INTERNATIONAL STANDARD

ISO 9361-2

Second edition
2011-12-15

Indexable inserts for cutting tools — Ceramic inserts with rounded corners —

Part 2:
Dimensions of inserts with cylindrical fixing hole

Plaquettes amovibles pour outils coupants — Plaquettes en céramique avec arrondi de pointe — Partie 2: Dimensions des plaquettes avec trou de fixation cylindrique

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 9361-2 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 9, *Tools with cutting edges made of hard cutting materials*.

This second edition cancels and replaces the first edition (ISO 9261-2:1991), which has been technically revised.

ISO 9361 consists of the following parts, under the general title *Indexable inserts for cutting tools — Ceramic inserts with rounded corners*:

— *Part 1: Dimensions of inserts without fixing hole*

— *Part 2: Dimensions of inserts with cylindrical fixing hole*

Indexable inserts for cutting tools — Ceramic inserts with rounded corners —

Part 2:
Dimensions of inserts with cylindrical fixing hole

1 Scope

This part of ISO 9361 specifies the dimensions of indexable ceramic inserts with rounded corners, with cylindrical fixing hole, with 0° normal clearance. These inserts are primarily intended to be mounted by top and hole clamping or hole clamping alone on external and internal turning tools.

Ceramic cutting materials consist of a variety of oxides, nitrides and carbides. In contrast with hardmetals (including cermets), ceramics do not have a metallic binding matrix. Such ceramic materials are, for example, oxide ceramics (consisting primarily of aluminium oxide Al_2O_3), carboxide ceramics (consisting generally of a mixture of aluminium oxide and other materials, such as titanium carbide TiC) and nitride ceramics (consisting generally of a mixture of silicon nitride and other materials, such as yttrium oxide Y_2O_3 and aluminium oxide).

2 Normative references

The following referenced documents are indispensable for the application 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 1832:2004, *Indexable inserts for cutting tools — Designation*

ISO 9361-1, *Indexable inserts for cutting tools — Ceramic inserts with rounded corners — Part 1: Dimensions of inserts without fixing hole*

3 Types of inserts

The types of indexable ceramic inserts specified in this part of ISO 9361 are the following:

— TN: triangular inserts, with 0° normal clearance;

— SN: square inserts, with 0° normal clearance;

— CN: rhombic inserts, with 0° normal clearance and 80° included angle;

— DN: rhombic inserts, with 0° normal clearance and 55° included angle;

— VN: rhombic inserts, with 0° normal clearance and 35° included angle;

— RN: round inserts, with 0° normal clearance.

Inserts dealt with in this part of ISO 9361 are standardized without chip breakers.

In general, the inserts are used with chamfered and rounded cutting edges (see Clause 6).

Table B.1 gives the range of sizes for the inserts (see Annex B).

4   Tolerances

The indexable ceramic inserts, which are the subject of this part of ISO 9361, are provided in tolerance classes in accordance with ISO 1832.

Other tolerances are given in Tables 1 to 7.

5   Fixing hole

In order to guarantee interchangeability when mounting the insert, the diameter, d_1, of the fixing hole, is related to the diameter, d, of the inscribed circle of the insert according to Table 1.

Table 1 — Fixing hole

Dimensions in millimetres

d		9,525	12,7	15,875	19,05
d_1	$\pm\,0,08$	3,81	5,16	6,35	7,94

6   Cutting edge

6.1   Cutting edge condition

The cutting edge condition of the indexable ceramic inserts (see Figures 1 and 2) specified in this part of ISO 9361 shall be selected from those specified in ISO 1832.

