



■ Made
■ in
■ Germany



FRANKEN
 **TOP-Cut**

Universalfräser für die Mikro-Zerspanung
Universal End Mills for Micro Machining



Mehr als 100 Jahre Präzision und Innovation. More than 100 years of precision and innovation.

FRANKEN als Teil der EMUGE-FRANKEN Unternehmensgruppe beschäftigt sich seit seiner Gründung mit der Entwicklung und Produktion von Fräswerkzeugen. Präzision und Innovation prägen das breite Angebot von Fräsern aus Hartmetall und HSS sowie PKD-, CBN- oder wendeplattenbestückten Fräskörpern.

Die Fertigung am deutschen Produktionsstandort in Rückersdorf reicht von Standard-Schaft- und Bohrungsfräsern bis hin zu hochgenauen Form- und Profil-Sonderfräsern. Mit seiner Typen- und Schneidstoffvielfalt, dem hohen Standard und der kompromisslosen Präzision entspricht das Fräserprogramm den höchsten Qualitätsanforderungen.

Als Ergänzung zu den Fräswerkzeugen führen wir ein durchgängiges Programm an Fräspannmitteln und Zubehör für die verschiedensten Adaptierungsmöglichkeiten.

Ever since its foundation FRANKEN as part of the EMUGE-FRANKEN company association has been developing and manufacturing milling tools. The wide range of end mills of solid carbide and HSS as well as PCD and CBN inserts or milling cutters with indexable inserts is characterised by precision and innovation.

The production in our German manufacturing plant in Rückersdorf includes standard end mills and bore cutters as well as highly precise special form and profile milling tools. With its large variety of tool types and cutting materials, the consistently high standards and uncompromising precision, our product range of milling cutters meets even the highest quality requirements.

In addition to our selection of milling tools, we also offer a comprehensive range of clamping systems, tool holders and accessories.



Die Produktlinie FRANKEN TOP-Cut „Micro“ setzt sich folgendermaßen zusammen:

- Hartmetall-Schaftfräser
- Hartmetall-Kugelfräser
- Hartmetall-Torusfräser

Die Hartmetall-Fräswerkzeuge sind mit Halslängen von $2,2 \times d_1$, $5 \times d_1$ und $10 \times d_1$ verfügbar und decken einen Schneidendurchmesserbereich von 0,2 bis 2 mm lagermäßig ab.

Die neu entwickelte Halsgeometrie ermöglicht einen optimalen Einsatz der Werkzeuge auch bei tiefen Konturen. Durch die hohe Biegebruchfestigkeit des Hartmetallsubstrates hält sie auch radialen Wechselbelastungen, die bei der Bearbeitung auf die Werkzeugschneide und somit auch auf den freigesetzten Hals wirken, stand.

Für einen bestmöglichen Verschleißschutz besitzen die Hartmetall-Fräswerkzeuge eine neu entwickelte ALCR-Beschichtung, welche darüber hinaus die Standzeit der Werkzeuge maximiert.

The product line FRANKEN TOP-Cut „Micro“ consists of the following:

- Solid carbide end mills
- Solid carbide ball nose end mills
- Solid carbide torus end mills

The solid carbide end mills with neck lengths of $2.2 \times d_1$, $5 \times d_1$ and $10 \times d_1$ and a cutting diameter of 0.2 to 2 mm are available from stock.

The newly developed neck geometry enables the optimal application of these tools even in deep contours. Thanks to its high radial bending strength it withstands alternating radial stress on the cutting edge and thus on the relieved neck during the machining process.

The carbide end mills feature a newly developed ALCR-coating to provide the best possible wear resistance and to maximise the service life of the tools.



Vorteile:

- Große Baumaßvielfalt
- Hochgenaue Schneidengeometrie
- Zum Bearbeiten kleinster Gravuren, Elektroden und Bauteile

Einsatzgebiete:

- In fast allen Materialien einsetzbar
- Gehärtete Stähle bis 55 HRC
- Hochgenaue Bearbeitungen
- HSC-Schichten von 2D- und 3D-Konturen
- Bearbeitung tiefer Kavitäten

Werkzeugtypen:

- Schaft-, Kugel- und Torusfräser
- Kurze und lange Ausführung
- 3 Halslängen verfügbar (2,2:1 / 5:1 / 10:1)
- Verfügbare Werkzeugdurchmesser 0,2 - 2,0 mm
- Schaftdurchmesser 3 mm, 4 mm und 6 mm
- Schafttoleranz h5

Advantages:

- Large range of dimensions
- High precision cutting geometry
- For machining smallest engravings, electrodes and components

Applications:

- For almost all materials
- Hardened steels up to 55 HRC
- High precision machining
- For HSC finishing of 2D and 3D contours
- Cavities with different depths can be machined

Types of tools:

- End mills, ball nose and torus end mills
- Short and long design
- 3 neck lengths available (2.2:1 / 5:1 / 10:1)
- Available tool diameters 0.2 - 2.0 mm
- Shank diameters 3 mm, 4 mm and 6 mm
- Shank tolerance h5

Schneidstoff

- Hartmetall

Cutting material

- Solid carbide

Schaftfräser

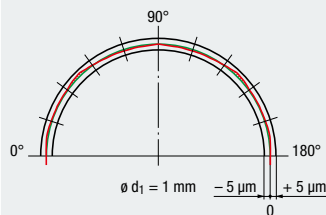
- Neuentwickelte Hochleistungsbeschichtung ermöglicht eine deutliche Erhöhung der Werkzeugstandzeit
- Kurze, stabile Schneidenausführung
- Kein Kantenbruch, erzeugt scharfe Kanten am Bauteil

End mills

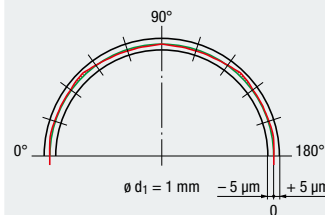
- Newly developed high-performance coating significantly increases tool life
- Short, robust cutting edge design
- No edge chamfer, generates sharp corner at the workpiece

