
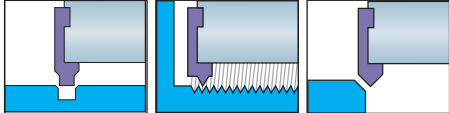

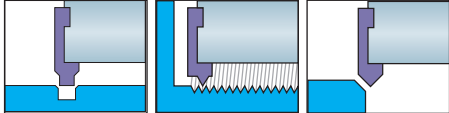

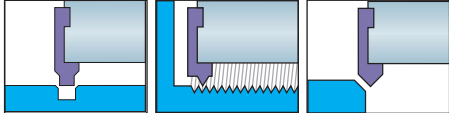


**Circular- and Thread Milling  
Tools with Inserts (Single Point)**



## Table of Contents

	Type	Ø min. mm	Thread from	Page
 	04	8		22-23
	03	11	M14	22-23
	02	20	M22	24-25
	01	25	M30	26-28
 	023	33	M36	30-31
	013	65	M68 x 1	32-33
 	P16	18	M20 x 1	36-37
	P20	22		38-39
	P25	27	M30 x 1,5	40-41
<b>Technical Data</b>				
Tips about circular and thread milling				42-44
Cutting data table				45
Carbide grades				42

## Circular Milling Tools for Contours and Threads



The circular milling principle allows outside and inside contours to be manufactured to individual requirements on all CNC machining centers and milling machines. High efficiency is achieved by short machining times, extended tool life, and by reducing or eliminating with expensive special tools.

- **High-Precision Free Contours**
  - **High-Precision Plunge Cuts**
  - **True-to-Gauge Threads**
- can be executed with the utmost ease and without chip obstruction problems.

Blind holes can be tapped practically to the base without under-cutting. The use of uniform pitches also reduces storage and purchasing costs. As long as maximum dimensions are maintained, insert profiles can be customized to your specifications.



## Circular Milling Tools with Polygonal Insert Seat and 6 Cutting Edges for a High Chipping Volume



The new generation of circular cutters allows,

- **Guard Ring Slots**
- **Metric Internal Threads acc. to DIN**
- **Whitworth Threads**

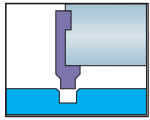
to be milled in components with great precision. The polygonal connection between the insert and cutter body improves the economy and quality of the machining process.

- **Longer Tool Lifetimes**
- **Higher Chipping Volume**
- **Higher Feeds**
- **Shorter Machining Times**

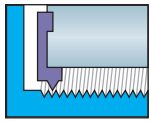
P16, P20 and P26 are the designations of the three basic types. They are available with various shank and insert dimensions that extend the application scope.

The milling cutters are available in various lengths. The carbide variants are made with a tool-steel head.

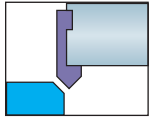
## Symbols



Cutting, profile cutting,  
Guardring slots, O-Ring slots



Thread milling



Chamfering and deburring



Type designation



Tool shaft without clamping surface



Tool shaft with Weldon clamping surface



Cutter with tightening thread



Cutter with cross groove



Smallest necessary bore-diameter



Maximum cutting depth



Internal coolant supply



Blank inserts must be equipped with a clearance angle!



Inserts without profile, ready for use with clearance angle.



Inserts for guard ring slots



Inserts for O-ring slots



DIN standard



Thread standard



Thread with undercut (Trio-Cut)



for right- and left hand internal thread  
for left hand thread modify your NC-program!



for right- and left hand external thread  
for left hand thread modify your NC-program!



Full form

Full form thread milling



Partial form

Partial form thread milling



Drill milling

Drill milling (Trio-Cut)



Inserts with chamfered edges



Inserts with chipbreakers from 5 mm cutting width



For chamfering and deburring



Number of inserts (Polygon Cutter)



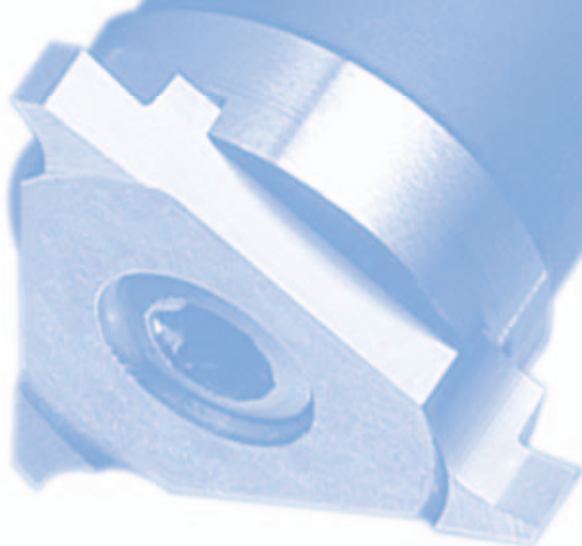
Thread depth max.



## Circular Milling Tools

Bore Ø mm	Cutting depth max. mm	Type	Page
≥ 8 mm	1,60 mm	03/04	22-23
≥ 20 mm	2,65 mm	02	24-25
≥ 25 mm	3,45 mm	01	26-28

- **Circular Milling**
- **Guard Ring Slots**
- **O-Ring Slots**
- **Thread Milling**
- **Chamfering and Deburring**

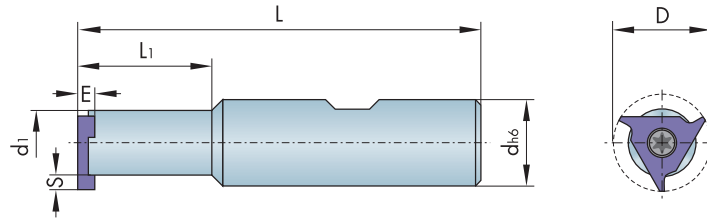


**Type 03/04**

**Circular Milling Tools**

- Cutting Data Page 45
- Carbide Grades Page 42
- Inserts Page 23

<b>Typ</b> <b>03</b> <b>04</b>	<b>DIN 1835</b> <b>Form A</b>	<b>DIN 1835</b> <b>Form B</b>
<b>Ø min.</b> <b>8 mm</b>	<b>S max.</b> <b>1,6 mm</b>	

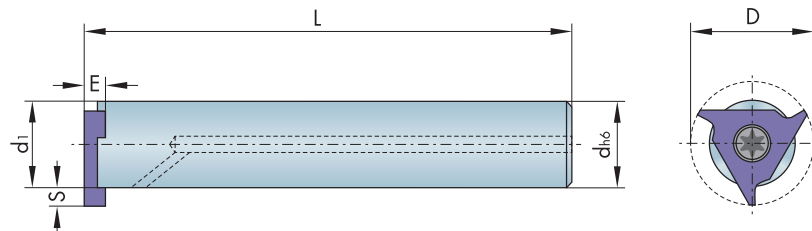


Order No.	Type	Form	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
												T6 IP Screw-driver	Screw
123491	04	B	8	7,9	10	7,1	0,35	2,00	59,2	19,20	Steel	111705	107530
123477	03	B	11	10,6	10	7,4	1,60	2,34	59,54	19,54	Steel	111705	107530
123478	03	B	11	10,6	12	7,4	1,60	2,34	67,0	19,54	Steel	111705	107530
123479	03	A	11	10,6	12	7,4	1,60	2,34	67,0	19,54	Steel	111705	107530
123480*	03	B	11	10,6	10	7,4	1,60	2,34	76,54	36,54	Carbide	111705	107530

Screw torque 0,9 Nm

\* With internal coolant supply

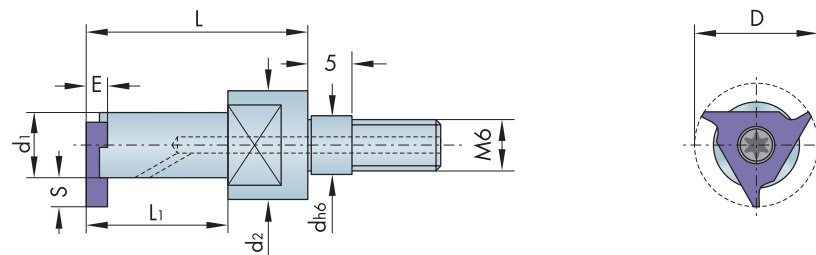
<b>Typ</b> <b>03</b>	<b>DIN 1835</b> <b>Form A</b>
<b>Ø min.</b> <b>11 mm</b>	<b>S max.</b> <b>1,25 mm</b>



Order No.	Type	Form	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	E mm	*L mm	Shaft	Spare part No.	
											T6 IP Screw-driver	Screw
123489	03	A	11	10,6	8	8	1,25	2,34	80	Carbide	111705	107530

Screw torque 0,9 Nm

<b>Typ</b> <b>03</b>	
<b>Ø min.</b> <b>11 mm</b>	<b>S max.</b> <b>1,6 mm</b>




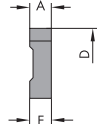

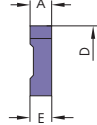

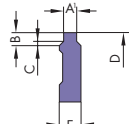

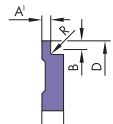

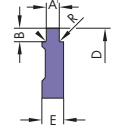

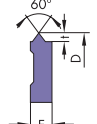

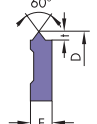
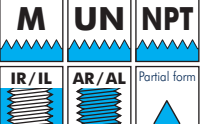
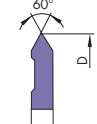
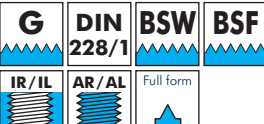
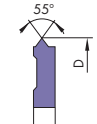

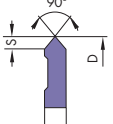
Order No.	Type	Bore Ø min.	D mm	dh6 mm	d1 mm	d2 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
												T6 IP Screw-driver	Screw
123481	03	11	10,6	6,5	7,4	10	1,6	2,34	25	16	Steel	111705	107530