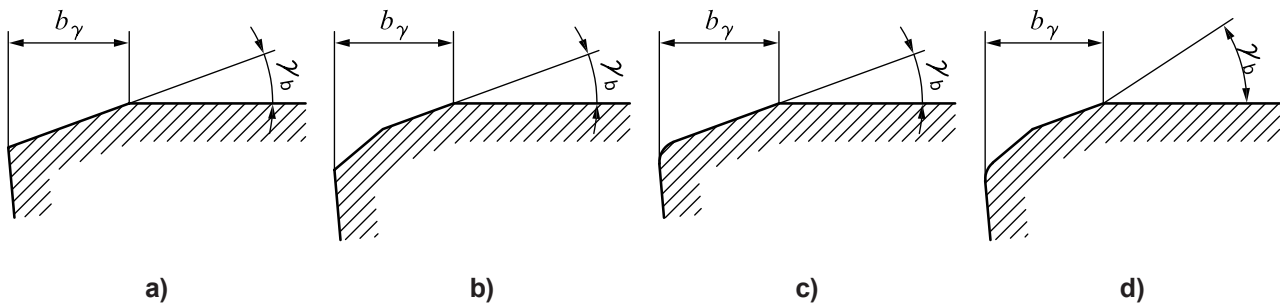a)   b)   c)   d)

Figure 1 — Cutting edge condition 1 in this part of ISO 9361 related to ISO 1832
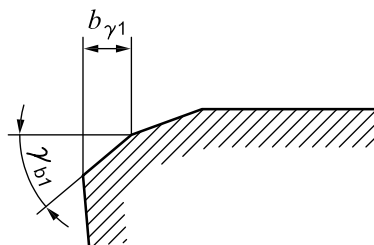

Figure 2 — Cutting edge condition 2 in this part of ISO 9361 related to ISO 1832

6.2 Additional information

The dimensions of chamfered cutting edges T, S, K or P may be specified, following the letter symbol for cutting edge condition in accordance with ISO 1832, namely symbols 8 and 10.

NOTE   In the case of cutting edge conditions K and P, the first chamfer, $b_{\gamma 1}$, defined in accordance with Figure 2, is at the manufacturer's discretion and is not part of the additional information (i.e. five-digit number) as described in 6.2.

EXAMPLE   A chamfered cutting edge T on an insert TN.A160412 with b_γ = 0,2 mm and γ_b = 20° is designated as follows, including the required additional information:

TN.A160412T 02020

7 Designation and marking

7.1 Designation

The designation of the indexable ceramic inserts which form the subject of this part of ISO 9361 shall conform to ISO 1832.

In addition to this designation, one or both of the following may be indicated:

— the number symbol for the additional information on cutting edge dimensions, in accordance with 6.2;

— the commercial designation of the ceramic grade.

7.2 Marking

The following symbol, at least, shall be marked on the insert itself (except when this is difficult to carry out on smaller inserts): symbol of the commercial designation of the ceramic grade.

8 Measurement

Annex A indicates the methods of measuring the dimension m of the indexable inserts covered by this part of ISO 9361.

9 Recommended dimensions

9.1 General

The choice of the more common dimensions is restricted to the values given in Tables 3 to 7. It is strongly recommended that these standard inserts be used each time wherever possible (first preference). When other inserts are required, their dimensions shall be selected from the non-shaded areas of Table B.1 (second preference). Inserts corresponding to the dimensions given in the shaded areas of this table are not recommended.

NOTE   The m dimensions are calculated using the exact values, rounded off to the third decimal point, of the corner radius, r_ε, in accordance with Table 2.

Table 2 — Values of r_ε used for calculation of dimension m

Designation of r_ε	04	08	12	16	20	24
Calculation value of r_ε, mm	0,397	0,794	1,191	1,588	1,984	2,381

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9.2 Triangular inserts
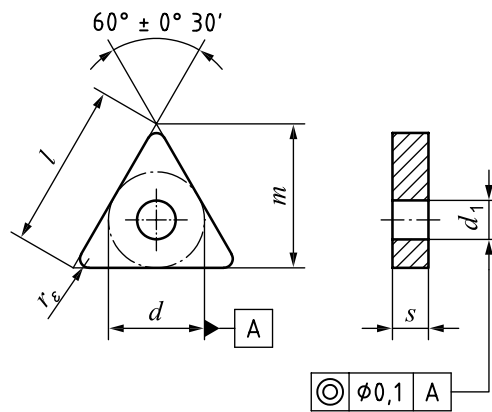
Figure 3 — Triangular inserts