Kugelfräser

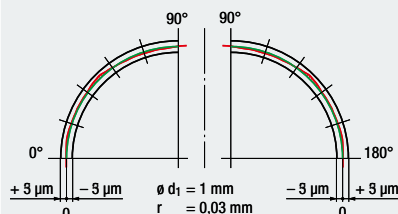
- Neuentwickelte Hochleistungsbeschichtung ermöglicht eine deutliche Erhöhung der Werkzeugstandzeit
- Kurze, stabile Schneidenausführung
- Sehr genaue Formtoleranz $\pm 5 \mu\text{m}$


Ball nose end mills

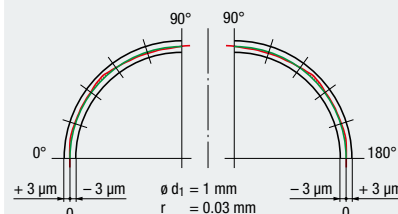
- Newly developed high-performance coating significantly increases tool life
- Short, robust cutting edge design
- Highly accurate dimensional tolerance $\pm 5 \mu\text{m}$


Torusfräser

- Neuentwickelte Hochleistungsbeschichtung ermöglicht eine deutliche Erhöhung der Werkzeugstandzeit
- Kurze, stabile Schneidenausführung
- Sehr genaue Formtoleranz $\pm 5 \mu\text{m}$


Torus end mills

- Newly developed high-performance coating significantly increases tool life
- Short, robust cutting edge design
- Highly accurate dimensional tolerance $\pm 5 \mu\text{m}$



Hinweis zur Ermittlung von Drehzahl und Vorschubgeschwindigkeit

Übersteigt die mit der empfohlenen Schnittgeschwindigkeit v_c und dem Schneidendurchmesser d_1 errechnete Drehzahl n die maximale Spindeldrehzahl $n_{\max}$, muss die effektive Vorschubgeschwindigkeit v_f mit der maximalen Spindeldrehzahl $n_{\max}$ berechnet werden!



Beispiel

Berechnung der Spindeldrehzahl n

Schneidendurchmesser d_1 : 0,2 mm
 Schnittgeschwindigkeit v_c : 240 m/min

$$n = \frac{v_c \times 1000}{d_1 \times \pi} \quad [\text{min}^{-1}] \quad n = \frac{240 \times 1000}{0,2 \times \pi} \quad [\text{min}^{-1}]$$

 Errechnete Spindeldrehzahl n : 381 972 min⁻¹
Maximale Spindeldrehzahl $n_{\max}$: 42 000 min⁻¹



Berechnung der effektiven Vorschubgeschwindigkeit v_f

Maximale Spindeldrehzahl $n_{\max}$: 42 000 min⁻¹
 Vorschub pro Zahn f_z : 0,003 mm
 Zähnezahl Z : 2

$$v_f = f_z \times Z \times n \quad [\text{mm/min}] \quad v_f = 0,003 \times 2 \times 42\,000 \quad [\text{mm/min}]$$

Effektive Vorschubgeschwindigkeit v_f : 252 mm/min

Note with regard to determining rotational speed and feed speed

If the rotational speed n calculated with the recommended cutting speed v_c and the cutting diameter d_1 exceeds the maximum spindle speed $n_{\max}$, the effective feed speed v_f must be calculated with the maximum spindle speed $n_{\max}$!



Example

Calculation of spindle speed n

Cutting diameter d_1 : 0.2 mm
 Cutting speed v_c : 240 m/min

$$n = \frac{v_c \times 1000}{d_1 \times \pi} \quad [\text{rpm}] \quad n = \frac{240 \times 1000}{0.2 \times \pi} \quad [\text{rpm}]$$

 Calculated spindle speed n : 381 972 rpm
Maximum spindle speed $n_{\max}$: 42 000 rpm



Calculation of effective feed speed v_f

Spindle speed $n_{\max}$: 42 000 rpm
 Feed per tooth f_z : 0.003 mm
 Flutes Z : 2

$$v_f = f_z \times Z \times n \quad [\text{mm/min}] \quad v_f = 0.003 \times 2 \times 42\,000 \quad [\text{mm/min}]$$

Effective feed speed v_f : 252 mm/min



Wegweiser

Bitte beachten:

Die Eignung der Fräswerkzeuge ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 11 - 39 zu finden.

Product finder

Please note:

The suitability of the milling tools is indicated as follows:

- = very suitable
- = suitable

Please find the cutting conditions on pages 11 - 39.

