



BSI Standards Publication

## **Cutting tool data representation and exchange**

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

**National foreword**

This Published Document is the UK implementation of ISO/TS 13399-302:2013.

The UK participation in its preparation was entrusted to Technical Committee MTE/18, Tools tips and inserts for cutting applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2013. Published by BSI Standards Limited 2013

ISBN 978 0 580 83145 4

ICS 25.100.01; 35.240.50

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2013.

**Amendments issued since publication**

Date	Text affected
------	---------------

---

---

---

**Cutting tool data representation and  
exchange —**

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**

*Représentation et échange des données relatives aux outils coupants —*

*Partie 302: Description des modèles 3D basés sur les propriétés de l'ISO/  
TS 13399-3: Modélisation des forets monoblocs et des outils de lamage*





**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vii</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Starting elements, coordinate systems, planes</b> .....	<b>1</b>
3.1 General.....	1
3.2 Reference system.....	2
3.3 Coordinate system at the cutting part.....	2
3.4 MCS coordinate system.....	3
3.5 Planes.....	4
3.6 Cutting reference point (CRP).....	4
<b>4 Design of the model</b> .....	<b>5</b>
4.1 General.....	5
4.2 Necessary parameters for the connection interface feature.....	6
<b>5 Twist drill</b> .....	<b>6</b>
5.1 General.....	6
5.2 Necessary properties.....	7
5.3 Geometry of the non-cutting part including the connection.....	8
5.4 Geometry of the cutting part.....	8
5.5 Twist drill — Complete.....	9
<b>6 Step drill</b> .....	<b>10</b>
6.1 General.....	10
6.2 Necessary properties.....	10
6.3 Geometry of the non-cutting part including the connection.....	11
6.4 Geometry of the cutting part.....	11
6.5 Step drill — Complete.....	12
<b>7 Core drill</b> .....	<b>12</b>
7.1 General.....	12
7.2 Necessary properties.....	13
7.3 Geometry of the non-cutting part including the connection.....	14
7.4 Geometry of the cutting part.....	14
7.5 Core drill — Complete.....	15
<b>8 Counterbore</b> .....	<b>15</b>
8.1 General.....	15
8.2 Necessary properties.....	16
8.3 Geometry of the non-cutting part including the connection.....	16
8.4 Geometry of the cutting part.....	16
8.5 Counterbore — Complete.....	17
<b>9 Stepped countersinking tool or tapered countersinking tool</b> .....	<b>18</b>
9.1 General.....	18
9.2 Necessary properties.....	19
9.3 Geometry of the non-cutting part including the connection.....	20
9.4 Geometry of the cutting part.....	20
9.5 Stepped or tapered countersinking tool — Complete.....	22
<b>10 Spot drill</b> .....	<b>23</b>
10.1 General.....	23
10.2 Necessary properties.....	23
10.3 Geometry of the non-cutting part including the connection.....	24
10.4 Geometry of the cutting part.....	24
10.5 Spot drill — Complete.....	25

<b>11</b>	<b>Centre drill</b> .....	<b>25</b>
	11.1 General.....	25
	11.2 Necessary properties.....	27
	11.3 Geometry of the non-cutting part including the connection.....	28
	11.4 Geometry of the cutting part.....	28
	11.5 Centre drill — Complete.....	29
<b>12</b>	<b>Shell core drills</b> .....	<b>30</b>
	12.1 General.....	30
	12.2 Necessary properties.....	31
	12.3 Geometry of the non-cutting part.....	32
	12.4 Geometry of the cutting part.....	33
	12.5 Shell core drill — Complete.....	34
<b>13</b>	<b>Shell counterbore</b> .....	<b>34</b>
	13.1 General.....	34
	13.2 Necessary properties.....	35
	13.3 Geometry of the non-cutting part.....	35
	13.4 Geometry of the cutting part.....	35
	13.5 Shell counterbore — Complete.....	35
<b>14</b>	<b>Tapered shell countersinking tool</b> .....	<b>36</b>
	14.1 General.....	36
	14.2 Necessary properties.....	37
	14.3 Geometry of the non-cutting part.....	37
	14.4 Geometry of the cutting part.....	38
	14.5 Tapered shell countersinking tool.....	38
<b>15</b>	<b>Stepped shell countersinking tool</b> .....	<b>38</b>
	15.1 General.....	38
	15.2 Necessary properties.....	39
	15.3 Geometry of the non-cutting part.....	39
	15.4 Geometry of the cutting part.....	40
	15.5 Stepped shell countersinking tool complete.....	40
<b>16</b>	<b>Modelling of guide pilots</b> .....	<b>40</b>
	16.1 General.....	40
	16.2 Necessary properties.....	41
	16.3 Guide pilot.....	41
<b>17</b>	<b>Design of details</b> .....	<b>42</b>
	17.1 Basis for modelling.....	42
	17.2 Contact/clamping surfaces — Orientation.....	42
	17.3 Chamfers, roundings, others.....	43
<b>18</b>	<b>Attributes of surfaces — Visualization of model features</b> .....	<b>43</b>
<b>19</b>	<b>Structure of design elements (tree of model)</b> .....	<b>43</b>
<b>20</b>	<b>Data exchange model</b> .....	<b>44</b>
	<b>Annex A (informative) Information about nominal dimensions</b> .....	<b>45</b>
	<b>Bibliography</b> .....	<b>46</b>