Screw torque 0,9 Nm

Type 03/04

Circular Milling Inserts

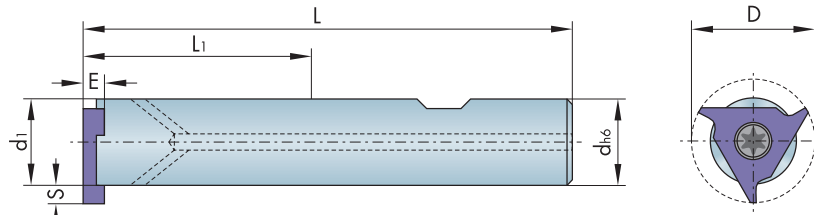
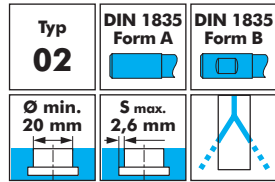


 <p>Blank</p> <p>Must be equipped with a clearance angle.</p> 	<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">A mm</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Smax. mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>FKN</th> </tr> </thead> <tbody> <tr> <td>04</td> <td>2,00</td> <td>7,9</td> <td>2,34</td> <td>0,35</td> <td>141702</td> <td>141622</td> </tr> <tr> <td>03</td> <td>2,34</td> <td>10,6</td> <td>2,34</td> <td>1,60</td> <td>141636</td> <td>141637</td> </tr> <tr> <td>03</td> <td>3,00</td> <td>10,6</td> <td>3,00</td> <td>1,60</td> <td>141649</td> <td>141700</td> </tr> <tr> <td>03</td> <td>4,00</td> <td>10,6</td> <td>4,00</td> <td>1,60</td> <td>141588</td> <td>141708</td> </tr> </tbody> </table>	Type	A mm	D mm	E mm	Smax. mm	Order No.		K10	FKN	04	2,00	7,9	2,34	0,35	141702	141622	03	2,34	10,6	2,34	1,60	141636	141637	03	3,00	10,6	3,00	1,60	141649	141700	03	4,00	10,6	4,00	1,60	141588	141708																												
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 <p>without profile</p> <p>Ready for use with clearance angle.</p> 	<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">A mm</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Smax. mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>04</td> <td>2,00</td> <td>7,9</td> <td>2,34</td> <td>0,35</td> <td>141737</td> <td>141719</td> </tr> <tr> <td>03</td> <td>2,34</td> <td>10,6</td> <td>2,34</td> <td>1,60</td> <td>141634</td> <td>141642</td> </tr> <tr> <td>03</td> <td>3,00</td> <td>10,6</td> <td>3,00</td> <td>1,60</td> <td>141621</td> <td>141669</td> </tr> </tbody> </table>	Type	A mm	D mm	E mm	Smax. mm	Order No.		K10	TINAMATIC	04	2,00	7,9	2,34	0,35	141737	141719	03	2,34	10,6	2,34	1,60	141634	141642	03	3,00	10,6	3,00	1,60	141621	141669																																			
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 <p>M DIN 13 IR/IL Full form</p> 	<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Pitch</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">t mm</th> <th rowspan="2">Thread</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>03</td> <td>1,0</td> <td>10,6</td> <td>2,34</td> <td>0,578</td> <td>≥ M 12</td> <td>141620</td> <td>141613</td> </tr> <tr> <td>03</td> <td>1,5</td> <td>10,6</td> <td>2,34</td> <td>0,864</td> <td>≥ M 14</td> <td>141632</td> <td>141674</td> </tr> <tr> <td>03</td> <td>2,0</td> <td>10,6</td> <td>3,00</td> <td>1,159</td> <td>≥ M 16</td> <td>141675</td> <td>141647</td> </tr> </tbody> </table>	Type	Pitch	D mm	E mm	t mm	Thread	Order No.		K10	TINAMATIC	03	1,0	10,6	2,34	0,578	≥ M 12	141620	141613	03	1,5	10,6	2,34	0,864	≥ M 14	141632	141674	03	2,0	10,6	3,00	1,159	≥ M 16	141675	141647																															
Type	Pitch							D mm	E mm	t mm	Thread	Order No.																																																						
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03	1,0	10,6	2,34	0,578	≥ M 12	141620	141613																																																											
03	1,5	10,6	2,34	0,864	≥ M 14	141632	141674																																																											
03	2,0	10,6	3,00	1,159	≥ M 16	141675	141647																																																											
 <p>UNC IR/IL Full form</p> 	<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Pitch / "</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">t mm</th> <th rowspan="2">Thread</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>03</td> <td>10</td> <td>10,6</td> <td></td> <td>1,47</td> <td>3/4-10</td> <td></td> <td>149732</td> </tr> <tr> <td>03</td> <td>11</td> <td>10,6</td> <td></td> <td>1,349</td> <td>5/8-11</td> <td></td> <td>149204</td> </tr> <tr> <td>03</td> <td>13</td> <td>10,0</td> <td></td> <td>1,099</td> <td>1/2-13</td> <td></td> <td>149460</td> </tr> </tbody> </table>	Type	Pitch / "	D mm	E mm	t mm	Thread	Order No.		K10	TINAMATIC	03	10	10,6		1,47	3/4-10		149732	03	11	10,6		1,349	5/8-11		149204	03	13	10,0		1,099	1/2-13		149460																															
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**Type 02**

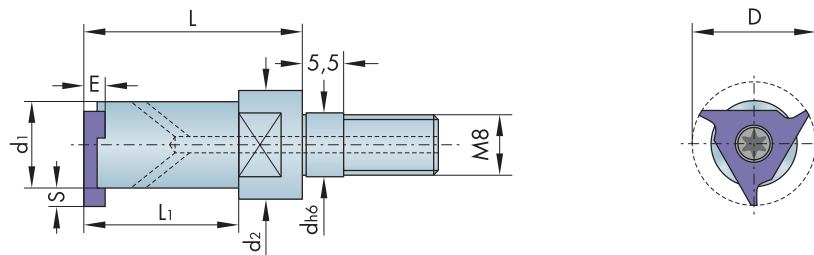
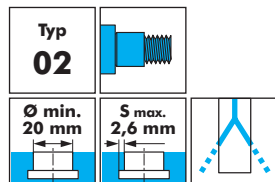
**Circular Milling Tools**

- Cutting Data Page 45
- Carbide Grades Page 42
- Inserts Page 25



Order No.	Form	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
											T15 IP Screw-driver	Screw
123445	B	20	17,5	12	12,0	2,6	3,5	77,55	32,2	Steel	111671	107547
123446	B	20	17,5	16	12,0	2,6	3,5	82,1	32,2	Steel	111671	107547
123447	A	20	17,5	16	12,0	2,6	3,5	82,1	32,2	Steel	111671	107547
123448	B	20	17,5	12	12,0	2,6	3,5	112,2	67,2	Carbide	111671	107547
123470	A	20	17,5	12	12,0	2,6	3,5	82,8	–	Carbide	111671	107547
123471	A	20	17,5	12	12,0	2,6	3,5	100,0	–	Carbide	111671	107547
123474	A	20	17,5	12	12,0	2,6	3,5	125,0	–	Carbide	111671	107547

Screw torque 3,8 Nm




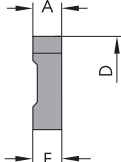

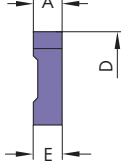

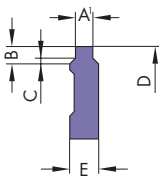

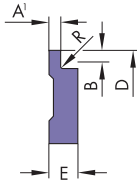

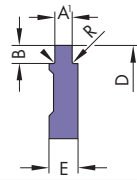



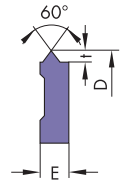






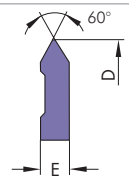






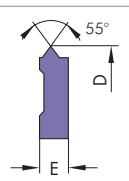

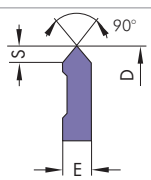
Order No.	Bore Ø min.	D mm	dh6 mm	d1 mm	d2 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
											T15 IP Screw-driver	Screw
123450	20	17,5	8,5	12,2	15,4	2,6	3,5	31	22	Steel	111671	107547

Screw torque 3,8 Nm

Type 02

Circular Milling Inserts

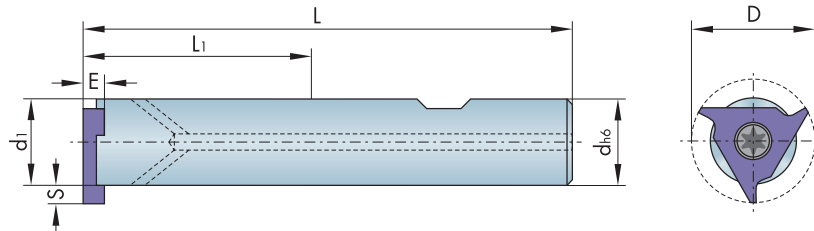
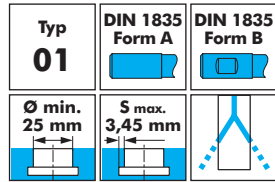