Einsatzgebiete – Material Applications – material				Material-Beispiele Material examples	Material-Nummern Material numbers
P	Stahlwerkstoffe		Steel materials		
	1.1	Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	Cq15 1.1132 S235JR (St37-2) 1.0037 10SPb20 1.0722
	2.1	Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	3.1	Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067
	4.1	Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	5.1	Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
M	Nichtrostende Stahlwerkstoffe		Stainless steel materials		
	1.1	Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ²	X2CrTi12 1.4512
	2.1	Austenitisch	Austenitic	≤ 950 N/mm ²	X6CrNiMoTi17-12-2 1.4571
	3.1	Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	≤ 1100 N/mm ²	X2CrNiMoN22-5-3 1.4462
K	4.1	Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ²	X2CrNiMoN25-7-4 1.4410
	Gusswerkstoffe		Cast materials		
	1.1	Gusseisen mit Lamellengrafit (GJL)	Cast iron with lamellar graphite (GJL)	100-250 N/mm ²	EN-GJL-200 (GG20) EN-JL-1030
	1.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	250-450 N/mm ²	EN-GJL-300 (GG30) EN-JL-1050
	2.1	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	350-500 N/mm ²	EN-GJS-400-15 (GGG40) EN-JS-1030
	2.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	500-900 N/mm ²	EN-GJS-700-2 (GGG70) EN-JS-1070
N	3.1	Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	300-400 N/mm ²	GJV 300
	3.2	Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	400-500 N/mm ²	GJV 450
	4.1	Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	250-500 N/mm ²	EN-GJMW-350-4 (GTW-35) EN-JM-1010
	4.2	Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	500-800 N/mm ²	EN-GJMB-450-6 (GTS-45) EN-JM-1140
	Nichteisenwerkstoffe		Non-ferrous materials		
	Aluminium-Legierungen		Aluminium alloys		
S	1.1	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 200 N/mm ²	EN AW-AlMn1 EN AW-3103
	1.2	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 350 N/mm ²	EN AW-AlMgSi EN AW-6060
	1.3	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 550 N/mm ²	EN AW-AlZn5Mg3Cu EN AW-7022
	1.4	Aluminium-Knetlegierungen	Wrought aluminium alloys	Si ≤ 7%	EN AC-AlMg5 EN AC-51300
	1.5	Aluminium-Gusslegierungen	Aluminium cast alloys	7% < Si ≤ 12%	EN AC-AISi9Cu3 EN AC-46500
	1.6	Aluminium-Gusslegierungen	Aluminium cast alloys	12% < Si ≤ 17%	GD-AISi17Cu4FeMg
	Kupfer-Legierungen		Copper alloys		
	2.1	Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	≤ 400 N/mm ²	E-Cu 57
	2.2	Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	≤ 550 N/mm ²	CuZn37 (Ms63) EN CW 508 L
	2.3	Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	≤ 550 N/mm ²	CuZn36Pb3 (Ms58) EN CW 603 N
	2.4	Kupfer-Aluminium-Legierungen (Alubronze, langspanend)	Copper-aluminium alloys (alu bronze, long-chipping)	≤ 800 N/mm ²	CuAl10Ni5Fe4 EN CW 307 G
	2.5	Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	≤ 700 N/mm ²	CuSn8P EN CW 459 K
	2.6	Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	≤ 400 N/mm ²	CuSn7 ZnPb (Rg7) 2.1090
	2.7	Kupfer-Sonderlegierungen	Special copper alloys	≤ 600 N/mm ²	(AMPCO® 8)
	2.8	Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ²	(AMPCO® 45)
	Magnesium-Legierungen		Magnesium alloys		
	3.1	Magnesium-Knetlegierungen	Magnesium wrought alloys	≤ 500 N/mm ²	MgAl6Zn 3.5612
	3.2	Magnesium-Gusslegierungen	Magnesium cast alloys	≤ 500 N/mm ²	EN-MCMgAl9Zn1 EN-MC21120
H	Kunststoffe		Synthetics		
	4.1	Duroplaste (kurzspanend)	Duroplastics (short-chipping)		Bakelit, Pertinax
	4.2	Thermoplaste (langspanend)	Thermoplastics (long-chipping)		PMMA, POM, PVC
	4.3	Faserverstärkte Kunststoffe (Faseranteil ≤ 30%)	Fibre-reinforced synthetics (fibre content ≤ 30%)		GFK, CFK, AFK
	4.4	Faserverstärkte Kunststoffe (Faseranteil > 30%)	Fibre-reinforced synthetics (fibre content > 30%)		GFK, CFK, AFK
	Besondere Werkstoffe		Special materials		
	5.1	Grafit	Graphite		C 8000
	5.2	Wolfram-Kupfer-Legierungen	Tungsten-copper alloys		W-Cu 80/20
	5.3	Verbundwerkstoffe	Composite materials		Hyllite, Alucobond
	Spezialwerkstoffe		Special materials		
	Titan-Legierungen		Titanium alloys		
H	1.1	Reintitan	Pure titanium	≤ 450 N/mm ²	Ti1 3.7025
	1.2	Titan-Legierungen	Titanium alloys	≤ 900 N/mm ²	TiAl6V4 3.7165
	1.3	Titan-Legierungen	Titanium alloys	≤ 1250 N/mm ²	TiAl4Mo4Sn2 3.7185
	Nickel-, Kobalt- und Eisen-Legierungen		Nickel alloys, cobalt alloys and iron alloys		
	2.1	Reinnickel	Pure nickel	≤ 600 N/mm ²	Ni 99.6 2.4060
	2.2	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1000 N/mm ²	Monel 400 2.4360
	2.3	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm ²	Inconel 718 2.4668
	2.4	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1000 N/mm ²	Udimet 605
	2.5	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1600 N/mm ²	Haynes 25 2.4964
	2.6	Eisen-Basis-Legierungen	Iron-base alloys	≤ 1500 N/mm ²	Incoloy 800 1.4958
H	Harte Werkstoffe		Hard materials		
	1.1	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	44 - 50 HRC	Weldox 1100
	1.2	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	50 - 55 HRC	Hardox 550
	1.3	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	55 - 60 HRC	Armox 600T
	1.4	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	60 - 63 HRC	Ferro-Titanit
	1.5	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	63 - 66 HRC	HSSE

Hartmetall-Schaftfräser „Micro“
Solid carbide end mills „Micro“



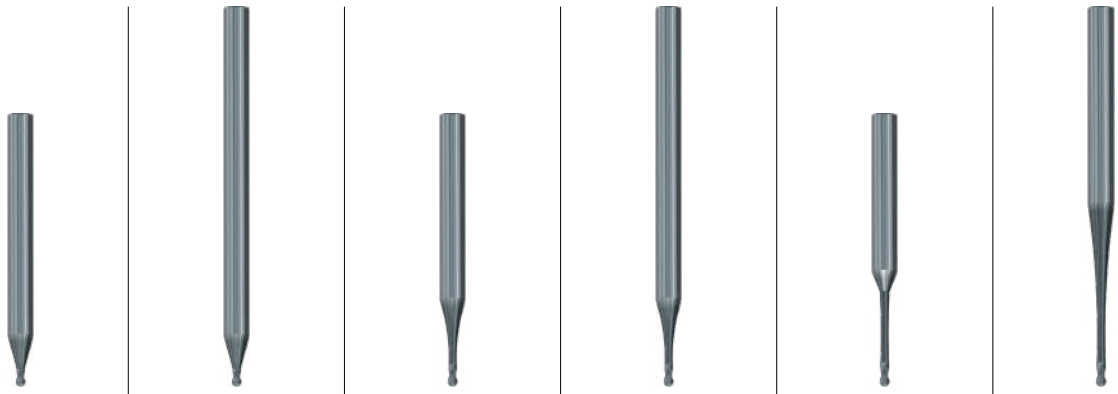
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2,2 x d ₁		5 x d ₁		10 x d ₁		l ₃
ø 0,2 - 2,0 mm		ø 0,2 - 2,0 mm		ø 0,2 - 2,0 mm		d ₁
2		2		2		Z (Flutes)
2760L	2763L	2761L	2764L	2762L	2765L	
10	12	14	16	18	20	Seite · Page
11	13	15	17	19	21	v _c / f _z