Table 3 — Dimensions of triangular inserts

Dimensions in millimetres

Insert	l $\approx$	d	s	m	r_ε $\pm 0,1$	d_1 $\pm 0,08$
TN.A160404				13,891	0,4	
TN.A160408	16,5	9,525	4,76	13,494	0,8	3,81
TN.A160412				13,097	1,2	
TN.A160416				12,7	1,6	
TN.A220608				18,256	0,8	
TN.A220612	22	12,7	6,35	17,859	1,2	5,16
TN.A220616				17,463	1,6	
TN.A220620				17,066	2	

9.3 Square inserts
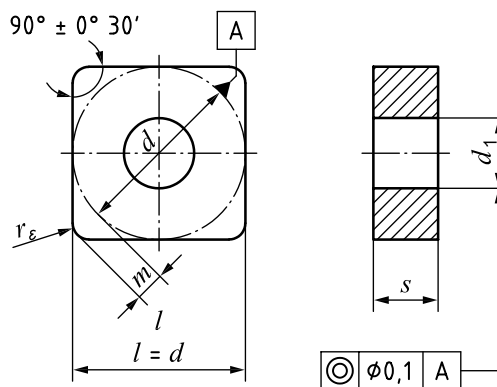
Figure 4 — Square inserts

Table 4 — Dimensions of square inserts

Dimensions in millimetres

Insert	d	s	m	r_ε ± 0,1	d_1 ± 0,08
SN.A120404	12,7	4,76	2,466	0,4	5,16
SN.A120408			2,301	0,8	
SN.A120412			2,137	1,2	
SN.A120416			1,972	1,6	
SN.A120608	12,7	6,35	2,031	0,8	5,16
SN.A120612			2,137	1,2	
SN.A120616			1,972	1,6	
SN.A120620			1,808	2	
SN.A150612	15,875	6,35	2,795	1,2	6,35
SN.A150616			2,63	1,6	
SN.A150620			2,466	2	

9.4 Rhombic inserts with 80° included angle
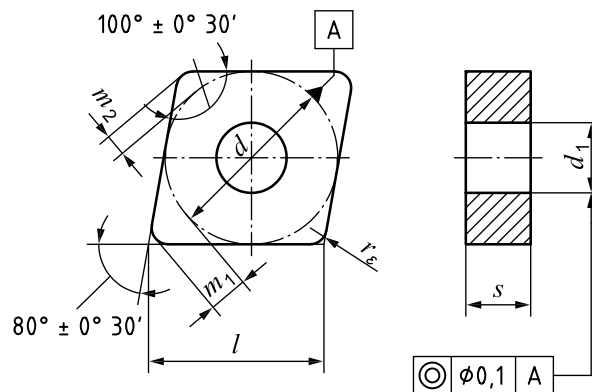

Figure 5 — Rhombic inserts with 80° included angle

Table 5 — Dimensions of rhombic inserts with 80° included angle

<div align="right">Dimensions in millimetres</div>

Insert	l $\approx$	d	s	m_1[a]	m_2	r_ε $\pm\,0,1$	d_1 $\pm\,0,08$
CN.A120404				3,308	1,818	0,4	
CN.A120408	12,9	12,7	4,76	3,088	1,697	0,8	5,16
CN.A120412				2,867	1,576	1,2	
CN.A120416				2,647	1,455	1,6	
CN.A120608				3,088	1,697	0,8	
CN.A120612	12,9	12,7	6,35	2,867	1,576	1,2	5,16
CN.A120616				2,647	1,455	1,6	
CN.A120620				2,426	1,334	2	
CN.A160612				3,749	2,061	1,2	
CN.A160616	16,1	15,875	6,35	3,529	1,393	1,6	6,35
CN.A160620				3,308	1,818	2	