 <p>Blank</p> <p>Must be equipped with a clearance angle.</p>		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">A mm</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Smax. mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>FKN</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>3,5</td> <td>17,5</td> <td>3,5</td> <td>2,6</td> <td>141553</td> <td>141564</td> </tr> <tr> <td>02</td> <td>5,0</td> <td>17,5</td> <td>5,0</td> <td>2,6</td> <td>141590</td> <td>141576</td> </tr> <tr> <td>02</td> <td>6,0</td> <td>17,5</td> <td>6,0</td> <td>2,6</td> <td>141591</td> <td>141577</td> </tr> </tbody> </table>	Type	A mm	D mm	E mm	Smax. mm	Order No.		K10	FKN	02	3,5	17,5	3,5	2,6	141553	141564	02	5,0	17,5	5,0	2,6	141590	141576	02	6,0	17,5	6,0	2,6	141591	141577																																																					
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 <p>without profile</p> <p>Ready for use with clearance angle.</p>		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">A mm</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Smax. mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>3,5</td> <td>17,5</td> <td>3,5</td> <td>2,6</td> <td>141563</td> <td>141533</td> </tr> <tr> <td>02</td> <td>5,0</td> <td>17,5</td> <td>5,0</td> <td>2,6</td> <td>141582</td> <td>141535</td> </tr> <tr> <td>02</td> <td>6,0</td> <td>17,5</td> <td>6,0</td> <td>2,6</td> <td>141571</td> <td>141544</td> </tr> </tbody> </table>	Type	A mm	D mm	E mm	Smax. mm	Order No.		K10	TINAMATIC	02	3,5	17,5	3,5	2,6	141563	141533	02	5,0	17,5	5,0	2,6	141582	141535	02	6,0	17,5	6,0	2,6	141571	141544																																																					
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02	2,65	17,5	3,5	2,73	1,75	0,3	141463	141477																																																																													
02	3,15	17,5	3,5	3,23	2,20	0,3	141438	141440																																																																													
 <p>O-Ring</p> <p>DIN 3771</p>		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">O-Ring</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">A<sup>1</sup><sub>-0,03</sub> mm</th> <th rowspan="2">B mm</th> <th rowspan="2">R mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>1,80</td> <td>17,5</td> <td>3,5</td> <td>2,28</td> <td>1,45</td> <td>0,2</td> <td>141509</td> <td>141510</td> </tr> <tr> <td>02</td> <td>2,65</td> <td>17,5</td> <td>5,0</td> <td>3,08</td> <td>2,30</td> <td>0,2</td> <td>141512</td> <td>141470</td> </tr> </tbody> </table>	Type	O-Ring	D mm	E mm	A <sup>1</sup> <sub>-0,03</sub> mm	B mm	R mm	Order No.		K10	TINAMATIC	02	1,80	17,5	3,5	2,28	1,45	0,2	141509	141510	02	2,65	17,5	5,0	3,08	2,30	0,2	141512	141470																																																						
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02	2,65	17,5	5,0	3,08	2,30	0,2	141512	141470																																																																													
 <p>M</p> <p>DIN 13</p>  <p>IR/IL</p>  <p>Full form</p>		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Pitch</th> <th rowspan="2">D mm</th> <th rowspan="2">t mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Thread</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>1,0</td> <td>17,5</td> <td>0,578</td> <td>-</td> <td>-</td> <td>141471</td> <td>141443</td> </tr> <tr> <td>02</td> <td>1,5</td> <td>17,5</td> <td>0,864</td> <td>-</td> <td>-</td> <td>141501</td> <td>141482</td> </tr> <tr> <td>02</td> <td>2,0</td> <td>17,5</td> <td>1,159</td> <td>-</td> <td>-</td> <td>141461</td> <td>141484</td> </tr> <tr> <td>02</td> <td>2,5</td> <td>17,5</td> <td>1,444</td> <td>-</td> <td>-</td> <td>141538</td> <td>141514</td> </tr> <tr> <td>02</td> <td>2,5</td> <td>16,0</td> <td>1,444</td> <td>-</td> <td>only M20</td> <td>141499</td> <td>141516</td> </tr> <tr> <td>02</td> <td>3,0</td> <td>17,5</td> <td>1,728</td> <td>-</td> <td>-</td> <td>141493</td> <td>141494</td> </tr> </tbody> </table>	Type	Pitch	D mm	t mm	E mm	Thread	Order No.		K10	TINAMATIC	02	1,0	17,5	0,578	-	-	141471	141443	02	1,5	17,5	0,864	-	-	141501	141482	02	2,0	17,5	1,159	-	-	141461	141484	02	2,5	17,5	1,444	-	-	141538	141514	02	2,5	16,0	1,444	-	only M20	141499	141516	02	3,0	17,5	1,728	-	-	141493	141494																									
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 <p>G</p> <p>DIN 228/1</p>  <p>BSW</p>  <p>BSF</p>  <p>IR/IL</p>  <p>AR/AL</p>  <p>Full form</p>		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Pitch / "</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Thread</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>11</td> <td>17,5</td> <td>3,5</td> <td>-</td> <td>141539</td> <td>141522</td> </tr> <tr> <td>02</td> <td>14</td> <td>17,5</td> <td>3,5</td> <td>-</td> <td>141540</td> <td>141488</td> </tr> <tr> <td>02</td> <td>14</td> <td>16,0</td> <td>3,5</td> <td>only G1/2"</td> <td>141490</td> <td>141508</td> </tr> </tbody> </table>	Type	Pitch / "	D mm	E mm	Thread	Order No.		K10	TINAMATIC	02	11	17,5	3,5	-	141539	141522	02	14	17,5	3,5	-	141540	141488	02	14	16,0	3,5	only G1/2"	141490	141508																																																					
Type	Pitch / "	D mm						E mm	Thread	Order No.																																																																											
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		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">Smax. x 45° mm</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>02</td> <td>2,5</td> <td>17,5</td> <td>5,0</td> <td>141529</td> <td>141495</td> </tr> </tbody> </table>	Type	Smax. x 45° mm	D mm	E mm	Order No.		K10	TINAMATIC	02	2,5	17,5	5,0	141529	141495																																																																					
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02	2,5	17,5	5,0	141529	141495																																																																																

Type 01

Circular Milling Tools

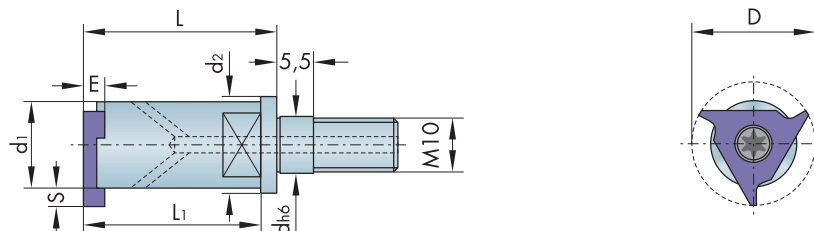
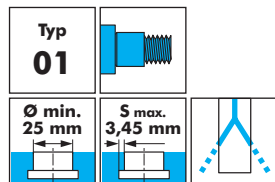
- Cutting Data Page 45
- Carbide Grades Page 42
- Inserts Page 27-28



Order No.	Form	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
											T20 IP Screw-driver	Screw
123412	B	25	23	16	16	3,45	4	91,0	42,5	Steel	111594	107551
123414	B	25	23	16	16	3,45	4	120,0	71,5	Steel	111594	107551
123415**	A	25	23	20	17	3,00	4	97,0	45,0	Steel	111594	107551
170320	A	25	23	16	17	3,00	4	141,0	92,5	Carbide	111594	107551
123416	B	25	23	16	17	3,00	4	141,0	92,5	Carbide	111594	107551
123440	A	25	23	16	16	3,45	4	115,0	-	Carbide	111594	107551
123441	A	25	23	16	16	3,00	4	152,5	-	Carbide	111594	107551

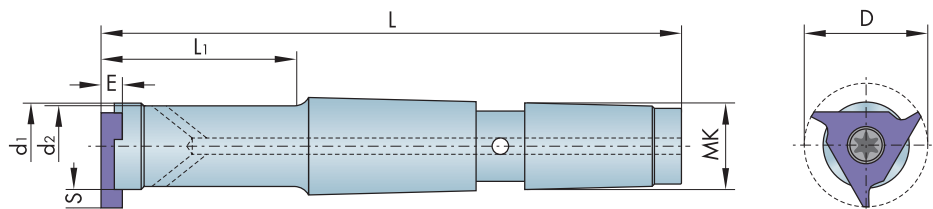
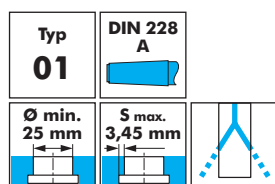
Screw torque 5,5 Nm

\*\* Also suitable as basic body for a tandem cutter.



Order No.	Bore Ø min.	D mm	dh6 mm	d1 mm	d2 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
											T20 IP Screw-driver	Screw
123419	25	23	10,5	16,1	18	3,45	4	36	33	Steel	111594	107551

Screw torque 5,5 Nm



Order No.	Bore Ø min.	D mm	MK	d1 mm	d2 mm	Smax. mm	E mm	*L mm	*L1 mm	Shaft	Spare part No.	
											T20 IP Screw-driver	Screw
123421	25	23	MK 2	16,1	15	3,45	4	106,5	34,5	Steel	111594	107551
123422	25	23	MK 2	16,1	15	3,45	4	135,5	63,5	Steel	111594	107551

Screw torque 5,5 Nm

\* If using inserts with width 6,5 mm the dimensions L and L<sub>1</sub> will increase by 2,5 mm.