						1.1	P
						2.1	
						3.1	
						4.1	
						5.1	
						1.1	M
						2.1	
						3.1	
						4.1	
						1.1	K
						1.2	
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						2.2	
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						3.2	
						4.1	
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						2.8	
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						4.1	
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						4.3	
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						5.1	N
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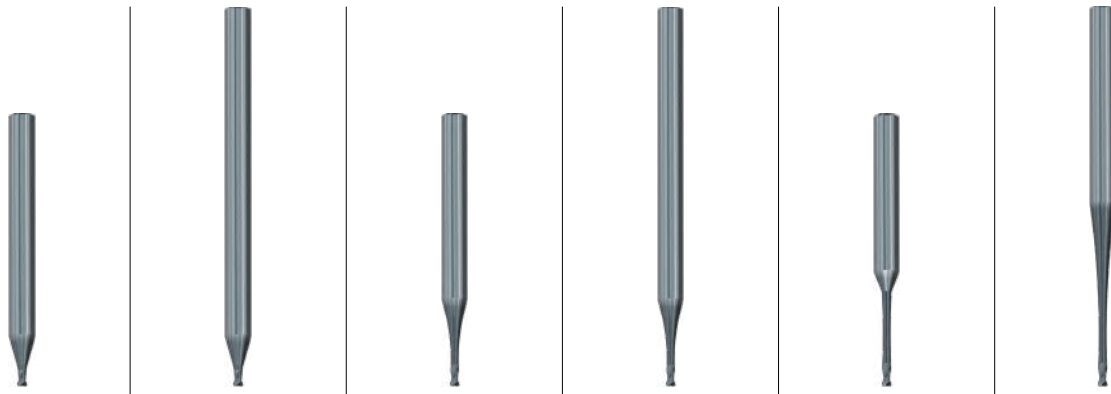
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

Hartmetall-Kugelfräser „Micro“
Solid carbide ball nose end mills “Micro”



N							
l_3	2,2 x d_1		5 x d_1		10 x d_1		
d_1	ø 0,2 - 2,0 mm		ø 0,2 - 2,0 mm		ø 0,2 - 2,0 mm		
Z (Flutes)	2		2		2		
	2770L	2773L	2771L	2774L	2772L	2775L	
Seite · Page	22	24	26	28	30	32	
v_c / f_z	23	25	27	29	31	33	
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	■	■	■	■	■	
	2.2	■	■	■	■	■	
	3.1	■	■	■	■	■	
	3.2	■	■	■	■	■	
	4.1	■	■	■	■	■	
	4.2	■	■	■	■	■	
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						
	2.3						
	2.4						
	2.5						
H	1.1	□	□	□	□	□	
	1.2	□	□	□	□	□	
	1.3						
	1.4						
	1.5						

Hartmetall-Torusfräser „Micro“
Solid carbide torus end mills "Micro"



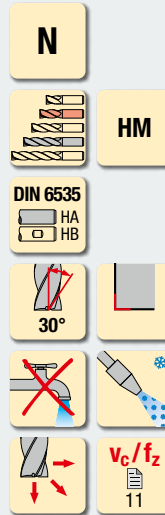
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2,2 x d ₁ ø 0,5 - 2,0 mm		5 x d ₁ ø 0,5 - 2,0 mm		10 x d ₁ ø 0,5 - 2,0 mm		l ₃ d ₁ Z (Flutes)
2		2		2		
2780L	2783L	2781L	2784L	2782L	2785L	
34	34	36	36	38	38	Seite · Page
35	35	37	37	39	39	v _c / f _z
■	■	■	■	■	■	1.1
■	■	■	■	■	■	2.1
■	■	■	■	■	■	3.1
■	■	■	■	■	■	4.1
■	■	■	■	■	■	5.1
■	■	■	■	■	■	1.1
■	■	■	■	■	■	2.1
□	□	□	□	□	□	3.1
□	□	□	□	□	□	4.1
■	■	■	■	■	■	1.1
■	■	■	■	■	■	1.2
■	■	■	■	■	■	2.1
■	■	■	■	■	■	2.2
■	■	■	■	■	■	3.1
■	■	■	■	■	■	3.2
■	■	■	■	■	■	4.1
■	■	■	■	■	■	4.2
■	■	■	■	■	■	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
□	□	□	□	□	□	1.1
□	□	□	□	□	□	1.2
□	□	□	□	□	□	1.3
□	□	□	□	□	□	2.1
□	□	□	□	□	□	2.2
□	□	□	□	□	□	2.3
□	□	□	□	□	□	2.4
□	□	□	□	□	□	2.5
□	□	□	□	□	□	2.6
□	□	□	□	□	□	1.1
□	□	□	□	□	□	1.2
□	□	□	□	□	□	1.3
□	□	□	□	□	□	1.4
□	□	□	□	□	□	1.5

