

FRANKEN

Frästechnik
Milling Technology

Turbine

**inkl. Tonnenfräser für bessere
Oberflächengüten und kürzere
Bearbeitungszeiten**

incl. barrel-shaped cutters for better
surface finish and shorter machining time



Fräser für die Impeller- und Schaufelblattbearbeitung
Milling Cutters for Machining of Impellers and Turbine Blades

Wegweiser

Bitte beachten:

Die Eignung der Fräser für die Impeller- und Schaufelblattbearbeitung ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 34 - 52 zu finden.

Product finder

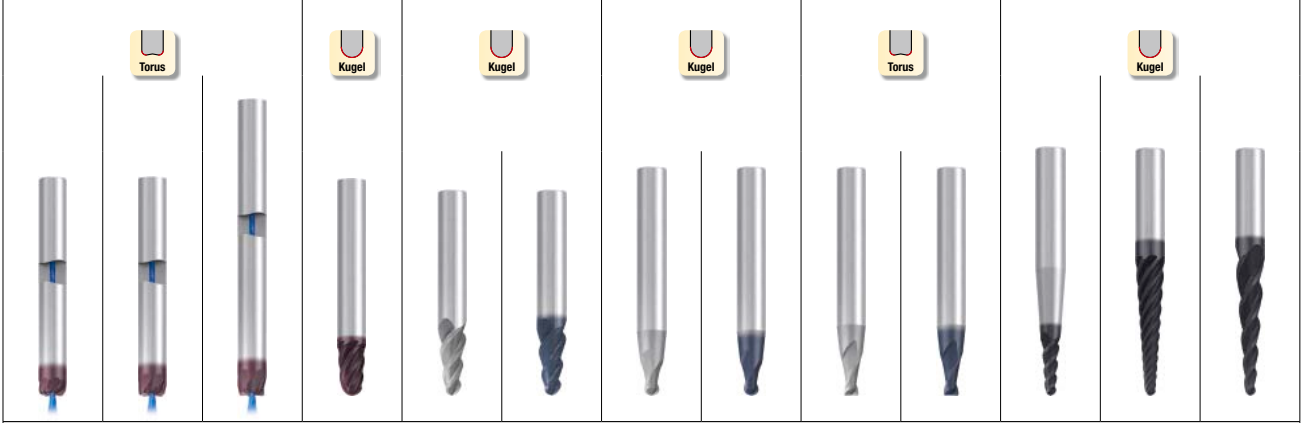
Please note:

The suitability of milling cutters for machining of impellers and turbine blades is indicated as follows:

- = very suitable
- = suitable

Please find the cutting conditions on pages 34 - 52.

Einsatzgebiete – Material Applications – material		Material-Beispiele Material examples	Material-Nummern Material numbers	
P	Stahlwerkstoffe Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Steel materials Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	
	5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	
M	Nichtrostende Stahlwerkstoffe	Stainless steel materials		
	1.1 Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ²	
	2.1 Austenitisch	Austenitic	≤ 950 N/mm ²	
	3.1 Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	≤ 1100 N/mm ²	
K	Gusswerkstoffe	Cast materials		
	1.1 Gusseisen mit Lamellengrafit (GJL)	Cast iron with lamellar graphite (GJL)	100-250 N/mm ²	
	2.1 Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	250-450 N/mm ²	
	3.1 Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	300-400 N/mm ²	
	4.1 Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	250-500 N/mm ²	
N	Nichteisenwerkstoffe	Non-ferrous materials		
	1.1 Aluminium-Legierungen	Aluminium alloys	≤ 200 N/mm ²	
	1.2 Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 350 N/mm ²	
	1.3		≤ 550 N/mm ²	
	1.4		Si ≤ 7%	
	1.5 Aluminium-Gusslegierungen	Aluminium cast alloys	7% < Si ≤ 12%	
	1.6		12% < Si ≤ 17%	
	2.1 Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	≤ 400 N/mm ²	
	2.2 Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	≤ 550 N/mm ²	
	2.3 Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	≤ 550 N/mm ²	
	2.4 Kupfer-Aluminium-Legierungen (Alubronze, langspanend)	Copper-aluminium alloys (alu bronze, long-chipping)	≤ 800 N/mm ²	
	2.5 Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	≤ 700 N/mm ²	
	2.6 Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	≤ 400 N/mm ²	
	2.7	Special copper alloys	≤ 600 N/mm ²	
	2.8		≤ 1400 N/mm ²	
	3.1 Magnesium-Knetlegierungen	Magnesium wrought alloys	≤ 500 N/mm ²	
3.2 Magnesium-Gusslegierungen	Magnesium cast alloys	≤ 500 N/mm ²		
S	Kunststoffe	Synthetics		
	4.1 Duroplaste (kurzspanend)	Duroplastics (short-chipping)		
	4.2 Thermoplaste (langspanend)	Thermoplastics (long-chipping)		
	4.3 Faserverstärkte Kunststoffe (Faseranteil ≤ 30%)	Fibre-reinforced synthetics (fibre content ≤ 30%)		
	4.4 Faserverstärkte Kunststoffe (Faseranteil > 30%)	Fibre-reinforced synthetics (fibre content > 30%)		
	Besondere Werkstoffe	Special materials		
	5.1 Grafit	Graphite		
	5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys		
	5.3 Verbundwerkstoffe	Composite materials		
	Spezialwerkstoffe	Special materials		
1.1 Titan-Legierungen	Titanium alloys			
1.2 Reintitan	Pure titanium	≤ 450 N/mm ²		
1.3	Titanium alloys	≤ 900 N/mm ²		
H	Nickel-, Kobalt- und Eisen-Legierungen	Nickel alloys, cobalt alloys and iron alloys		
	2.1 Reinnickel	Pure nickel	≤ 600 N/mm ²	
	2.2		≤ 1000 N/mm ²	
	2.3 Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm ²	
	2.4		≤ 1000 N/mm ²	
	2.5 Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1600 N/mm ²	
	2.6 Eisen-Basis-Legierungen	Iron-base alloys	≤ 1500 N/mm ²	
H	Harte Werkstoffe	Hard materials		
	1.1		44 - 50 HRC	
	1.2		50 - 55 HRC	
	1.3	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	55 - 60 HRC
	1.4		60 - 63 HRC	
	1.5		63 - 66 HRC	















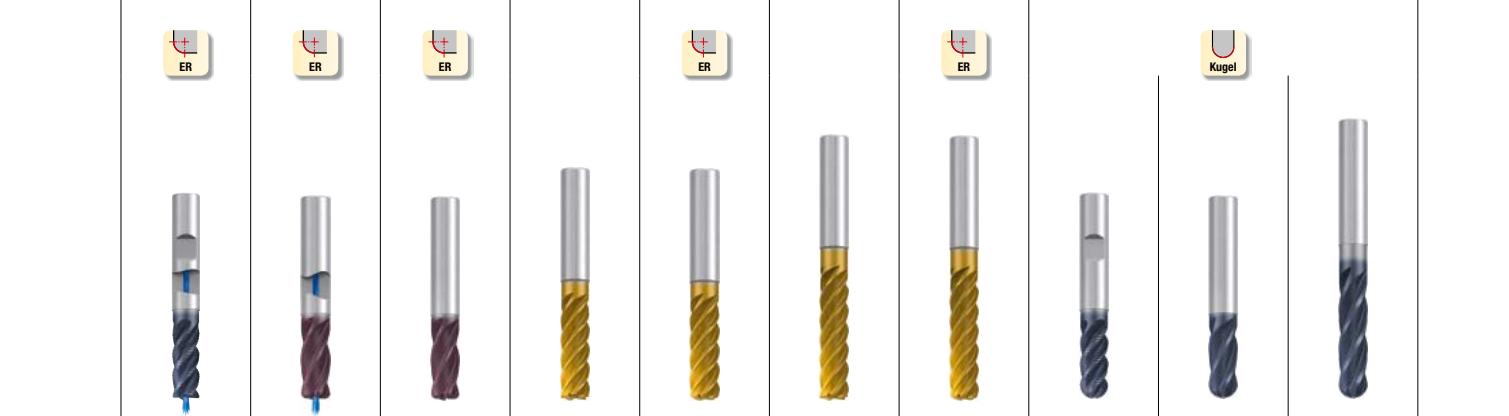
Allround

N										NR	N		
8-16 mm	8° 8-11 mm	8° 9-19 mm	4° R3-8 mm	3-17,5° R0,5-3 mm	3-17,5° R0,5-3 mm	3-8° R1,5-3 mm	3-8° R1,5-3 mm	3-8° 3-5 mm	3-8° 3-5 mm	4° R2-4 mm	4° R2-4 mm	4° R2-4 mm	Z (Flutes)
5-9	7-9	5-13	3/6	3	3	2	2	2	2	3	3/6	3	
2676AZ	2677AZ	2678AZ	2679A	3440	3440A	3442	3442A	3444	3444A	3546L	3548L	3550L	
7	8	8	9	10	10	11	11	12	12	13	14	15	Seite · Page
34	35	35	36	37	38	37	38	39	39	40	41	42	v_c / f_z

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■	■	■	■		□		□		□				2.8
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					■		■		■				4.1
					■		■		■				4.2
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■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

										
	Allround		Allround	Inox						
	N		N	NF <small>fein - fine</small>						
	0,5-5° 2-12 mm	0,5-5° 2-12 mm	r ₁ 1-3 mm r ₂ 75-95 mm	6-20 mm	12-20 mm	6-20 mm	12-20 mm	6-20 mm	6-20 mm	
Z (Flutes)	3 - 4	3 - 4	3 - 4	4	4	4	4	4	4	
	1900 - 1905	1900A - 1905A	3538L	2646TZ	2642TZ	2648TZ	2670TZ	2656TZ	2658TZ	
				2647TZ	2643TZ	2649TZ	2671TZ	2657TZ	2659TZ	
Seite · Page	16-17	16-17	18	20	21	20	21	22	22	
	43	43	44	45	45	45	45	45	45	
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5.3		■								
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	1.2		■	■	■	■	■	■	■	■
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	1.4									
	1.5									



Allround		Allround		Inox			Allround	Allround		
NR <small>fein · fine</small>	N		N			NR <small>fein · fine</small>	N			
6-20 mm	3-20 mm	3-20 mm	3-20 mm	12-20 mm	12-20 mm	12-20 mm	3-20 mm	2-16 mm	6-16 mm	
4	4	4	4-5	5	5	5	3-4	4	4	Z (Flutes)
2673AZ	2698AZ	2699A	2644T	2654T	2645T	2655T	2667A	1867A	1967A	
23	24	25	26	26	27	27	28	29	29	Seite · Page
46	47	47	48	48	48	48	46	49	49	

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										1.4	
										1.5	

■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

Einschraubfräskörper für runde Wendeschneidplatten
Indexable screw-in end mills for round inserts



IC 8 - IC 12



16 - 40 mm

Z (Inserts)	2 - 5
	9155, 9160, 9165
Seite · Page	32

Steel		Hard materials		Allround
IC 8-12	IC 8-12	IC 8-12	IC 8-16	IC 8-12
PE1	KC3	KP1	PE3	KC3
0°		0°		20°
9601A	9607A	9608A	9619X	9617A

Seite · Page	30	30	30	30	31
v_c / f_z	50	50	50	51	52

P	1.1	■	■	□	■
	2.1	■	■	□	■
	3.1	■	■	□	■
	4.1	■	□	□	■
	5.1	■	□	□	■
M	1.1				■
	2.1				□
	3.1				■
	4.1				■
K	1.1	□	■	■	■
	1.2	□	■	■	■
	2.1	□	■	■	■
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	3.1	□	■	■	■
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	4.1	□	■	■	■
	4.2	□	■	■	■
N	1.1				□
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	1.4				□
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H	1.1		■	■	
	1.2		□	■	
	1.3		□	■	
	1.4		□	■	
	1.5		□	□	

Aufsteckfräskörper für runde Wendeschneidplatten
Indexable milling cutters for round inserts



IC 10 - IC 16



50 - 125 mm

Z (Inserts)	4 - 8
	9260, 9265, 9275
Seite · Page	33

- Hochleistungswerkzeug
- Mit 5-9 Schneiden
- Ungleiche Teilung
- Vibrationsarme Bearbeitung
- Innere Kühlschmierstoff-Zufuhr
- Mit Eckenradien 1 und 2 mm

- Multi-functional tool
- With 5-9 flutes
- Variable spacing
- Low-vibration machining
- Internal coolant supply
- With corner radii 1 and 2 mm

N

ICA

HM

DIN 6535
HA
HB

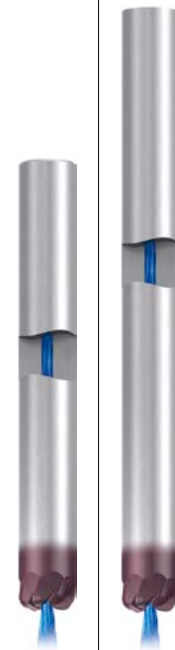
Torus

20°

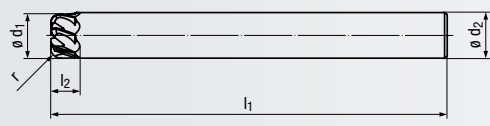
ER

V_c/f_z
34

Optional



Allround



Beschichtung - Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für hochfeste Werkstoffe geeignet
- Auch für Nickel-Basis-Legierungen einsetzbar
- Für die Zerspanung von Titan-Legierungen geeignet
- Einsatz in allen Turbinenwerkstoffen möglich

Applications – material (see page 2)

- Especially suitable for high-strength materials
- Also suitable in nickel-base alloys
- For the machining of titanium alloys
- Suitable in all turbine materials

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8 5.2
S	1.1-2.6

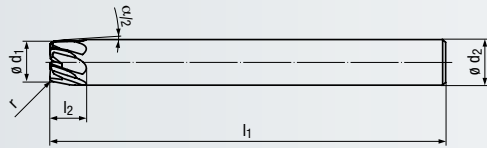
Lange und extra lange Ausführung · Long and extra long design

Eckenradius · Corner radius

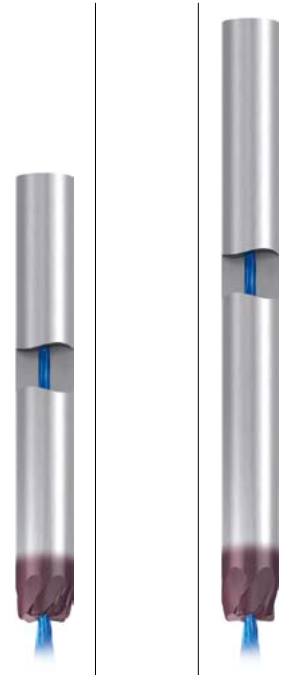
Bestell-Code · Order code								2676AZ		
$\varnothing d_1$ f8	r ±0,01	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code				
8	1	3	80	8	5	.008010	●			
8	2	4	80	8	5	.008020	●			
10	1	3	80	10	7	.010010	●			
10	2	4	80	10	7	.010020	●			
12	1	3	108	12	7	.012010		●		
12	2	4	108	12	7	.012020		●		
16	1	3	108	16	9	.016010		●		
16	2	4	108	16	9	.016020		●		

- Hochleistungswerkzeug
- Mit 5-13 Schneiden
- Ungleiche Teilung
- Vibrationsarme Bearbeitung
- Innere Kühlschmierstoff-Zufuhr
- Lange und extra lange Ausführung
- Kegelwinkel 8°

- Multi-functional tool
- With 5-13 flutes
- Variable spacing
- Low-vibration machining
- Internal coolant supply
- Long and extra long design
- Taper angle 8°



- N**
- ICA**
- HM**
- DIN 6535**
HA
HB
- 20°** Torus
- Vc/fz**
35
- Optional**



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für hochfeste Werkstoffe geeignet
- Auch für Nickel-Basis-Legierungen einsetzbar
- Für die Zerspänung von Titan-Legierungen geeignet
- Einsatz in allen Turbinenwerkstoffen möglich

Applications – material (see page 2)

- Especially suitable for high-strength materials
- Also suitable in nickel-base alloys
- For the machining of titanium alloys
- Suitable in all turbine materials

TIALN

TIALN

P	1.1-5.1	P	1.1-5.1
M	1.1-4.1	M	1.1-4.1
K	1.1-4.2	K	1.1-4.2
N	2.1-2.8 5.2	N	2.1-2.8 5.2
S	1.1-2.6	S	1.1-2.6

Lange Ausführung · Long design

Bestell-Code · Order code

2677AZ

$\alpha/2$	$\varnothing d_1$	r $\pm 0,01$	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
8°	8	0,8	7,5	80	10	7	.008008	●		
	9	1	3,5	80	10	7	.009010	●		
	10	1	7,5	80	12	9	.010010	●		
	11	1	3,5	80	12	9	.011010	●		

Extra lange Ausführung · Extra long design

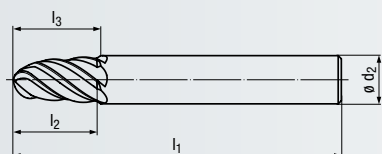
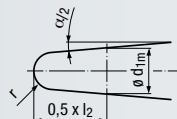
Bestell-Code · Order code

2678AZ

$\alpha/2$	$\varnothing d_1$	r $\pm 0,01$	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
8°	9	1	3,5	108	10	5	.009010		●	
	10	1	7,5	108	12	7	.010010		●	
	11	1	3,5	108	12	7	.011010		●	
	15	1	3,5	108	16	9	.015010		●	
	15	1	3,5	108	16	13	.115010		●	
	19	1	3,5	108	20	9	.019010		●	
19	1	3,5	108	20	13	.119010		●		

- Hochleistungswerkzeug
- Mit 3 Schneiden im Radius
- 6 Umfangsschneiden
- Kegelwinkel 4°

- Multi-functional tool
- 3 flutes in the ball nose section
- 6 radial flutes
- Taper angle 4°



N

HM **DIN 6535**
HA
HB

Kugel

v_c / f_z
36

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für hochfeste Werkstoffe geeignet
- Auch für Nickel-Basis-Legierungen einsetzbar
- Für die Zerspaltung von Titan-Legierungen geeignet
- Einsatz in allen Turbinenwerkstoffen möglich

Applications – material (see page 2)

- Especially suitable for high-strength materials
- Also suitable in nickel-base alloys
- For the machining of titanium alloys
- Suitable in all turbine materials

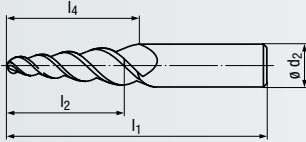
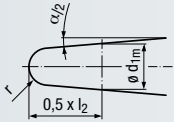
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8 5.2
S	1.1-2.6

Bestell-Code · Order code

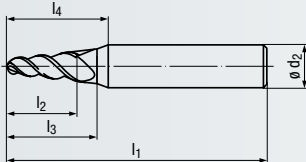
2679A

$\alpha/2$	r	l_2	l_3	l_1	d_{1m}	$\emptyset d_2$ h6	Z (Flutes)	Dimens.- Code			
4°	3	30	47	108	7,89	12	3/6	.04030A	●		
	3,5	39	39	108	9,26	12	3/6	.04035A	●		
	4	32	32	108	9,70	12	3/6	.04040A	●		
	5	35	49	108	11,77	16	3/6	.04050A	●		
	6	34	34	108	13,57	16	3/6	.04060A	●		
	8	36	36	108	17,44	20	3/6	.04080A	●		

- Multifunktionales Werkzeug
- Mit 3 Schneiden
- Verschiedene Kegelwinkel
- Multi-functional tool
- With 3 flutes
- Various taper angles



Design I₃:



N

HM DIN 6535
HA
HB

45° Kugel

V_c/f_z
37 - 38

Optional



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- In fast allen Werkstoffen einsetzbar
- Zum Schlichten geeignet

Applications – material (see page 2)

- For almost all materials
- Suitable for finishing

TIALN

P	1.1-2.1
N	1.1-1.3
N	2.1-2.3
N	4.1-4.2

P	1.1-3.1	4.1-5.1
M	1.1-2.1	
K	1.1-2.2	3.1-4.2
N	1.1-1.4	1.5
N	2.1-2.6	2.7-2.8
N	3.1-4.4, 5.2-5.3	
S	1.1-1.2	1.3
S	2.1-2.2	2.3-2.6