## 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. [www.iso.org/directives](http://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. [www.iso.org/patents](http://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 100: Definitions, principles and methods for reference dictionaries* [Technical Specification]
- *Part 150: Usage guidelines* [Technical Specification]
- *Part 301: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of thread-cutting taps, thread-forming taps and thread-cutting dies* [Technical Specification]
- *Part 302: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of solid drills and countersinking tools* [Technical Specification]

The following parts are under preparation:

- *Part 51: Designation system for customer solution cutting tools*
- *Part 80: Concept for the design of 3D models based on properties according to ISO/TS 13399: Overview and principles* [Technical Specification]

- *Part 201: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of regular inserts [Technical Specification]*
- *Part 202: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of irregular inserts [Technical Specification]*
- *Part 203: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of exchangeable inserts for drilling [Technical Specification]*
- *Part 204: Concept for the design of 3D models based on properties according to ISO/TS 13399-2: Modelling of inserts for reaming [Technical Specification]*
- *Part 303: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of end mills with solid cutting edges [Technical Specification]*
- *Part 304: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of milling cutters with arbor hole and solid cutting edges [Technical Specification]*
- *Part 307: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of end mills for indexable inserts [Technical Specification]*
- *Part 308: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of milling cutter with arbor hole for indexable inserts [Technical Specification]*
- *Part 309: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Tool holders for indexable inserts [Technical Specification]*
- *Part 311: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of solid reamers [Technical Specification]*
- *Part 312: Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of reamers for indexable inserts [Technical Specification]*
- *Part 401: Concept for the design of 3D models based on properties according to ISO/TS 13399-4: Modelling of converting, extending and reducing adaptive items [Technical Specification]*
- *Part 405: Concept for the design of 3D models based on properties according to ISO/TS 13399-4: Modelling of collets [Technical Specification]*

## Introduction

This part of ISO 13399 describes the concept, terms and definitions for designing simplified 3D models of drills and countersinking tools with solid cutting edges, which can be used for NC programming, simulation of manufacturing processes and the avoidance of collisions within machining processes. It is not intended to standardize the design of the cutting tool itself.

A cutting tool is used in a machine tool to remove material from a workpiece by a shearing action at the cutting edges of the tool. Cutting tool data that can be described by ISO 13399 (all parts) include, but are not limited to, everything between the workpiece and the machine tool. Information about inserts, solid tools, assembled tools, adaptors, components and their relationships can be represented by ISO 13399 (all parts). The increasing demand by the end user for 3D models for the purposes defined above is the basis for the development of this series of International Standards.

The objective of ISO 13399 (all parts) is to provide the means to represent information describing cutting tools in computer-sensible form, independent of any particular computer system. The representation will facilitate the processing and exchange of cutting tool data within and among different software systems and computer platforms and support the application of these data in manufacturing planning, cutting operations and the supply of tools. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and for archiving. The methods used for these representations are those developed by ISO/TC 184/SC 4 for the representation of product data by standardized information models and reference dictionaries.

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



# Cutting tool data representation and exchange —

## Part 302:

# Concept for the design of 3D models based on properties according to ISO/TS 13399-3: Modelling of solid drills and countersinking tools

## 1 Scope

This part of ISO 13399 specifies a concept for the design of tool items, limited to any kind of drilling and countersinking tools with solid cutting edges, together with the usage of the related properties and domains of values.

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

- definitions and identifications of the design features of drills and countersinking tools with solid cutting edges, with a link to the properties used;
- definitions and identifications of the internal structure of the 3D model that represents the features and properties of drills and countersinking tools with solid cutting edges.

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

- applications where these standard data may be stored or referenced;
- concept of 3D models for cutting tools;
- concept of 3D models for cutting items;
- concept of 3D models for other tool items not described in the scope of this part of ISO 13399;
- concept of 3D models for adaptive items;
- concept of 3D models for assembly and auxiliary items.

## 2 Normative references

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

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

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

## 3 Starting elements, coordinate systems, planes

### 3.1 General

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