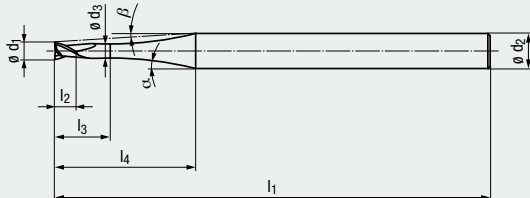
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- Centre cutting
- 3 neck lengths available



$$l_3 = 2,2 \times d_1$$


Beschichtung · Coating
Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

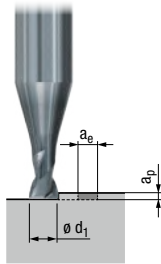
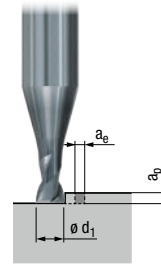
Kurze Ausführung · Short design
Scharfkantig · Sharp-edged

ø d ₁	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)			
0,2	-0,016	0,12	0,56	38	0,16	5,7	3	16,5°	14°	2	2760L.000203	
0,3	-0,019	0,18	0,85	38	0,24	5,8	3	17°	13,5°	2	2760L.000303	
0,4	-0,020	0,24	1,16	38	0,32	5,8	3	17°	13°	2	2760L.000403	
0,5	-0,020	0,3	1,1	38	0,4	5,8	3	16°	12,5°	2	2760L.000503	
0,6	-0,020	0,36	1,32	38	0,48	5,9	3	16°	12°	2	2760L.000603	
0,7	-0,020	0,42	1,54	38	0,56	5,9	3	16°	11,5°	2	2760L.000703	
0,8	-0,020	0,48	1,76	38	0,64	5,9	3	16°	11°	2	2760L.000803	
0,9	-0,020	0,54	1,98	38	0,72	5,9	3	16°	10,5°	2	2760L.000903	
1,0	-0,020	0,6	2,2	38	0,8	5,9	3	16,5°	10°	2	2760L.001003	
1,1	-0,020	0,66	2,42	38	0,88	6	3	16°	9,5°	2	2760L.001103	
1,2	-0,020	0,72	2,64	38	0,96	6	3	16°	9°	2	2760L.001203	
1,3	-0,020	0,78	2,86	38	1,04	6	3	16,5°	8,5°	2	2760L.001303	
1,4	-0,020	0,84	3,08	38	1,12	6,1	3	16°	8°	2	2760L.001403	
1,5	-0,020	0,9	3,3	38	1,2	6,1	3	16°	7,5°	2	2760L.001503	
1,6	-0,020	0,96	3,52	38	1,28	6,2	3	16°	7°	2	2760L.001603	
1,7	-0,020	1,02	3,74	38	1,36	6,2	3	16°	6,5°	2	2760L.001703	
1,8	-0,020	1,08	3,96	38	1,44	6,2	3	16°	6°	2	2760L.001803	
1,9	-0,020	1,14	4,18	38	1,52	6,2	3	16,5°	5,5°	2	2760L.001903	
0,2	-0,016	0,12	0,56	43	0,16	7,5	4	17°	14,5°	2	2760L.000204	
0,3	-0,019	0,18	0,85	43	0,24	7,7	4	16,5°	14°	2	2760L.000304	
0,4	-0,020	0,24	1,16	43	0,32	7,6	4	17°	14°	2	2760L.000404	
0,5	-0,020	0,3	1,1	43	0,4	7,6	4	16,5°	13,5°	2	2760L.000504	
0,6	-0,020	0,36	1,32	43	0,48	7,8	4	16°	12,5°	2	2760L.000604	
0,7	-0,020	0,42	1,54	43	0,56	7,7	4	16°	12,5°	2	2760L.000704	
0,8	-0,020	0,48	1,76	43	0,64	7,7	4	16,5°	12°	2	2760L.000804	
0,9	-0,020	0,54	1,98	43	0,72	7,7	4	16,5°	12°	2	2760L.000904	
1,0	-0,020	0,6	2,2	43	0,8	7,7	4	16,5°	11,5°	2	2760L.001004	
1,1	-0,020	0,66	2,42	43	0,88	7,8	4	16,5°	11°	2	2760L.001104	
1,2	-0,020	0,72	2,64	43	0,96	7,8	4	16,5°	10,5°	2	2760L.001204	
1,3	-0,020	0,78	2,86	43	1,04	7,8	4	16,5°	10,5°	2	2760L.001304	
1,4	-0,020	0,84	3,08	43	1,12	7,9	4	16,5°	10°	2	2760L.001404	
1,5	-0,020	0,9	3,3	43	1,2	7,9	4	16,5°	9,5°	2	2760L.001504	
1,6	-0,020	0,96	3,52	43	1,28	8,1	4	16°	9°	2	2760L.001604	
1,7	-0,020	1,02	3,74	43	1,36	8	4	16,5°	8,5°	2	2760L.001704	
1,8	-0,020	1,08	3,96	43	1,44	8	4	16,5°	8,5°	2	2760L.001804	
1,9	-0,020	1,14	4,18	43	1,52	8	4	16,5°	8°	2	2760L.001904	
2,0	-0,020	1,2	4,4	43	1,6	8,4	4	15°	7°	2	2760L.002004	
2,0	-0,020	1,2	4,4	50	1,6	11,9	6	16°	10°	2	2760L.002006	


Hartmetall-Schaftfräser „Micro“ – kurze Ausführung
Solid carbide end mills “Micro” – short design

$$l_3 = 2,2 \times d_1$$

N

Schruppen
Roughing

Schlichten
Finishing

Gültig für · Valid for
 2760L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	2.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	3.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	4.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	5.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
M	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	3.1					95	$0,013 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	4.1					75	$0,010 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
K	1.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	1.2	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	2.1	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	2.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	3.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	3.2	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	4.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	4.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
N	1.1	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.2	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.3	195	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	195	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.4	175	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.5					140	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	1.6					95	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.2	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.3	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	2.4	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.5	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.6	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	□	□	■
	2.7	75	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,014 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.8	55	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	3.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	3.2	140	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	4.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	4.2	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$		□	□	■
	4.3												
	4.4												
	5.1												
	5.2	95	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	5.3	120	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		■
S	1.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.2	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,011 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.3	120	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					120	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		
	1.2					75	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