**Type 01**

**Circular Milling Inserts**



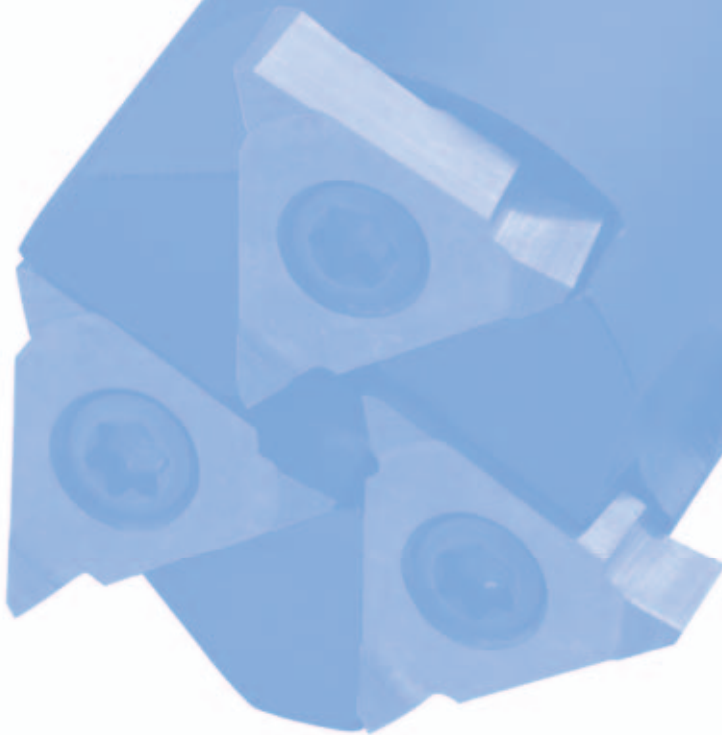
				Type	Pitch	D mm	E mm	t mm	Order No.	
									K10	TINAMATIC
				01	1,0	23	–	0,578	141265	141317
				01	1,5	23	–	0,864	141311	141291
				01	2,0	23	–	1,159	141284	141312
				01	2,5	23	–	1,444	141286	141287
				01	3,0	23	–	1,728	141303	141339
				01	3,5	23	–	2,023	141344	141300
				01	4,0	23	–	2,308	141335	141347
				01	4,5	23	–	2,602	141359	141365
				01	5,0*	23	–	2,887	141349	141342
				01	5,5*	23	–	3,182	106874	141350
				01	6,0*	23	–	3,467	141338	141369
				<p>* not suitable for cutters no. 123415, 123416, 123441</p>						
				Type	Pitch	D mm	E mm	Order No.		
								K10	TINAMATIC	
				01	1-4	23	–	141329	141366	
				Type	Pitch / "	D mm	E mm	Order No.		
								K10	TINAMATIC	
				01	11	23	4,0	141384	141381	
				Type	S <sub>max.</sub> x 45° mm	D mm	E mm	Order No.		
								K10	TINAMATIC	
				01	3,25	23	6,5	141354	141382	



## Circular Milling Tools

Bore Ø mm	Cutting depth max. mm	Type	Page
≥ 33 mm	4,0 mm	023	30-31
≥ 63 mm	6,0 mm	013	32-33

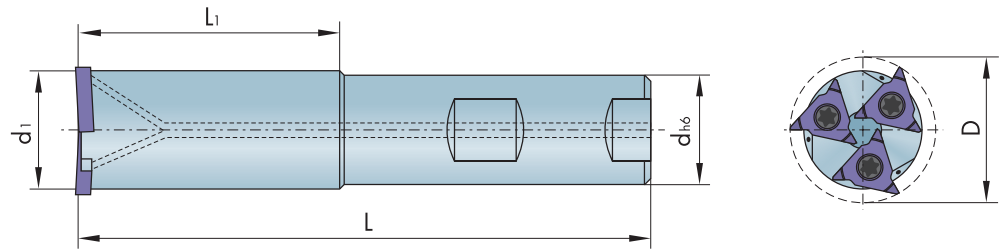
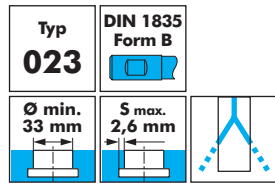
- **Circular Milling**
- **Guard Ring Slots**
- **O-Ring Slots**
- **Thread Milling**
- **Chamfering and Deburring**



**Type 023**

**Circular Milling Tools**

- Cutting Data Page 45
- Carbide Grades Page 42
- Inserts Page 31

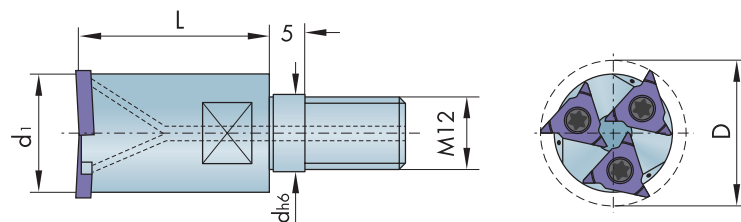
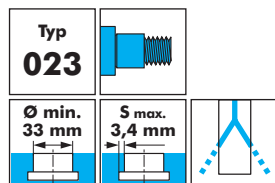


Order No.	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	A mm	L mm	L1 mm	Inserts	Shaft
123462	33	32	25	26,8	2,6	5	125	67	3	Steel

Spare part No.

T15 IP Screw-driver	Screw
111671	107547

Screw torque 3,8 Nm

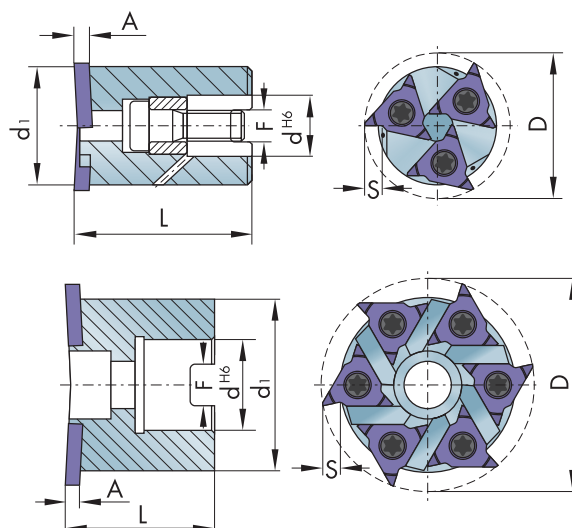
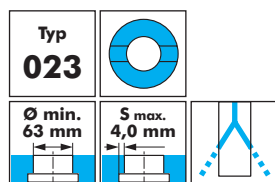


Order No.	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	A mm	L mm	Inserts	Shaft
123465	33	32	12,5	24,3	3,8	5	40	3	Steel

Spare part No.

T15 IP Screw-driver	Screw
111671	107547

Screw torque 3,8 Nm



Order No.	Bore Ø min.	D mm	dh6 mm	d1 mm	Smax. mm	A mm	F mm	L mm	Inserts
123464	40	38	16	31	3,4	5,0	8,4	46	3
123461*	55	50	22	42	3,9	5,0	10,4	40	6

Accessories

Key  
134984

Spare part No.

T15 IP Screw-driver	Screw
111671	107547
111671	107547

Screw torque 3,8 Nm


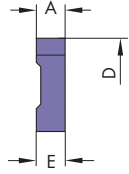

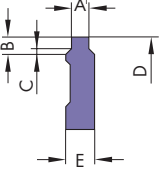

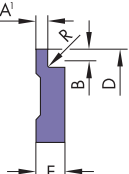

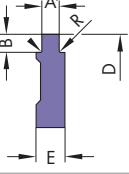




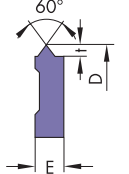






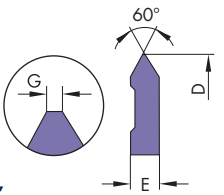







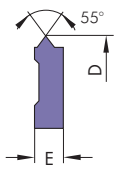
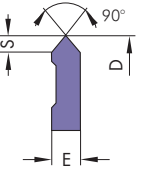
\* Cutter clamping screw internal hexagon

Order No.	114684
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Type 023

Circular Milling Inserts

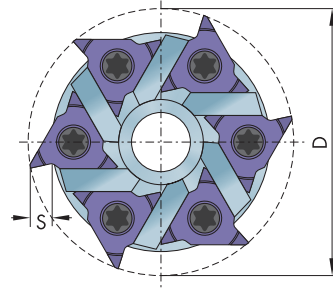
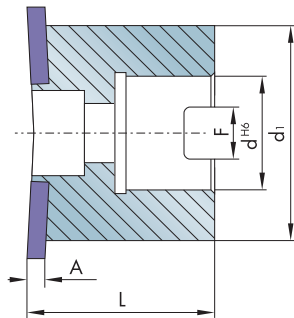
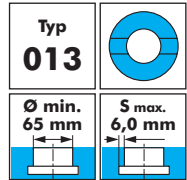


				<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th rowspan="2">A mm</th> <th rowspan="2">D mm</th> <th rowspan="2">E mm</th> <th rowspan="2">Smax. mm</th> <th colspan="2">Order No.</th> </tr> <tr> <th>K10</th> <th>TINAMATIC</th> </tr> </thead> <tbody> <tr> <td>023</td> <td>5,0</td> <td>17,5</td> <td>5,0</td> <td>4,00</td> <td>142016</td> <td>142060</td> </tr> </tbody> </table>				Type	A mm	D mm	E mm	Smax. mm	Order No.		K10	TINAMATIC	023	5,0	17,5	5,0	4,00	142016	142060																																																												
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023	5,0	17,5	5,0	4,00	142016	142060																																																																													
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				K10	TINAMATIC																																																																														
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023	2,3	17,5	5,0		142033																																																																														

**Type 013**

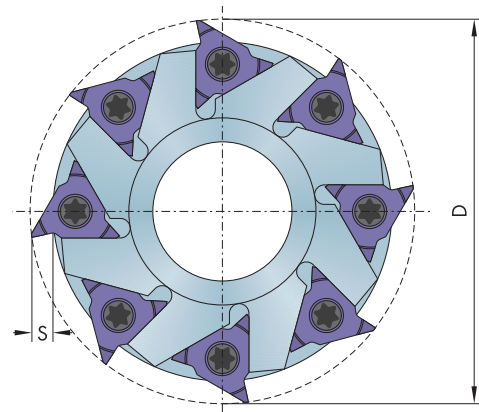
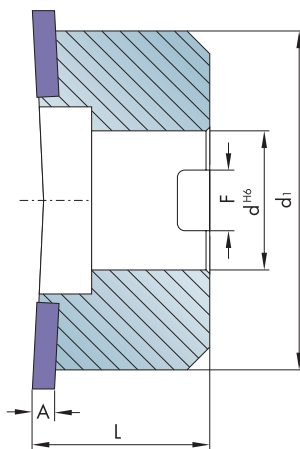
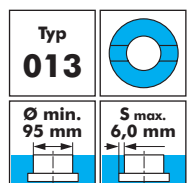
**Circular Milling Tools**

