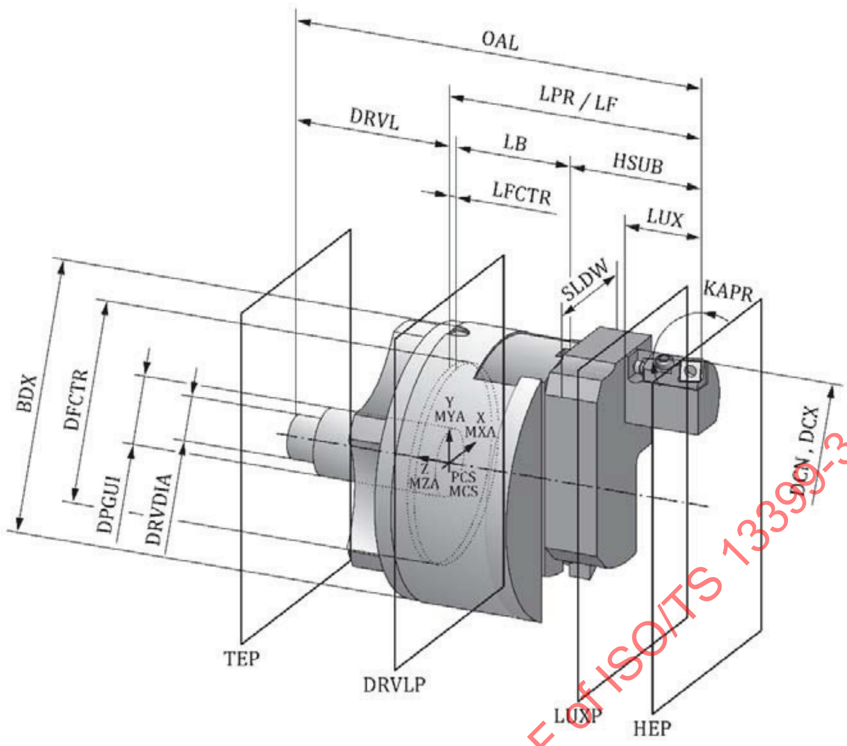


Figure 9 — Assembled feed out tool with one linear slide for internal machining

7 Machine operated feed out tool with one linear slide for external machining

7.1 General

Figure 10 shows the properties used for identification and classification of motion tools with one linear slide for external machining operations.

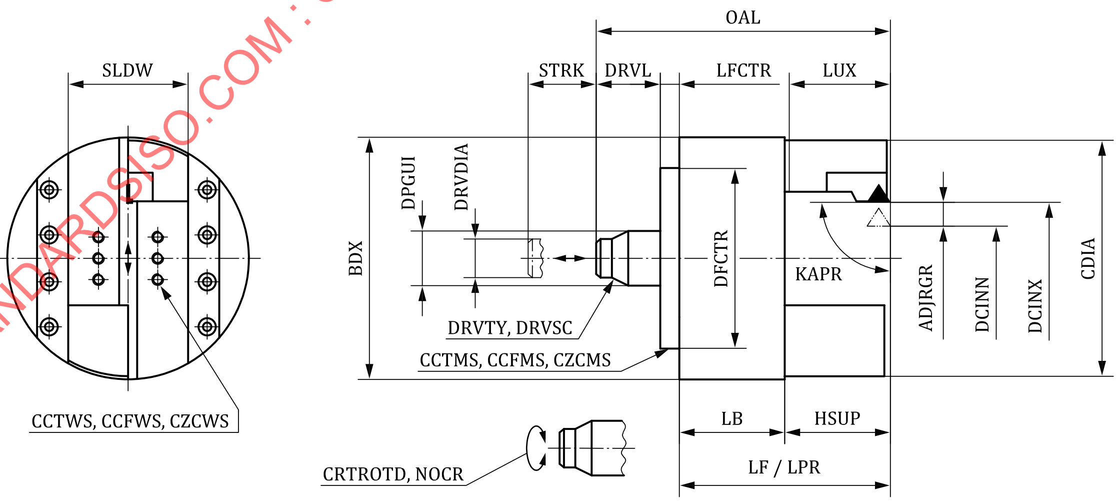


Figure 10 — Determination of properties for feed out tools with one linear slide for external machining

7.2 Necessary properties

Table 3 lists the properties for the modelling of a feed out tool with one linear slide. For the position of the cutting edge, the property "cutting diameter internal minimum" shall be used. The properties describing the other values of the cutting diameter shall be listed for information only.

Table 3 — Properties for the modelling of feed out tools with one linear slide for external machining

Preferred name	Preferred symbol
adjustment range radial	ADJRGR
body diameter, maximum	BDX
collision diameter	CDIA
cutting edge angle type code	CEATC
control rotation direction	CRTROTD
cutting diameter internal, minimum	DCINN
cutting diameter internal, maximum	DCINX
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code	IIC
tool cutting edge angle	KAPR
inclination angle	LAMS
body length	LB
functional length	LF
protruding length	LPR
usable length, maximum	LUX
master insert identification	MIID
control revolutions count	NOCR
overall length	OAL
slide travel direction	SLDDIR
slide width	SLDW
stroke	STRK

7.3 Location of coordinate systems

The coordinate systems shall be located as described in 6.3, but for external machining processes.

7.4 Assembled feed out tool with one linear slide for external machining

For the assembly, see 6.4, but as for external machining operations. See also Figure 15 for the arrangement of the assembled part, but with one slide only.

8 Machine operated feed out tool with two linear slides for internal machining

8.1 General

Figure 11 shows the properties used for identification and classification of motion tools with two linear slides for internal machining operations.

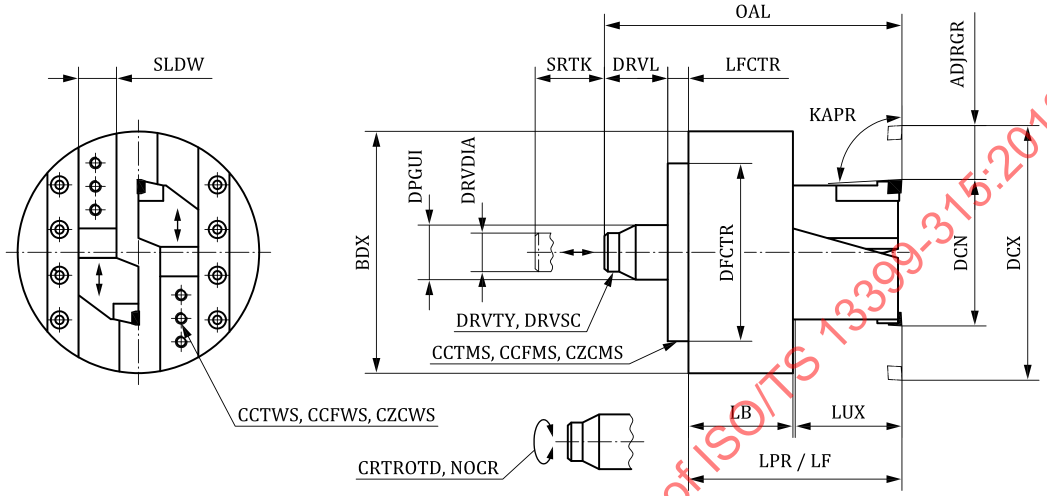


Figure 11 — Determination of properties for feed out tools with two linear slides for internal machining

8.2 Necessary properties

See 6.2 and Table 2 for necessary properties.

8.3 Location of coordinate systems and assembled feed out tool

See Clause 6 for the arrangement of the coordinate systems and the assembly of the components, but with two slides.

9 Machine operated feed out tool with two linear slides for external machining

9.1 General

Figure 12 shows the properties used for identification and classification of motion tools with two linear slides for external machining operations.