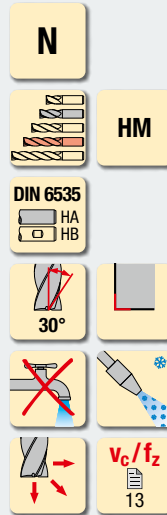
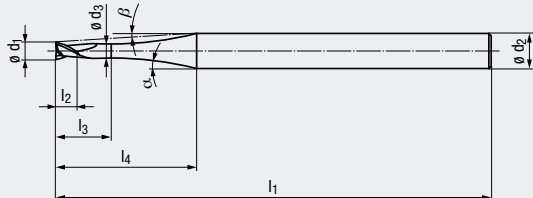
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- Centre cutting
- 3 neck lengths available

$$l_3 = 2,2 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

Lange Ausführung · Long design

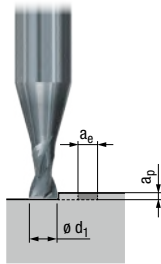
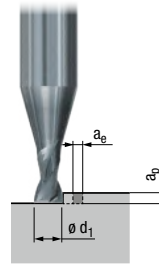
Scharfkantig · Sharp-edged

$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)		
0,2 -0,016	0,2	0,64	43	0,16	5,7	3	17°	14°	2	2763L.000203	
0,5 -0,020	0,5	1,1	43	0,4	5,8	3	16°	12,5°	2	2763L.000503	
0,8 -0,020	0,8	1,76	43	0,64	5,9	3	16°	11°	2	2763L.000803	
1,0 -0,020	1	2,2	43	0,8	5,9	3	16°	10°	2	2763L.001003	
1,5 -0,020	1,5	3,3	43	1,2	6,1	3	16°	7,5°	2	2763L.001503	
1,8 -0,020	1,8	3,96	43	1,44	6,2	3	16°	6°	2	2763L.001803	
0,2 -0,016	0,2	0,64	60	0,16	7,5	4	17°	14,5°	2	2763L.000204	
0,5 -0,020	0,5	1,1	60	0,4	7,6	4	16°	13,5°	2	2763L.000504	
0,8 -0,020	0,8	1,76	60	0,64	7,7	4	16°	12°	2	2763L.000804	
1,0 -0,020	1	2,2	60	0,8	7,7	4	16°	11,5°	2	2763L.001004	
1,5 -0,020	1,5	3,3	60	1,2	7,9	4	16°	9,5°	2	2763L.001504	
1,8 -0,020	1,8	3,96	60	1,44	8	4	16°	8,5°	2	2763L.001804	
2,0 -0,020	2,0	4,4	60	1,6	8,4	4	15°	7°	2	2763L.002004	
2,0 -0,020	2,0	4,4	57	1,6	11,9	6	16°	10°	2	2763L.002006	


Hartmetall-Schaftfräser „Micro“ – lange Ausführung
 Solid carbide end mills “Micro” – long design

$$l_3 = 2,2 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2763L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☒	☐	☒
	2.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☒	☐	☒
	3.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☒	☐	☒
	4.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	5.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
M	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			☐	☒
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			☐	☒
	3.1					95	$0,013 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	4.1					75	$0,010 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
K	1.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☒		☐
	1.2	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☒		☐
	2.1	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	☐	☒		☐
	2.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	☐	☒		☐
	3.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	3.2	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	4.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	☐	☒		☐
	4.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	☐	☒		☐
N	1.1	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			☐	☒
	1.2	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			☐	☒
	1.3	195	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	195	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	1.4	175	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	1.5					140	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.6					95	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			☐	☒
	2.2	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			☐	☒
	2.3	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☐	☐	☒
	2.4	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	2.5	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	2.6	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	☐	☐	☐	☒
	2.7	75	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,014 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.8	55	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	3.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	3.2	140	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	4.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☐	☐	☒
	4.2	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	☐	☐	☐	☒
	4.3												
	4.4												
	5.1												
	5.2	95	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	5.3	120	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	☐	☒		☒
S	1.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	1.2	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,011 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	1.3	120	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			☐	☒
	2.2												
	2.3												
H	1.1					120	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		
	1.2					75	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$	☐	☒		
	1.3												
	1.4												
	1.5												

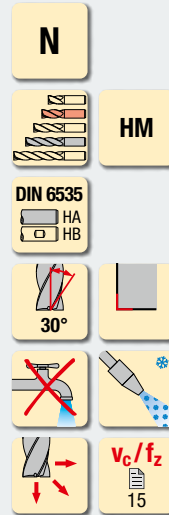
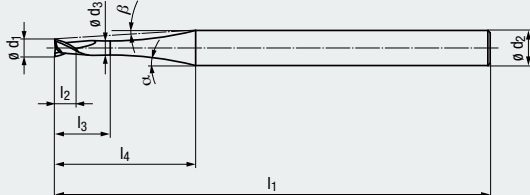
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- Centre cutting
- 3 neck lengths available

$$l_3 = 5 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

Kurze Ausführung · Short design

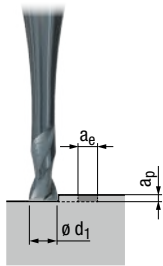
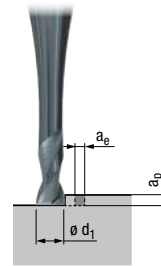
Scharfkantig · Sharp-edged