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- Carbide Grades Page 42
- Inserts Page 33



Order No.	Bore Ø min.	D mm	dH6 mm	d1 mm	Smax. mm	A mm	F mm	L mm	Inserts
123435	65	63	27	51	6	6,5	12,4	44	6

Spare part No.	
T20 IP Screw-driver	Screw
111594	107551
Screw torque 5,5 Nm	
Cutter clamping screw internal hexagon	
Order No.	114695



Order No.	Bore Ø min.	D mm	dH6 mm	d1 mm	Smax. mm	A mm	F mm	L mm	Inserts
123436	95	90	32	78	6	6,5	14,4	40	8

Spare part No.	
T20 IP Screw-driver	Screw
111594	107551
Screw torque 5,5 Nm	

**Type 013**

**Circular Milling Inserts**



without profile				Type		Order No.			
Ready for use with clearance angle.				A mm	D mm	E mm	Smax. mm	K10	TINAMATIC
				6,5	23	6,5	6,0	141963	141972

DIN 471/472				Type			Order No.					
With chamfered edge				G-Ring	D mm	E mm	A' <sub>-0,03</sub> mm	B mm	Cx45° mm	K10	TINAMATIC	
				013	1,85	23	6,5	1,93	1,25	0,2	141913	141914
				013	2,15	23	6,5	2,23	1,50	0,2	141867	141892
				013	2,65	23	6,5	2,73	1,50	0,2	141895	141915
				013	2,65	23	6,5	2,73	1,75	0,2	141906	141907
				013	3,15	23	6,5	3,23	1,75	0,2	141893	141924
				013	4,15	23	6,5	4,23	2,00	0,2	141904	141905
				013	4,15	23	6,5	4,23	2,50	0,2	141896	141927

DIN 472				Type			Order No.					
Without chamfered edge				G-Ring	D mm	E mm	A' <sub>-0,03</sub> mm	B mm	R mm	K10	TINAMATIC	
				013	2,15	23	6,5	2,23	1,75	0,3	141894	141937
				013	2,65	23	6,5	2,73	1,75	0,3	141922	141925
				013	3,15	23	6,5	3,23	2,20	0,3	141928	141930
				013	4,15	23	6,5	4,23	2,50	0,3	141933	141934
				013	5,15	23	6,5	5,23	3,50	0,3	141940	141932

O-Ring		DIN 3771				Type			Order No.					
						O-Ring	D mm	E mm	A' <sub>-0,03</sub> mm	B mm	R mm	K10	TINAMATIC	
						013	2,65	23	6,5	3,08	2,3	0,2	141897	141919
						013	3,55	23	6,5	4,08	3,1	0,2	141929	141916

M		DIN 13		IR/IL		Full form				Type			Order No.			
										Pitch	D mm	E mm	t mm	K10	TINAMATIC	
										013	1,5	23	6,5	0,864	141923	141920
										013	2,0	23	6,5	1,159	141950	141910
										013	2,5	23	6,5	1,444	141953	141935
										013	3,0	23	6,5	1,728	141959	141943
										013	3,5	23	6,5	2,023	141960	141961
										013	4,0	23	6,5	2,308	141945	141947
										013	4,5	23	6,5	2,602	141936	141964
										013	5,0	23	6,5	2,887	141962	141955
										013	6,0	23	6,5	3,467	141944	141976

M		UN		NPT		IR/IL		AR/AL		Partial form				Type			Order No.			
														Pitch	D mm	E mm	G mm	K10	TINAMATIC	
														013	1-3	23	6,5	0,1		141969
														013	3,5-6	23	6,5	0,4		141951

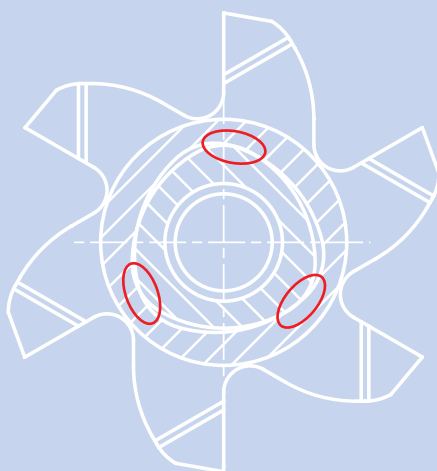
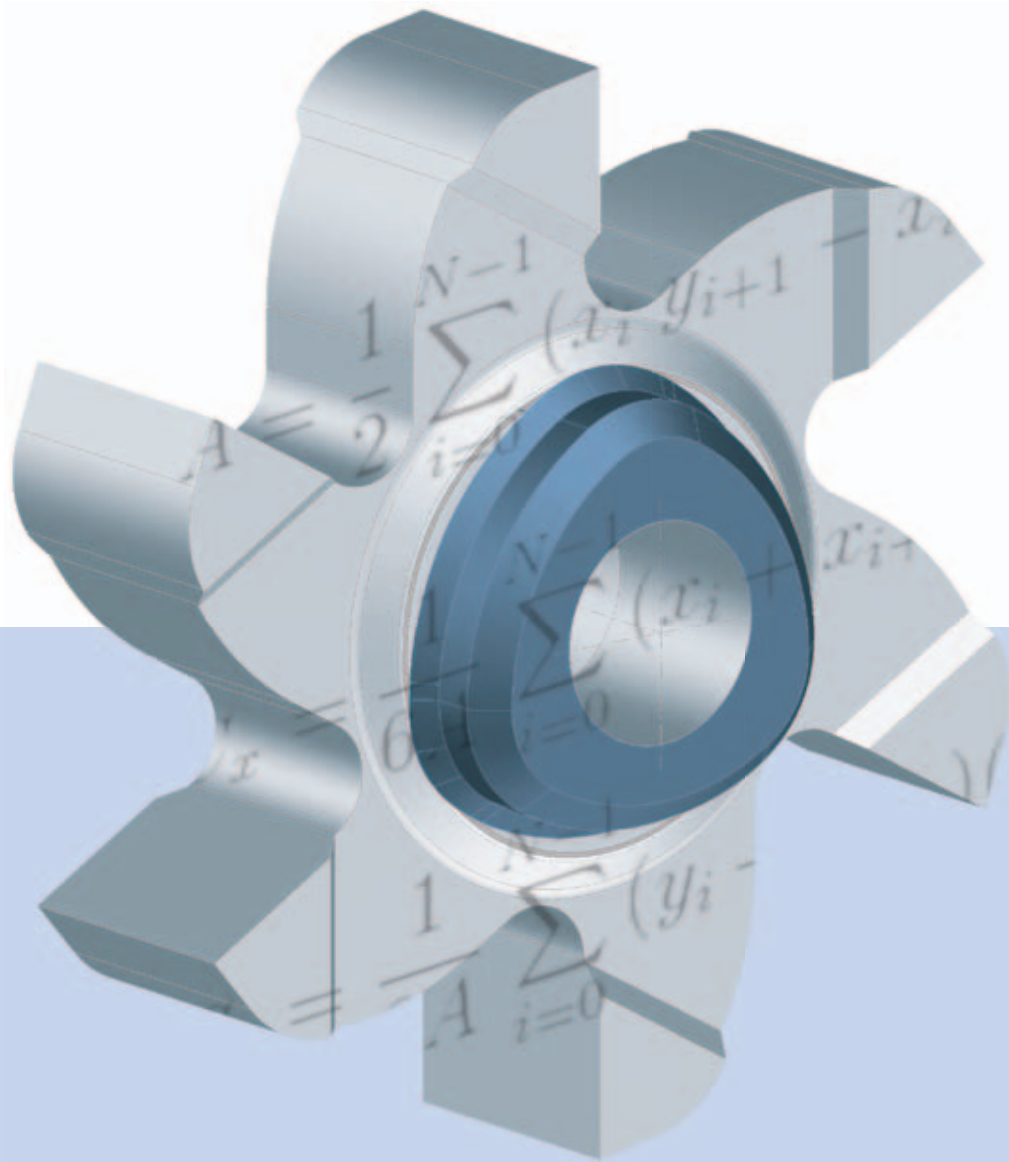
  

G		DIN 228/1		BSW		BSF		IR/IL		AR/AL		Full form				Type			Order No.		
																Pitch / "	D mm	E mm	K10	TINAMATIC	
																013	11	23	6,5	107098	141941




# PolyMILL

## The Polygon in the mimatic® P-Interface



### Advantages

- Concentricity over 3-point polygon
- Power transmission by 3-point polygon
- High stability through closed circular ring
- High resistance against broken die during interrupted cut

 = Transmission zones



## Circular Milling Tools

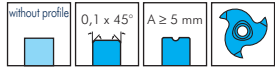
Inserts / Operation	Page
Grooving	36
Circlip Grooves	37
Thread Milling	38-39
Radius Milling	39
Chamfering and Deburring	40
<b>Basic Holders</b>	<b>40-41</b>

- **Polygonal Insert Seat for high Chip Volume**
- **Circular Milling**
- **Slots and T-Slots**
- **Guard Ring Slots**
- **O-Ring Slots**
- **Thread Milling**
- **Chamfering and Deburring**
- **High Precision**
- **High Service Life**
- **High Stability**

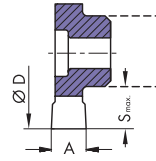


# Grooving

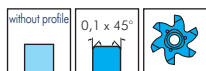
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- Cutting Data Page 45