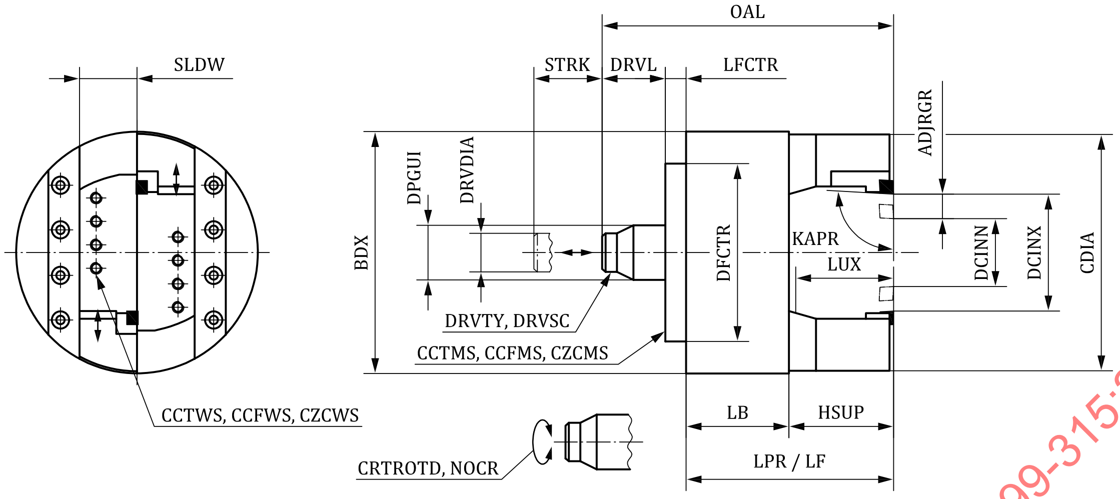


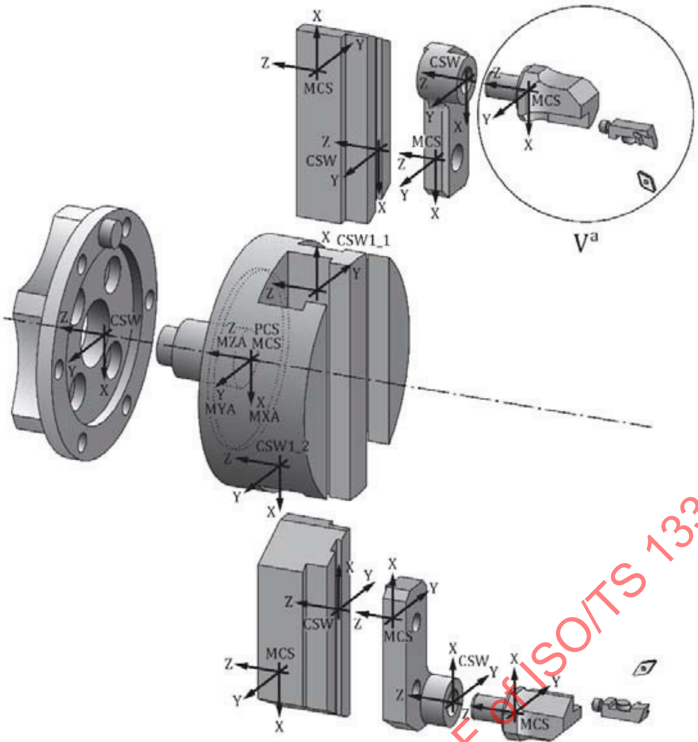
Figure 12 — Determination of properties for feed out tools with two linear slides for external machining

9.2 Necessary properties

See 7.2 and Table 3 for necessary properties.

9.3 Location of coordinate systems

Figures 13 and 14 show the positions and orientations of the coordinate systems to be used for mounting.



Key

a [Figure 14](#) illustrates detail "V".

Figure 13 — Location and orientation of coordinate systems on a feed out tool with two linear slides

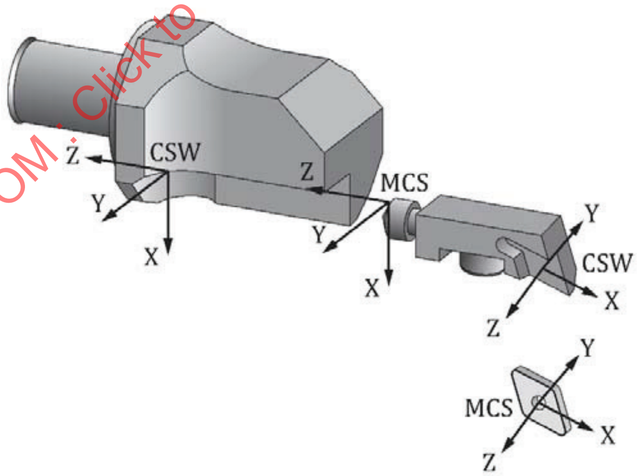


Figure 14 — Detail "V" of Figure 13

9.4 Assembled feed out tool with two linear slides for external machining

Figure 15 shows the assembled machine operated feed out tool with two linear slides for external machining processes. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

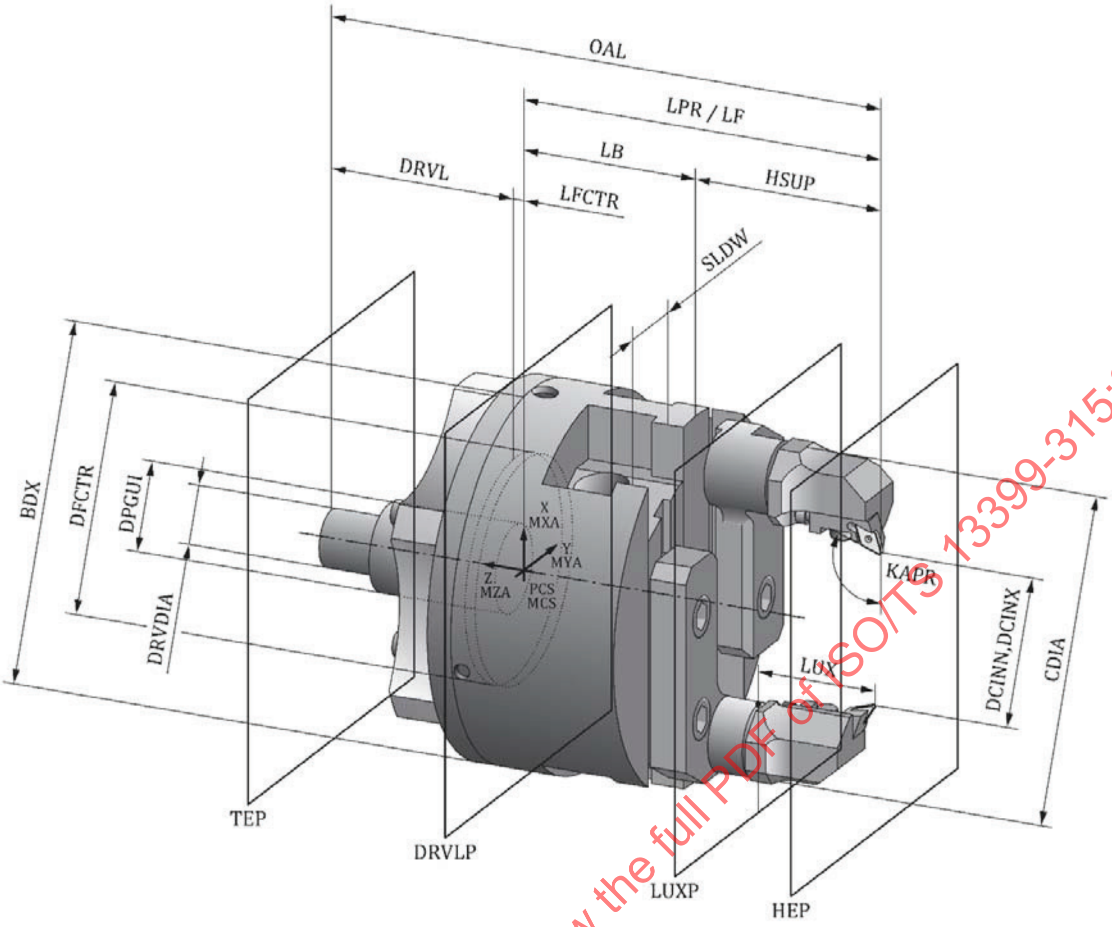


Figure 15 — Assembled feed out tool with two linear slides for external machining

10 Machine operated feed out tool with two linear slides for internal pull back machining

10.1 General

Figure 16 shows the properties used for identification and classification of motion tools with two linear slides for internal pull back machining operations.

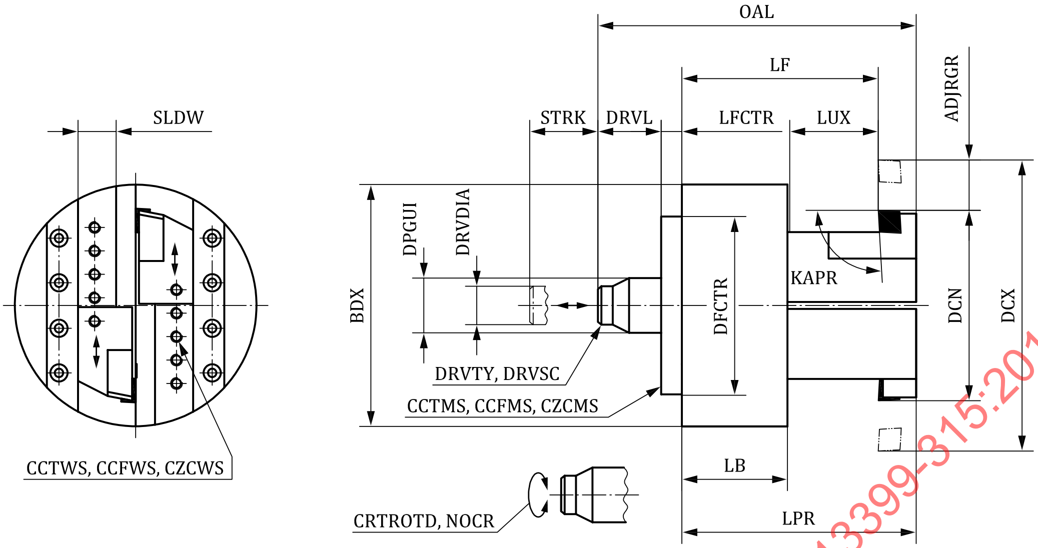


Figure 16 — Determination of properties for feed out tools with two linear slides for internal pull back machining

10.2 Necessary properties

See 6.2 and Table 2 for necessary properties.