$\emptyset d_1$	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h5	α	β	Z (Flutes)			
0,2	-0,016	0,2	1	38	0,16	6,4	3	16°	13°	2	2761L.000203	
0,3	-0,019	0,3	1,5	38	0,24	6,9	3	15,5°	11,5°	2	2761L.000303	
0,4	-0,020	0,4	2	38	0,32	7,4	3	15°	10,5°	2	2761L.000403	
0,5	-0,020	0,5	2,5	38	0,4	7,8	3	15°	9,5°	2	2761L.000503	
0,6	-0,020	0,6	3	38	0,48	8,3	3	14,5°	8,5°	2	2761L.000603	
0,7	-0,020	0,7	3,5	38	0,56	8,8	3	13,5°	8°	2	2761L.000703	
0,8	-0,020	0,8	4	38	0,64	9	3	14°	7,5°	2	2761L.000803	
0,9	-0,020	0,9	4,5	38	0,72	9,5	3	13,5°	7°	2	2761L.000903	
1,0	-0,020	1,0	5	43	0,8	9,7	3	13,5°	6,5°	2	2761L.001003	
1,1	-0,020	1,1	5,5	43	0,88	10	3	13,5°	6°	2	2761L.001103	
1,2	-0,020	1,2	6	43	0,96	10,5	3	12,5°	5,5°	2	2761L.001203	
1,3	-0,020	1,3	6,5	43	1,04	11	3	12°	5°	2	2761L.001303	
1,4	-0,020	1,4	7	43	1,12	11,5	3	11,5°	4,5°	2	2761L.001403	
1,5	-0,020	1,5	7,5	43	1,2	11,8	3	11°	4°	2	2761L.001503	
1,6	-0,020	1,6	8	43	1,28	12	3	11°	4°	2	2761L.001603	
1,7	-0,020	1,7	8,5	43	1,36	12,5	3	10,5°	3,5°	2	2761L.001703	
1,8	-0,020	1,8	9	43	1,44	12,9	3	10°	3°	2	2761L.001803	
1,9	-0,020	1,9	9,5	43	1,52	13,2	3	9,5°	3°	2	2761L.001903	
0,2	-0,016	0,2	1	43	0,16	8,2	4	16,5°	13,5°	2	2761L.000204	
0,3	-0,019	0,3	1,5	43	0,24	8,8	4	16°	12,5°	2	2761L.000304	
0,4	-0,020	0,4	2	43	0,32	9,4	4	15,5°	11,5°	2	2761L.000404	
0,5	-0,020	0,5	2,5	43	0,4	9,8	4	15°	10,5°	2	2761L.000504	
0,6	-0,020	0,6	3	43	0,48	10,4	4	14,5°	9,5°	2	2761L.000604	
0,7	-0,020	0,7	3,5	43	0,56	11	4	14°	9°	2	2761L.000704	
0,8	-0,020	0,8	4	43	0,64	11,1	4	14°	8,5°	2	2761L.000804	
0,9	-0,020	0,9	4,5	43	0,72	11,7	4	13,5°	8°	2	2761L.000904	
1,0	-0,020	1,0	5	43	0,8	11,9	4	13,5°	7,5°	2	2761L.001004	
1,1	-0,020	1,1	5,5	43	0,88	12,2	4	13,5°	7°	2	2761L.001104	
1,2	-0,020	1,2	6	43	0,96	12,9	4	13°	6,5°	2	2761L.001204	
1,3	-0,020	1,3	6,5	43	1,04	13,5	4	12°	6°	2	2761L.001304	
1,4	-0,020	1,4	7	43	1,12	14,2	4	11,5°	5,5°	2	2761L.001404	
1,5	-0,020	1,5	7,5	43	1,2	14,5	4	11,5°	5,5°	2	2761L.001504	
1,6	-0,020	1,6	8	43	1,28	14,7	4	11,5°	5°	2	2761L.001604	
1,7	-0,020	1,7	8,5	43	1,36	15,4	4	10,5°	4,5°	2	2761L.001704	
1,8	-0,020	1,8	9	43	1,44	16	4	10°	4,5°	2	2761L.001804	
1,9	-0,020	1,9	9,5	43	1,52	16,4	4	9,5°	4°	2	2761L.001904	
2,0	-0,020	2,0	10	43	1,6	15,3	4	12°	4°	2	2761L.002004	
2,0	-0,020	2,0	10	50	1,6	19,7	6	13°	6,5°	2	2761L.002006	


Hartmetall-Schaftfräser „Micro“ – kurze Ausführung
 Solid carbide end mills “Micro” – short design

$$l_3 = 5 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2761L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	3.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	4.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■	□	■
	5.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■	□	■
M	1.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	2.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	3.1					75	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	4.1					40	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
K	1.1	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	1.2	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	2.1	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■		□
	2.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■		□
	3.1	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		□
	3.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		□
	4.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,012 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■		□
	4.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■		□
N	1.1	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	1.2	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	1.3	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	1.4	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	1.5					120	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	1.6					75	$0,014 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.1	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	2.2	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	2.3	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	□	□	■
	2.4	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	2.5	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	2.6	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	□	□	■
	2.7	70	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	70	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.8	45	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	45	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	3.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	3.2	120	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	4.1	140	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	4.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,016 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			□	■
	5.3	120	$0,004 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■		■
S	1.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	1.2	95	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	1.3	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.2												
	2.3												
H	1.1					95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	□	■		
	1.2					70	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

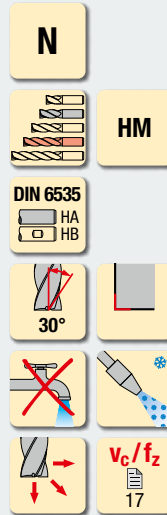
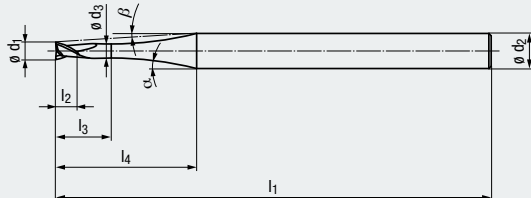
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- Centre cutting
- 3 neck lengths available

$$l_3 = 5 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

Lange Ausführung · Long design

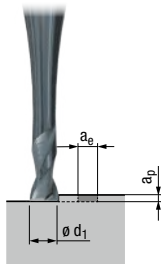
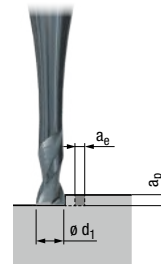
Scharfkantig · Sharp-edged