9.5 Rhombic inserts with 55° included angle
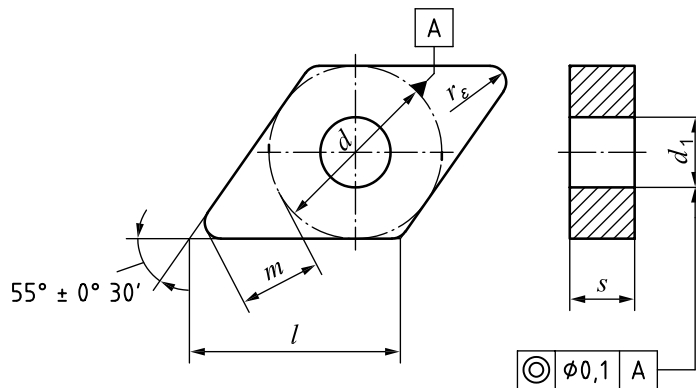

Figure 6 — Rhombic inserts with 55° included angle

Table 6 — Dimensions of rhombic inserts with 55° included angle

<div align="right">Dimensions in millimetres</div>

Insert	l $\approx$	d	s	m	r_ε $\pm\,0,1$	d_1 $\pm\,0,08$
DN.A150408				6,478	0,8	
DN.A150412	15,5	12,7	4,76	6,015	1,2	5,16
DN.A150416				5,552	1,6	
DN.A150608				6,478	0,8	
DN.A150612	15,5	12,7	6,35	6,015	1,2	5,16
DN.A150616				5,552	1,6	
DN.A150620				5,09	2	

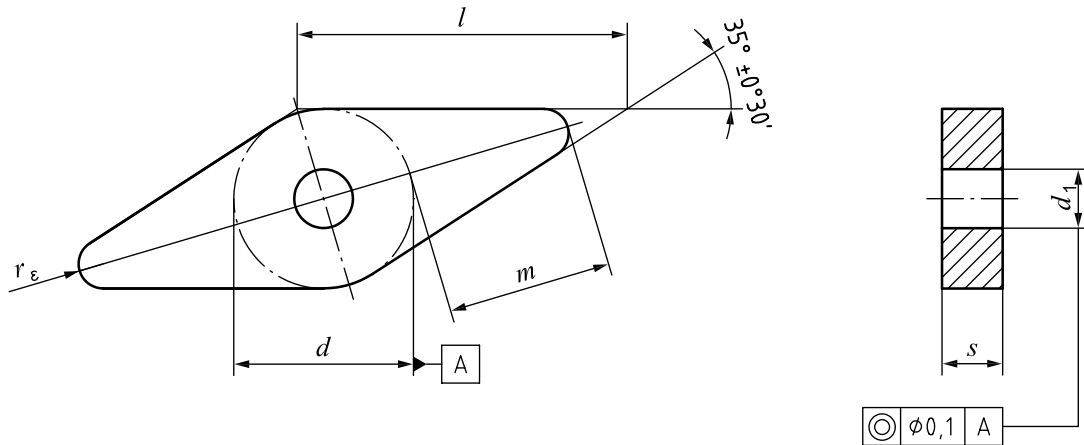## 9.6 Rhombic inserts with 35° included angle

Figure 7 — Rhombic inserts with 35° included angle

Table 7 — Dimensions of rhombic inserts with 35° included angle

Dimensions in millimetres

Insert	l $\approx$	d	s	m	r_ε $\pm 0,1$	d_1 $\pm 0,08$
—	16,6	9,525	4,76	10,66	0,2	3,81
VN.A160404				10,152	0,4	
VN.A160408				9,229	0,8	
VN.A160412				8,285	1,2	
—	22,1	12,7		13,837	0,4	5,16
VN.A220408				12,907	0,8	
VN.A220412				11,976	1,2	
VN.A220416				11,046	1,6	

9.7 Round inserts

See Figure 8 and Table 8.
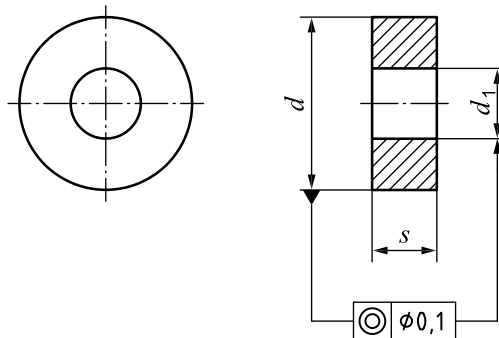
Figure 8 — Round inserts

Table 8 — Dimensions of round inserts

Dimensions in millimetres

Insert	d	s	d_1 $\pm\,0{,}08$
RN.A120400	12,7	4,76	5,16
RN.A150600	15,875	6,35	6,35
RN.A190600	19,05	6,35	7,94

Annex A
(normative)