10.3 Location of coordinate systems and assembled feed out tool

See Clause 6 for the arrangement of the coordinate systems and the assembly of the components, but with two slides mounted for pull back machining.

11 Machine operated feed out tool with one linear slide for external pull back machining

11.1 General

Figure 17 shows the properties used for identification and classification of motion tools with one linear slide for external pull back machining operations.

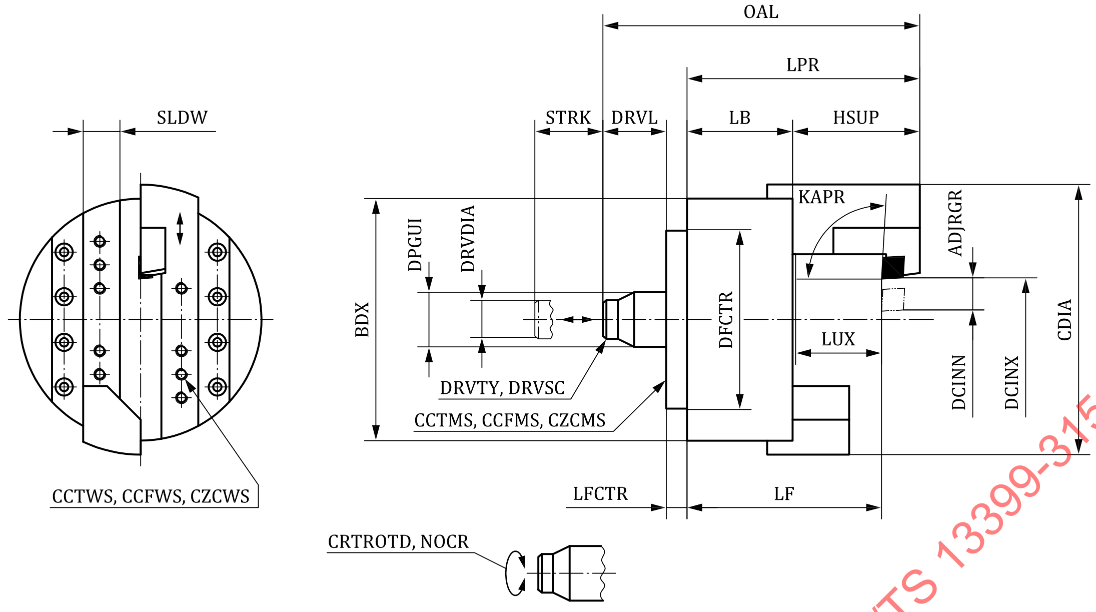


Figure 17 — Determination of properties for feed out tools with one linear slide for external pull back machining

11.2 Necessary properties

See 7.2 and Table 3 for necessary properties.

11.3 Location of coordinate systems and assembled feed out tool

See Clause 9 for the arrangement of the coordinate systems and the assembly of the components, but with one slide mounted for pull back machining.

12 Machine operated feed out tool with one inclined slide

12.1 General

Figure 18 shows the properties used for identification and classification of motion tools with one inclined slide for internal machining operations.

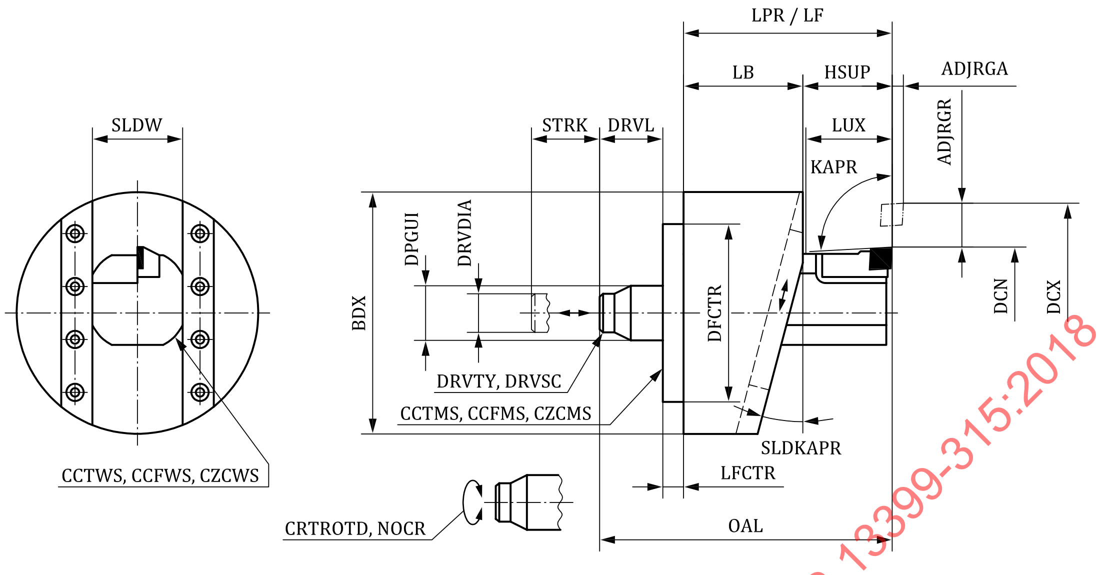


Figure 18 — Determination of properties for feed out tools with one inclined slide

12.2 Necessary properties

Table 4 lists the properties for the modelling of a feed out tool with inclined slides. For the position of the cutting edge the property "cutting diameter, maximum" shall be used. The properties describing the other values of the cutting diameter shall be listed for information only.

Table 4 — Properties for the modelling of feed out tools with inclined slides for internal or external machining

Preferred name	Preferred symbol
adjustment range radial	ADJRGR
body diameter, maximum	BDX
collision diameter	CDIA
cutting edge angle type code	CEATC
control rotation direction	CRTROTD
cutting diameter internal, minimum[a]	DCINN
cutting diameter internal, maximum[a]	DCINX
cutting diameter, minimum[a]	DCN
cutting diameter, maximum[a]	DCX
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code	IIC
tool cutting edge angle	KAPR
inclination angle	LAMS
body length	LB

[a] Dependent on external or internal machining.

Table 4 *(continued)*

Preferred name	Preferred symbol
functional length	LF
protruding length	LPR
usable length, maximum	LUX
master insert identification	MIID
control revolutions count	NOCR
overall length	OAL
slide travel direction	SLDDIR
slide setting angle	SLDKAPR
slide width	SLDW
stroke	STRK
[a] Dependent on external or internal machining.	

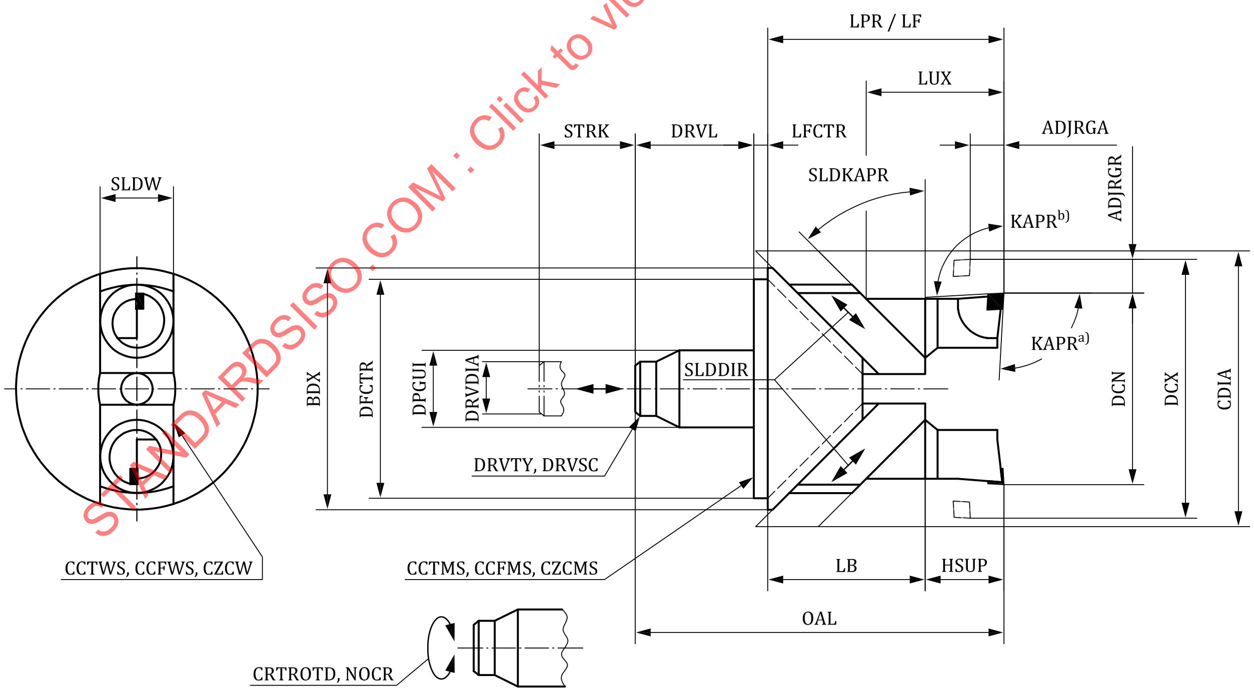
12.3 Location of coordinate systems and assembled feed out tool

See Clause 13 for the arrangement of the coordinate systems and the assembly of the components, but with one slide only.