Bestell-Code · Order code

3440

3440A

$\alpha/2$	r $\pm 0,005$	l ₂	l ₁	l ₃	l ₄	d _{1m}	ϕ d ₂ h6	Z (Flutes)	Dimens.- Code	3440	3440A
3°	1,5	20	62	20	24	3,90	6	3	.03015A	●	●
	2	21	66	–	21	4,90	6	3	.03020A	●	●
	2	31	80	31	35	5,42	8	3	.03020B	●	●
	3	22	72	–	22	6,85	8	3	.03030A	●	●
	3	31	80	31	35	7,32	10	3	.03030B	●	●
4°	0,5	20	62	20	24	2,33	6	3	.04005A	●	●
	1	20	62	20	24	3,26	6	3	.04010A	●	●
	1,5	20	63	20	25	4,20	8	3	.04015A	●	●
	2	20	68	–	30	5,13	8	3	.04020A	●	●
	2	30	72	–	30	5,83	8	3	.04020B	●	●
	3	25	72	–	31	7,34	10	3	.04030A	●	●
6°	3	31	80	–	31	7,76	10	3	.04030B	●	●
	0,5	20	62	–	24	3,00	6	3	.06005A	●	●
	1	19	62	–	19	3,80	6	3	.06010A	●	●
	1	29	72	–	29	4,85	8	3	.06010B	●	●
	1,5	15	62	–	15	4,28	6	3	.06015A	●	●
	1,5	25	68	–	25	5,33	8	3	.06015B	●	●
	2	20	68	–	20	5,70	8	3	.06020A	●	●
8°	2	30	80	–	30	6,76	10	3	.06020B	●	●
	3	21	72	–	21	7,61	10	3	.06030A	●	●
	3	31	83	–	31	8,66	12	3	.06030B	●	●
	0,5	18	62	–	18	3,40	6	3	.08005A	●	●
	1	15	62	–	15	3,85	6	3	.08010A	●	●
17,5°	1	22	63	–	22	4,83	8	3	.08010B	●	●
	1,5	19	63	–	19	5,28	8	3	.08015A	●	●
	1,5	26	72	–	26	6,26	10	3	.08015B	●	●
	2	23	72	–	23	6,71	10	3	.08020A	●	●
17,5°	0,5	8	57	–	8	3,26	6	3	.17505A	●	●

- Multifunktionales Werkzeug
- Mit 2 Schneiden
- Verschiedene Kegelwinkel

- Multi-functional tool
- With 2 flutes
- Various taper angles

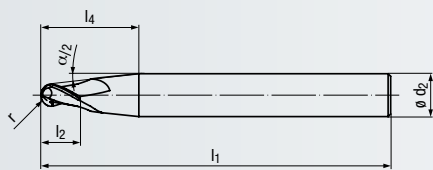
N

HM DIN 6535
HA
HB

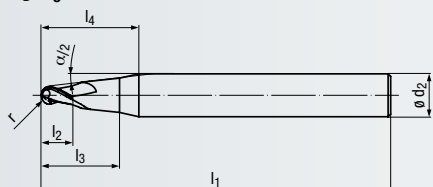
30° **Kugel**

v_c/f_z
37 - 38

Optional



Design I₃:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)
- In fast allen Werkstoffen einsetzbar
- Zum Schrumpfen und Schlichten geeignet

Applications – material (see page 2)
- For almost all materials
- Suitable for roughing and finishing

TIALN

- P** 1.1-2.1
- N** 1.1-1.3
- N** 2.1-2.3
- N** 4.1-4.2

- P** 1.1-3.1 4.1-5.1
- M** 1.1-2.1
- K** 1.1-2.2 3.1-4.2
- N** 1.1-1.4 1.5
- N** 2.1-2.6 2.7-2.8
- N** 3.1-4.4, 5.2-5.3
- S** 1.1-1.2 1.3
- S** 2.1-2.2 2.3-2.6

Bestell-Code · Order code									3442		3442A	
$\alpha/2$	r	l ₂	l ₁	l ₃	l ₄	ϕ d ₂	Z	Dimens.-Code				
	$\pm 0,01$					h6	(Flutes)					
3°	1,5	4	63	24	26	8	2	.03015A	●		●	
	3	7	80	38	39	10	2	.03030A	●		●	
4°	1,5	4	63	24	26	8	2	.04015A	●		●	
	3	7	80	-	33	10	2	.04030A	●		●	
6°	1,5	4	63	-	26	8	2	.06015A	●		●	
	3	7	80	-	23	10	2	.06030A	●		●	
8°	1,5	4	80	-	27	10	2	.08015A	●		●	
	3	7	83	-	25	12	2	.08030A	●		●	

- Multifunktionales Werkzeug
- Mit 2 Schneiden
- Verschiedene Kegelwinkel
- Multi-functional tool
- With 2 flutes
- Various taper angles

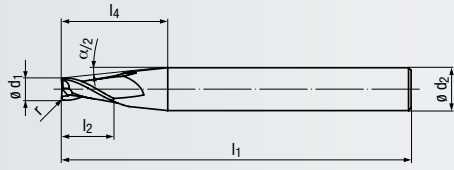
N

HM DIN 6535
HA
HB

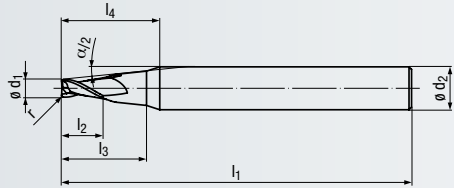
30° Torus

V_c / f_z
39

Optional



Design I₃:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen geeignet

Applications – material (see page 2)

- For almost all materials
- Suitable for roughing

TIALN

P	1.1-2.1
N	1.1-1.3
N	2.1-2.3
N	4.1-4.2

P	1.1-3.1	4.1-5.1
M	1.1-2.1	
K	1.1-2.2	3.1-4.2
N	1.1-1.4	1.5
N	2.1-2.6	2.7-2.8
N	3.1-4.4, 5.2-5.3	
S	1.1-1.2	1.3
S	2.1-2.2	2.3-2.6

Bestell-Code · Order code										3444		3444A	
$\alpha/2$	$\varnothing d_1$	r	l_2	l_1	l_3	l_4	$\varnothing d_2$	Z	Dimens.-Code				
		$\pm 0,01$					h_6	(Flutes)					
3°	3	0,3	6	63	24	26	8	2	.03003A	●		●	
	4	0,4	8	63	24	26	8	2	.03004A	●		●	
	5	0,5	10	63	25	26	8	2	.03005A	●		●	
4°	3	0,3	6	63	24	26	8	2	.04003A	●		●	
	4	0,4	8	63	25	26	8	2	.04004A	●		●	
	5	0,5	10	63	-	23	8	2	.04005A	●		●	
6°	3	0,3	6	63	-	25	8	2	.06003A	●		●	
	4	0,4	8	63	-	20	8	2	.06004A	●		●	
	5	0,5	10	80	-	25	10	2	.06005A	●		●	
8°	3	0,3	6	80	-	25	10	2	.08003A	●		●	
	4	0,4	8	80	-	22	10	2	.08004A	●		●	
	5	0,5	10	83	-	25	12	2	.08005A	●		●	

- Hochleistungswerkzeug
- Mit 3 Schneiden
- Schruppverzahnung
- Kegelwinkel 4°

- Multi-functional tool
- With 3 flutes
- Roughing profile
- Taper angle 4°

NR

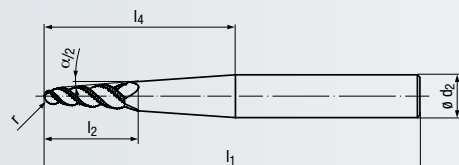
HM

DIN 6535
HA
HB

45° Kugel

v_c / f_z
40

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

Applications – material (see page 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar

- Especially suitable for difficult to cut materials
- For all tough materials

- M** 1.1-4.1
- N** 1.3-1.5
- S** 1.1-1.3
- S** 2.2-2.6

Lange Ausführung · Long design

Bestell-Code · Order code								3546L			
$\alpha/2$	r	l ₂	l ₁	l ₄	ϕd_2 h6	Z (Flutes)	Dimens.- Code				
	$\pm 0,015$										
4°	2	30	120	66	12	3	.04020A	●			
	3	35	140	81	16	3	.04030A	●			
	4	40	155	96	20	3	.04040A	●			

- Hochleistungswerkzeug
- Mit 3 Schneiden im Radius
- 6 Umfangsschneiden
- Kegelwinkel 4°

- Multi-functional tool
- 3 flutes in the ball nose section
- 6 radial flutes
- Taper angle 4°

N

HM

DIN 6535
HA
HB

38°

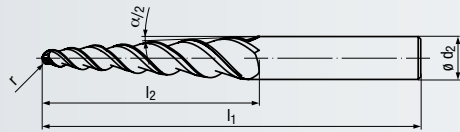
Kugel

V_c/f_z
41

Optional



Allround



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

Applications – material (see page 2)

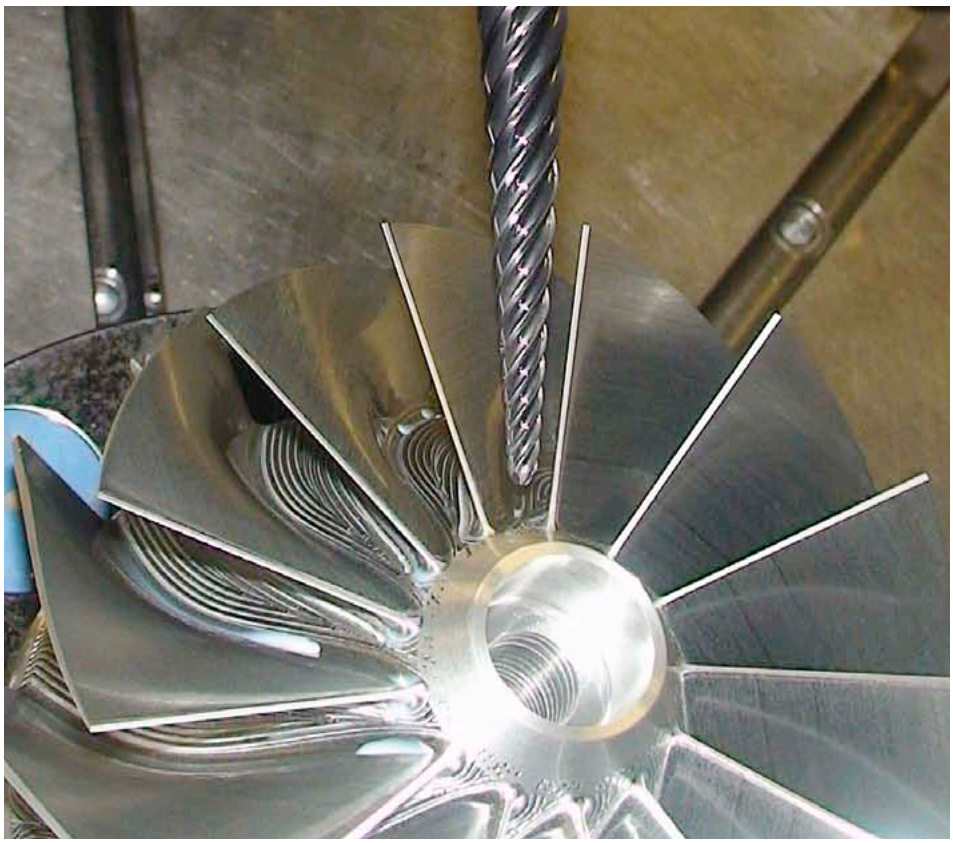
- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar

- Especially suitable for difficult to cut materials
- For all tough materials

- M** 1.1-4.1
- N** 1.3-1.5
- S** 1.1-1.3
- S** 2.2-2.6

Lange Ausführung · Long design

Bestell-Code · Order code								3548L			
$\alpha/2$	r $\pm 0,01$	l_2	l_1	l_4	ϕd_2 h6	Z (Flutes)	Dimens.- Code				
4°	2	59	120	59	12	3/6	.04020A	●			
	2	87	150	87	16	3/6	.04020B	●			
	3	74	140	74	16	3/6	.04030A	●			
	3	103	165	103	20	3/6	.04030B	●			
	4	89	155	89	20	3/6	.04040A	●			



- Hochleistungswerkzeug
- Mit 3 Schneiden
- Schlichtgeometrie
- Kegelwinkel 4°

- Multi-functional tool
- With 3 flutes
- Finishing geometry
- Taper angle 4°

N

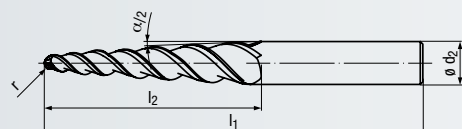
HM

DIN 6535
HA
HB

34/35/36° **Kugel**

V_c/f_z
42

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

Applications – material (see page 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar

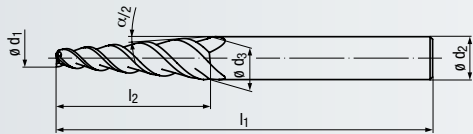
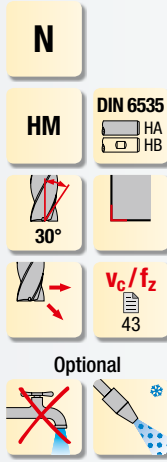
- Especially suitable for difficult to cut materials
- For all tough materials

- M** 1.1-4.1
- N** 1.3-1.5
- S** 1.1-1.3
- S** 2.2-2.6

Lange Ausführung · Long design

Bestell-Code · Order code								3550L			
$\alpha/2$	r ±0,01	l ₂	l ₁	l ₄	∅ d ₂ h6	Z (Flutes)	Dimens.- Code				
4°	2	59	120	59	12	3	.04020A	●			
	2	87	150	87	16	3	.04020B	●			
	3	74	140	74	16	3	.04030A	●			
	3	103	165	103	20	3	.04030B	●			
	4	89	155	89	20	3	.04040A	●			

- Multifunktionales Werkzeug
- Mit 3 oder 4 Schneiden
- Verschiedene Kegelwinkel
- Multi-functional tool
- With 3 or 4 flutes
- Various taper angles



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)
- In fast allen Werkstoffen einsetzbar

Applications – material (see page 2)
- For almost all materials

TIALN

- P 1.1-2.1
- N 1.1-1.3
- N 2.1-2.3
- N 4.1-4.2

- P 1.1-3.1 4.1-5.1
- M 1.1-2.1
- K 1.1-2.2 3.1-4.2
- N 1.1-1.4 1.5
- N 2.1-2.6 2.7-2.8
- N 3.1-4.4, 5.2-5.3
- S 1.1-1.2 1.3
- S 2.1-2.2 2.3-2.6
- H 1.1 1.2

Bestell-Code · Order code								1900	1901	1902	1900A	1901A	1902A
$\alpha/2$	$\varnothing d_1$	$\varnothing d_3$	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code						
0,5°	2	2,35	20	75	6	3	.002	●			●		
	3	3,45	25	75	6	3	.003	●			●		
	4	4,52	30	75	6	3	.004	●			●		
	5	5,52	30	75	6	3	.005	●			●		
	6	6,7	40	100	8	3	.006	●			●		
	8	8,79	45	100	10	4	.008	●			●		
	10	10,79	45	100	12	4	.010	●			●		
	12	12,79	45	100	14	4	.012	●			●		
1°	2	2,7	20	75	6	3	.002		●			●	
	3	3,87	25	75	6	3	.003		●			●	
	4	5,05	30	75	6	3	.004		●			●	
	5	6	28	75	6	3	.005		●			●	
	6	7,4	40	100	8	3	.006		●			●	
	8	9,57	45	100	10	4	.008		●			●	
	10	11,57	45	100	12	4	.010		●			●	
	12	13,57	45	100	14	4	.012		●			●	
1,5°	2	3,05	20	75	6	3	.002			●			●
	3	4,31	25	75	6	3	.003			●			●
	4	5,57	30	75	6	3	.004			●			●
	5	6,83	35	100	8	3	.005			●			●
	6	7,83	35	100	8	3	.006			●			●
	8	10,36	45	100	12	4	.008			●			●
	10	12,88	55	125	14	4	.010			●			●
	12	15,14	60	125	16	4	.012			●			●

- Multifunktionales Werkzeug
- Mit 3 und 4 Schneiden
- Verschiedene Kegelwinkel

- Multi-functional tool
- With 3 and 4 flutes
- Various taper angles

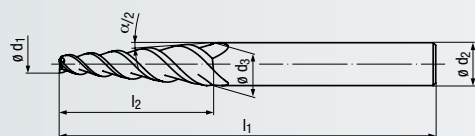
N

HM **DIN 6535**
 HA HB

30°

V_c/f_z
43

Optional



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)
 - In fast allen Werkstoffen einsetzbar

Applications – material (see page 2)
 - For almost all materials

TIALN

- P 1.1-2.1
- N 1.1-1.3
- N 2.1-2.3
- N 4.1-4.2

- P 1.1-3.1 4.1-5.1
- M 1.1-2.1
- K 1.1-2.2 3.1-4.2
- N 1.1-1.4 1.5
- N 2.1-2.6 2.7-2.8
- N 3.1-4.4, 5.2-5.3
- S 1.1-1.2 1.3
- S 2.1-2.2 2.3-2.6
- H 1.1 1.2

Bestell-Code · Order code								1903	1904	1905	1903A	1904A	1905A
$\alpha/2$	$\varnothing d_1$	$\varnothing d_3$	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code						
2°	2	3,4	20	75	6	3	.002	●			●		
	3	4,75	25	75	6	3	.003	●			●		
	4	6	28	75	6	3	.004	●			●		
	5	8	40	100	8	3	.005	●			●		
	6	9,14	45	100	10	3	.006	●			●		
	8	11,14	45	100	12	4	.008	●			●		
	10	13,84	55	125	14	4	.010	●			●		
	12	15,84	55	125	16	4	.012	●			●		
3°	2	4,1	20	75	6	3	.002		●			●	
	3	5,62	25	75	6	3	.003		●			●	
	4	8	38	100	8	3	.004		●			●	
	5	10	48	100	10	3	.005		●			●	
	6	12	50	100	12	3	.006		●			●	
	8	14	55	125	14	4	.008		●			●	
	10	16	55	125	16	4	.010		●			●	
	12	18	55	125	18	4	.012		●			●	
5°	2	5,5	20	75	6	3	.002			●			●
	3	8	28	100	8	3	.003			●			●
	4	10	34	100	10	3	.004			●			●
	5	12	40	100	12	3	.005			●			●
	6	14	45	100	14	3	.006			●			●
	8	16	45	125	16	4	.008			●			●
	10	18	45	125	18	4	.010			●			●
	12	20	45	125	20	4	.012			●			●

● = Lagerwerkzeug, siehe Preisliste · Stock tool, see price list
 ○ = Kurzfristig lieferbar, Preis auf Anfrage · Available at short notice, price on request

- Hochleistungswerkzeug
- Tropfenform
- Mit 3 oder 4 Schneiden
- Vibrationsarme Bearbeitung
- Hocheffiziente Schlichtbearbeitung
- Formtoleranz $\pm 0,01$ mm
- Multi-functional tool
- Oval form
- With 3 or 4 flutes
- Low-vibration machining
- Highly efficient finishing
- Form tolerance ± 0.01 mm

N

HM

DIN 6535
HA
HB

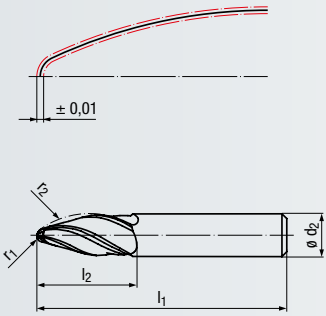
Form
 $\pm 0,01$

30°

Kugel

V_c / f_z
44

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

Applications – material (see page 2)

- Speziell für hochfeste Werkstoffe geeignet
- In fast allen Werkstoffen einsetzbar

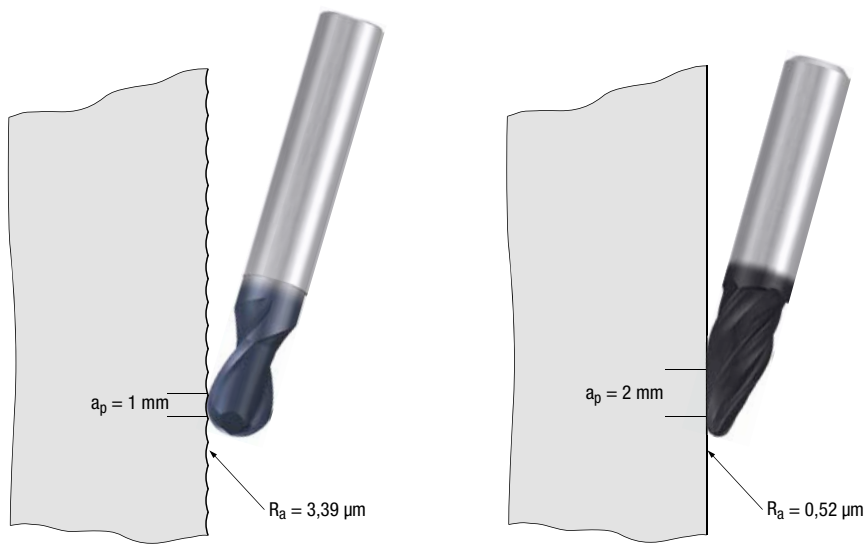
- Especially suitable for high-strength materials
- For almost all materials

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-2.1	2.2
K	3.1-4.1	4.2
N	1.1-1.4	1.5-1.6
N	2.1-3.2	4.1-4.2, 5.2
S	1.1-2.2	2.3
S	2.4	2.5-2.6
H		1.1

Lange Ausführung · Long design

Bestell-Code · Order code							3538L			
r ₁	r ₂	l ₁	l ₂	ø d ₂ h6	Z (Flutes)	Dimens.- Code				
1	95	57	22	6	3	.06095A	●			
1	90	63	25	8	3	.08090A	●			
2	85	72	26	10	4	.10085A	●			
2	80	83	28	12	4	.12080A	●			
3	75	92	31	16	4	.16075A	●			

Vergleich: Kugelfräser – Tonnenfräser
Comparison: Ball nose end mill – Barrel-shaped cutter



Ergebnis:
Tonnenfräser ermöglichen die doppelte axiale Zustellung (a_p) bei wesentlich besseren Oberflächengüten.