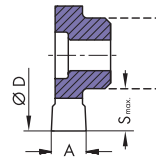
Ready for use with clearance angle



Type	A mm	D mm	Rake Angle	R mm	Smax. mm	Number of teeth	Order No.	
							K10	TINAMATIC
P12	P1212	1,5	11,7	6°	0,10	2,25	3	171862
	P1212	2,0	11,7	6°	0,15	2,25	3	171863
	P1212	2,5	11,7	6°	0,15	2,25	3	171865
	P1212	3,0	11,7	6°	0,15	2,25	3	171866
P16	P1616	3,5	16	0°	0,10	3,50	3	142531
	P1616	3,5	16	8°	0,10	3,50	3	142486
	P1616	3,5	16	12°	0,10	3,50	3	142526
	P1616	5,0	16	0°	0,10	3,50	3	142511
	P1616	5,0	16	8°	0,10	3,50	3	142502
	P1616	5,0	16	12°	0,10	3,50	3	142519
P25	P2525	4,0	25	0°	0,10	5,70	3	142514
	P2525	4,0	25	8°	0,10	5,70	3	142551
	P2525	4,0	25	12°	0,10	5,70	3	142585
	P2525	5,0	25	8°	0,10	5,70	3	107258
	P2525	6,5	25	0°	0,10	5,70	3	142522
	P2525	6,5	25	8°	0,10	5,70	3	142609
	P2525	6,5	25	12°	0,10	5,70	3	142631
	P2525	8,0	25	0°	0,10	5,70	3	142558
	P2525	8,0	25	8°	0,10	5,70	3	142578
	P2525	8,0	25	12°	0,10	5,70	3	142588



Ready for use with clearance angle



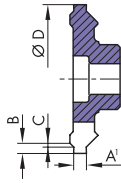
Type	A mm	D mm	Rake Angle	R mm	Smax. mm	Number of teeth	Order No.	
							K10	TINAMATIC
P16	P1616	3,0	16	6°	0,10	3,5	6	142494
	P1616	4,0	16	6°	0,10	3,5	6	142565
	P1616	5,0	16	6°	0,10	3,5	6	142586
	P1618	1,5	17,7	6°	0,10	4,0	6	171939
	P1618	2,0	17,7	6°	0,10	4,0	6	171941
	P1618	2,5	17,7	6°	0,15	4,0	6	171943
P20	P2020	3,0	20	6°	0,10	4,2	6	168673
	P2020	4,0	20	6°	0,10	4,2	6	168674
	P2020	5,0	20	6°	0,10	4,2	6	142655
	P2022	1,5	21,7	6°	0,10	5,0	6	171957
	P2022	2,0	21,7	6°	0,15	5,0	6	171959
	P2022	2,5	21,7	6°	0,20	5,0	6	171961
P25	P2526	3,0	26	6°	0,10	6,2	6	171962
	P2526	4,0	26	6°	0,10	6,2	6	142601
	P2526	5,0	26	6°	0,10	6,2	6	142677
	P2526	6,5	26	6°	0,10	6,2	6	142589
	P2528	1,5	27,7	6°	0,10	6,8	6	142618
	P2528	2,0	27,7	6°	0,15	6,8	6	171981
	P2528	2,5	27,7	6°	0,20	6,8	6	171982
	P2528	3,0	27,7	6°	0,20	6,8	6	171984

## Circlip Grooves

- Cutting Insert Holder Page 40-41
- Cutting Data Page 45



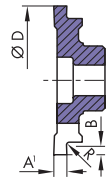
With chamfered edge



Type	DIN Width	D mm	A' <sub>-0,03</sub> mm	B mm	Cx45° mm	Number of teeth	Order No TINAMATIC	
P16	P1616	1,10	16	1,18	0,50	0,10	6	142423
	P1616	1,30	16	1,38	0,85	0,15	6	142528
	P1616	1,60	16	1,68	1,00	0,15	6	142561
	P1616	1,85	16	1,93	1,25	0,20	6	142562
P20	P2020	1,10	20	1,18	0,50	0,10	6	168675
	P2020	1,30	20	1,38	0,85	0,15	6	168676
	P2020	1,60	20	1,68	1,00	0,15	6	168677
	P2020	1,85	20	1,93	1,25	0,20	6	168678
	P2022	1,60	21,7	1,68	1,00	0,15	6	171968
	P2022	1,85	21,7	1,93	1,25	0,20	6	171969
	P2022	2,15	21,7	2,23	1,50	0,20	6	171970
	P2022	2,65	21,7	2,73	1,75	0,20	6	171971
P25	P2526	1,30	26	1,38	0,85	0,15	6	142646
	P2526	1,60	26	1,68	1,00	0,15	6	142660
	P2526	1,85	26	1,93	1,25	0,20	6	142607
	P2526	2,15	26	2,23	1,50	0,20	6	142591
	P2526	2,65	26	2,73	1,75	0,20	6	142597
	P2526	3,15	26	3,23	1,75	0,20	6	142661



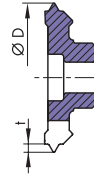
Without chamfered edge



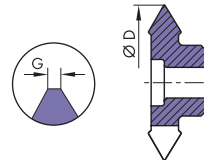
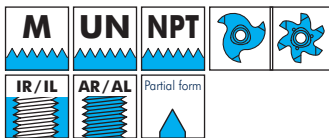
Type	DIN Width	D mm	A' <sub>-0,03</sub> mm	B mm	R mm	Number of teeth	Order No TINAMATIC	
P12	P1210	0,90	9,6	0,98	1,20	0,3	3	172125
	P1212	1,10	11,7	1,18	1,00	0,3	3	171868
	P1212	1,30	11,7	1,38	1,00	0,3	3	171869
	P1212	1,60	11,7	1,68	1,00	0,3	3	171870
P16	P1616	1,10	16	1,18	0,90	0,3	6	142548
	P1616	1,30	16	1,38	1,10	0,3	6	142509
	P1616	1,60	16	1,68	1,25	0,3	6	142533
	P1616	1,85	16	1,93	1,25	0,3	6	142536
	P1618	1,10	17,7	1,18	0,90	0,3	6	171945
	P1618	1,30	17,7	1,38	1,10	0,3	6	171946
	P1618	1,60	17,7	1,68	1,25	0,3	6	171947
	P1618	1,85	17,7	1,93	1,25	0,3	6	171948
P20	P2020	1,10	20	1,18	0,90	0,3	6	168679
	P2020	1,30	20	1,38	1,10	0,3	6	168680
	P2020	1,60	20	1,68	1,25	0,3	6	168681
	P2020	1,85	20	1,93	1,25	0,3	6	168682
	P2022	1,60	21,7	1,68	1,25	0,3	6	171964
	P2022	1,85	21,7	1,93	1,25	0,3	6	171965
	P2022	2,15	21,7	2,23	1,75	0,3	6	171966
	P2022	2,65	21,7	2,73	1,75	0,3	6	171967
P25	P2526	1,30	26	1,38	1,10	0,3	6	142598
	P2526	1,60	26	1,68	1,25	0,3	6	142653
	P2526	1,85	26	1,93	1,25	0,3	6	142616
	P2526	2,15	26	2,23	1,75	0,3	6	142637
	P2526	2,65	26	2,73	1,75	0,3	6	142662
	P2526	3,15	26	3,23	2,20	0,3	6	142643

# Thread Milling

- Cutting Insert Holder Page 40-41
- Cutting Data Page 45



Type	Pitch mm	D mm	t mm	Thread	Number of teeth	Order No. TINAMATIC	
P12	P1210	1,0	9,6		3	171875	
	P1210	1,5	9,6		3	171876	
	P1211	2,0	10,5		3	171877	
P16	P1616	1,5	16		6	142569	
	P1616	2,0	16		6	142570	
	P1616	2,5	16		6	142543	
	P1616	2,5	16	only M20	6	142534	
P20	P1616	3,0	16		6	142575	
	P2020	1,5	20		6	168683	
	P2020	2,0	20		6	168684	
P25	P2020	3,0	20	only M24	6	168685	
	P2526	1,5	26	0,864	6	142617	
	P2526	2,0	26	1,159	6	142644	
	P2526	3,0	26	1,728	6	142599	
	P2524	3,5	24	2,023	only M30	6	142671
	P2526	3,5	26	2,023		6	142623
	P2526	4,0	26	2,308		6	142624
	P2526	4,0	26	2,308	only M36	6	169675
	P2526	4,5	26	2,602	6	142638	
	P2526	5,0	26	2,887	6	107275	

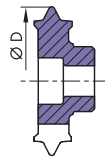
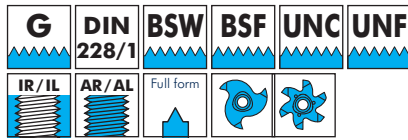


Type	Pitch mm	D mm	G mm	Number of teeth	Order No. TINAMATIC	
P12	P1212	1-3	11,7	3	171911	
P16	P1616	1-4*	16,0	6	142580	
	P1616	2,5-4	16,0	6	142544	
P20	P1618	1-3	17,7	6	171954	
	P2020	1-3	20,0	6	168686	
	P2022	1-2	21,7	6	171972	
P25	P2022	2-4	21,7	6	171973	
	P2526	1-3	26,0	0,10	6	142647
	P2526	2,5-5	26,0	0,25	6	142592

\* Not suited for pitch 4,0 mm with the cutters 123588 and 123590

## Thread Milling

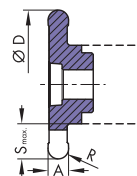
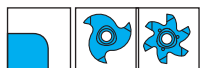
- Cutting Insert Holder Page 40-41
- Cutting Data Page 45