13 Machine operated feed out tool with two inclined slides

13.1 General

Figure 19 shows the properties used for identification and classification of motion tools with two inclined slides for internal machining operations.



Key

a CEATC = "E" if slide motion from outside to inside.

b CEATC = "S" if slide motion from inside to outside.

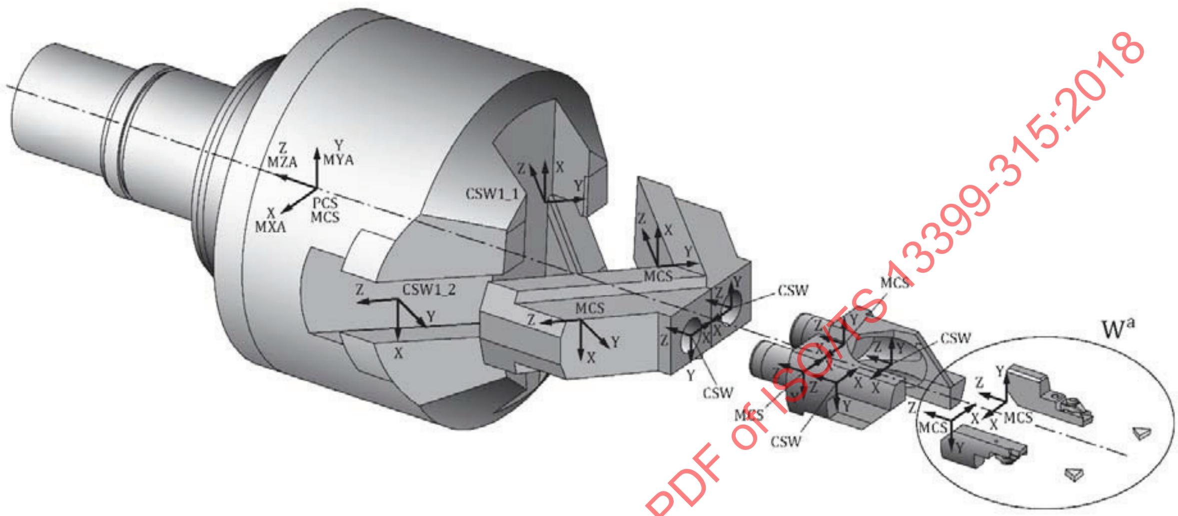
Figure 19 — Determination of properties for feed out tools with two inclined slides

13.2 Necessary properties

See 12.2 and Table 4 for necessary properties.

13.3 Location of coordinate systems

Figures 20 and 21 show the positions and orientations of the coordinate systems to be used for mounting. The model is shown with the position of the inserts on the minimum cutting diameter.



Key

a Figure 21 illustrates detail "W".

Figure 20 — Location and orientation of coordinate systems on a feed out tool with two inclined slides

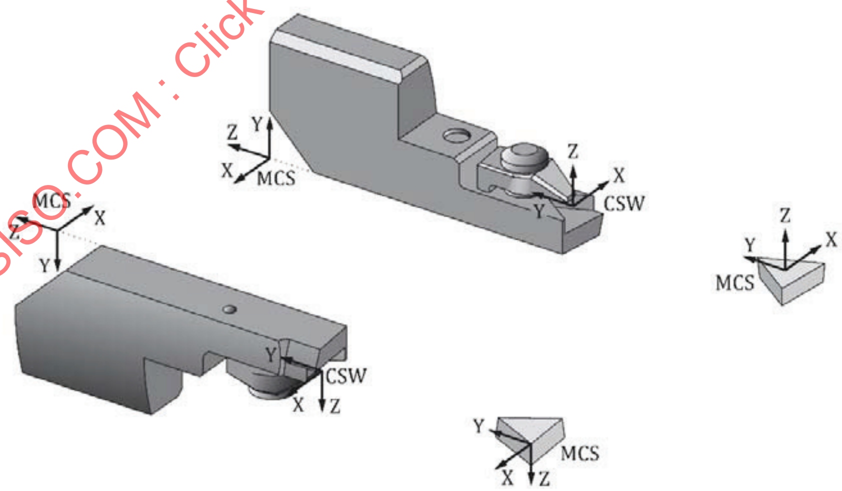


Figure 21 — Detail "W" of Figure 20

13.4 Assembled feed out tool with two inclined slides for internal machining

Figure 22 shows the assembled machine operated feed out tool with two inclined slides for internal machining processes. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

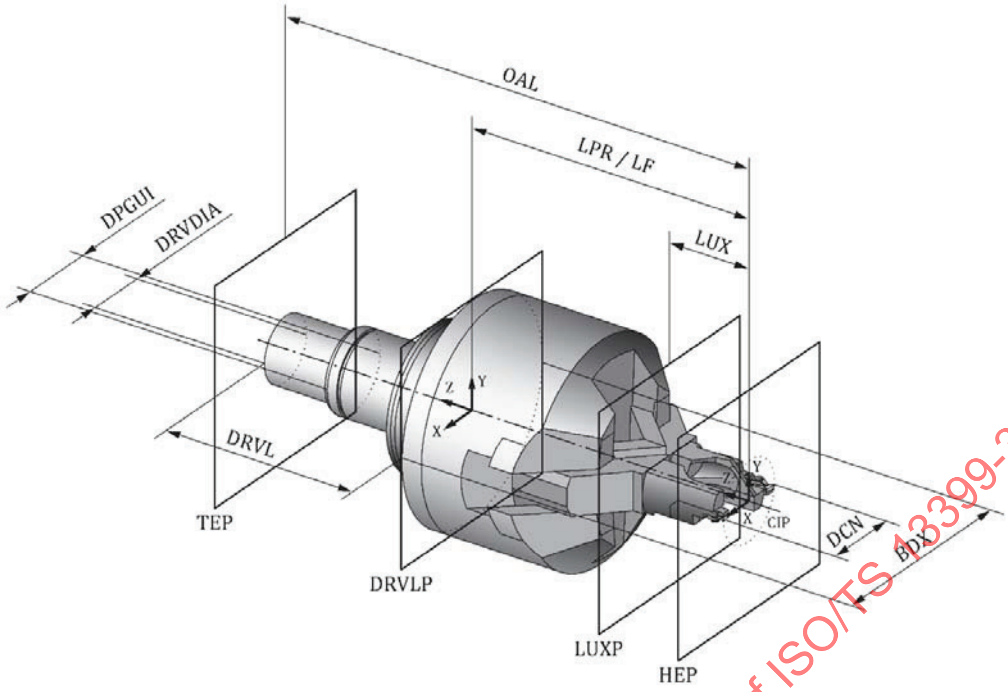


Figure 22 — Assembled feed out tool with two inclined slides for internal machining

14 Machine operated feed out tool with one rotatory slide

14.1 General

Figure 23 shows the properties used for identification and classification of motion tools with one rotatory slide for internal machining operations.

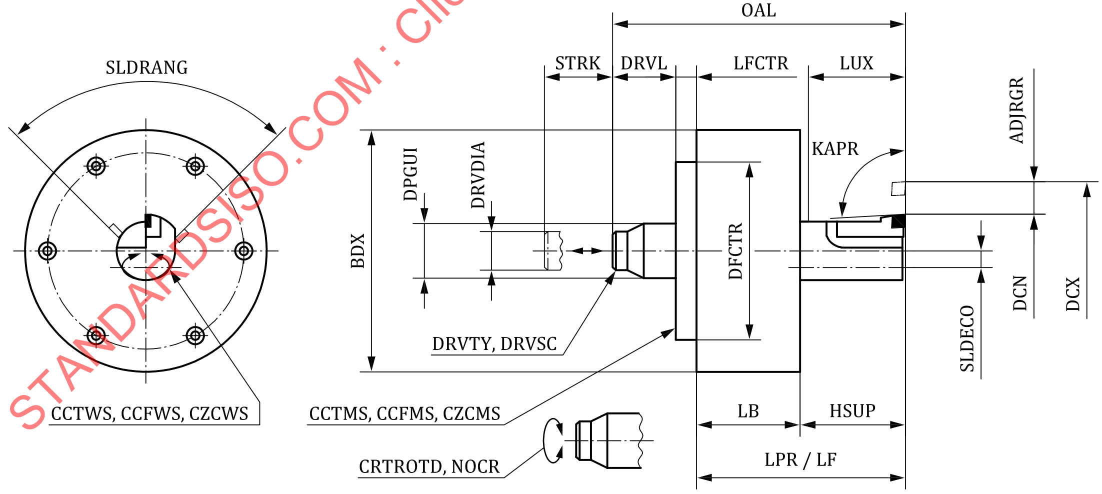


Figure 23 — Determination of properties for feed out tools with one rotatory slide

14.2 Necessary properties

Table 5 lists the properties for the modelling of a feed out tool with one rotary slide. For the position of the cutting edge the property "cutting diameter, maximum" shall be used. The properties describing the other values of the cutting diameter shall be listed for information only.