Result:
Double axial depth of cut (a_p) and much better surface finish with barrel-shaped cutters.



- Hochleistungswerkzeug
- Feine Schruppschicht-Verzahnung für zähe Werkstoffe
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- 3 Baulängen verfügbar
- High performance tool
- Fine semi-finishing profile for tough materials
- Internal coolant supply, axial exit (ICA)
- 3 lengths available

NF fein fine

ICA

HM

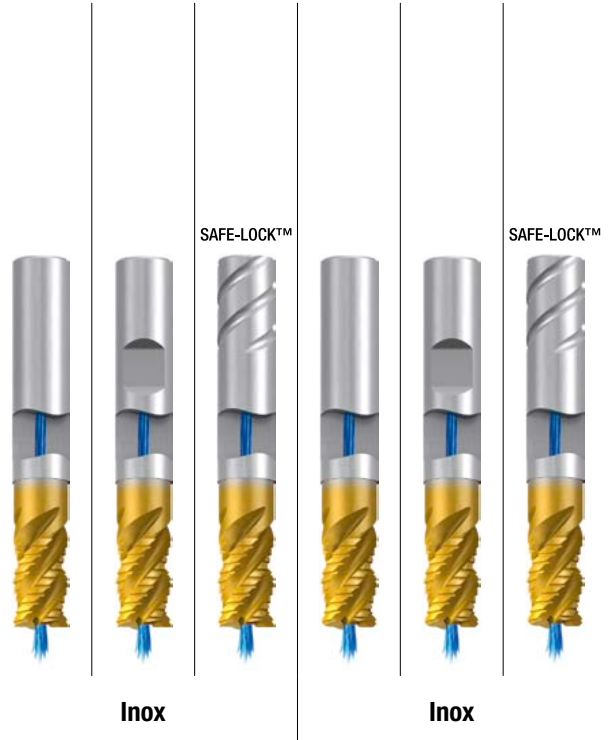
DIN 6535
HA
HB

45° 45°

ER 3-5°

V_c / f_z
45

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar
- Zum HPC-Schruppen geeignet

Applications – material (see page 2)

- Especially suitable for difficult to cut materials
- For all tough materials
- Suitable for HPC roughing

TIN / TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

TIN / TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code

$\varnothing d_1$ h11	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code	2646TZ	2647TZ	2646TT			
6	10	54	5,8	16	6	18	4	.006	●	●				
8	12	58	7,7	20	8	22	4	.008	●	●				
10	14	66	9,5	24	10	26	4	.010	●	●				
12	16	73	11,5	26	12	28	4	.012	●	●	○			
16	22	82	15,5	32	16	34	4	.016	●	●	○			
20	26	92	19,5	40	20	42	4	.020	●	●	○			

DIN 6527 – Kurze Ausführung · Short design

Eckenradius · Corner radius

Bestell-Code · Order code

$\varnothing d_1$ h11	r	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code			2642TZ	2643TZ	2642TT
12	2,5	16	73	11,5	26	12	28	4	.012025			●	●	○
12	3	16	73	11,5	26	12	28	4	.012030			●	●	○
12	4	16	73	11,5	26	12	28	4	.012040			●	●	○
16	2,5	22	82	15,5	32	16	34	4	.016025			●	●	○
16	3	22	82	15,5	32	16	34	4	.016030			●	●	○
16	4	22	82	15,5	32	16	34	4	.016040			●	●	○
20	2,5	26	92	19,5	40	20	42	4	.020025			●	●	○
20	3	26	92	19,5	40	20	42	4	.020030			●	●	○
20	4	26	92	19,5	40	20	42	4	.020040			●	●	○

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 53
Information regarding SAFE-LOCK™ clamping system, see page 53

- Hochleistungswerkzeug
- Feine Schruppschicht-Verzahnung für zähe Werkstoffe
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- 3 Baulängen verfügbar

- High performance tool
- Fine semi-finishing profile for tough materials
- Internal coolant supply, axial exit (ICA)
- 3 lengths available

NF fein fine

ICA

HM

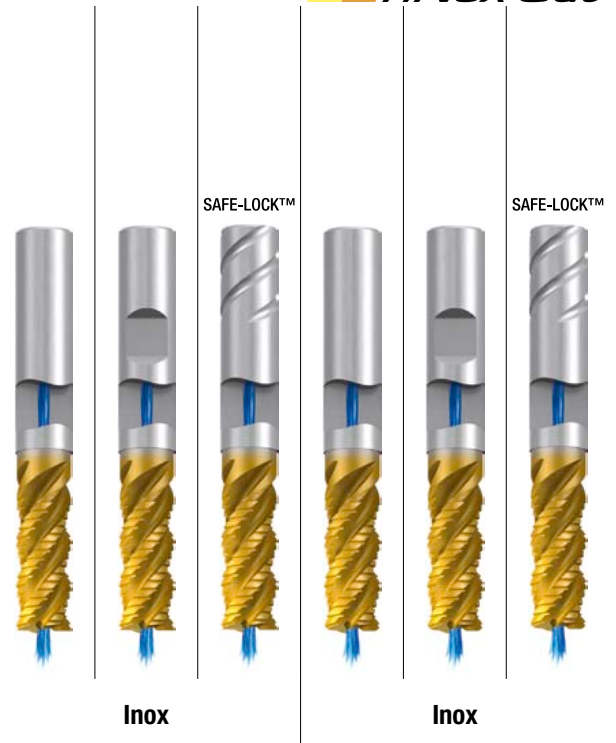
DIN 6535
HA HB

45° 45°

ER 3-5°

V_c / f_z
45

Optional



Beschichtung - Coating

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar
- Zum HPC-Schruppen geeignet

Applications – material (see page 2)

- Especially suitable for difficult to cut materials
- For all tough materials
- Suitable for HPC roughing

TIN / TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

TIN / TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code										2648TZ	2649TZ	2648TT		
ø d1 h11	l2	l1	ø d3	l4	ø d2 h6	lA	Z (Flutes)	Dimens.- Code						
6	13	57	5,8	20	6	21	4	.006	●	●				
8	19	63	7,7	25	8	27	4	.008	●	●				
10	22	72	9,5	30	10	32	4	.010	●	●				
12	26	83	11,5	35	12	38	4	.012	●	●	○			
16	32	92	15,5	40	16	44	4	.016	●	●	○			
20	38	104	19,5	50	20	54	4	.020	●	●	○			

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code												2670TZ	2671TZ	2670TT
ø d1 h11	r	l2	l1	ø d3	l4	ø d2 h6	lA	Z (Flutes)	Dimens.- Code					
12	2,5	26	83	11,5	35	12	38	4	.012025			●	●	○
12	3	26	83	11,5	35	12	38	4	.012030			●	●	○
12	4	26	83	11,5	35	12	38	4	.012040			●	●	○
16	2,5	32	92	15,5	40	16	44	4	.016025			●	●	○
16	3	32	92	15,5	40	16	44	4	.016030			●	●	○
16	4	32	92	15,5	40	16	44	4	.016040			●	●	○
20	2,5	38	104	19,5	50	20	54	4	.020025			●	●	○
20	3	38	104	19,5	50	20	54	4	.020030			●	●	○
20	4	38	104	19,5	50	20	54	4	.020040			●	●	○

- Hochleistungswerkzeug
- Feine Schruppschicht-Verzahnung für zähe Werkstoffe
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- Extra lange Ausführung mit langer Schneidenlänge
- 3 Baulängen verfügbar

- High performance tool
- Fine semi-finishing profile for tough materials
- Internal coolant supply, axial exit (ICA)
- Extra long design with long flute length
- 3 lengths available

NF fein fine

ICA

HM

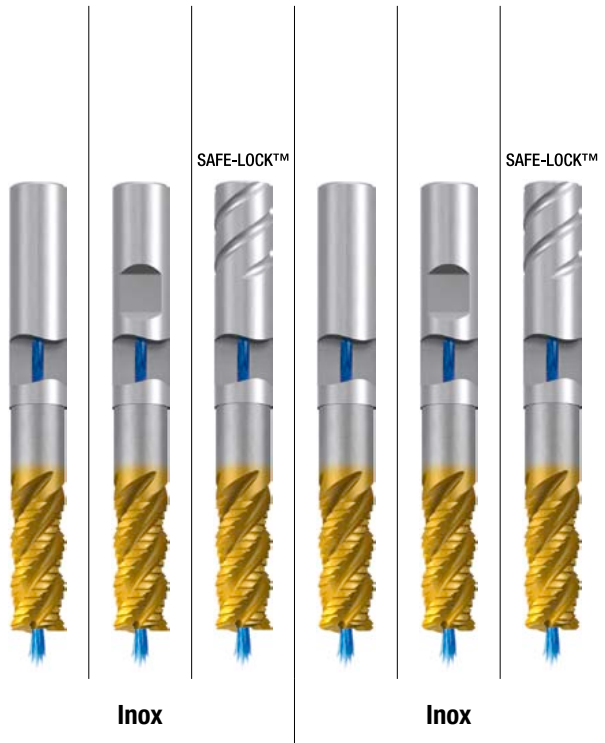
DIN 6535
HA
HB

45° 45°

ER 3-5°

V_c / f_z
45

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar
- Zum HPC-Schruppen geeignet

Applications – material (see page 2)

- Especially suitable for difficult to cut materials
- For all tough materials
- Suitable for HPC roughing

TIN / TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

TIN / TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\varnothing d_1$ h11	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code	2656TZ	2657TZ	2656TT
6	13	62	5,8	25	6	26	4	.006	●	●	
8	19	68	7,7	30	8	32	4	.008	●	●	
10	22	80	9,5	35	10	40	4	.010	●	●	
12	26	93	11,5	45	12	48	4	.012	●	●	○
16	32	108	15,5	55	16	60	4	.016	●	●	○
20	38	126	19,5	70	20	76	4	.020	●	●	○

Extra lange Ausführung · Extra long design

Eckenradius · Corner radius

Bestell-Code · Order code

$\varnothing d_1$ h11	r	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code	2658TZ	2659TZ	2658TT
6	0,5	13	62	5,8	25	6	26	4	.006005	●	●	
6	1	13	62	5,8	25	6	26	4	.006010	●	●	
8	1	19	68	7,7	30	8	32	4	.008010	●	●	
8	2	19	68	7,7	30	8	32	4	.008020	●	●	
10	2	22	80	9,5	35	10	40	4	.010020	●	●	
10	2,5	22	80	9,5	35	10	40	4	.010025	●	●	
12	2	26	93	11,5	45	12	48	4	.012020	●	●	○
12	2,5	26	93	11,5	45	12	48	4	.012025	●	●	○
12	3	26	93	11,5	45	12	48	4	.012030	●	●	○
12	4	26	93	11,5	45	12	48	4	.012040	●	●	○
16	2	32	108	15,5	55	16	60	4	.016020	●	●	○
16	2,5	32	108	15,5	55	16	60	4	.016025	●	●	○
16	3	32	108	15,5	55	16	60	4	.016030	●	●	○
16	4	32	108	15,5	55	16	60	4	.016040	●	●	○
20	2	38	126	19,5	70	20	76	4	.020020	●	●	○
20	2,5	38	126	19,5	70	20	76	4	.020025	●	●	○
20	3	38	126	19,5	70	20	76	4	.020030	●	●	○
20	4	38	126	19,5	70	20	76	4	.020040	●	●	○

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 53
Information regarding SAFE-LOCK™ clamping system, see page 53

- Multifunktionales Hochleistungswerkzeug
- Verschiedene Eckenradien pro Schneiddurchmesser
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)

- Multi-functional, high performance tool
- Several corner radii per cutting diameter
- Internal coolant supply, axial exit (ICA)

NR

fein
fine

ICA

HM

DIN 6535

HA

HB

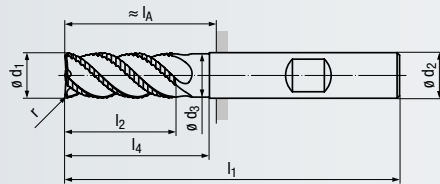
45°

ER

3-5°

V_c/f_z
46

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

- In fast allen Werkstoffen einsetzbar
- Volumenzerspanung
- Zum Schruppen bei labilen Verhältnissen hervorragend geeignet

Applications – material (see page 2)

- For almost all materials
- High-volume machining
- Suitable for roughing under unstable conditions

P	1.1-5.1
M	1.1-2.1
K	1.1-4.2
N	2.1-2.8
N	5.2
S	1.1-1.3
H	1.1

DIN 6527 – Lange Ausführung · Long design

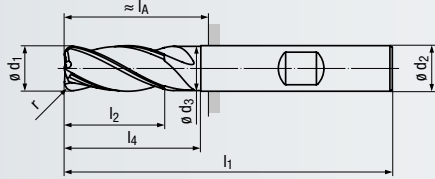
Eckenradius · Corner radius

Bestell-Code · Order code										2673AZ		
ø d ₁ h11	r	l ₂	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A	Z (Flutes)	Dimens.- Code			
6	0,5	13	57	5,8	20	6	21	4	.006005	●		
6	1	13	57	5,8	20	6	21	4	.006010	●		
6	1,5	13	57	5,8	20	6	21	4	.006015	●		
8	0,5	19	63	7,7	25	8	27	4	.008005	●		
8	1	19	63	7,7	25	8	27	4	.008010	●		
8	1,5	19	63	7,7	25	8	27	4	.008015	●		
8	2	19	63	7,7	25	8	27	4	.008020	●		
10	1	22	72	9,5	30	10	32	4	.010010	●		
10	1,5	22	72	9,5	30	10	32	4	.010015	●		
10	2	22	72	9,5	30	10	32	4	.010020	●		
12	1	26	83	11,5	35	12	38	4	.012010	●		
12	1,5	26	83	11,5	35	12	38	4	.012015	●		
12	2	26	83	11,5	35	12	38	4	.012020	●		
12	3	26	83	11,5	35	12	38	4	.012030	●		
14	1	26	83	13,5	35	14	38	4	.014010	●		
14	1,5	26	83	13,5	35	14	38	4	.014015	●		
14	2	26	83	13,5	35	14	38	4	.014020	●		
14	3	26	83	13,5	35	14	38	4	.014030	●		
16	1	32	92	15,5	40	16	44	4	.016010	●		
16	1,5	32	92	15,5	40	16	44	4	.016015	●		
16	2	32	92	15,5	40	16	44	4	.016020	●		
16	3	32	92	15,5	40	16	44	4	.016030	●		
20	1,5	38	104	19,5	50	20	54	4	.020015	●		
20	2	38	104	19,5	50	20	54	4	.020020	●		
20	3	38	104	19,5	50	20	54	4	.020030	●		

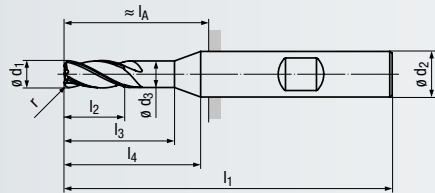
Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Verschiedene Eckenradien pro Schneidendurchmesser
- Schneiden zur Mitte

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Several corner radii per cutting diameter
- Centre cutting



Design I₃:



N

HM

DIN 6535
HA
HB

3-5°

35/38°

ER

V_c/f_z
47

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 2)

Applications – material (see page 2)

- In fast allen Werkstoffen, inklusive zähe Werkstoffe, einsetzbar
- Sehr gut zum Schruppen und Schlichten geeignet

- For almost all materials, including tough materials
- Very suitable for roughing and finishing

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4 1.5-1.6
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code											2698A	2699A			
$\varnothing d_1$ h10	r ±0,02	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A D	Z (Flutes)	Dimens.- Code					
3	0,1	8	14	57	2,9	20	6	21	4	.003001	●	●			
3	0,3	8	14	57	2,9	20	6	21	4	.003003	●	●			
3	0,5	8	14	57	2,9	20	6	21	4	.003005	●	●			
4	0,1	11	18	57	3,8	20	6	21	4	.004001	●	●			
4	0,3	11	18	57	3,8	20	6	21	4	.004003	●	●			
4	0,4	11	18	57	3,8	20	6	21	4	.004004	●	●			
4	0,5	11	18	57	3,8	20	6	21	4	.004005	●	●			
5	0,1	13	19	57	4,8	20	6	21	4	.005001	●	●			
5	0,3	13	19	57	4,8	20	6	21	4	.005003	●	●			
5	0,5	13	19	57	4,8	20	6	21	4	.005005	●	●			
5	1	13	19	57	4,8	20	6	21	4	.005010	●	●			
6	0,1	13	-	57	5,8	20	6	21	4	.006001	●	●			
6	0,5	13	-	57	5,8	20	6	21	4	.006005	●	●			
6	1,0	13	-	57	5,8	20	6	21	4	.006010	●	●			
6	1,5	13	-	57	5,8	20	6	21	4	.006015	●	●			
8	0,15	19	-	63	7,7	25	8	27	4	.008001	●	●			
8	0,5	19	-	63	7,7	25	8	27	4	.008005	●	●			
8	1	19	-	63	7,7	25	8	27	4	.008010	●	●			
8	1,5	19	-	63	7,7	25	8	27	4	.008015	●	●			
8	2	19	-	63	7,7	25	8	27	4	.008020	●	●			
10	0,15	22	-	72	9,5	30	10	32	4	.010001	●	●			
10	0,5	22	-	72	9,5	30	10	32	4	.010005	●	●			
10	1	22	-	72	9,5	30	10	32	4	.010010	●	●			
10	1,5	22	-	72	9,5	30	10	32	4	.010015	●	●			
10	2	22	-	72	9,5	30	10	32	4	.010020	●	●			
12	0,2	26	-	83	11,5	35	12	38	4	.012002	●	●			
12	0,5	26	-	83	11,5	35	12	38	4	.012005	●	●			
12	1	26	-	83	11,5	35	12	38	4	.012010	●	●			
12	1,5	26	-	83	11,5	35	12	38	4	.012015	●	●			
12	2	26	-	83	11,5	35	12	38	4	.012020	●	●			
12	3	26	-	83	11,5	35	12	38	4	.012030	●	●			
14	1	26	-	83	13,5	35	14	38	4	.014010	●	●			
16	0,3	32	-	92	15,5	40	16	44	4	.016003	●	●			
16	0,5	32	-	92	15,5	40	16	44	4	.016005	●	●			
16	1	32	-	92	15,5	40	16	44	4	.016010	●	●			
16	1,5	32	-	92	15,5	40	16	44	4	.016015	●	●			
16	2	32	-	92	15,5	40	16	44	4	.016020	●	●			
16	3	32	-	92	15,5	40	16	44	4	.016030	●	●			
16	4	32	-	92	15,5	40	16	44	4	.016040	●	●			
20	0,3	38	-	104	19,5	50	20	54	4	.020003	●	●			
20	0,5	38	-	104	19,5	50	20	54	4	.020005	●	●			
20	1	38	-	104	19,5	50	20	54	4	.020010	●	●			
20	1,5	38	-	104	19,5	50	20	54	4	.020015	●	●			
20	2	38	-	104	19,5	50	20	54	4	.020020	●	●			
20	3	38	-	104	19,5	50	20	54	4	.020030	●	●			