Method of measurement of m dimension

A.1   Triangular inserts

Dimension m is related to the side opposite the corner which is being measured. The insert shall be placed on a surface plate, as shown in Figure A.1, and checked by means of a dial gauge zeroed with the aid of a gauge block corresponding to dimension m. The dial gauge then gives a reading of the error when applied to the inserts being measured.
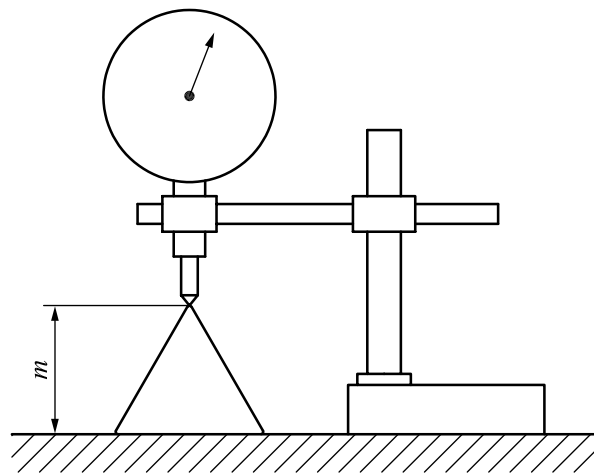

Figure A.1 — Triangular insert

A.2   Square inserts

Dimension m shall be checked with reference to the diameter, d, of a precision roller, where d corresponds to the nominal diameter of the inscribed circle of the insert. The insert shall be mounted on a 90° V-block, as shown in Figure A.2, and checked by means of a dial gauge, which shall be zeroed to dimension m by means of a roller with the aid of a gauge block. The dial gauge then gives a direct reading of the error when applied to the inserts being measured.

Figure A.2 — Square insert

A.3   Rhombic inserts

Dimension m shall be checked with reference to the diameter, d, of a precision roller, where d corresponds to the nominal size of the inscribed circle of the insert. The insert shall be mounted on a 35°, 55°, 80° or 100° V-block, as shown in Figure A.3, and checked by means of a dial gauge, which shall be zeroed to dimension m by means of a roller with the aid of a gauge block. The dial gauge then gives a direct reading of the error when applied to the inserts being measured.
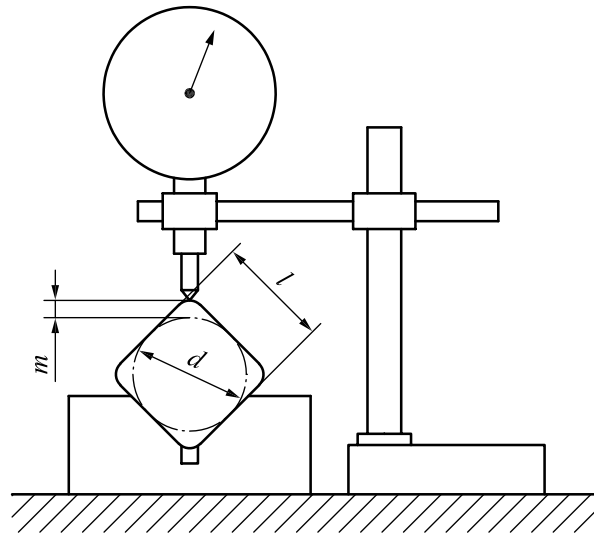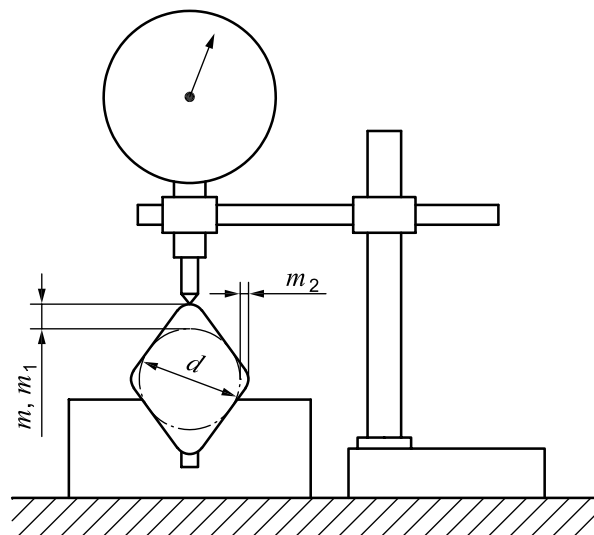

Figure A.3 — Rhombic insert

A.4   Round inserts

The diameter, d, shall be measured with a micrometer or similar device.