Table 5 — Properties for the modelling of feed out tools with one rotary slide for internal machining

Preferred name	Preferred symbol
adjustment range radial	ADJRGR
body diameter, maximum	BDX
cutting edge angle type code	CEATC
control rotation direction	CRTROTD
cutting diameter, minimum	DCN
cutting diameter, maximum	DCX
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code	IIC
tool cutting edge angle	KAPR
inclination angle	LAMS
body length	LB
functional length	LF
protruding length	LPR
usable length, maximum	LUX
master insert identification	MIID
control revolutions count	NOCR
overall length	OAL
slide eccentricity	SLDECC
slide rotation angle	SLDRANG
slide width	SLDW
stroke	STRK

14.3 Location of coordinate systems

Figure 24 shows the positions and orientations of the coordinate systems to be used for mounting. The model is shown with the position of the inserts on the maximum cutting diameter.

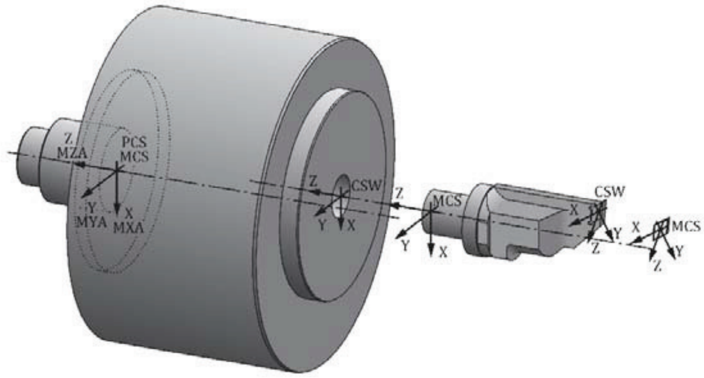


Figure 24 — Location and orientation of coordinate systems on a feed out tool with one rotary slide

14.4 Assembled feed out tool with one rotary slide

Figure 25 shows the assembled machine operated feed out tool with one rotary slides for internal machining processes. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

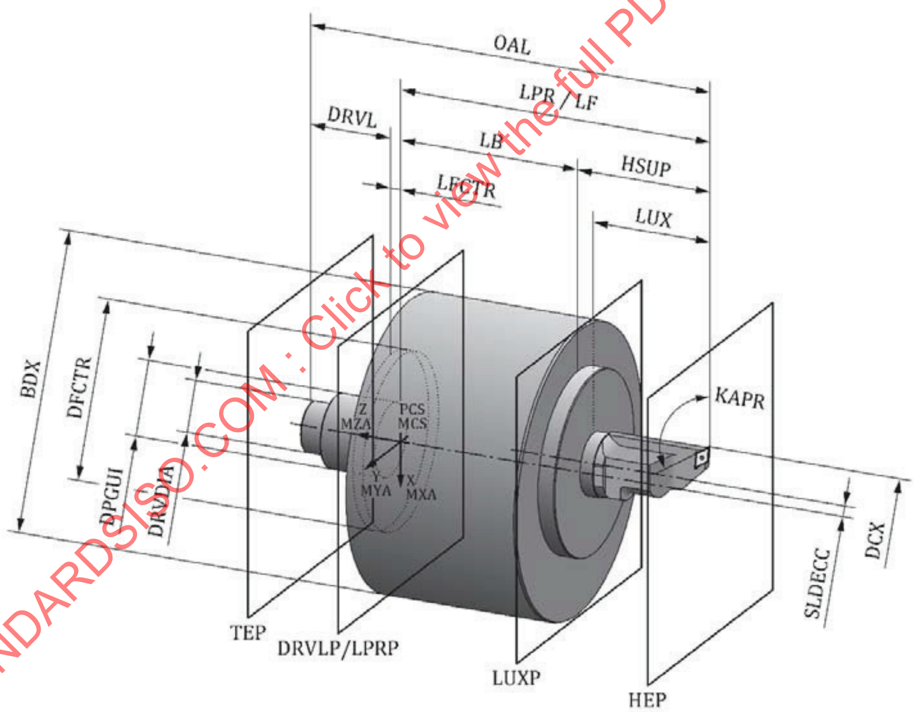


Figure 25 — Assembled feed out tool with one rotary slide for internal machining

15 Machine operated feed out tool with one swing slide

15.1 General

Figure 26 shows the properties used for identification and classification of motion tools with one swing slide for internal machining operations.

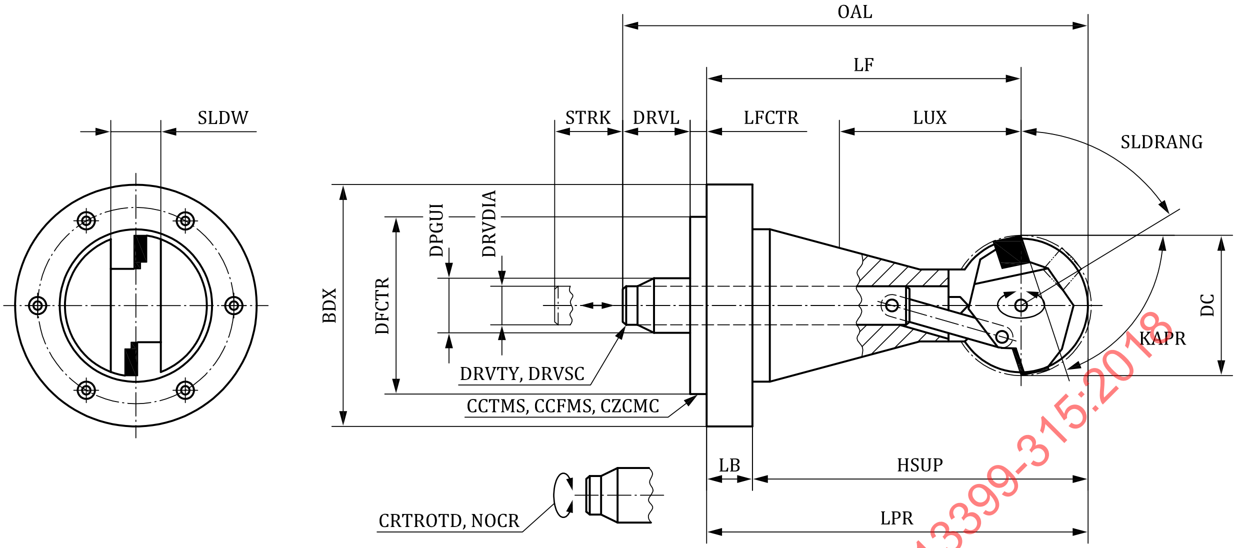


Figure 26 — Determination of properties for feed out tools with one swing slide

15.2 Necessary properties

Table 6 lists the properties for the modelling of a feed out tool with one swing slide.

Table 6 — Properties for the modelling of feed out tools with one swing slide for internal machining

Preferred name	Preferred symbol
body diameter, maximum	BDX
cutting edge angle type code	CEATC
control rotation direction	CRTROTD
cutting diameter	DC
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code	IIC
tool cutting edge angle	KAPR
inclination angle	LAMS
body length	LB
functional length	LF
protruding length	LPR
usable length, maximum	LUX
master insert identification	MIID
control revolutions count	NOCR
overall length	OAL

Table 6 *(continued)*

Preferred name	Preferred symbol
slide rotation angle	SLDRANG
slide width	SLDW
stroke	STRK

15.3 Location of coordinate systems

See Clause 13 for the arrangement of the coordinate systems, but with one swing slide only.