Type	Pitch / "	D mm	Thread	Number of teeth	Order No. TINAMATIC
<b>UNC</b>					
P12	P1210	12	9,6	3	171883
	P1211	11	10,5	3	171880
	P1212	10	11,7	3	171879
P16	P1616	9	16,0	6	172148
P20	P2018	8	18,0	6	172149
	P2020	7	20,0	6	172150
P25	P2524	6	24,0	6	172151
	P2526	5	26,0	6	172152
	P2526	4,5	26,0	6	172153
<b>UNF</b>					
P12	P1210	1/2-20	9,6	3	171884
	P1211	9/16-18	10,5	3	171885
	P1212	3/4-16	11,7	3	171900
P16	P1618	7/8-14	17,7	6	171950
P20	P2020	1-12	20,0	6	171951
<b>G,BSW, BSF</b>					
P12	P1210	19	9,6	3	171912
P16	P1616	11	16,0	6	142549
	P1616	14	16,0	6	142576
	P1616	10	16,0	6	167014
	P1618	14	17,7	6	171949
	P2020	11	20,0	6	168687
P20	P2020	14	20,0	6	168688
P25	P2526	11	26,0	6	142600
				all threads > 1"	

## Radius Milling

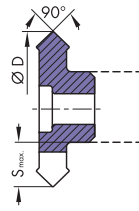
- Cutting Insert Holder Page 40-41
- Cutting Data Page 45



Type	D mm	A mm	R mm	Smax. mm	Number of teeth	Order No. TINAMATIC
P12	P1210	9,6	2,2	1,1	1,20	171924
	P1212	11,7	2,2	1,1	2,25	171874
P16	P1618	17,7	2,2	1,1	4,20	171953
P20	P2022	21,7	2,0	1,0	5,00	171975
	P2022	21,7	2,4	1,2	5,00	171976
	P2022	21,7	2,8	1,4	5,00	171977
	P2022	21,7	3,0	1,5	5,00	171978

## Chamfering and Deburring

- Cutting Insert Holder Page 40-41
- Cutting Data Page 45



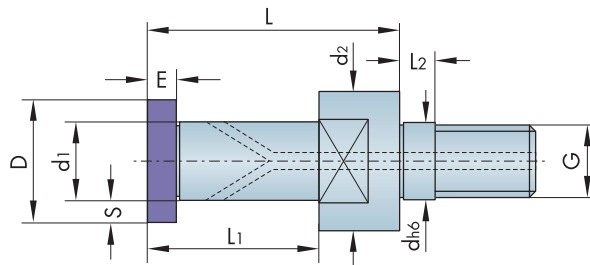
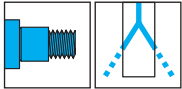
Type	D mm	A / P	S <sub>max.</sub> x 45° mm	Number of teeth	Order No. TINAMATIC	
P12	P1210	9,6	90°	1,2	3	171914
	P1212	11,7	90°	1,5	3	171913
P16	P1616	16,0	90°	1,9	6	142521
	P1618	17,7	90°	1,3	6	171955
P20	P2020	20,0	90°	1,9	6	168689
	P2022	21,7	90°	1,6	6	171979
P25	P2526	26,0	90°	2,1	6	142676

## Circular Milling Tools with Polygonal Insert Seat

- Inserts Page 36-40
- Cutting Data Page 45



Please adapt cutting data to overhangs length



Type	Order No.	Bore Ø min.	D mm	dh6 mm	d1 mm	d2 mm	S <sub>max.</sub> mm	E mm	L* mm	L1* mm	L2 mm	G	Shaft	Spare part No.	
														Screwdriver	Screw
P16	123586	18	16	8,5	9	14,4	3,5	3,5	29,5	19,5	5,5	M8	Steel	111656	143158
P20	123618	22	20	10,5	11,5	18,0	4,2	5	35,0	25,0	5,5	M10	Steel	111671	107597
P25	123605	27	25	12,5	13,6	22,5	5,7	4	42,5	29,5	5,0	M12	Steel	111594	107529

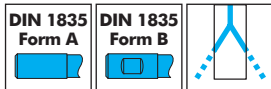
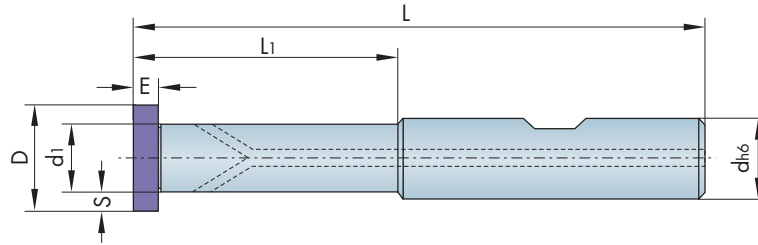
\* If inserts width <> 4,0 mm are used, dimensions L and L<sub>1</sub> change accordingly.

Screw torques

143158	T8 IP	1,1 Nm
107597	T15 IP	3,8 Nm
107529	T20 IP	5,5 Nm

## Circular Milling Tools with Polygonal Insert Seat

- Inserts Page 36-40
- Cutting Data Page 45



Type	Order No.	Form	Bore Ø min.	dh6 mm	d1 mm	Smax. mm	E mm	L* mm	L1* mm	Shaft	Spare part No.	
											Screw-driver	Screw
P12	123619	B	12	12	7	2,25	2	69,5	22	Steel	T8 IP 111656	M2,5x7 107596 (1,0 Nm)
	100228	B	12	12	7	2,25	2	69,5	22	Carbide		
	171778	A	12	12	7	2,25	2	69,5	22	Carbide		
	171780	B	12	12	7	2,25	2	82	32	Carbide		
	171781	A	12	12	7	2,25	2	82	32	Carbide		
	171783	B	12	12	7	2,25	2	102	42	Carbide		
P16	123573	B	18	12	9	4,0	3,5	71,5	25	Steel	T8 IP 111656	M3x12 143158 (1,1 Nm)
	123577	B	18	12	9	4,0	3,5	71,5	25	Carbide		
	171787	A	18	12	9	4,0	3,5	71,5	25	Carbide		
	123580	B	18	12	9	4,0	3,5	86,5	40	Carbide		
	171789	A	18	12	9	4,0	3,5	86,5	40	Carbide		
	123584	A	18	12	9	4,0	3,5	104	34	Carbide		
P20	123590	A	18	12	12	4,0	3,5	126,6	-	Carbide	T15 IP 111671	M4x13 107597 (3,8 Nm)
	123615	B	22	16	11,5	5,0	5	85,6	35,6	Steel		
	123616	B	22	16	11,5	5,0	5	85,6	35,6	Carbide		
	171794	A	22	16	11,5	5,0	5	85,6	35,6	Carbide		
	123617	B	22	16	11,5	5,0	5	105,6	55,6	Carbide		
P25	171796	A	22	16	11,5	5,0	5	105,6	55,6	Carbide	T20 IP 111594	M5x13,5 107529 (5,5 Nm)
	123592	B	28	16	13,6	6,8	4	84,2	35	Steel		
	123598	B	28	16	13,6	6,8	4	84,2	35	Carbide		
	171855	A	28	16	13,6	6,8	4	84,2	35	Carbide		
	123600	B	28	16	13,6	6,8	4	99,2	50	Carbide		
	171857	A	28	16	13,6	6,8	4	99,2	50	Carbide		
	123603	B	28	16	13,6	6,8	4	114,2	65	Carbide		
	171859	A	28	16	13,6	6,8	4	114,2	65	Carbide		
	123609	A	28	16	16	5,7	4	109,6	-	Carbide		
	123611	A	28	16	15,5	6,8	4	154,3	-	Carbide		
123613	A	28	20	16	6,8	4	180	25	Carbide			

\* If inserts width <> dimension E are used, dimensions L and L<sub>1</sub> change accordingly.  
\*\* without coolant

## Carbide Grades

### K

Uncoated universal grade for turning unalloyed grey cast iron, black heart castings, alloys and non-ferrous metals with stable machining conditions. High wear resistance.

### P

Uncoated universal grade for turning steel. Good resistance to thermal and mechanical stress with high wear resistance and edge toughness.

### FKN

Uncoated grade with fine grain, specifically for titanium and other alloys as well as non-ferrous metals. The homogeneous structure ensures good edge toughness and resistance to wear at high cutting speeds.

### TINAMATIC

Grade with multi-layer wear-resistant coating for dry and high-speed machining. Very high thermal and chemical resistance in combination with long service life.

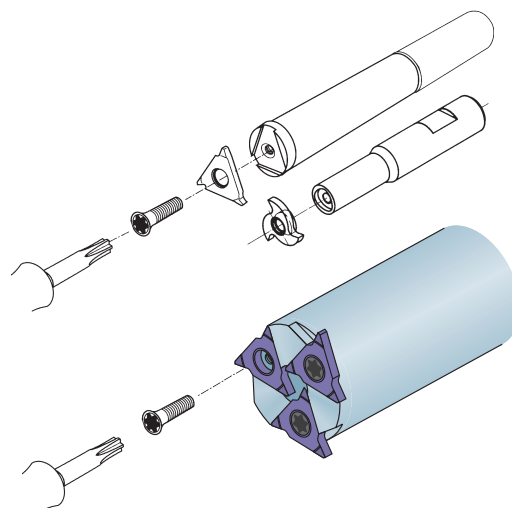
## Assembling Instructions

### Changing Inserts

Clamp cutter before changing insert. Loosen insert screw. Remove used insert and clean the insert pocket before clamping new insert.

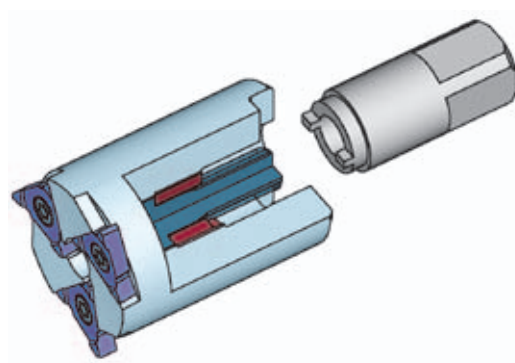
**Note:**

Please use the appropriate TIP hex key for the tightening of the inserts.