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Verschiedene Eckenradien pro Schneiddurchmesser
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Several corner radii per cutting diameter
- Internal coolant supply, axial exit (ICA)

N

ICA

HM

DIN 6535
HA
HB

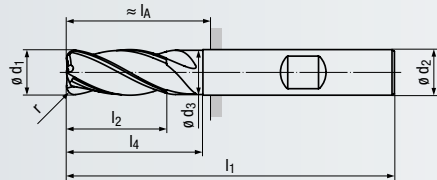
35/38°

ER

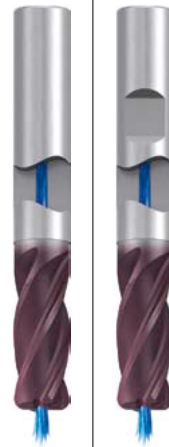
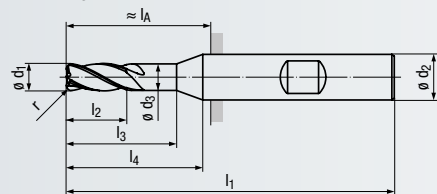
3-5°

V_c/f_z
47

Optional



Design I₃:



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- In fast allen Werkstoffen, inklusive zähe Werkstoffe, einsetzbar
- Sehr gut zum Schruppen und Schlichten geeignet

Applications – material (see page 2)

- For almost all materials, including tough materials
- Very suitable for roughing and finishing

TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4 1.5-1.6
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

DIN 6527 – Lange Ausführung · Long design

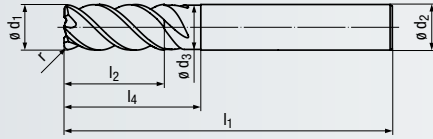
Eckenradius · Corner radius

Bestell-Code · Order code											2698AZ	2699AZ			
$\varnothing d_1$ h10	r ±0,02	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code					
3	0,3	8	14	57	2,9	20	6	21	4	.003003	●	●			
3	0,5	8	14	57	2,9	20	6	21	4	.003005	●	●			
4	0,3	11	18	57	3,8	20	6	21	4	.004003	●	●			
4	0,5	11	18	57	3,8	20	6	21	4	.004005	●	●			
5	0,3	13	19	57	4,8	20	6	21	4	.005003	●	●			
5	0,5	13	19	57	4,8	20	6	21	4	.005005	●	●			
6	0,5	13	–	57	5,8	20	6	21	4	.006005	●	●			
6	1,0	13	–	57	5,8	20	6	21	4	.006010	●	●			
6	1,5	13	–	57	5,8	20	6	21	4	.006015	●	●			
8	0,5	19	–	63	7,7	25	8	27	4	.008005	●	●			
8	1	19	–	63	7,7	25	8	27	4	.008010	●	●			
8	1,5	19	–	63	7,7	25	8	27	4	.008015	●	●			
8	2	19	–	63	7,7	25	8	27	4	.008020	●	●			
10	1	22	–	72	9,5	30	10	32	4	.010010	●	●			
10	1,5	22	–	72	9,5	30	10	32	4	.010015	●	●			
10	2	22	–	72	9,5	30	10	32	4	.010020	●	●			
12	1	26	–	83	11,5	35	12	38	4	.012010	●	●			
12	1,5	26	–	83	11,5	35	12	38	4	.012015	●	●			
12	2	26	–	83	11,5	35	12	38	4	.012020	●	●			
12	3	26	–	83	11,5	35	12	38	4	.012030	●	●			
16	1	32	–	92	15,5	40	16	44	4	.016010	●	●			
16	1,5	32	–	92	15,5	40	16	44	4	.016015	●	●			
16	2	32	–	92	15,5	40	16	44	4	.016020	●	●			
16	3	32	–	92	15,5	40	16	44	4	.016030	●	●			
20	1,5	38	–	104	19,5	50	20	54	4	.020015	●	●			
20	2	38	–	104	19,5	50	20	54	4	.020020	●	●			
20	3	38	–	104	19,5	50	20	54	4	.020030	●	●			

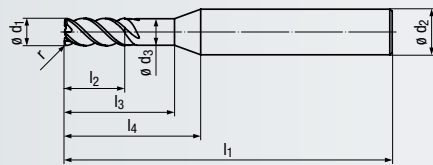
Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Hochleistungswerkzeug
- Schlicht-Verzahnung für zähe Werkstoffe
- Keine Vibrationen durch spezielle Geometrie
- Verschiedene Eckenradien pro Schneidendurchmesser
- Schneidlänge 3 x d₁

- High performance tool
- Finishing end mill for tough materials
- Special geometry prevents vibration
- Several corner radii per cutting diameter
- Flute length 3 x d₁



Design I₃:



N

HM

DIN 6535
HA
HB

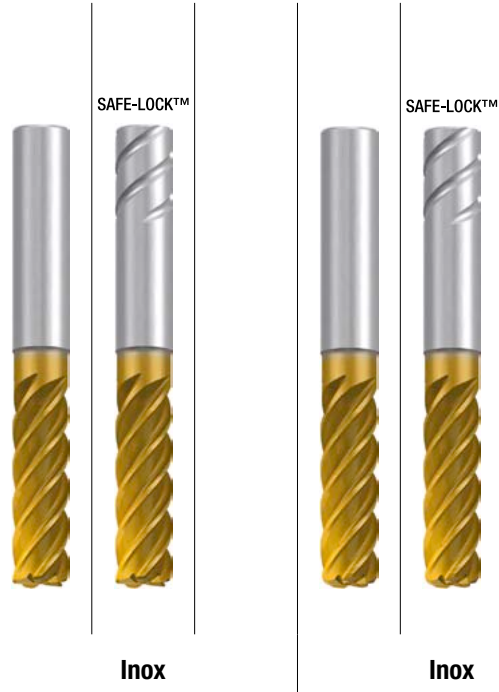
38/40/42°

KB x 45°

ER

V_c/f_z
48

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

Applications – material (see page 2)

- Especially suitable for difficult to cut materials
- For all tough materials
- Suitable for HSC finishing

TIN / TIALN

- P 1.1-5.1
- M 1.1-4.1
- K 1.1-4.2
- N 2.1-2.8, 5.2 1.2-1.6
- S 1.1-2.6

TIN / TIALN

- P 1.1-5.1
- M 1.1-4.1
- K 1.1-4.2
- N 2.1-2.8, 5.2 1.2-1.6
- S 1.1-2.6

3 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2644T	2644TS				
∅ d ₁ h10	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	KB	Z (Flutes)	Dimens.- Code						
3	9	12	62	2,9	23	6	0,07	4	.003	●					
4	12	16	62	3,8	25	6	0,07	4	.004	●					
5	15	20	62	4,8	25	6	0,12	4	.005	●					
6	18	–	62	5,8	25	6	0,12	4	.006	●					
8	24	–	68	7,7	30	8	0,12	5	.008	●					
10	30	–	80	9,5	35	10	0,2	5	.010	●					
12	36	–	93	11,5	45	12	0,2	5	.012	●	○				
16	48	–	112	15,5	60	16	0,2	5	.016	●	○				
20	60	–	130	19,5	75	20	0,3	5	.020	●	○				

3 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code										Eckenradius · Corner radius					
∅ d ₁ h10	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	Z (Flutes)	Dimens.- Code			2654T	2654TS		
12	2,5	36	–	93	11,5	45	12	5	.012025			●	○		
12	3	36	–	93	11,5	45	12	5	.012030			●	○		
12	4	36	–	93	11,5	45	12	5	.012040			●	○		
16	2,5	48	–	112	15,5	60	16	5	.016025			●	○		
16	3	48	–	112	15,5	60	16	5	.016030			●	○		
16	4	48	–	112	15,5	60	16	5	.016040			●	○		
20	2,5	60	–	130	19,5	75	20	5	.020025			●	○		
20	3	60	–	130	19,5	75	20	5	.020030			●	○		
20	4	60	–	130	19,5	75	20	5	.020040			●	○		

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 53
Information regarding SAFE-LOCK™ clamping system, see page 53

- Hochleistungswerkzeug
- Schlicht-Verzahnung für zähe Werkstoffe
- Keine Vibrationen durch spezielle Geometrie
- Verschiedene Eckenradien pro Schneidendurchmesser
- Extra lange Ausführungen
- Schneidenlänge $4 \times d_1$

- High performance tool
- Finishing end mill for tough materials
- Special geometry prevents vibration
- Several corner radii per cutting diameter
- Extra long design
- Flute length $4 \times d_1$

N

HM


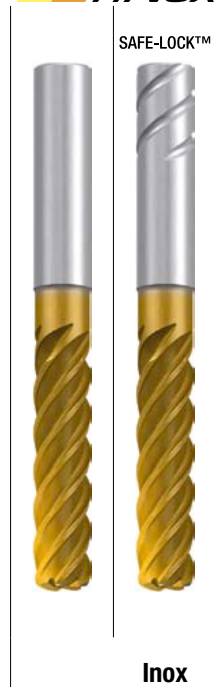
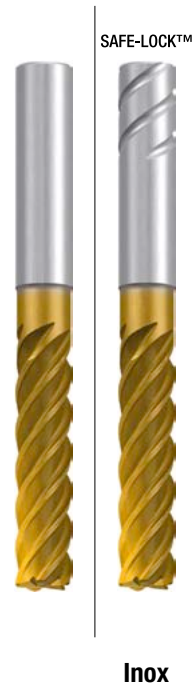
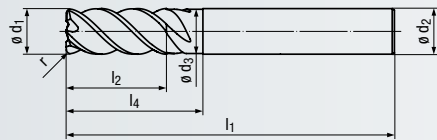
DIN 6535
HA
HB

38/40/42° **KB x 45°**

ER

v_c/f_z
48

Optional

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- Speziell für schwer zerspanbare Werkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

Applications – material (see page 2)

- Especially suitable for difficult to cut materials
- For all tough materials
- Suitable for HSC finishing

TIN / TIALN

- P** 1.1-5.1
- M** 1.1-4.1
- K** 1.1-4.2
- N** 2.1-2.8, 5.2 1.2-1.6
- S** 1.1-2.6

TIN / TIALN

- P** 1.1-5.1
- M** 1.1-4.1
- K** 1.1-4.2
- N** 2.1-2.8, 5.2 1.2-1.6
- S** 1.1-2.6

4 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2645T	2645TS				
$\varnothing d_1$	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	KB	Z	Dimens.-Code							
h10					h6		(Flutes)								
12	48	107	11,5	60	12	0,2	5	.012	●	○					
16	64	128	15,5	75	16	0,2	5	.016	●	○					
20	80	150	19,5	90	20	0,3	5	.020	●	○					

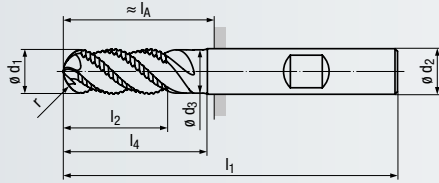
4 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code										Eckenradius · Corner radius					
$\varnothing d_1$	r	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	Z	Dimens.-Code							
h10						h6	(Flutes)								
12	2,5	48	107	11,5	60	12	5	.012025	●	○					
12	3	48	107	11,5	60	12	5	.012030	●	○					
12	4	48	107	11,5	60	12	5	.012040	●	○					
16	2,5	64	128	15,5	75	16	5	.016025	●	○					
16	3	64	128	15,5	75	16	5	.016030	●	○					
16	4	64	128	15,5	75	16	5	.016040	●	○					
20	2,5	80	150	19,5	90	20	5	.020025	●	○					
20	3	80	150	19,5	90	20	5	.020030	●	○					
20	4	80	150	19,5	90	20	5	.020040	●	○					

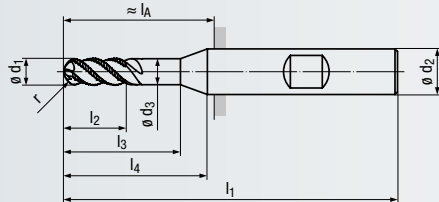
Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Multifunktionales Hochleistungswerkzeug
- Spanteiler auch im Radiusbereich
- Schneiden zur Mitte

- Multi-functional, high performance tool
- Chip-breakers also in the radius section
- Centre cutting



Design I₃:



- NR** fein fine
- HM**
- DIN 6535** HA HB
- 45°**
- Kugel**
- 3-5°**
- V_c/f_z** 46
- Optional**



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 2)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen bei labilen Verhältnissen hervorragend geeignet
- Zum 3D-Schruppen geeignet

Applications – material (see page 2)

- For almost all materials
- Suitable for roughing under unstable conditions
- Suitable for 3D-roughing

TIALN

P	1.1-5.1
K	1.1-4.2
N	2.1-2.8, 5.2 4.1
S	1.1-1.3
H	1.1

Lange Ausführung · Long design

Bestell-Code · Order code

ϕd_1 h11	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A	Z (Flutes)	Dimens.- Code	2667A				
3	1,5	8	14	57	2,9	18	6	21	3	.003	●				
4	2	11	18	57	3,8	20	6	21	3	.004	●				
5	2,5	13	19	57	4,8	20	6	21	3	.005	●				
6	3	13	–	57	5,8	20	6	21	4	.006	●				
8	4	19	–	63	7,7	25	8	27	4	.008	●				
10	5	22	–	72	9,5	30	10	32	4	.010	●				
12	6	26	–	83	11,5	35	12	38	4	.012	●				
14	7	26	–	83	13,5	35	14	38	4	.014	●				
16	8	32	–	92	15,5	40	16	44	4	.016	●				
20	10	38	–	104	19,5	50	20	54	4	.020	●				

- Multifunktionales Werkzeug
- Schneiden zur Mitte
- 2 Baulängen verfügbar

- Multi-functional tool
- Centre cutting
- 2 lengths available

N

HM

DIN 6535
HA
HB

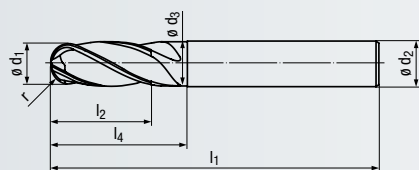
30°

Kugel

3-5°

V_c/f_z
49

Optional



Allround



Allround

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 2)

- In fast allen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

Applications – material (see page 2)

- For almost all materials
- Suitable for HSC finishing

P	1.1-5.1		P	1.1-5.1	
M	1.1-2.1	3.1-4.1	M	1.1-2.1	3.1-4.1
K	1.1-2.2	3.1-4.2	K	1.1-2.2	3.1-4.2
N	2.1-2.8, 4.1-4.2		N	2.1-2.8, 4.1-4.2	
N	5.2-5.3		N	5.2-5.3	
S		1.1-2.6	S		1.1-2.6

Lange Ausführung · Long design

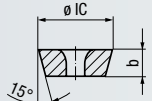



Bestell-Code · Order code									1867A		
$\varnothing d_1$ h10	r	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
2	1	6	38	—	—	2	4	.002	●		
3	1,5	10	38	—	—	3	4	.003	●		
4	2	10	40	—	—	4	4	.004	●		
5	2,5	13	50	4,8	20	5	4	.005	●		
6	3	13	57	5,8	20	6	4	.006	●		
8	4	19	63	7,7	25	8	4	.008	●		
10	5	22	72	9,7	30	10	4	.010	●		
12	6	26	83	11,6	35	12	4	.012	●		
14	7	26	83	13,6	35	14	4	.014	●		
16	8	32	92	15,5	40	16	4	.016	●		

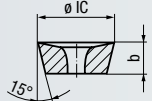

Extra lange Ausführung · Extra long design

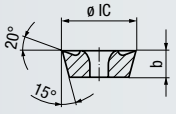

Bestell-Code · Order code											1967A
$\varnothing d_1$ h10	r	l_2	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
6	3	40	100	5,8	60	6	4	.006			●
8	4	40	100	7,7	60	8	4	.008			●
10	5	40	100	9,7	55	10	4	.010			●
12	6	45	100	11,6	50	12	4	.012			●
14	7	45	100	13,6	50	14	4	.014			●
16	8	65	150	15,5	90	16	4	.016			●



Bestell-Code mit seitlicher Mitnahmefläche: 1868A (lange Ausführung) und 1968A (extra lange Ausführung)
Order code with side-lock clamping: 1868A (long design) and 1968A (extra long design)

<ul style="list-style-type: none"> - Ohne Spanleitstufe - Leistungsfähige Hartmetallsorten <ul style="list-style-type: none"> - Without chip former - High performance carbide grades <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">HM</div> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">0°</div> </div> <div style="text-align: center; margin-top: 10px;">  <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4; display: inline-block;">V_c/f_z 50</div> </div>	 Steel	 Steel	 Hard materials																			
Schneidstoff · Cutting material	PE1	KC3	KP1																			
Beschichtung · Coating	TIALN	TIALN	TIALN																			
Einsatzgebiete – Material (siehe Seite 2) <ul style="list-style-type: none"> - Für Stahl- und Gusswerkstoffe - Geeignet zur Bearbeitung harter Werkstoffe - Zum Schruppen und Schlichten 	Applications – material (see page 2) <ul style="list-style-type: none"> - For steel and cast materials - Suitable for machining hard materials - For roughing and finishing 	<table border="1" style="width: 100%; text-align: center;"> <tr><td>P</td><td>1.1-5.1</td><td></td></tr> <tr><td>K</td><td>1.1-4.2</td><td></td></tr> <tr><td>H</td><td>1.1-1.2</td><td>1.3-1.5</td></tr> </table>	P	1.1-5.1		K	1.1-4.2		H	1.1-1.2	1.3-1.5	<table border="1" style="width: 100%; text-align: center;"> <tr><td>P</td><td>1.1-3.1</td><td>4.1-5.1</td></tr> <tr><td>K</td><td>1.1-4.2</td><td></td></tr> <tr><td>H</td><td>1.1-1.4</td><td>1.5</td></tr> </table>	P	1.1-3.1	4.1-5.1	K	1.1-4.2		H	1.1-1.4	1.5	
P	1.1-5.1																					
K	1.1-4.2																					
H	1.1-1.2	1.3-1.5																				
P	1.1-3.1	4.1-5.1																				
K	1.1-4.2																					
H	1.1-1.4	1.5																				
Bestell-Code · Order code	9601A	9607A	9608A																			
<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>IC</th> <th>b</th> <th>Dimens.-Code</th> </tr> </thead> <tbody> <tr><td>IC 8</td><td>2,6</td><td>.08</td></tr> <tr><td>IC 10</td><td>3,6</td><td>.10</td></tr> <tr><td>IC 12</td><td>4,5</td><td>.12</td></tr> </tbody> </table>	IC	b	Dimens.-Code	IC 8	2,6	.08	IC 10	3,6	.10	IC 12	4,5	.12	●	●	●							
IC	b	Dimens.-Code																				
IC 8	2,6	.08																				
IC 10	3,6	.10																				
IC 12	4,5	.12																				

<ul style="list-style-type: none"> - Mit Spanmulde für optimalen Spanfluss - Universell verwendbar <ul style="list-style-type: none"> - With chip former for optimal chip removal - Highly versatile <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4;">HM</div> </div> <div style="text-align: center; margin-top: 10px;">  <div style="border: 1px solid black; padding: 5px; background-color: #fff9c4; display: inline-block;">V_c/f_z 51</div> </div>	Präzisionsgesintert Precision-sintered  Allround																					
Schneidstoff · Cutting material	PE3																					
Beschichtung · Coating	ALO																					
Einsatzgebiete – Material (siehe Seite 2) <ul style="list-style-type: none"> - Zum Schruppen von Stahlwerkstoffen und nicht-rostenden Stahlwerkstoffen 	Applications – material (see page 2) <ul style="list-style-type: none"> - For roughing steel materials and stainless steel materials 	<table border="1" style="width: 100%; text-align: center;"> <tr><td>P</td><td>1.1-5.1</td><td></td></tr> <tr><td>M</td><td>1.1-4.1</td><td></td></tr> <tr><td>K</td><td>1.1-4.2</td><td></td></tr> <tr><td>N</td><td>2.1-3.2</td><td></td></tr> <tr><td>N</td><td>5.1-5.2</td><td></td></tr> <tr><td>S</td><td>1.1-1.3</td><td></td></tr> </table>	P	1.1-5.1		M	1.1-4.1		K	1.1-4.2		N	2.1-3.2		N	5.1-5.2		S	1.1-1.3			
P	1.1-5.1																					
M	1.1-4.1																					
K	1.1-4.2																					
N	2.1-3.2																					
N	5.1-5.2																					
S	1.1-1.3																					
Bestell-Code · Order code	9619X																					
<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>IC</th> <th>b</th> <th>Dimens.-Code</th> </tr> </thead> <tbody> <tr><td>IC 8</td><td>2,6</td><td>.08</td></tr> <tr><td>IC 10</td><td>3,6</td><td>.10</td></tr> <tr><td>IC 12</td><td>4,5</td><td>.12</td></tr> <tr><td>IC 16</td><td>5,5</td><td>.16</td></tr> </tbody> </table>	IC	b	Dimens.-Code	IC 8	2,6	.08	IC 10	3,6	.10	IC 12	4,5	.12	IC 16	5,5	.16	●	●	●				
IC	b	Dimens.-Code																				
IC 8	2,6	.08																				
IC 10	3,6	.10																				
IC 12	4,5	.12																				
IC 16	5,5	.16																				