15.4 Assembled feed out tool with one swing slide

Figure 27 shows the assembled machine operated feed out tool with one swing slide for internal machining processes. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

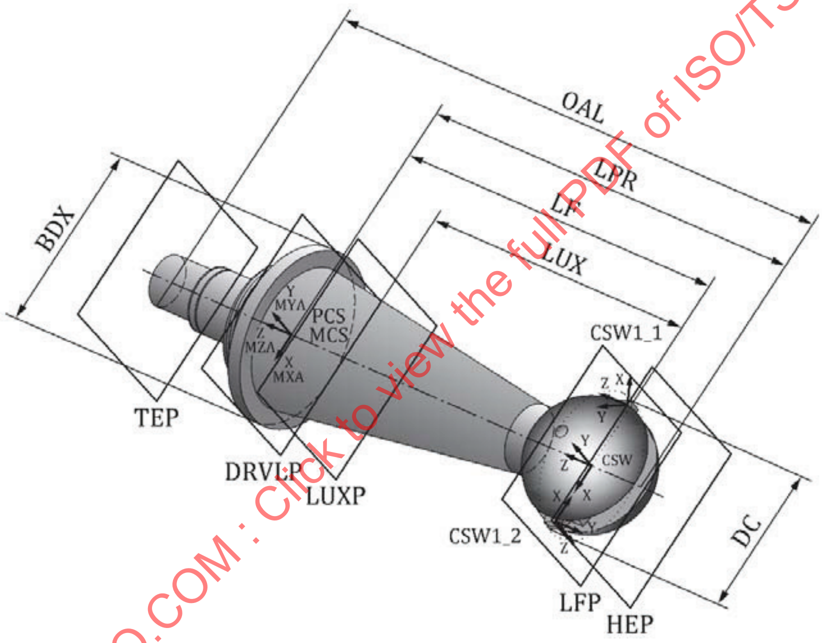


Figure 27 — Assembled feed out tool with one swing slide for internal machining

16 Machine operated feed out tool with one peripheral swivelling slide

16.1 General

Figure 28 shows the properties used for identification and classification of motion tools with one peripheral swivelling slide for internal machining operations.

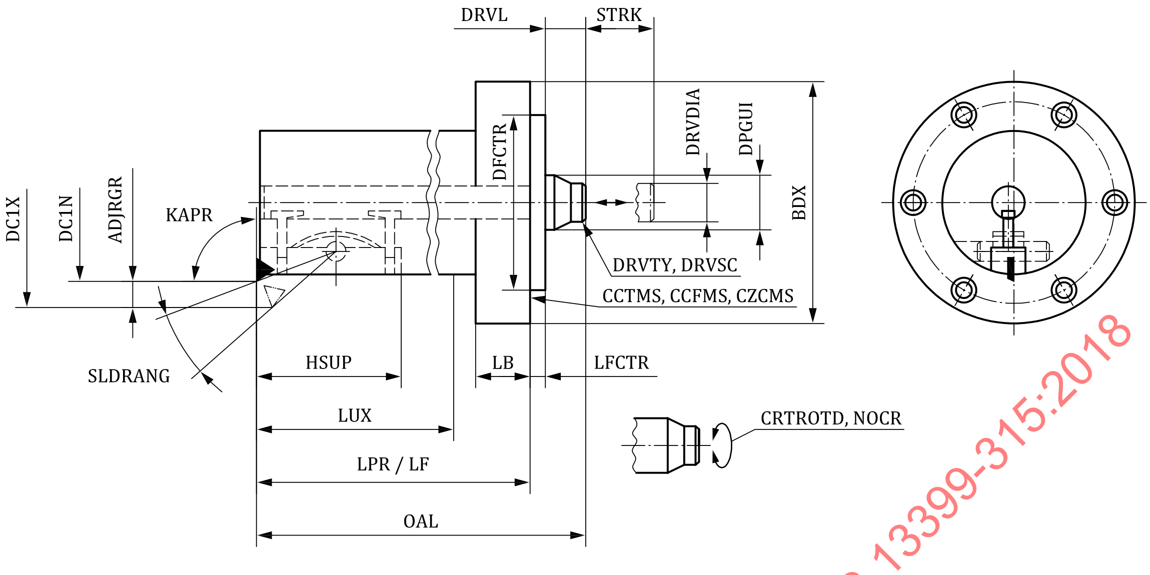


Figure 28 — Determination of properties for feed out tools with one peripheral swivelling slide

16.2 Necessary properties

Table 7 lists the properties for the modelling of a feed out tool with one peripheral swivelling slide.

Table 7 — Properties for the modelling of feed out tools with one peripheral swivelling slide for internal machining

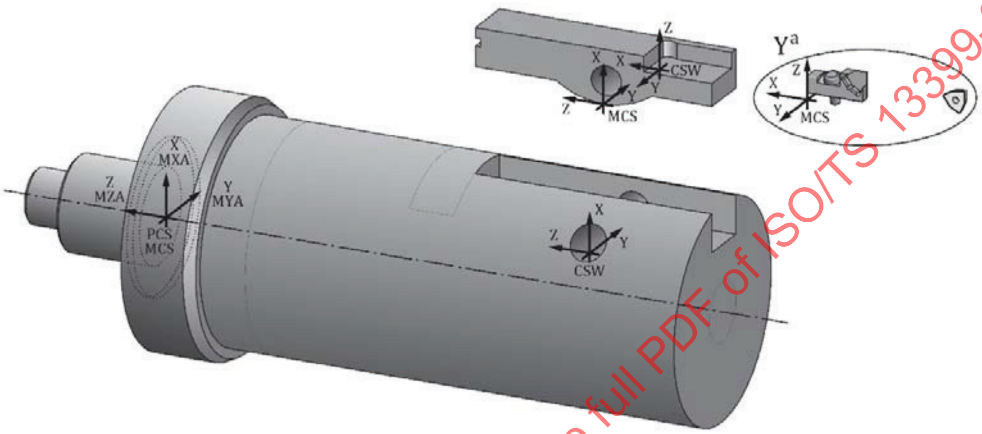
Preferred name	Preferred symbol
adjustment range axial	ADJRGA
adjustment range radial	ADJRGR
body diameter, maximum	BDX
cutting edge angle type code	CEATC
control rotation direction	CRTROTD
cutting diameter, minimum	DCN
cutting diameter, maximum	DCX
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code	IIC
tool cutting edge angle	KAPR
inclination angle	LAMS
body length	LB
functional length	LF
protruding length	LPR
usable length, maximum	LUX
master insert identification	MIID
control revolutions count	NOCR

Table 7 *(continued)*

Preferred name	Preferred symbol
overall length	OAL
slide rotation angle	SLDRANG
slide width	SLDW
stroke	STRK

16.3 Location of coordinate systems

Figures 29 and 30 show the positions and orientations of the coordinate systems to be used for mounting. The model is shown with the position of the inserts on the minimum cutting diameter.



Key

a Figure 30 illustrates detail "Y".

Figure 29 — Location and orientation of coordinate systems on a feed out tool with one peripheral swivelling slide

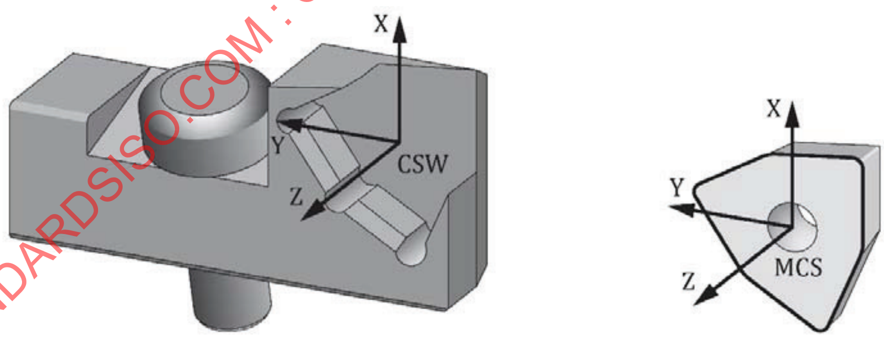


Figure 30 — Detail "Y" of Figure 30

16.4 Assembled feed out tool with one peripheral swivelling slide

Figure 31 shows the assembled machine operated feed out tool with one peripheral swivelling slide for internal machining processes. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

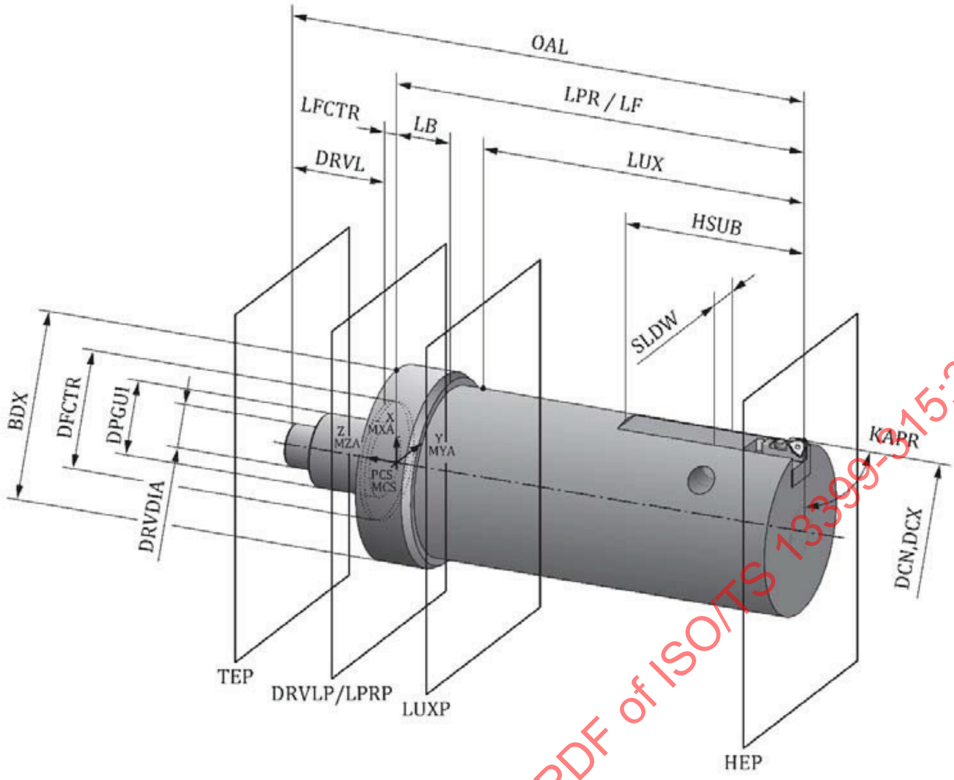


Figure 31 — Assembled feed out tool with one peripheral swivelling slide

17 Machine operated feed out tool with one central swivelling slide

17.1 General

Figure 32 shows the properties used for identification and classification of motion tools with one central swivelling slide for internal machining operations.