### Changing Clamping Screws

Only for circular milling cutter no. 123464



# Calculation Formula for the Circular Milling

$$n = \frac{V_c \cdot 1000}{d \cdot \pi} \quad V_c = \frac{d \cdot \pi \cdot n}{1000}$$

$$Vf_2 = f_z \cdot z \cdot n \quad n = \frac{Vf_2}{f_z \cdot z} \quad f_d = \frac{Vf_2}{z \cdot n}$$

$$Vf_3 = \frac{Vf_2 \cdot (D + d)}{D} \quad \text{Cutting external}$$

$$Vf_2 = \frac{D \cdot Vf_f}{(D + d)}$$

$$Vf_f = \frac{Vf_2 \cdot (D - d)}{D} \quad \text{Cutting internal}$$

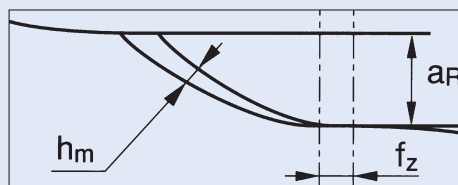
$$Vf_2 = \frac{D \cdot Vf_f}{(D - d)}$$

$$Vf_f = 0,25 \cdot Vf_f \quad \text{Plunge in straight}$$

$$Vf_f = Vf_f \quad \text{Plunge in with a circle}$$

$$h_m = \frac{f_z}{\sqrt{\frac{d}{a_R}}}$$

$$f_z = h_m \cdot \sqrt{\frac{d}{a_R}}$$



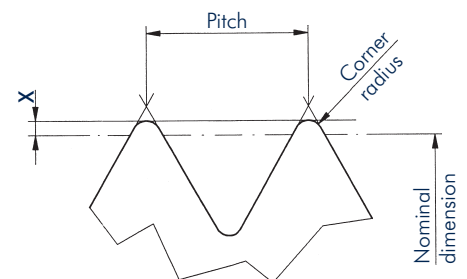
Middle chip thickness  
 $h_m \approx 0,05 \text{ mm/rev.}$

## Symbols

- $n$  (rpm) = spindle speed
- $V_c$  (m/min) = cutting speed
- $d$  (mm) = cutter diameter
- $D$  (mm) = shaft or bore  $\varnothing$
- $Vf_2$  (mm/min) = eff. feed speed
- $h_m$  (mm/rev.) = middle chip thickness
- $Vf_f$  (mm/min) = programmed feed speed
- $Vf$  (mm/min) = programmed plunge feed
- $f_z$  (mm) = feed per insert
- $z$  = number of inserts
- $a_r$  (mm) = chip depth, radial

## Correction Values for Internal Thread Milling

Pitch	Correction Value X
0,50	0,017
0,75	0,031
0,80	0,035
1,00	0,036
1,25	0,045
1,50	0,052
1,75	0,059
2,00	0,076
2,50	0,091
3,00	0,104
3,50	0,129
4,00	0,143
4,50	0,166
5,00	0,181
5,50	0,205
6,00	0,219

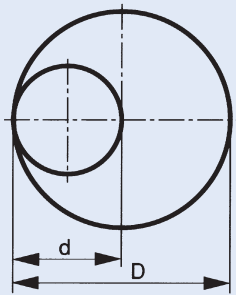


### Note

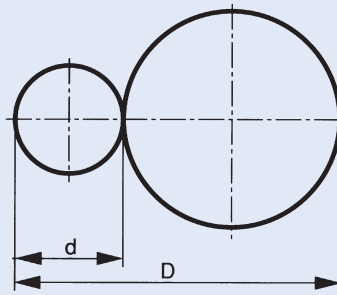
Internal threads are programmed to the nominal dimension.  
In order to achieve the exact thread size desired, there is a correction value for any given pitch. This correction value must be deducted from the radius of the cutter when programming.

## Information about Circular Milling

### Internal milling

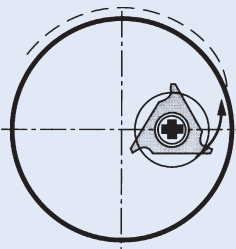


### External milling

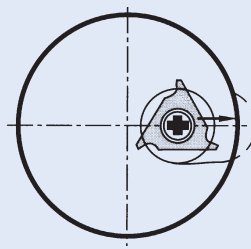


The best diameter relation is reached if the bore diameter to the cutter diameter is 2:1. **Climb milling is recommended.**

### Plunge in with a circle

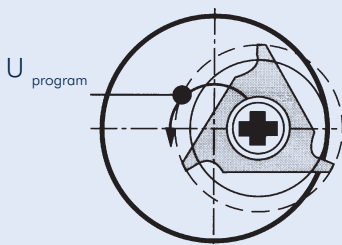


### Straight plunge in

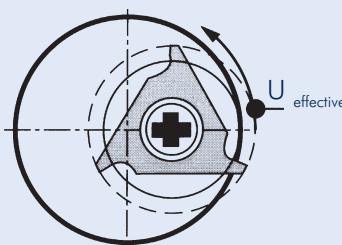


If possible, always plunge in with a circle. If plunging in straight, only use 1/3 of the feed. After having reached the plunge depth, move with full speed.

### Programmed feed regarding to cutter center


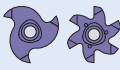


### Effective feed regarding to cutter O.D.



Always check the real feed speed at cutter O.D.

# Cutting Data Reference Values: Circular-, Linear- and Thread Milling as well as Cutting with Polygonal Insert Seat

Material to be machined	Strength N/mm <sup>2</sup>	Cutting Speed V <sub>c</sub> (m/min.)	Feed per tooth fz* mm	
				
General construction steels	< 500	250	0,05 - 0,12	0,05 - 0,25
	500 - 800	180	0,05 - 0,12	0,05 - 0,25
Free cutting steels	< 850	180	0,05 - 0,12	0,05 - 0,25
	850 - 1000	120	0,05 - 0,12	0,05 - 0,25
Unalloyed heat-treatable steels	< 700	250	0,05 - 0,12	0,05 - 0,25
	700 - 850	180	0,05 - 0,12	0,05 - 0,25
	850 - 1000	120	0,05 - 0,12	0,05 - 0,25
Alloyed heat-treatable steels	850 - 1000	180	0,05 - 0,12	0,05 - 0,25
	1000 - 1200	100	0,05 - 0,12	0,05 - 0,25
Unalloyed cementation steels	< 750	120	0,05 - 0,12	0,05 - 0,25
Alloyed cementation steels	< 1000	120	0,05 - 0,12	0,05 - 0,25
	> 1000	100	0,05 - 0,12	0,05 - 0,25
Nitriding steels	< 1000	120	0,05 - 0,12	0,05 - 0,25
Cast Steel	> 1000	100	0,05 - 0,12	0,05 - 0,25
Tool steels	< 850	180	0,05 - 0,12	0,05 - 0,25
	850 - 1100	120	0,05 - 0,12	0,05 - 0,25
	1100 - 1400	100	0,05 - 0,12	0,05 - 0,25
Rapid steels	830 - 1200	120	0,05 - 0,12	0,05 - 0,25
Nonwearing construction steels	< 1350	120	0,05 - 0,12	0,05 - 0,15
	< 1850	100	0,05 - 0,12	0,05 - 0,15
Spring steels	< 1500	80	0,05 - 0,08	0,05 - 0,15
Stainless steel, sulphured	< 700	250	0,05 - 0,12	0,05 - 0,15
Stainless steel, austenitic	< 700	180	0,05 - 0,12	0,05 - 0,15
Stainless steel, martensitic	< 1100	120	0,05 - 0,12	0,05 - 0,15
Hardened steels	48 - 55 HRC	100	0,05 - 0,10	0,05 - 0,15
	55 - 60 HRC	100	0,05 - 0,08	0,05 - 0,10
Cast Iron	60 - 67 HRC	100	0,05 - 0,08	0,05 - 0,08
Cast iron (GG)	< 180 HB	180	0,05 - 0,12	0,05 - 0,25
	> 180 HB	120	0,05 - 0,12	0,05 - 0,25
Cast iron (GGG, GT)	> 180 HB	120	0,05 - 0,12	0,05 - 0,25
	> 260 HB	100	0,05 - 0,12	0,05 - 0,25
Aluminium, aluminium alloys	< 530	400	0,05 - 0,25	0,15 - 0,40
Aluminium cast alloys	< 10% Si	< 600	0,05 - 0,25	0,15 - 0,40
	> 10% Si	< 600	0,05 - 0,25	0,15 - 0,40
Magnesium, magnesium alloys	< 280	400	0,05 - 0,25	0,15 - 0,40
Copper, low alloyed	< 400	500	0,05 - 0,25	0,15 - 0,40
Cooper Alloys	< 850	120	0,05 - 0,12	0,05 - 0,15
Brass, short-chipping	< 600	400	0,05 - 0,25	0,15 - 0,40
Brass, long-chipping	< 600	400	0,05 - 0,25	0,15 - 0,40
Bronze, short-chipping	< 600	400	0,05 - 0,25	0,15 - 0,40
	650 - 850	400	0,05 - 0,25	0,15 - 0,40
Bronze, long-chipping	< 850	300	0,05 - 0,25	0,15 - 0,40
	850 - 1200	500	0,05 - 0,25	0,15 - 0,40
Graphite	-	500		0,15 - 0,40
Thermosetting- and Thermoplastics	-	500		
GFK and CFK	-	400		
Titanium, titanium alloys	< 850	80	0,01 - 0,05	0,01 - 0,08
	850 - 1200	60	0,01 - 0,05	0,01 - 0,08
Special alloys	< 1200	120	0,05 - 0,12	0,05 - 0,15

\* The indicated feed values apply only with circular bringing in loop. During linear bringing in movement the feed motion amounts to max. 30%