- Spanleitstufe 20° - Chip former 20°					
		HM	20°		
		v_c/f_z 52	AI		
Schneidstoff · Cutting material		KC3			
Beschichtung · Coating		TIALN			
Einsatzgebiete – Material (siehe Seite 2)		M 1.1-2.1 N 1.1-1.4 N 2.1-2.2 2.3-2.8 N 4.1-4.4 S 1.1 1.2-1.3			
- Geeignet zum Vorschlichten und Schlichten von Nichteisenwerkstoffen		Applications – material (see page 2) - Suitable for pre-finishing and finishing non-ferrous materials			
Bestell-Code · Order code		9617A			
IC	b	Dimens.-Code			
IC 8	2,6	.08	●		
IC 10	3,6	.10	●		
IC 12	4,5	.12	●		

Lieferbar solange vorrätig
Available while stocks last

Bearbeitungsbeispiele
Application examples



3D Schruppen
3D Roughing

Material:	1.4021 – X20Cr13
Werkzeug:	Einschraubfräskörper D40 / Wendeplatte PE3 IC12
Tool:	Screw-in milling body D40 / Indexable insert PE3 IC12
Artikel-Nr.:	9165.400404 / 9619X.12
Article no.:	
Kühlung:	Emulsion von außen sowie innere Kühlschmierstoff-Zufuhr mit 40 bar
Cooling:	External cooling with emulsion and internal coolant supply at 40 bar
Schnittdaten:	v _c = 140 m/min, n = 1115 min ⁻¹ (rpm)
Cutting data:	f _z = 0,2 mm, v _f = 892 mm/min
Axiale Zustellung:	a _p = 1,5 mm
Axial depth of cut:	
Radiale Zustellung:	a _e = 28 mm
Radial depth of cut:	

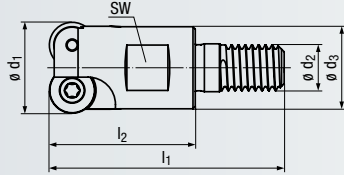
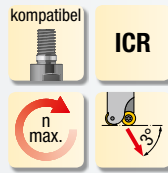
Planfräsen
Face milling

Material:	1.4301 – X5CrNi 18-20
Material:	
Werkzeug:	Einschraubfräskörper D25 / Wendeplatte PE3 IC10
Tool:	Screw-in milling body D25 / Indexable insert PE3 IC10
Artikel-Nr.:	9160.250363 / 9619X.10
Article no.:	
Kühlung:	Emulsion von außen sowie innere Kühlschmierstoff-Zufuhr mit 40 bar
Cooling:	External cooling with emulsion and internal coolant supply at 40 bar
Schnittdaten:	v _c = 60 m/min, n = 764 min ⁻¹ (rpm)
Cutting data:	f _z = 0,2 mm, v _f = 458 mm/min
Axiale Zustellung:	a _p = 1 mm
Axial depth of cut:	
Radiale Zustellung:	a _e = 17,5 mm
Radial depth of cut:	

● = Lagerwerkzeug, siehe Preisliste · Stock tool, see price list
○ = Kurzfristig lieferbar, Preis auf Anfrage · Available at short notice, price on request

- Einschraubfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern

- Indexable screw-in end mill
- Internal coolant supply, radial exit (ICR)
- Compatible with commercially available screw-in holders and adapters



IC 8

Bestell-Code · Order code

9155

$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code	
16	25	43	10	13	M 8	15 Nm	40 000	2	.160252	●
20	32	52	15	18	M 10	30 Nm	35 000	2	.200322	● *
20	32	52	15	18	M 10	30 Nm	35 000	3	.200323	●
25	32	54	17	21	M 12	50 Nm	30 000	3	.250323	●

IC 10

Bestell-Code · Order code

9160

$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code	
20	32	52	15	18	M 10	30 Nm	45 000	2	.200322	●
25	36	58	17	21	M 12	50 Nm	40 000	2	.250362	●
25	36	58	17	21	M 12	50 Nm	40 000	3	.250363	●
32	40	64	22	29	M 16	100 Nm	30 000	4	.320404	●
40	40	64	22	29	M 16	100 Nm	25 000	5	.400405	●

IC 12

Bestell-Code · Order code

9165

$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code	
25	36	58	17	21	M 12	50 Nm	40 000	2	.250362	●
32	40	64	22	29	M 16	100 Nm	30 000	3	.320403	●
40	40	64	22	29	M 16	100 Nm	25 000	4	.400404	●

Lieferumfang: ohne Wendeschneidplatten, mit Torx-Schrauben
Delivery: without inserts, with Torx screws

* Lieferbar solange vorrätig
Available while stocks last

Zubehör · Accessories

Schraubendreher · Screwdriver



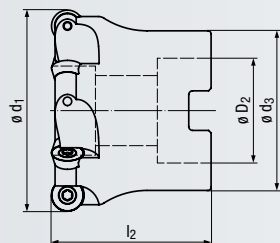
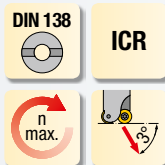
Spannschraube · Clamping Screw



Bestell-Code · Order code	Größe Size	Dimens.- Code	
IC 8	Torx T9	.09	●
IC 10 / IC 12	Torx T15	.15	●
IC 16	Torx T20	.20	●

Bestell-Code · Order code	Größe Size	M_d max.	Dimens.- Code	
IC 8	M3 x 5,6 x Torx T9	2,25 Nm	.305609	●
IC 10 (d ₁ = 20)	M3,5 x 6,5 x Torx T15	3,45 Nm	.356515	●
IC 10 / IC 12	M3,5 x 9 x Torx T15	3,45 Nm	.359015	●
IC 16	M4,5 x 10 x Torx T20	7,6 Nm	.451020	●

- Aufsteckfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Indexable milling cutter
- Internal coolant supply, radial exit (ICR)



IC 10

Bestell-Code · Order code							9260
$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code	
50	50	40	22	22 000	5	.05005	●
63	50	50	27	18 000	6	.06306	●
80	50	50	27	16 000	7	.08007	●

IC 12

Bestell-Code · Order code							9265
$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code	
50	50	40	22	22 000	5	.05005	●
63	50	50	27	20 000	6	.06306	●
80	50	60	27	18 000	7	.08007	●
100	56	78	32	15 000	8	.10008	●

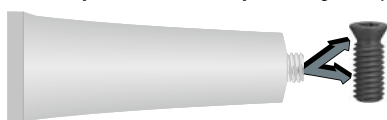
IC 16

Bestell-Code · Order code							9275
$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code	
52	50	40	22	25 000	4	.05204	●
63	50	50	27	20 000	5	.06305	●
80	50	60	27	18 000	6	.08006	●
100	56	78	32	15 000	7	.10007	●
125	65	90	40	12 000	8	.12508	●

Lieferumfang: ohne Wendeschneidplatten, mit Torx-Schrauben
 Delivery: without inserts, with Torx screws

Zubehör · Accessories

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



Bestell-Code · Order code		9000
Menge Quantity	Dimens.- Code	
100 g	.000	●

Sicherstellung der Lösbarkeit von Torx-Schrauben für Wendeschneidplatten durch leichtes Einfetten von Gewinde und Senkkopf!

Applying a light coating of grease on thread and countersunk head ensures that the Torx screws for the inserts can be loosened again.

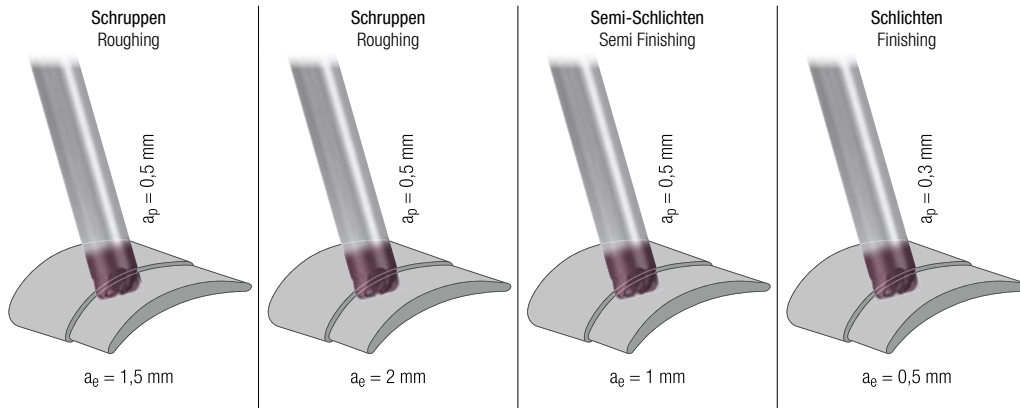


Hartmetall-Torusfräser – lange und extra lange Ausführung

Solid carbide torus end mills – long and extra long design

N

Gültig für · Valid for
2676AZ

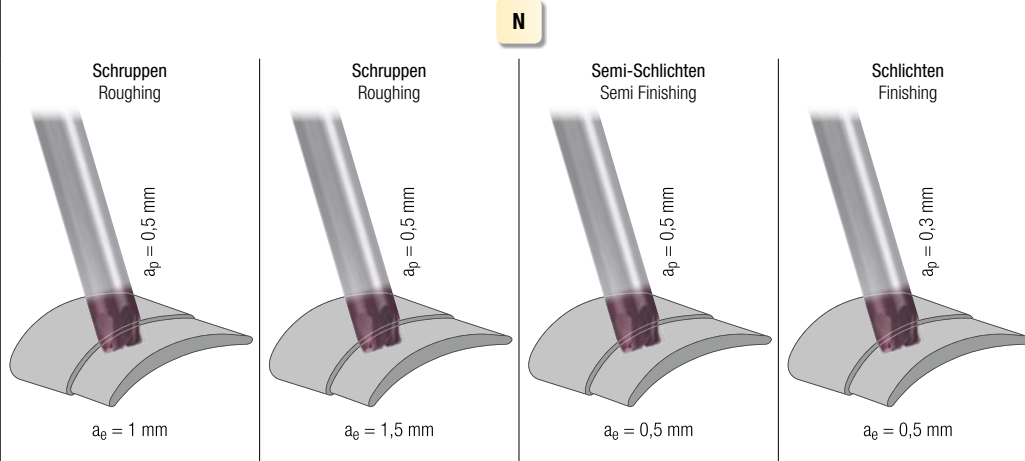


		Schruppen Roughing		Schruppen Roughing		Semi-Schlichten Semi Finishing		Schlichten Finishing				MMS MQL	
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1	160	$0,008 \times d_1$	140	$0,007 \times d_1$	180	$0,009 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	150	$0,007 \times d_1$	130	$0,006 \times d_1$	170	$0,008 \times d_1$	190	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	140	$0,006 \times d_1$	120	$0,006 \times d_1$	160	$0,007 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	130	$0,006 \times d_1$	110	$0,005 \times d_1$	150	$0,006 \times d_1$	170	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	5.1	120	$0,005 \times d_1$	110	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
M	1.1	90	$0,006 \times d_1$	80	$0,005 \times d_1$	100	$0,006 \times d_1$	120	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,005 \times d_1$	70	$0,004 \times d_1$	90	$0,005 \times d_1$	100	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60	$0,004 \times d_1$	50	$0,004 \times d_1$	70	$0,005 \times d_1$	80	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40	$0,004 \times d_1$	40	$0,003 \times d_1$	50	$0,004 \times d_1$	60	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	190	$0,01 \times d_1$	160	$0,008 \times d_1$	210	$0,011 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	190	$0,01 \times d_1$	160	$0,008 \times d_1$	210	$0,011 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	170	$0,009 \times d_1$	150	$0,008 \times d_1$	190	$0,01 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	170	$0,009 \times d_1$	150	$0,008 \times d_1$	190	$0,01 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	160	$0,008 \times d_1$	140	$0,007 \times d_1$	180	$0,009 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	160	$0,008 \times d_1$	140	$0,007 \times d_1$	180	$0,009 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	140	$0,007 \times d_1$	120	$0,006 \times d_1$	160	$0,008 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2	120	$0,006 \times d_1$	110	$0,006 \times d_1$	140	$0,007 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N	1.1							500	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2							500	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3							500	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4							440	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5							400	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6							300	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	200	$0,008 \times d_1$	180	$0,007 \times d_1$	230	$0,009 \times d_1$	260	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	200	$0,008 \times d_1$	180	$0,007 \times d_1$	230	$0,009 \times d_1$	260	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	200	$0,008 \times d_1$	180	$0,007 \times d_1$	230	$0,009 \times d_1$	260	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	170	$0,006 \times d_1$	150	$0,006 \times d_1$	190	$0,007 \times d_1$	220	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	170	$0,006 \times d_1$	150	$0,006 \times d_1$	190	$0,007 \times d_1$	220	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	170	$0,006 \times d_1$	150	$0,006 \times d_1$	190	$0,007 \times d_1$	220	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	110	$0,006 \times d_1$	90	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	110	$0,006 \times d_1$	90	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	320	$0,016 \times d_1$	280	$0,014 \times d_1$	360	$0,018 \times d_1$	400	$0,012 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	320	$0,016 \times d_1$	280	$0,014 \times d_1$	360	$0,018 \times d_1$	400	$0,012 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1													
4.2													
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1	120	$0,008 \times d_1$	110	$0,007 \times d_1$	140	$0,009 \times d_1$	160	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	90	$0,007 \times d_1$	80	$0,006 \times d_1$	100	$0,008 \times d_1$	120	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	60	$0,006 \times d_1$	50	$0,006 \times d_1$	70	$0,007 \times d_1$	80	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	90	$0,007 \times d_1$	80	$0,006 \times d_1$	100	$0,008 \times d_1$	110	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	40	$0,006 \times d_1$	30	$0,005 \times d_1$	50	$0,006 \times d_1$	50	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	30	$0,005 \times d_1$	30	$0,004 \times d_1$	30	$0,005 \times d_1$	40	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	40	$0,006 \times d_1$	30	$0,005 \times d_1$	50	$0,006 \times d_1$	50	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5	20	$0,005 \times d_1$	20	$0,004 \times d_1$	30	$0,005 \times d_1$	30	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6	30	$0,004 \times d_1$	30	$0,004 \times d_1$	30	$0,005 \times d_1$	40	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

Konische Hartmetall-Torusfräser – lange und extra lange Ausführung
Tapered solid carbide torus end mills – long and extra long design

Gültig für · Valid for

2677AZ
2678AZ



N

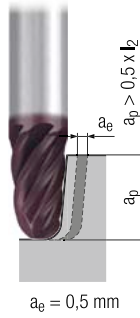
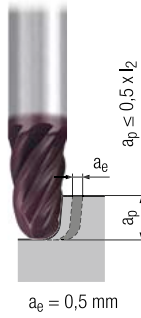
		Schruppen Roughing		Semi-Schlichten Semi Finishing		Schlichten Finishing							
		V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]						
P	1.1	160	$0,005 \times d_1$	140	$0,004 \times d_1$	180	$0,008 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	150	$0,005 \times d_1$	130	$0,004 \times d_1$	170	$0,007 \times d_1$	190	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	140	$0,004 \times d_1$	120	$0,003 \times d_1$	160	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	130	$0,004 \times d_1$	110	$0,003 \times d_1$	150	$0,006 \times d_1$	170	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	5.1	120	$0,003 \times d_1$	110	$0,002 \times d_1$	140	$0,005 \times d_1$	160	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
M	1.1	90	$0,004 \times d_1$	80	$0,003 \times d_1$	100	$0,006 \times d_1$	120	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,003 \times d_1$	70	$0,002 \times d_1$	90	$0,005 \times d_1$	100	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60	$0,003 \times d_1$	50	$0,002 \times d_1$	70	$0,004 \times d_1$	80	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40	$0,002 \times d_1$	40	$0,002 \times d_1$	50	$0,004 \times d_1$	60	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	190	$0,006 \times d_1$	160	$0,005 \times d_1$	210	$0,01 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	190	$0,006 \times d_1$	160	$0,005 \times d_1$	210	$0,01 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	170	$0,006 \times d_1$	150	$0,004 \times d_1$	190	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	170	$0,006 \times d_1$	150	$0,004 \times d_1$	190	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	160	$0,005 \times d_1$	140	$0,004 \times d_1$	180	$0,008 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	160	$0,005 \times d_1$	140	$0,004 \times d_1$	180	$0,008 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	140	$0,005 \times d_1$	120	$0,004 \times d_1$	160	$0,007 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	120	$0,004 \times d_1$	110	$0,003 \times d_1$	140	$0,006 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1							500	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2							500	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3							500	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4							440	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5							400	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6							300	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	200	$0,005 \times d_1$	180	$0,004 \times d_1$	230	$0,008 \times d_1$	260	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	200	$0,005 \times d_1$	180	$0,004 \times d_1$	230	$0,008 \times d_1$	260	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	200	$0,005 \times d_1$	180	$0,004 \times d_1$	230	$0,008 \times d_1$	260	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	170	$0,004 \times d_1$	150	$0,003 \times d_1$	190	$0,006 \times d_1$	220	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	170	$0,004 \times d_1$	150	$0,003 \times d_1$	190	$0,006 \times d_1$	220	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	170	$0,004 \times d_1$	150	$0,003 \times d_1$	190	$0,006 \times d_1$	220	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	110	$0,004 \times d_1$	90	$0,003 \times d_1$	120	$0,006 \times d_1$	140	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	110	$0,004 \times d_1$	90	$0,003 \times d_1$	120	$0,006 \times d_1$	140	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	320	$0,01 \times d_1$	280	$0,008 \times d_1$	360	$0,016 \times d_1$	400	$0,012 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	320	$0,01 \times d_1$	280	$0,008 \times d_1$	360	$0,016 \times d_1$	400	$0,012 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1													
4.2													
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1	120	$0,005 \times d_1$	110	$0,004 \times d_1$	140	$0,008 \times d_1$	160	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	90	$0,005 \times d_1$	80	$0,004 \times d_1$	100	$0,007 \times d_1$	120	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	60	$0,004 \times d_1$	50	$0,003 \times d_1$	70	$0,006 \times d_1$	80	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	90	$0,005 \times d_1$	80	$0,004 \times d_1$	100	$0,007 \times d_1$	110	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	40	$0,004 \times d_1$	30	$0,003 \times d_1$	50	$0,006 \times d_1$	50	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	30	$0,003 \times d_1$	30	$0,002 \times d_1$	30	$0,005 \times d_1$	40	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	40	$0,004 \times d_1$	30	$0,003 \times d_1$	50	$0,006 \times d_1$	50	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5	20	$0,003 \times d_1$	20	$0,002 \times d_1$	30	$0,005 \times d_1$	30	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6	30	$0,003 \times d_1$	30	$0,002 \times d_1$	30	$0,004 \times d_1$	40	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

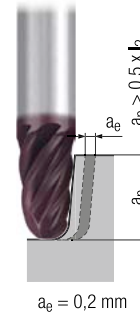
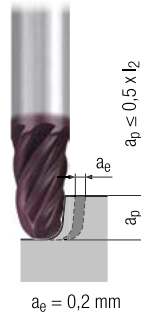
Konische Hartmetall-Kugelfräser Tapered solid carbide ball nose end mills

N

Vorschlichten
Pre-finishing

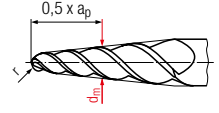


Schlichten
Finishing



Gültig für · Valid for
2679A

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.
For the calculation of rpm (n), use the average diameter d_m (measuring point at $0,5 \times a_p$).