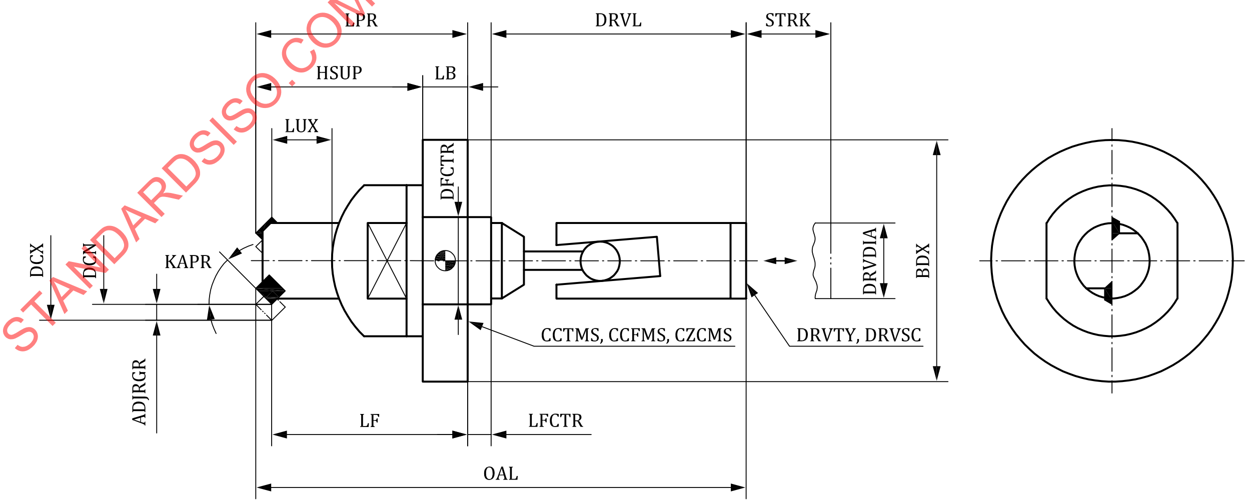


Figure 32 — Determination of properties for feed out tools with one central swivelling slide

17.2 Necessary properties

See 16.2 and Table 7 for the necessary properties.

17.3 Location of coordinate systems

See 16.3 for the determination of the coordinate systems and their location.

17.4 Assembled feed out tool with one central swivelling slide

The 3D model shall look similar to the model in 16.4.

18 Machine operated feed out tool with multiple slides

18.1 General

Figure 33 shows the properties used for identification and classification of motion tools with multiple slides for internal machining operations. Figure 33 shows an example of a feed out tool with three slides.

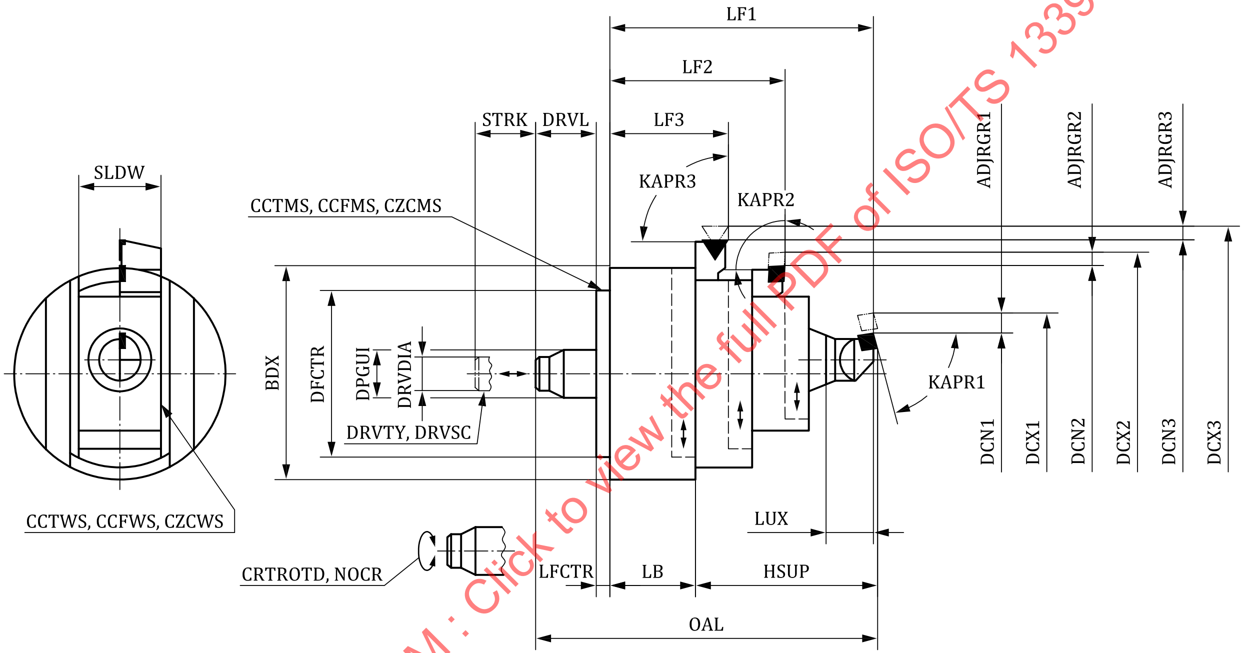


Figure 33 — Example of determination of properties for feed out tools with three slides

18.2 Necessary properties

Table 8 lists the properties for the modelling of a feed out tool with multiple slides.

Table 8 — Properties for the modelling of feed out tools with multiple slides

Preferred name	Preferred symbol
adjustment range axial[a]	ADJRGA
adjustment range radial[a]	ADJRGR
body diameter, maximum	BDX
cutting edge angle type code[a]	CEATC
control rotation direction	CRTROTD
cutting diameter internal, minimum[a,b]	DCINN
cutting diameter internal, maximum[a,b]	DCINX
[a] Shall be indexed by means of using "slide count".	
[b] Dependent on type of cutting diameter — external or internal — see definition.	

Table 8 *(continued)*

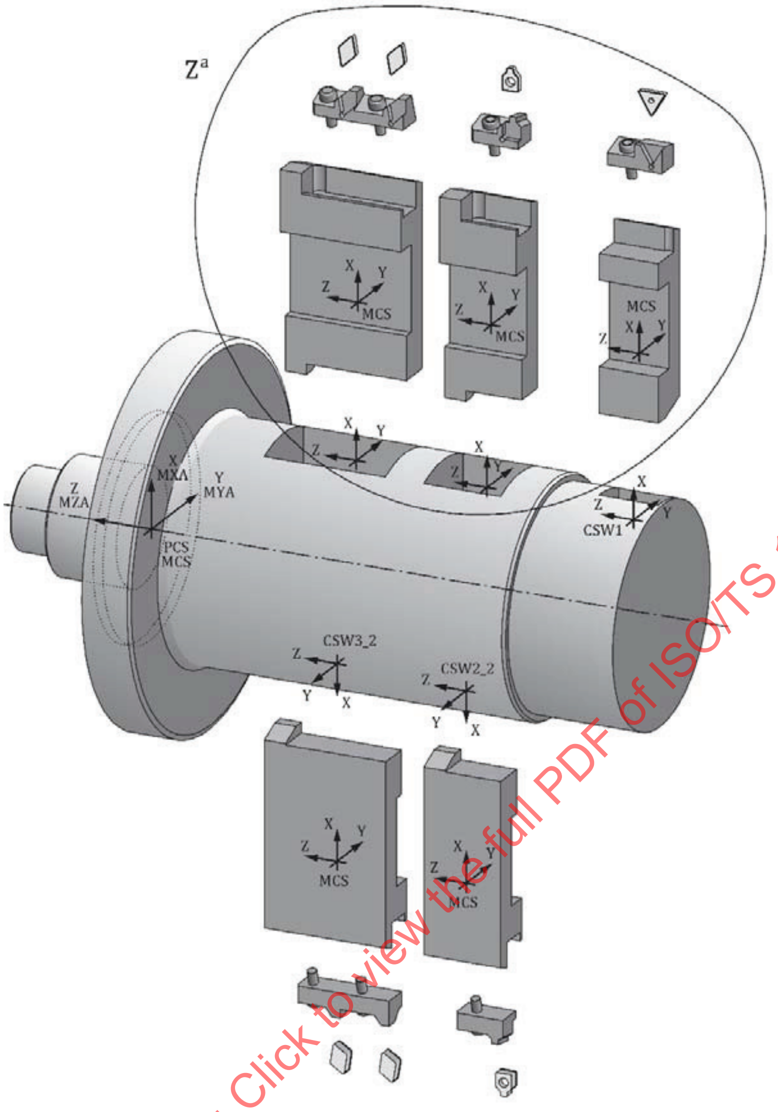
Preferred name	Preferred symbol
cutting diameter, minimum[a,b]	DCN
cutting diameter, maximum[a,b]	DCX
centring flange diameter	DFCTR
guide pipe diameter	DPGUI
drive diameter	DRVDIA
drive length	DRVL
orthogonal rake angle[a]	GAMO
centring flange length	LFCTR
support height	HSUP
insert interface code[a]	IIC
tool cutting edge angle[a]	KAPR
inclination angle[a]	LAMS
body length	LB
functional length[a]	LF
protruding length	LPR
usable length, maximum	LUX
master insert identification[a]	MIID
control revolutions count	NOCR
overall length	OAL
slide count	SLDCNT
slide width	SLDW
stroke	STRK