Annex B
(normative)

Inserts with rounded corners, with cylindrical fixing hole, with shapes covered by this part of ISO 9361

Table B.1 — Range of sizes

Dimensions in millimetres

d	Designation	$d/2$	Corner radius, r_ε					
			0,4	0,8	1,2	1,6	2	2,4
9,525	TN.A 1604		+	+	+	+		
12,7	TN.A 2204							
	TN.A 2206			+	+	+	+	
12,7	SN.A 1204		+	+	+	+		
	SN.A 1206			+	+	+	+	
15,875	SN.A 1506				+	+	+	
19,05	SN.A 1906							
12,7	CN.A 1204		+	+	+	+		
	CN.A 1206			+	+	+	+	
15,875	CN.A 1606				+	+	+	
19,05	SN.A 1906							
12,7	DN.A 1504			+	+	+		
	DN.A 1506			+	+	+	+	
12,7	RN.A 120400	+						
15,875	RN.A 150600	+						
19,05	RN.A 190600	+						
9,525	VN.A 1604		+	+	+			
12,7	VN.A 2204			+	+	+		

+	First preference; inserts included in this part of ISO 9361 (see Tables 3 to 7).
	Non-shaded areas: second preference; inserts not covered by this part of ISO 9361.
▒	Shaded areas: inserts not recommended.

Annex C
(informative)

Relationship between designations in this part of ISO 9361 and the ISO 13399 series

C.1   Relationship between designations

For the relationship between designations in this part of ISO 9361 and preferred symbols according to the ISO 13399 series, see Table C.1.

Table C.1 — Relationship between designations in this part of ISO 9361 and the ISO 13399 series

Symbol in this part of ISO 9361	Reference in this part of ISO 9361	Property name in the ISO 13399 series	Symbol in the ISO 13399 series	Reference in the ISO 13399 series
—	Clause 3	Insert shape code	SC	ISO/TS 13399-2 71CE7A9F0C79F
—	6.1 Figure 1	Cutting edge condition code	CECC	ISO/TS 13399-2 71DD6C90953D8
d	Tables 1, 3, 4, 5, 6, 7, 8	Inscribed circle diameter	IC	ISO/TS 13399-2 71CE7A96D9F7D
d_1	Tables 1, 3, 4, 5, 6, 7, 8	Fixing hole diameter	D1	ISO/TS 13399-2 71CE7A968C8FE
l	Tables 3, 5, 6, 7	Cutting edge length	L	ISO/TS 13399-2 71DD6C95DA49B
m	Tables 3, 4, 6, 7	m-dimension	M	ISO/TS 13399-2 71CE7AA0972DB
m_1	Table 5	m-dimension	M	ISO/TS 13399-2 71CE7AA0972DB
m_2	Table 5	m2-dimension	M2	ISO/TS 13399-2 71CE7AA05C819
r_ε	Tables 2, 3, 4, 5, 6, 7	Corner radius	RE	ISO/TS 13399-2 71DD6C8ACA503
s	Tables 3, 4, 5, 6, 7, 8	Insert thickness	S	ISO/TS 13399-2 71CE7A9F5308C
$b_\gamma + \gamma_b$	6.1, 6.2	Face land size code	FLSC	ISO/TS 13399-2 71DD6C9371B86

Bibliography

[1]   ISO 883, *Indexable hardmetal (carbide) inserts with rounded corners, without fixing hole — Dimensions*

[2]   ISO 3286, *Single point cutting tools — Corner radii*

[3]   ISO 3364, *Indexable hardmetal (carbide) inserts with rounded corners, with cylindrical fixing hole — Dimensions*

[4]   ISO 3365, *Indexable hardmetal (carbide) inserts with wiper edges, without fixing hole — Dimensions*

[5]   ISO 13399 (all parts), *Cutting tool data representation and exchange*

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