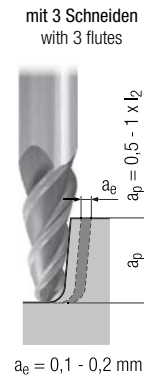
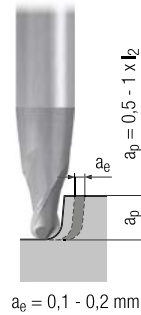
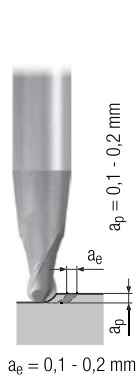
$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$

		Vorschlichten Pre-finishing		Schlichten Finishing		MMS MQL	Coolant						
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]								
P	1.1	130	0,008 x r	100	0,007 x r	160	0,011 x r	120	0,009 x r	□	■	□	■
	2.1	120	0,007 x r	90	0,006 x r	150	0,01 x r	110	0,008 x r	□	■	□	■
	3.1	110	0,006 x r	90	0,006 x r	140	0,009 x r	100	0,007 x r	□	■	□	■
	4.1	110	0,006 x r	80	0,005 x r	130	0,008 x r	100	0,006 x r	□	■	□	■
	5.1	100	0,005 x r	80	0,004 x r	120	0,007 x r	90	0,005 x r	□	■	□	■
M	1.1	70	0,006 x r	60	0,005 x r	90	0,008 x r	70	0,006 x r			□	■
	2.1	60	0,005 x r	50	0,004 x r	80	0,007 x r	60	0,005 x r			□	■
	3.1	50	0,004 x r	40	0,004 x r	60	0,006 x r	40	0,005 x r			□	■
	4.1	30	0,004 x r	30	0,003 x r	40	0,005 x r	30	0,004 x r			□	■
K	1.1	150	0,01 x r	120	0,008 x r	190	0,013 x r	140	0,011 x r	□	■	□	■
	1.2	150	0,01 x r	120	0,008 x r	190	0,013 x r	140	0,011 x r	□	■	□	■
	2.1	140	0,009 x r	110	0,008 x r	170	0,012 x r	130	0,01 x r	□	■	□	■
	2.2	140	0,009 x r	110	0,008 x r	170	0,012 x r	130	0,01 x r	□	■	□	■
	3.1	130	0,008 x r	100	0,007 x r	160	0,011 x r	120	0,009 x r	□	■	□	■
	3.2	130	0,008 x r	100	0,007 x r	160	0,011 x r	120	0,009 x r	□	■	□	■
	4.1	110	0,007 x r	90	0,006 x r	140	0,01 x r	100	0,008 x r	□	■	□	■
	4.2	100	0,006 x r	80	0,006 x r	120	0,009 x r	90	0,007 x r	□	■	□	■
N	1.1					400	0,015 x r	300	0,013 x r			□	■
	1.2					400	0,016 x r	300	0,013 x r			□	■
	1.3					400	0,017 x r	300	0,014 x r			□	■
	1.4					350	0,013 x r	260	0,011 x r			□	■
	1.5					320	0,012 x r	240	0,01 x r			□	■
	1.6					240	0,011 x r	180	0,009 x r			□	■
	2.1	160	0,008 x r	130	0,007 x r	200	0,011 x r	150	0,009 x r			□	■
	2.2	160	0,008 x r	130	0,007 x r	200	0,011 x r	150	0,009 x r			□	■
	2.3	160	0,008 x r	130	0,007 x r	200	0,011 x r	150	0,009 x r			□	■
	2.4	140	0,006 x r	110	0,006 x r	170	0,009 x r	130	0,007 x r			□	■
	2.5	140	0,006 x r	110	0,006 x r	170	0,009 x r	130	0,007 x r			□	■
	2.6	140	0,006 x r	110	0,006 x r	170	0,009 x r	130	0,007 x r			□	■
	2.7	90	0,006 x r	70	0,005 x r	110	0,008 x r	80	0,006 x r			□	■
	2.8	90	0,006 x r	70	0,005 x r	110	0,008 x r	80	0,006 x r			□	■
	3.1	260	0,016 x r	200	0,014 x r	320	0,022 x r	240	0,018 x r			□	■
	3.2	260	0,016 x r	200	0,014 x r	320	0,022 x r	240	0,018 x r			□	■
4.1													
4.2													
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1	100	0,008 x r	80	0,007 x r	120	0,011 x r	90	0,009 x r			□	■
	1.2	70	0,007 x r	60	0,006 x r	90	0,01 x r	70	0,008 x r			□	■
	1.3	50	0,006 x r	40	0,006 x r	60	0,009 x r	40	0,007 x r			□	■
	2.1	70	0,007 x r	50	0,006 x r	90	0,01 x r	60	0,008 x r			□	■
	2.2	30	0,006 x r	20	0,005 x r	40	0,008 x r	30	0,006 x r			□	■
	2.3	20	0,005 x r	20	0,004 x r	30	0,007 x r	20	0,005 x r			□	■
	2.4	30	0,006 x r	20	0,005 x r	40	0,008 x r	30	0,006 x r			□	■
2.5	20	0,005 x r	10	0,004 x r	20	0,007 x r	20	0,005 x r			□	■	
2.6	20	0,004 x r	20	0,004 x r	30	0,006 x r	20	0,005 x r			□	■	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

Konische Hartmetall-Kugelfräser
Tapered solid carbide ball nose end mills

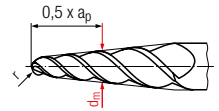
N

Gültig für · Valid for
3440 3442



Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.

For the calculation of rpm (n), use the average diameter d_m (measuring point at $0,5 \times a_p$).



$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$



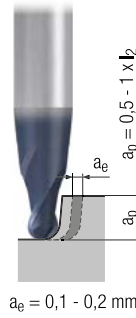
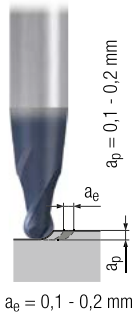
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL		
P	1.1	210	0,010 x r	110	0,010 x r	80	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	0,010 x r	100	0,010 x r	70	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1										
	4.1										
	5.1										
M	1.1										
	2.1										
	3.1										
	4.1										
K	1.1										
	1.2										
	2.1										
	2.2										
	3.1										
	3.2										
	4.1										
4.2											
N	1.1	490	0,016 x r	250	0,016 x r	180	0,016 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2	490	0,014 x r	250	0,014 x r	180	0,014 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3	490	0,012 x r	250	0,012 x r	180	0,012 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.4										
	1.5										
	1.6										
	2.1	180	0,010 x r	100	0,010 x r	70	0,010 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.2	180	0,010 x r	100	0,010 x r	70	0,010 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.3	180	0,010 x r	100	0,010 x r	70	0,010 x r	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
	3.1										
3.2											
4.1	320	0,016 x r	170	0,016 x r	130	0,016 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.2	460	0,016 x r	250	0,016 x r	110	0,016 x r		<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.3											
4.4											
5.1											
5.2											
5.3											
S	1.1										
	1.2										
	1.3										
	2.1										
	2.2										
	2.6										
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

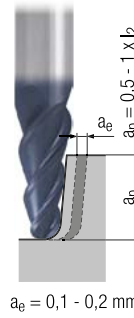
Konische Hartmetall-Kugelfräser Tapered solid carbide ball nose end mills

N

mit 2 Schneiden
with 2 flutes

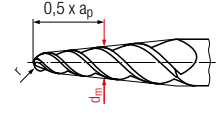


mit 3 Schneiden
with 3 flutes



Gültig für · Valid for
3440A 3442A

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.
For the calculation of rpm (n), use the average diameter d_m (measuring point at $0,5 \times a_p$).



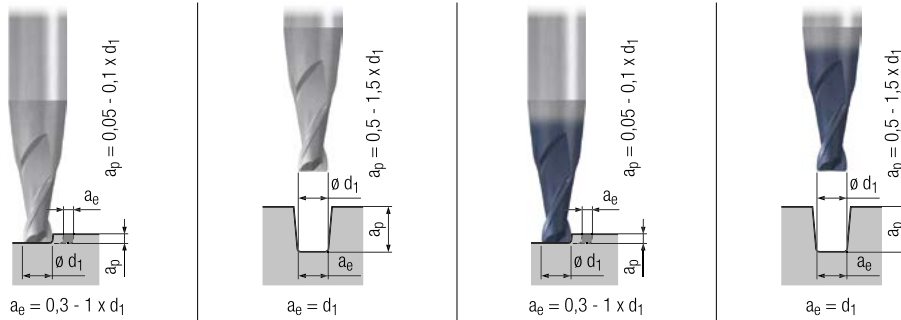
$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$

		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
										MMS MQL	
P	1.1	300	0,010 x r	160	0,010 x r	120	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	260	0,010 x r	140	0,010 x r	100	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	220	0,008 x r	120	0,008 x r	90	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	180	0,008 x r	100	0,008 x r	70	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	5.1	150	0,006 x r	80	0,006 x r	60	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
M	1.1	150	0,006 x r	80	0,006 x r	60	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	120	0,006 x r	70	0,006 x r	50	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	300	0,010 x r	160	0,010 x r	120	0,010 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	300	0,010 x r	160	0,010 x r	120	0,010 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	260	0,008 x r	140	0,008 x r	100	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	260	0,008 x r	140	0,008 x r	100	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	220	0,008 x r	120	0,008 x r	90	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	220	0,008 x r	120	0,008 x r	90	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	180	0,006 x r	100	0,006 x r	70	0,006 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	150	0,006 x r	80	0,006 x r	60	0,006 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1	700	0,016 x r	350	0,016 x r	260	0,016 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	700	0,014 x r	350	0,014 x r	260	0,014 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	700	0,012 x r	350	0,012 x r	260	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	500	0,014 x r	280	0,014 x r	200	0,014 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	450	0,012 x r	240	0,012 x r	180	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	260	0,010 x r	140	0,010 x r	100	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	260	0,010 x r	140	0,010 x r	100	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	260	0,010 x r	140	0,010 x r	100	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	220	0,008 x r	120	0,008 x r	80	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	220	0,008 x r	120	0,008 x r	80	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	220	0,008 x r	120	0,008 x r	80	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	140	0,006 x r	70	0,006 x r	50	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	140	0,006 x r	70	0,006 x r	50	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	600	0,018 x r	320	0,018 x r	240	0,018 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	600	0,014 x r	320	0,014 x r	240	0,014 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	460	0,016 x r	240	0,016 x r	180	0,016 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	650	0,016 x r	350	0,016 x r	160	0,016 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3	250	0,012 x r	180	0,012 x r	100	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4	180	0,012 x r	90	0,012 x r	70	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.2	180	0,006 x r	80	0,006 x r	60	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3	300	0,012 x r	160	0,012 x r	120	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
S	1.1	150	0,008 x r	80	0,008 x r	60	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	120	0,006 x r	60	0,006 x r	50	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	70	0,006 x r	40	0,006 x r	30	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	110	0,006 x r	50	0,006 x r	40	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	30	0,004 x r	20	0,004 x r	15	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	30	0,004 x r	20	0,004 x r	15	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.4	30	0,004 x r	20	0,004 x r	15	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.5	20	0,004 x r	15	0,004 x r	10	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6	30	0,004 x r	20	0,004 x r	15	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Konische Hartmetall-Torusfräser
Tapered solid carbide torus end mills

N

mit 2 Schneiden
with 2 flutes



Unbeschichtet · Uncoated

TIALN

Gültig für · Valid for

3444
3444A



		Unbeschichtet · Uncoated		TIALN									
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					v_c [m/min]	f_z [mm]		
P	1.1	150	$0,010 \times d_1$			220	$0,010 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	140	$0,009 \times d_1$			200	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1					160	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1					130	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1					110	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M	1.1					110	$0,006 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1					90	$0,006 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1											<input type="checkbox"/>	<input type="checkbox"/>
	4.1											<input type="checkbox"/>	<input type="checkbox"/>
K	1.1					220	$0,010 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2					220	$0,010 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1					190	$0,008 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.2					190	$0,008 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1					160	$0,008 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.2					160	$0,008 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.1					130	$0,006 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.2					110	$0,006 \times d_1$			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1	350	$0,016 \times d_1$	280	$0,010 \times d_1$	500	$0,016 \times d_1$	400	$0,010 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	350	$0,014 \times d_1$	280	$0,008 \times d_1$	500	$0,014 \times d_1$	400	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	350	$0,012 \times d_1$	250	$0,006 \times d_1$	500	$0,012 \times d_1$	350	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4					380	$0,014 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5					340	$0,012 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6											<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	140	$0,010 \times d_1$			200	$0,010 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	140	$0,010 \times d_1$			200	$0,010 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	140	$0,010 \times d_1$			200	$0,010 \times d_1$			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4					160	$0,008 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5					160	$0,008 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6					160	$0,008 \times d_1$			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7					100	$0,006 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8					100	$0,006 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1					450	$0,018 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2					450	$0,014 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	220	$0,015 \times d_1$			320	$0,015 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	350	$0,015 \times d_1$			500	$0,015 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3					200	$0,012 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4					140	$0,012 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1											<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.2					120	$0,006 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3					220	$0,012 \times d_1$				<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
S	1.1					110	$0,007 \times d_1$	50	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2					90	$0,006 \times d_1$	40	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3					50	$0,005 \times d_1$	30	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1					80	$0,006 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2					30	$0,004 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3					30	$0,004 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4					30	$0,004 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5					20	$0,004 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6					30	$0,004 \times d_1$					<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



Konische Hartmetall-Kugelfräser – lange Ausführung

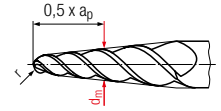
Tapered solid carbide ball nose end mills – long design

NR



Gültig für · Valid for
3546L

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.
For the calculation of rpm (n), use the average diameter d_m (measuring point at $0.5 \times a_p$).



$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$

		v_c	f_z	v_c	f_z		
		[m/min]	[mm]	[m/min]	[mm]		
P	1.1						
	2.1						
	3.1						
	4.1						
	5.1						
M	1.1	120	0,03	90	0,07		■
	2.1	120	0,03	90	0,07		■
	3.1	100	0,03	70	0,07		■
	4.1	100	0,03	70	0,07		■
K	1.1						
	1.2						
	2.1						
	2.2						
	3.1						
	3.2						
	4.1						
N	1.1						
	1.2						
	1.3	400	0,06	280	0,12		■
	1.4	280	0,06	200	0,12		■
	1.5	200	0,06	140	0,12		■
	1.6						
	2.1						
	2.2						
	2.3						
	2.4						
	2.5						
	2.6						
	2.7						
	2.8						
	3.1						
	3.2						
4.1							
4.2							
4.3							
4.4							
5.1							
5.2							
5.3							
S	1.1	120	0,03	90	0,07		■
	1.2	100	0,03	75	0,07		■
	1.3	60	0,03	45	0,07		■
	2.1						
	2.2	30	0,03	25	0,07		■
	2.3	30	0,03	25	0,07		■
2.4	30	0,03	25	0,07		■	
2.5	20	0,03	15	0,07		■	
2.6	30	0,03	25	0,07		■	
H	1.1						
	1.2						
	1.3						
	1.4						
	1.5						



Konische Hartmetall-Kugelfräser – lange Ausführung
Tapered solid carbide ball nose end mills – long design

N

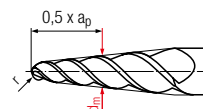


$a_p \text{ max.} = l_z$
 $a_p = 0,1 - 0,2 \text{ mm}$

Gültig für · Valid for
3548L

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.

For the calculation of rpm (n), use the average diameter d_m (measuring point at $0,5 \times a_p$).



$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$



	v_c [m/min]	f_z [mm]			
P	1.1				
	2.1				
	3.1				
	4.1				
	5.1				
M	1.1	60	0,03		■
	2.1	60	0,03		■
	3.1	50	0,03		■
	4.1	50	0,03		■
K	1.1				
	1.2				
	2.1				
	2.2				
	3.1				
	4.1				
N	1.1				
	1.2				
	1.3	200	0,06		■
	1.4	140	0,06		■
	1.5	100	0,06		■
	1.6				
	2.1				
	2.2				
	2.3				
	2.4				
	2.5				
	2.6				
	2.7				
	2.8				
	3.1				
	3.2				
4.1					
4.2					
4.3					
4.4					
5.1					
5.2					
5.3					
S	1.1	60	0,03		■
	1.2	50	0,03		■
	1.3	30	0,03		■
	2.1				
	2.2	15	0,03		■
	2.3	15	0,03		■
2.4	15	0,03		■	
2.5	10	0,03		■	
2.6	15	0,03		■	
H	1.1				
	1.2				
	1.3				
	1.4				
1.5					

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



Konische Hartmetall-Kugelfräser – lange Ausführung Tapered solid carbide ball nose end mills – long design

N



$a_e = 0,5 - 1 \text{ mm}$

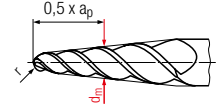


$a_p \text{ max.} = l_2$
 $a_e = 0,1 - 0,2 \text{ mm}$

Gültig für · Valid for
3550L

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.

For the calculation of rpm (n), use the average diameter d_m (measuring point at $0.5 \times a_p$).



$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]



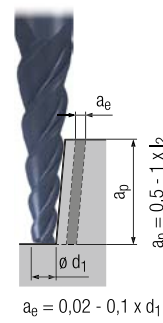
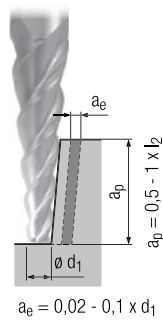
MMS
MQL



		P		M		K		N		S		H	
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]
P	1.1												
	2.1												
	3.1												
	4.1												
	5.1												
M	1.1	90	0,07	60	0,03								■
	2.1	90	0,07	60	0,03								■
	3.1	70	0,07	50	0,03								■
	4.1	70	0,07	50	0,03								■
K	1.1												
	1.2												
	2.1												
	2.2												
	3.1												
	3.2												
	4.1												
4.2													
N	1.1												
	1.2												
	1.3	280	0,12	200	0,06								■
	1.4	200	0,12	140	0,06								■
	1.5	140	0,12	100	0,06								■
	1.6												
	2.1												
	2.2												
	2.3												
	2.4												
	2.5												
	2.6												
	2.7												
	2.8												
	3.1												
	3.2												
4.1													
4.2													
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1	90	0,07	60	0,03								■
	1.2	75	0,07	50	0,03								■
	1.3	45	0,07	30	0,03								■
	2.1												
	2.2	25	0,07	15	0,03								■
	2.3	25	0,07	15	0,03								■
2.4	25	0,07	15	0,03								■	
2.5	15	0,07	10	0,03								■	
2.6	25	0,07	15	0,03								■	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

Konische Hartmetallfräser
Tapered solid carbide end mills

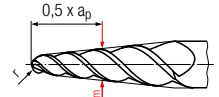
N



Gültig für · Valid for

1900	1902	1904
1900A	1902A	1904A
1901	1903	1905
1901A	1903A	1905A

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.
For the calculation of rpm (n), use the average diameter d_m (measuring point at $0,5 \times a_p$).