[a] Shall be indexed by means of using "slide count".

[b] Dependent on type of cutting diameter — external or internal — see definition.

18.3 Location of coordinate systems

Figures 34 and 35 show the positions and orientations of the coordinate systems to be used for mounting. The model is shown with the position of the inserts on the minimum cutting diameter.



Key

a Figure 35 illustrates detail "Z".

Figure 34 — Location and orientation of coordinate systems on the example of a feed out tool with slides on three cutting levels

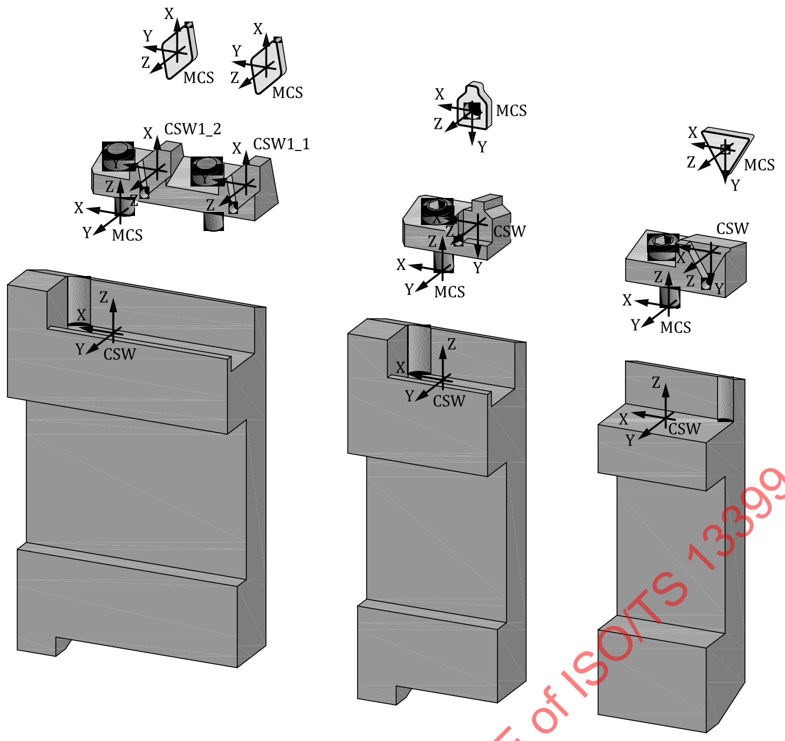


Figure 35 — Detail "Z" of Figure 34

18.4 Example of an assembled feed out tool with three slides

Figure 36 shows the assembled machine operated feed out tool with three slides for internal machining processes. The individual components of the assembly shall be designed to manufacturer's discretion. The assembly shall be done by means of using the individual coordinate systems "MCS" and "CSW" of the components.

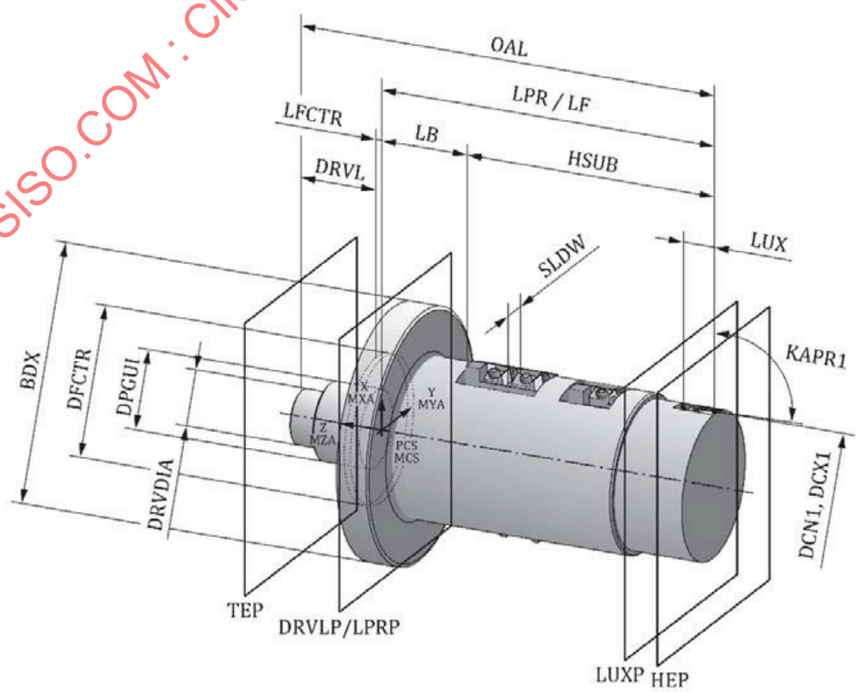


Figure 36 — Example of an assembled feed out tool with three slides

19 Components of machine operated feed out tools

19.1 Flange adaptor

19.1.1 General

Figure 37 shows the properties used for identification and classification of the flange adaptor component of a motion tool.

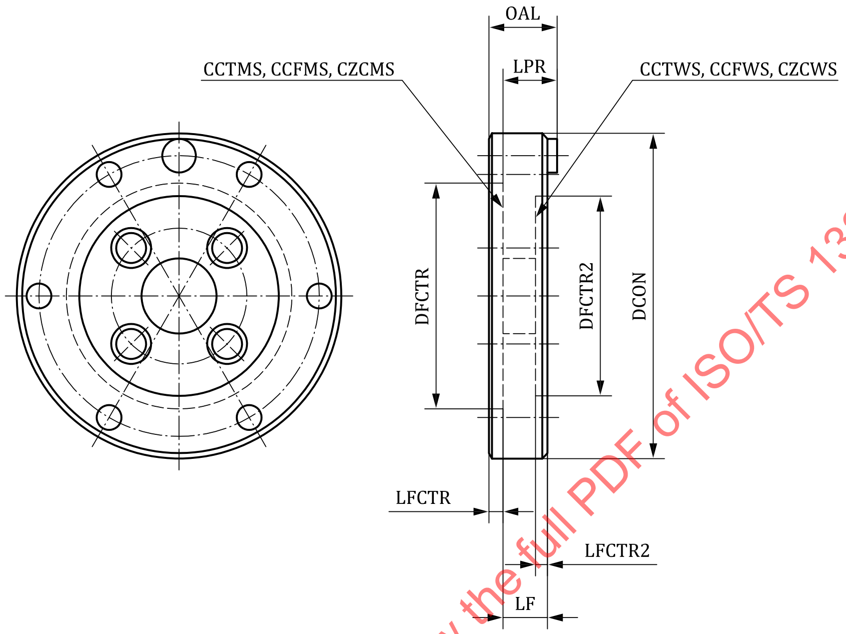


Figure 37 — Determination of properties for a flange adaptor

19.1.2 Necessary properties

Table 9 lists the properties for the modelling of adaptor for a feed out tool.

Table 9 — Properties for the modelling of adaptor

Preferred name	Preferred symbol
connection diameter machine side	DCON
centring flange diameter	DFCTR
centring flange diameter	DFCTR2
centring flange length	LFCTR
centring flange length	LFCTR2
functional length	LF
protruding length	LPR
overall length	OAL

19.1.3 Example of a model of a flange adaptor

Figure 38 shows the model of a flange adaptor. The modelling of the hole pattern using temporary properties is upon manufacturer's discretion and shall not be part of a data exchange.