$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$



		Unbeschichtet Uncoated		TiAlN					
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1	110	$0,005 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	100	$0,005 \times d_1$	120	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1			100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1			80	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1			70	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
M	1.1			70	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1			50	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1								
	4.1								
K	1.1			140	$0,005 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2			140	$0,005 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1			120	$0,004 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.2			120	$0,004 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1			100	$0,004 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.2			100	$0,004 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.1			80	$0,003 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.2			70	$0,003 \times d_1$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1	500	$0,008 \times d_1$	600	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	500	$0,007 \times d_1$	600	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	500	$0,006 \times d_1$	600	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4			350	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5			300	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6								
	2.1	100	$0,005 \times d_1$	120	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	100	$0,005 \times d_1$	120	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	100	$0,005 \times d_1$	120	$0,005 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4			100	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5			100	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6			100	$0,004 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7			60	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8			60	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1			260	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2			260	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	180	$0,008 \times d_1$	200	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	240	$0,008 \times d_1$	280	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.3			130	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4			80	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1									
5.2			70	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3			140	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
S	1.1			70	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2			60	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3			40	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1			50	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2			30	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3			20	$0,002 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4			20	$0,002 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5			15	$0,002 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.6			20	$0,002 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1			70	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2			60	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.3								
	1.4								
	1.5								

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



Hartmetall-Tonnenfräser (Tropfenform) – lange Ausführung Solid carbide barrel-shaped cutters (oval form) – long design

N

Schlichten
Finishing



Aufmaß · Allowance
0,05 - 0,1 mm

Schlichten
Finishing



Aufmaß · Allowance
0,1 - 0,2 mm

Schlichten
Finishing



Aufmaß · Allowance
0,2 - 0,3 mm

Gültig für · Valid for
3538L

Für die Berechnung der Drehzahl n muss mit dem mittleren Durchmesser d_m (Messpunkt bei $0,5 \times a_p$) gerechnet werden.
For the calculation of rpm (n), use the average diameter d_m (measuring point at $0.5 \times a_p$).

$$n = \frac{v_c \times 1000}{d_m \times \pi} \text{ [min}^{-1}\text{]}$$



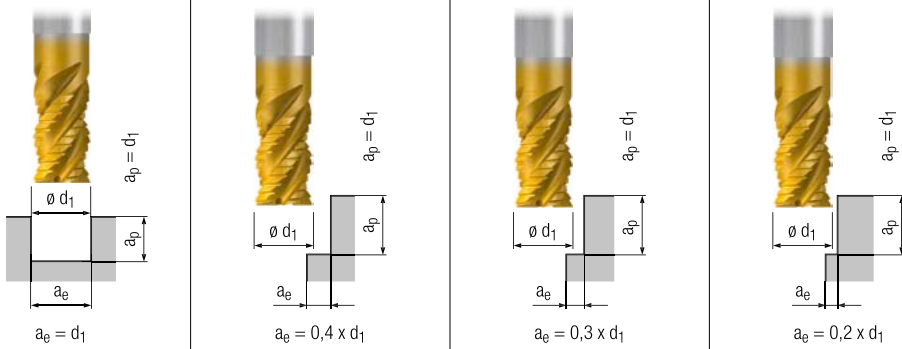
		Schlichten Finishing		Schlichten Finishing		Schlichten Finishing				MMS MQL	
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1	200	$0,008 \times r_1$	200	$0,007 \times r_1$	200	$0,006 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	$0,007 \times r_1$	180	$0,006 \times r_1$	180	$0,005 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	150	$0,006 \times r_1$	150	$0,005 \times r_1$	150	$0,004 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	140	$0,005 \times r_1$	140	$0,004 \times r_1$	140	$0,003 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	5.1	130	$0,005 \times r_1$	130	$0,004 \times r_1$	130	$0,003 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
M	1.1	100	$0,005 \times r_1$	100	$0,004 \times r_1$	100	$0,003 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,005 \times r_1$	80	$0,004 \times r_1$	80	$0,003 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60	$0,004 \times r_1$	60	$0,003 \times r_1$	60	$0,002 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40	$0,004 \times r_1$	40	$0,003 \times r_1$	40	$0,002 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	200	$0,008 \times r_1$	200	$0,007 \times r_1$	200	$0,006 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2	200	$0,008 \times r_1$	200	$0,007 \times r_1$	200	$0,006 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1	180	$0,007 \times r_1$	180	$0,006 \times r_1$	180	$0,005 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.2	180	$0,007 \times r_1$	180	$0,006 \times r_1$	180	$0,005 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1	150	$0,007 \times r_1$	150	$0,006 \times r_1$	150	$0,005 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.2	150	$0,007 \times r_1$	150	$0,006 \times r_1$	150	$0,005 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.1	130	$0,005 \times r_1$	130	$0,004 \times r_1$	130	$0,003 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.2	100	$0,004 \times r_1$	100	$0,004 \times r_1$	100	$0,004 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1	600	$0,015 \times r_1$	600	$0,013 \times r_1$	600	$0,011 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	600	$0,013 \times r_1$	600	$0,011 \times r_1$	600	$0,009 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	600	$0,012 \times r_1$	600	$0,010 \times r_1$	600	$0,008 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	410	$0,013 \times r_1$	410	$0,011 \times r_1$	410	$0,009 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	380	$0,012 \times r_1$	380	$0,010 \times r_1$	380	$0,008 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6	270	$0,010 \times r_1$	270	$0,008 \times r_1$	270	$0,006 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	$0,008 \times r_1$	180	$0,007 \times r_1$	180	$0,006 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180	$0,008 \times r_1$	180	$0,007 \times r_1$	180	$0,006 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	180	$0,008 \times r_1$	180	$0,007 \times r_1$	180	$0,006 \times r_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	170	$0,007 \times r_1$	170	$0,006 \times r_1$	170	$0,005 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	170	$0,007 \times r_1$	170	$0,006 \times r_1$	170	$0,005 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	170	$0,007 \times r_1$	170	$0,006 \times r_1$	170	$0,005 \times r_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	100	$0,005 \times r_1$	100	$0,004 \times r_1$	100	$0,003 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	100	$0,005 \times r_1$	100	$0,004 \times r_1$	100	$0,003 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	410	$0,015 \times r_1$	410	$0,013 \times r_1$	410	$0,011 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	410	$0,012 \times r_1$	410	$0,010 \times r_1$	410	$0,008 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	410	$0,013 \times r_1$	410	$0,011 \times r_1$	410	$0,009 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	600	$0,013 \times r_1$	600	$0,011 \times r_1$	600	$0,009 \times r_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.3											
4.4											
5.1											
5.2	100	$0,005 \times r_1$	100	$0,004 \times r_1$	100	$0,003 \times r_1$					<input checked="" type="checkbox"/>
5.3											
S	1.1	100	$0,006 \times r_1$	100	$0,005 \times r_1$	100	$0,004 \times r_1$				<input checked="" type="checkbox"/>
	1.2	80	$0,005 \times r_1$	80	$0,004 \times r_1$	80	$0,003 \times r_1$				<input checked="" type="checkbox"/>
	1.3	60	$0,005 \times r_1$	60	$0,004 \times r_1$	60	$0,003 \times r_1$				<input checked="" type="checkbox"/>
	2.1	80	$0,004 \times r_1$	80	$0,003 \times r_1$	80	$0,002 \times r_1$				<input checked="" type="checkbox"/>
	2.2	30	$0,004 \times r_1$	30	$0,003 \times r_1$	30	$0,002 \times r_1$				<input checked="" type="checkbox"/>
	2.3	30	$0,004 \times r_1$	30	$0,003 \times r_1$	30	$0,002 \times r_1$				<input checked="" type="checkbox"/>
	2.4	30	$0,004 \times r_1$	30	$0,003 \times r_1$	30	$0,002 \times r_1$				<input checked="" type="checkbox"/>
2.5	30	$0,004 \times r_1$	30	$0,003 \times r_1$	30	$0,002 \times r_1$				<input checked="" type="checkbox"/>	
2.6	30	$0,004 \times r_1$	30	$0,003 \times r_1$	30	$0,002 \times r_1$				<input checked="" type="checkbox"/>	
H	1.1	130	$0,005 \times r_1$	130	$0,004 \times r_1$	130	$0,003 \times r_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2										
	1.3										
	1.4										
	1.5										

Hartmetall-Schafffräser – kurze, lange und extra lange Ausführung
Solid carbide end mills – short, long and extra long design

NF

Gültig für · Valid for

- 2642TT 2648TZ 2659TZ
- 2642TZ 2649TZ 2670TT
- 2643TZ 2656TT 2670TZ
- 2646TT 2656TZ 2671TZ
- 2646TZ 2657TZ
- 2647TZ 2658TT
- 2648TT 2658TZ



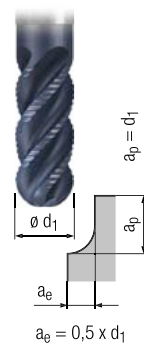
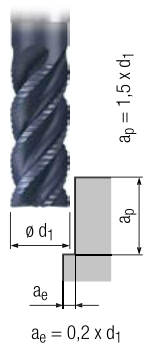
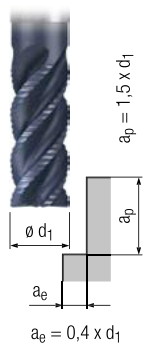
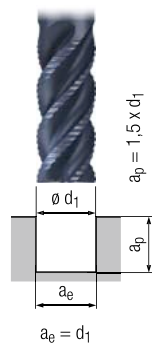
		V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	MMS MQL			
P	1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	190	$0,008 \times d_1$	□	■	□	■
	2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	180	$0,007 \times d_1$	□	■	□	■
	3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	□	■	□	■
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■		
	5.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		
M	1.1	100	$0,004 \times d_1$	120	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$				■
	2.1	80	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$				■
	3.1	50	$0,003 \times d_1$	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
	4.1	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,004 \times d_1$	60	$0,004 \times d_1$				■
K	1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	190	$0,008 \times d_1$	□	■		
	1.2	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	190	$0,008 \times d_1$	□	■		
	2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	180	$0,006 \times d_1$	□	■		
	2.2	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	180	$0,006 \times d_1$	□	■		
	3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$	140	$0,006 \times d_1$	□	■		
	3.2	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$	140	$0,006 \times d_1$	□	■		
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■		
	4.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$	□	■		
N	1.1												
	1.2												
	1.3												
	1.4												
	1.5												
	1.6												
	2.1	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$	180	$0,008 \times d_1$			□	■
	2.2	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$	180	$0,008 \times d_1$			□	■
	2.3	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$	180	$0,008 \times d_1$		□	□	■
	2.4	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$			□	■
	2.5	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$			□	■
	2.6	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$			□	■
	2.7	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$		□	□	■
	2.8	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■
	3.1												
	3.2												
4.1													
4.2													
4.3													
4.4													
5.1													
5.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$				■	
5.3													
S	1.1	70	$0,005 \times d_1$	80	$0,005 \times d_1$	100	$0,006 \times d_1$	110	$0,007 \times d_1$				■
	1.2	60	$0,004 \times d_1$	70	$0,004 \times d_1$	80	$0,005 \times d_1$	100	$0,006 \times d_1$				■
	1.3	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,004 \times d_1$	50	$0,004 \times d_1$				■
	2.1	70	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$	110	$0,006 \times d_1$				■
	2.2	20	$0,003 \times d_1$	20	$0,004 \times d_1$	25	$0,004 \times d_1$	30	$0,005 \times d_1$				■
	2.3	10	$0,002 \times d_1$	15	$0,002 \times d_1$	15	$0,003 \times d_1$	20	$0,003 \times d_1$				■
	2.4	20	$0,003 \times d_1$	25	$0,003 \times d_1$	35	$0,004 \times d_1$	30	$0,004 \times d_1$				■
2.5	10	$0,002 \times d_1$	10	$0,002 \times d_1$	10	$0,003 \times d_1$	20	$0,003 \times d_1$				■	
2.6	10	$0,003 \times d_1$	10	$0,003 \times d_1$	10	$0,004 \times d_1$	20	$0,004 \times d_1$				■	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

Hartmetall-Schaft- und Kugelfräser – lange Ausführung Solid carbide end mills and ball nose end mills – long design

Gültig für · Valid for
2667A 2673AZ

NR



		Vc [m/min]		fz [mm]		Vc [m/min]		fz [mm]				MMS MQL	
		Vc	fz	Vc	fz	Vc	fz	Vc	fz				
P	1.1	140	0,006 x d1	160	0,007 x d1	180	0,008 x d1	140	0,004 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	130	0,006 x d1	150	0,006 x d1	170	0,007 x d1	130	0,003 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	120	0,005 x d1	140	0,005 x d1	160	0,006 x d1	110	0,003 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	110	0,004 x d1	130	0,004 x d1	140	0,005 x d1	90	0,002 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	100	0,004 x d1	120	0,004 x d1	130	0,004 x d1	70	0,002 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M	1.1	70	0,004 x d1	80	0,004 x d1	90	0,005 x d1						<input checked="" type="checkbox"/>
	2.1	60	0,004 x d1	70	0,004 x d1	80	0,005 x d1						<input checked="" type="checkbox"/>
	3.1												
	4.1												
K	1.1	140	0,007 x d1	160	0,007 x d1	180	0,008 x d1	140	0,004 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	140	0,007 x d1	160	0,007 x d1	180	0,008 x d1	140	0,004 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	120	0,005 x d1	140	0,006 x d1	160	0,007 x d1	130	0,003 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	120	0,005 x d1	140	0,006 x d1	160	0,007 x d1	130	0,003 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	110	0,005 x d1	130	0,006 x d1	140	0,007 x d1	110	0,003 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	110	0,005 x d1	130	0,006 x d1	140	0,007 x d1	110	0,003 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	80	0,004 x d1	90	0,004 x d1	100	0,005 x d1	90	0,002 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2	70	0,004 x d1	80	0,004 x d1	90	0,005 x d1	70	0,002 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N	1.1												
	1.2	420	0,008 x d1	480	0,009 x d1	550	0,010 x d1						<input checked="" type="checkbox"/>
	1.3	420	0,008 x d1	480	0,009 x d1	550	0,011 x d1						<input checked="" type="checkbox"/>
	1.4	280	0,008 x d1	320	0,009 x d1	360	0,010 x d1						<input checked="" type="checkbox"/>
	1.5												
	1.6												
	2.1	120	0,007 x d1	140	0,007 x d1	160	0,008 x d1	130	0,004 x d1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	120	0,007 x d1	140	0,007 x d1	160	0,008 x d1	130	0,004 x d1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	120	0,007 x d1	140	0,007 x d1	160	0,008 x d1	130	0,004 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	110	0,005 x d1	130	0,006 x d1	140	0,007 x d1	120	0,003 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	110	0,005 x d1	130	0,006 x d1	140	0,007 x d1	120	0,003 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	110	0,005 x d1	130	0,006 x d1	140	0,007 x d1	120	0,003 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	70	0,004 x d1	80	0,004 x d1	90	0,005 x d1	70	0,002 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	70	0,004 x d1	80	0,004 x d1	90	0,005 x d1	70	0,002 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1												
	3.2												
4.1	280	0,010 x d1	320	0,011 x d1	360	0,012 x d1	290	0,006 x d1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2													
4.3													
4.4													
5.1													
5.2	70	0,004 x d1	80	0,004 x d1	90	0,005 x d1	70	0,002 x d1				<input checked="" type="checkbox"/>	
5.3													
S	1.1	70	0,005 x d1	80	0,005 x d1	90	0,006 x d1	70	0,003 x d1				<input checked="" type="checkbox"/>
	1.2	60	0,004 x d1	70	0,004 x d1	80	0,005 x d1	60	0,002 x d1				<input checked="" type="checkbox"/>
	1.3	40	0,003 x d1	50	0,004 x d1	50	0,004 x d1	40	0,002 x d1				<input checked="" type="checkbox"/>
	2.1												
	2.2												
	2.3												
H	1.1	70	0,004 x d1	80	0,004 x d1	90	0,004 x d1	70	0,002 x d1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2												
	1.3												
	1.4												
	1.5												

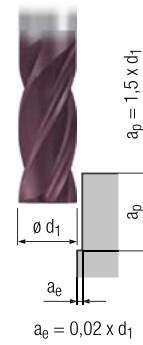
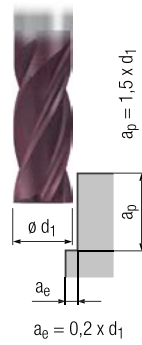
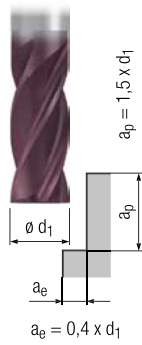


Hartmetall-Schafffräser – lange Ausführung
Solid carbide end mills – long design

N

Gültig für · Valid for

2698A
2698AZ
2699A
2699AZ



		V_c	f_z	V_c	f_z	V_c	f_z				
		[m/min]	[mm]	[m/min]	[mm]	[m/min]	[mm]				
P	1.1	150	$0,005 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	120	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	130	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M	1.1	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	70	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	150	$0,006 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	150	$0,006 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	100	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1	470	$0,010 \times d_1$	520	$0,011 \times d_1$	600	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	470	$0,009 \times d_1$	520	$0,010 \times d_1$	600	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	470	$0,008 \times d_1$	520	$0,009 \times d_1$	600	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	320	$0,009 \times d_1$	350	$0,010 \times d_1$	410	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	300	$0,008 \times d_1$	320	$0,009 \times d_1$	380	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6	210	$0,007 \times d_1$	230	$0,008 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	320	$0,010 \times d_1$	350	$0,011 \times d_1$	410	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	320	$0,008 \times d_1$	350	$0,009 \times d_1$	410	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	320	$0,009 \times d_1$	350	$0,009 \times d_1$	410	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	470	$0,009 \times d_1$	520	$0,009 \times d_1$	600	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3								<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.4								<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.1								<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.2	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3								<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
S	1.1	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	70	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	70	$0,002 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	20	$0,002 \times d_1$	15	$0,003 \times d_1$	30	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.6	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	130	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	80	$0,003 \times d_1$	80	$0,003 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	70	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

Hartmetall-Schafffräser – extra lange Ausführung Solid carbide end mills – extra long design

N

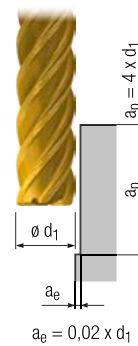
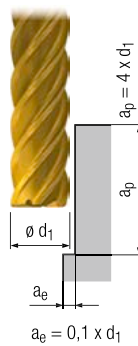
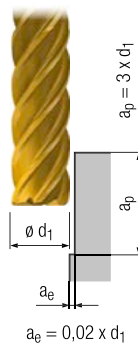
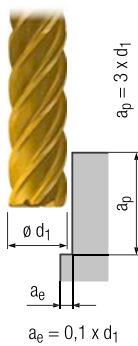
Gültig für · Valid for

2644T 2645TS 2655T
2644TS 2654T 2655TS
2645T 2654TS



3 x d₁

4 x d₁



	V _c [m/min]	f _z [mm]	V _c [m/min]	f _z [mm]	V _c [m/min]	f _z [mm]	V _c [m/min]	f _z [mm]	MMS MQL				
									☒	■	□	■	
P	1.1	120	0,005 x d ₁	140	0,006 x d ₁	100	0,005 x d ₁	120	0,005 x d ₁	☒	■	□	■
	2.1	110	0,004 x d ₁	130	0,005 x d ₁	90	0,004 x d ₁	110	0,005 x d ₁	☒	■	□	■
	3.1	90	0,004 x d ₁	110	0,005 x d ₁	70	0,004 x d ₁	90	0,004 x d ₁	☒	■	□	■
	4.1	70	0,003 x d ₁	80	0,004 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁	☒	■	□	■
	5.1	60	0,003 x d ₁	70	0,003 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁	☒	■	□	■
M	1.1	120	0,003 x d ₁	140	0,004 x d ₁	100	0,003 x d ₁	120	0,003 x d ₁				■
	2.1	100	0,003 x d ₁	120	0,004 x d ₁	80	0,003 x d ₁	100	0,003 x d ₁				■
	3.1	70	0,003 x d ₁	80	0,003 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁				■
	4.1	50	0,003 x d ₁	60	0,003 x d ₁	40	0,003 x d ₁	50	0,003 x d ₁				■
K	1.1	120	0,005 x d ₁	140	0,006 x d ₁	100	0,005 x d ₁	120	0,006 x d ₁	☒	■		
	1.2	120	0,005 x d ₁	140	0,006 x d ₁	100	0,005 x d ₁	120	0,006 x d ₁	☒	■		
	2.1	110	0,004 x d ₁	130	0,005 x d ₁	90	0,004 x d ₁	110	0,004 x d ₁	☒	■		
	2.2	110	0,004 x d ₁	130	0,005 x d ₁	90	0,004 x d ₁	110	0,004 x d ₁	☒	■		
	3.1	90	0,004 x d ₁	110	0,005 x d ₁	70	0,004 x d ₁	90	0,004 x d ₁	☒	■		
	3.2	90	0,004 x d ₁	110	0,005 x d ₁	70	0,004 x d ₁	90	0,004 x d ₁	☒	■		
	4.1	70	0,003 x d ₁	80	0,004 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁	☒	■		
	4.2	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁	☒	■		
N	1.1												
	1.2	540	0,008 x d ₁	650	0,010 x d ₁	430	0,008 x d ₁	540	0,009 x d ₁				■
	1.3	540	0,007 x d ₁	650	0,008 x d ₁	430	0,007 x d ₁	540	0,008 x d ₁				■
	1.4	320	0,008 x d ₁	380	0,010 x d ₁	260	0,008 x d ₁	320	0,009 x d ₁			□	■
	1.5	260	0,007 x d ₁	310	0,008 x d ₁	210	0,007 x d ₁	260	0,008 x d ₁			□	■
	1.6	160	0,006 x d ₁	190	0,007 x d ₁	130	0,006 x d ₁	160	0,007 x d ₁			□	■
	2.1	110	0,005 x d ₁	130	0,006 x d ₁	90	0,005 x d ₁	110	0,006 x d ₁			□	■
	2.2	110	0,005 x d ₁	130	0,006 x d ₁	90	0,005 x d ₁	110	0,006 x d ₁			□	■
	2.3	110	0,005 x d ₁	130	0,006 x d ₁	90	0,005 x d ₁	110	0,006 x d ₁			□	■
	2.4	100	0,004 x d ₁	120	0,005 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁			□	■
	2.5	100	0,004 x d ₁	120	0,005 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁			□	■
	2.6	100	0,004 x d ₁	120	0,005 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁			□	■
	2.7	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁			□	■
	2.8	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁			□	■
	3.1												
	3.2												
4.1													
4.2													
4.3													
4.4													
5.1													
5.2	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁				■	
5.3													
S	1.1	120	0,004 x d ₁	140	0,005 x d ₁	100	0,004 x d ₁	120	0,004 x d ₁				■
	1.2	100	0,003 x d ₁	120	0,004 x d ₁	80	0,003 x d ₁	100	0,003 x d ₁				■
	1.3	70	0,003 x d ₁	80	0,003 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁				■
	2.1	100	0,004 x d ₁	120	0,004 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁				■
	2.2	30	0,003 x d ₁	40	0,004 x d ₁	15	0,003 x d ₁	30	0,003 x d ₁				■
	2.3	20	0,002 x d ₁	25	0,002 x d ₁	25	0,002 x d ₁	20	0,002 x d ₁				■
	2.4	30	0,003 x d ₁	45	0,003 x d ₁	25	0,003 x d ₁	30	0,003 x d ₁				■
2.5	20	0,002 x d ₁	20	0,002 x d ₁	20	0,002 x d ₁	20	0,002 x d ₁				■	
2.6	20	0,003 x d ₁	20	0,003 x d ₁	20	0,003 x d ₁	20	0,003 x d ₁				■	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

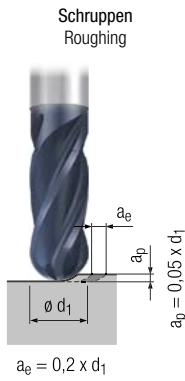


Hartmetall-Kugelfräser – lange und extra lange Ausführung
Solid carbide ball nose end mills – long and extra long design

N

Gültig für · Valid for

1867A
1967A

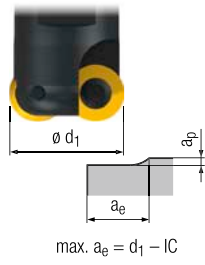


	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]			MMS MQL		
P	1.1	200	$0,014 \times d_1$	270	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	170	$0,013 \times d_1$	230	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	140	$0,011 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	110	$0,010 \times d_1$	160	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	100	$0,008 \times d_1$	130	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M	1.1	100	$0,008 \times d_1$	130	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,008 \times d_1$	110	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60	$0,006 \times d_1$	80	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40	$0,006 \times d_1$	60	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	200	$0,014 \times d_1$	270	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	200	$0,014 \times d_1$	270	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	180	$0,011 \times d_1$	230	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	180	$0,011 \times d_1$	230	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	140	$0,011 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	140	$0,011 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	110	$0,008 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2	100	$0,008 \times d_1$	130	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	2.1	180	$0,014 \times d_1$	230	$0,010 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180	$0,014 \times d_1$	230	$0,010 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	180	$0,014 \times d_1$	230	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	140	$0,011 \times d_1$	200	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	140	$0,011 \times d_1$	200	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	140	$0,011 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	90	$0,008 \times d_1$	120	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	90	$0,008 \times d_1$	120	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	400	$0,025 \times d_1$	500	$0,018 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	400	$0,020 \times d_1$	500	$0,014 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	290	$0,020 \times d_1$	400	$0,015 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	430	$0,020 \times d_1$	580	$0,015 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3									
4.4									
5.1									
5.2	100	$0,008 \times d_1$	130	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3	180	$0,017 \times d_1$	270	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
S	1.1	100	$0,010 \times d_1$	130	$0,007 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	80	$0,008 \times d_1$	110	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	40	$0,007 \times d_1$	60	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	70	$0,008 \times d_1$	100	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	25	$0,006 \times d_1$	40	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	25	$0,006 \times d_1$	30	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	25	$0,006 \times d_1$	30	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5	15	$0,006 \times d_1$	25	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6	25	$0,006 \times d_1$	30	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

Runde Wendeschneidplatten Round inserts

Gültig für · Valid for
9601A 9607A 9608A



IC 8 - 12



9601A

IC 8 - 12

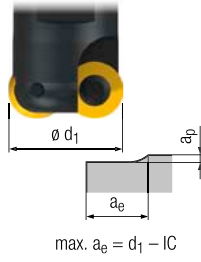


9607A 9608A

		v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL	
P	1.1	260 - 300	IC ÷ 50	0,05 - 0,10 x IC	260 - 300	IC ÷ 50	0,05 - 0,06 x IC	□	■		■
	2.1	260 - 300	IC ÷ 50	0,05 - 0,10 x IC	260 - 300	IC ÷ 50	0,05 - 0,06 x IC	□	■		■
	3.1	220 - 260	IC ÷ 60	0,05 - 0,10 x IC	220 - 260	IC ÷ 60	0,03 - 0,06 x IC	□	■		■
	4.1	200 - 240	IC ÷ 60	0,05 - 0,10 x IC	200 - 240	IC ÷ 60	0,03 - 0,06 x IC	□	■		□
	5.1	180 - 220	IC ÷ 60	0,05 - 0,10 x IC	180 - 220	IC ÷ 60	0,03 - 0,06 x IC	□	■		□
M	1.1										
	2.1										
	3.1										
	4.1										
K	1.1	180 - 220	IC ÷ 50	0,05 - 0,10 x IC	200 - 240	IC ÷ 50	0,03 - 0,06 x IC	□	■		■
	1.2	180 - 220	IC ÷ 50	0,05 - 0,10 x IC	200 - 240	IC ÷ 50	0,03 - 0,06 x IC	□	■		■
	2.1	160 - 200	IC ÷ 50	0,05 - 0,10 x IC	180 - 220	IC ÷ 50	0,03 - 0,06 x IC	□	■		■
	2.2	140 - 180	IC ÷ 50	0,05 - 0,10 x IC	160 - 200	IC ÷ 50	0,03 - 0,06 x IC	□	■		■
	3.1	80 - 120	IC ÷ 80	0,05 - 0,10 x IC	80 - 120	IC ÷ 80	0,03 - 0,06 x IC	□	■		■
	3.2	60 - 100	IC ÷ 80	0,05 - 0,10 x IC	60 - 100	IC ÷ 80	0,03 - 0,06 x IC	□	■		■
	4.1	100 - 140	IC ÷ 80	0,05 - 0,10 x IC	100 - 140	IC ÷ 80	0,03 - 0,06 x IC	□	■		■
4.2	120 - 160	IC ÷ 80	0,05 - 0,10 x IC	120 - 160	IC ÷ 80	0,03 - 0,06 x IC	□	■		■	
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
	3.1										
	3.2										
4.1											
4.2											
4.3											
4.4											
5.1											
5.2											
5.3											
S	1.1										
	1.2										
	1.3										
	2.1										
	2.2										
	2.6										
H	1.1				160 - 200	IC ÷ 60	0,03 - 0,06 x IC	□	■		
	1.2				140 - 180	IC ÷ 60	0,03 - 0,06 x IC	□	■		
	1.3				100 - 120	IC ÷ 60	0,02 - 0,04 x IC	□	■		
	1.4				80 - 100	IC ÷ 80	0,01 - 0,02 x IC	□	■		
	1.5				50 - 70	IC ÷ 100	0,01 - 0,02 x IC	□	■		

Runde Wendeschneidplatten
Round inserts

Gültig für · Valid for
9619X



IC 8 - 16



9619X

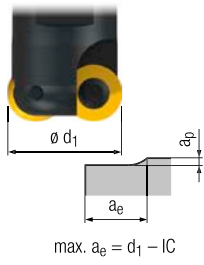


	V_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL	
P	1.1	260 - 300	IC = 50	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.1	260 - 300	IC = 50	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.1	220 - 260	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.1	200 - 240	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	5.1	180 - 220	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
M	1.1	120 - 160	IC = 60	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	60 - 100	IC = 60	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60 - 80	IC = 80	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40 - 60	IC = 80	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	180 - 220	IC = 50	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	1.2	180 - 220	IC = 50	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.1	160 - 200	IC = 50	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.2	140 - 180	IC = 50	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.1	80 - 120	IC = 80	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.2	60 - 100	IC = 80	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.1	100 - 140	IC = 80	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.2	120 - 160	IC = 80	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N	1.1						
	1.2						
	1.3						
	1.4						
	1.5						
	1.6						
	2.1	300 - 350	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.2	300 - 350	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.3	280 - 320	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.4	240 - 280	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.5	240 - 280	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.6	300 - 350	IC = 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.7	80 - 120	IC = 60	0,05 - 0,10 x IC		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.8	80 - 120	IC = 60	0,05 - 0,10 x IC		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.1	280 - 320	IC = 30	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	250 - 300	IC = 30	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1							
4.2							
4.3							
4.4							
5.1	180 - 220	IC = 30	0,20 - 0,30 x IC			<input checked="" type="checkbox"/>	
5.2	120 - 160	IC = 60	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3							
S	1.1	120 - 160	IC = 50	0,05 - 0,10 x IC			<input checked="" type="checkbox"/>
	1.2	120 - 160	IC = 50	0,05 - 0,10 x IC			<input checked="" type="checkbox"/>
	1.3	100 - 140	IC = 30	0,05 - 0,10 x IC			<input checked="" type="checkbox"/>
	2.1						
	2.2						
	2.6						
H	1.1						
	1.2						
	1.3						
	1.4						
	1.5						

■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

Runde Wendeschneidplatten
Round inserts

Gültig für · Valid for
9617A



IC 8 - 12

9617A

	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL	
P	1.1						
	2.1						
	3.1						
	4.1						
	5.1						
M	1.1	100-140	IC ÷ 80	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80-120	IC ÷ 80	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1						
	4.1						
K	1.1						
	1.2						
	2.1						
	2.2						
	3.1						
	3.2						
	4.1						
	4.2						
N	1.1	500-700	IC ÷ 30	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	500-700	IC ÷ 30	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	400-600	IC ÷ 30	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	300-400	IC ÷ 30	0,05 - 0,10 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5						
	1.6						
	2.1	300-350	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.2	300-350	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.3	280-320	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.4	240-280	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.5	240-280	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.6	300-350	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.7	80-120	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.8	80-120	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.1						
	3.2						
	4.1	200-240	IC ÷ 30	0,05 - 0,10 x IC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	80-120	IC ÷ 30	0,05 - 0,10 x IC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.3	100-140	IC ÷ 30	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.4	80-120	IC ÷ 30	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.1							
5.2							
5.3							
S	1.1	120-160	IC ÷ 50	0,05 - 0,10 x IC			<input checked="" type="checkbox"/>
	1.2	120-160	IC ÷ 50	0,05 - 0,10 x IC			<input checked="" type="checkbox"/>
	1.3	100-140	IC ÷ 30	0,05 - 0,10 x IC			<input checked="" type="checkbox"/>
	2.1						
	2.2						
	2.6						
H	1.1						
	1.2						
	1.3						
	1.4						
	1.5						

SAFE-LOCK™ by HAIMER



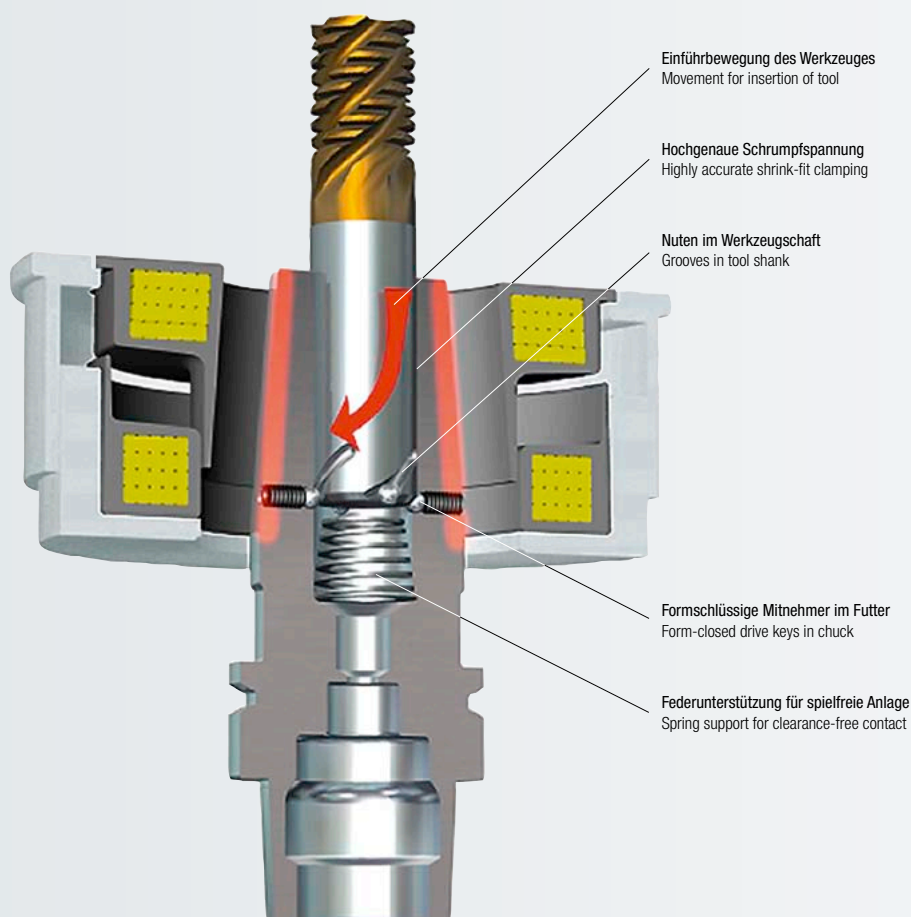
In der Hochleistungszerspanung (HPC) kann es vorkommen, dass das Werkzeug aus dem Futter herausgezogen wird. Ursache dafür ist eine langsame Mikrokriechbewegung. Sie entsteht bei Zerspanung mit hoher Drehzahl und hohen Auszugskräften. Auch Spannfutter mit extrem hoher Haltekraft können das Mikrokriechen nicht verhindern. Hochwertige Werkstücke werden so zu Ausschuss.

Abhilfe bietet das SAFE-LOCK™-System. Mitnehmerelemente im Futter greifen in Nuten am Werkzeugschaft. Zusätzlich zu den reibschlüssigen Klemmkraften des Schrumpffutters wird das Werkzeug formschlüssig gehalten. Dadurch wird das Mikrokriechen wirksam verhindert und das Werkzeug hält.

During high performance cutting (HPC), there is a risk of the cutting tool being pulled out of the chuck. The cause of this is a slow micro-creeping motion. This occurs when cutting at high speed and with high pull out forces. Even chucks with extremely high clamping force cannot prevent micro-creeping. High-quality workpieces become scrap as a result.

The SAFE-LOCK™ system solves the problem.

Keys in the chuck grip the grooves in the tool shank. In addition to the frictional clamping force of the shrink-fit chuck, the tool is held using positive locking. As a result, micro-creeping is effectively prevented and the tool is clamped safely.



Mit SAFE-LOCK™ auf der sicheren Seite:

- Für die Hochleistungszerspanung (HPC)
- Hochgenaue Spannung durch Schrumpftechnik
- Hohes Drehmoment durch formschlüssige Mitnahme
- Kein Verlust an Genauigkeit
- Kein Ausziehen des Werkzeuges
- Kein Durchdrehen des Werkzeuges
- Keine Schäden an Werkstück und Maschine
- Nut am Fräseschaft wird so ausgerichtet, dass der Fräser in das Futter hineingezogen wird (abhängig von der Drehrichtung)

On the safe side with SAFE-LOCK™:

- For high performance cutting (HPC)
- Highly accurate clamping by means of shrink-fit technology
- High torque as a result of form-closed clamping
- No loss of accuracy
- No pull out of the tool
- No slippage of the tool
- No damages to workpiece or machine
- Groove on tool shank is designed in such a way as to pull the tool into the chuck (depending on the direction of rotation)



Auf Anfrage fertigen wir auch:

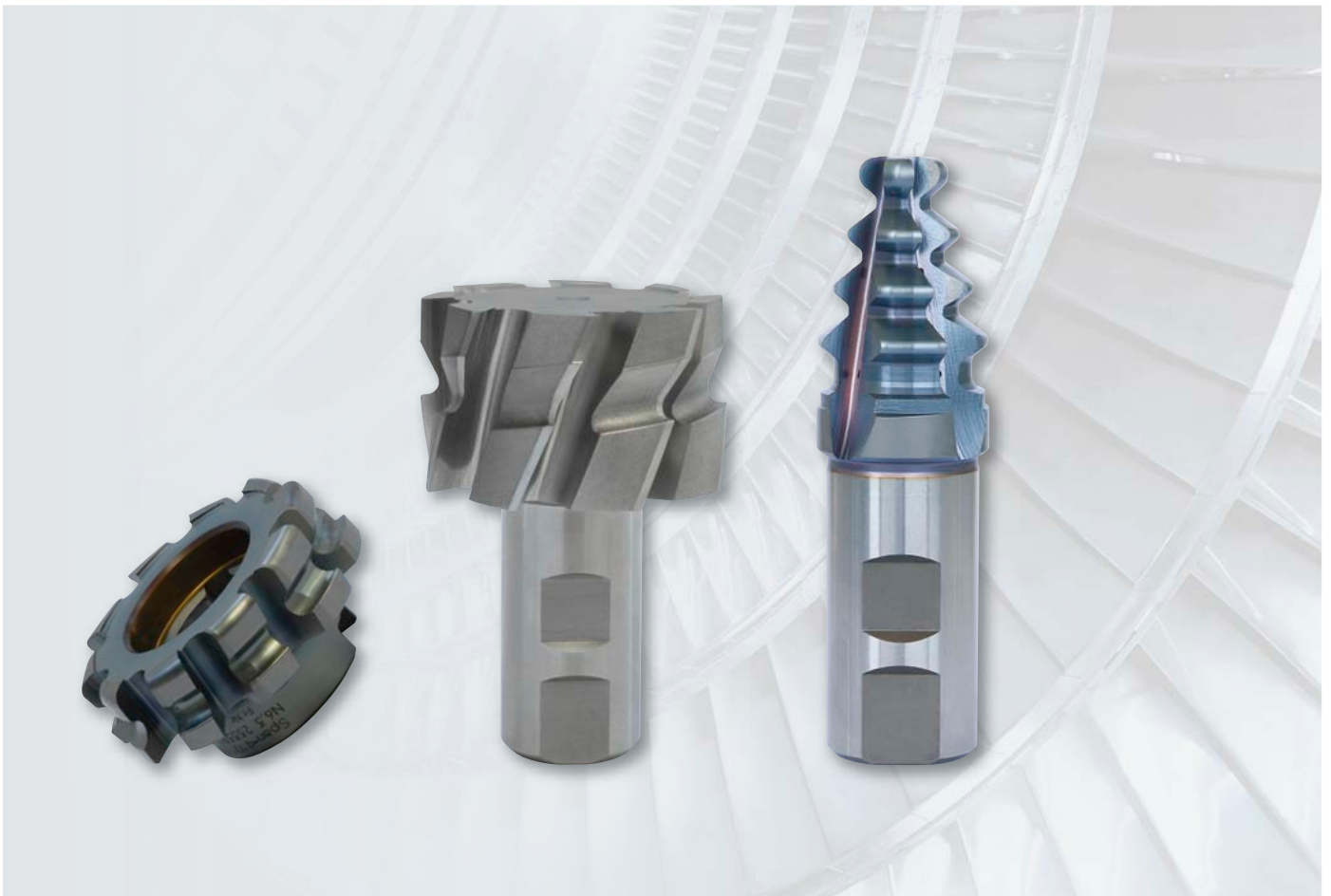
- Formfräser und Wälzfräser für Keilwellenprofile und Kettenräder
- Wälzfräser für Stirnräder, Zahnriemenscheiben und Kerbzahnwellen
- Schnecken- und Zahnstangenfräser

On request we also produce:

- Form cutters and hobs for spline shafts and roller chain sprockets
- Hobs for spur wheels, timing belt pulleys and serration shafts
- Rack and worm milling cutters



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