$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)			
0,2	-0,016	0,2	1	43	0,16	6,4	3	16°	13°	2	2764L.000203	
0,5	-0,020	0,5	2,5	43	0,4	7,8	3	15°	9,5°	2	2764L.000503	
0,8	-0,020	0,8	4	43	0,64	9	3	14°	7,5°	2	2764L.000803	
1,0	-0,020	1,0	5	50	0,8	9,7	3	13,5°	6,5°	2	2764L.001003	
1,5	-0,020	1,5	7,5	50	1,2	11,8	3	11°	4°	2	2764L.001503	
1,8	-0,020	1,8	9	50	1,44	12,9	3	10°	3°	2	2764L.001803	
0,2	-0,016	0,2	1	60	0,16	8,2	4	16,5°	13,5°	2	2764L.000204	
0,5	-0,020	0,5	2,5	60	0,4	9,8	4	15°	10,5°	2	2764L.000504	
0,8	-0,020	0,8	4	60	0,64	11,1	4	14°	8,5°	2	2764L.000804	
1,0	-0,020	1,0	5	60	0,8	11,9	4	13,5°	7,5°	2	2764L.001004	
1,5	-0,020	1,5	7,5	60	1,2	14,5	4	11,5°	5,5°	2	2764L.001504	
1,8	-0,020	1,8	9	60	1,44	16	4	10°	4,5°	2	2764L.001804	
2,0	-0,020	2	10	60	1,6	15,3	4	12°	4°	2	2764L.002004	
2,0	-0,020	2	10	57	1,6	19,7	6	13°	6,5°	2	2764L.002006	


Hartmetall-Schaftfräser „Micro“ – lange Ausführung
 Solid carbide end mills “Micro” – long design

$$l_3 = 5 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2764L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	4.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
	5.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
M	1.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	3.1					75	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1					40	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
K	1.1	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	1.2	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	2.1	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	2.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	3.1	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	3.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	4.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,012 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	4.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
N	1.1	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.2	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.3	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.4	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.5					120	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	1.6					75	$0,014 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.2	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.3	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☐	☐	☒
	2.4	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.5	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.6	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☐	☐	☒
	2.7	70	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	70	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.8	45	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	45	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	3.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	3.2	120	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1	140	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,016 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.3												
	4.4												
	5.1												
	5.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	5.3	120	$0,004 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☒
S	1.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.2	95	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.3	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.2												
	2.3												
H	1.1					95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		
	1.2					70	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		
	1.3												
	1.4												
	1.5												

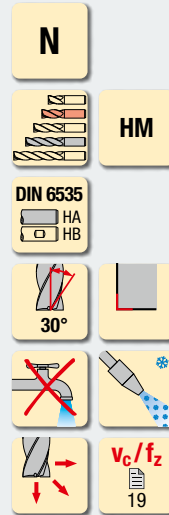
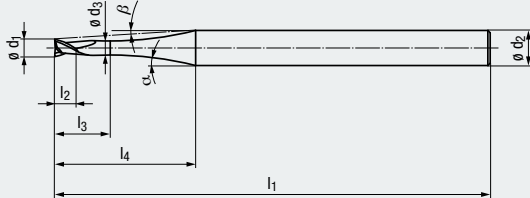
 ■ = sehr gut geeignet · very suitable
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 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- Centre cutting
- 3 neck lengths available

$$l_3 = 10 \times d_1$$


Beschichtung · Coating
Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

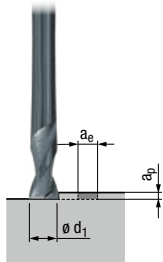
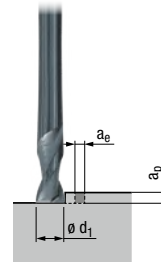
Kurze Ausführung · Short design
Scharfkantig · Sharp-edged

ø d ₁	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)		
0,2 -0,016	0,2	2	38	0,16	9,2	3	12,5°	9°	2	2762L.000203	
0,3 -0,019	0,3	3	38	0,24	9,7	3	13°	8,5°	2	2762L.000303	
0,4 -0,020	0,4	4	38	0,32	10,2	3	13,5°	7,5°	2	2762L.000403	
0,5 -0,020	0,5	5	38	0,4	10,7	3	14°	7°	2	2762L.000503	
0,6 -0,020	0,6	6	38	0,48	11,6	3	13,5°	6,5°	2	2762L.000603	
0,7 -0,020	0,7	7	38	0,56	12,5	3	13,5°	5,5°	2	2762L.000703	
0,8 -0,020	0,8	8	38	0,64	13,5	3	13°	5°	2	2762L.000803	
0,9 -0,020	0,9	9	38	0,72	14,4	3	12,5°	4,5°	2	2762L.000903	
1,0 -0,020	1,0	10	43	0,8	15,3	3	12°	4°	2	2762L.001003	
1,1 -0,020	1,1	11	43	0,88	15,9	3	12,5°	4°	2	2762L.001103	
1,2 -0,020	1,2	12	43	0,96	16,5	3	13°	3,5°	2	2762L.001203	
1,3 -0,020	1,3	13	43	1,04	17,1	3	13,5°	3,5°	2	2762L.001303	
1,4 -0,020	1,4	14	43	1,12	17,6	3	14°	3°	2	2762L.001403	
1,5 -0,020	1,5	15	43	1,2	18,1	3	15,5°	3°	2	2762L.001503	
1,6 -0,020	1,6	16	43	1,28	18,7	3	16,5°	2,5°	2	2762L.001603	
1,7 -0,020	1,7	17	43	1,36	19,3	3	18°	2,5°	2	2762L.001703	
1,8 -0,020	1,8	18	43	1,44	20	3	19°	2°	2	2762L.001803	
1,9 -0,020	1,9	19	43	1,52	20,5	3	22,5°	2°	2	2762L.001903	
0,2 -0,016	0,2	2	43	0,16	11,6	4	12,5°	10°	2	2762L.000204	
0,3 -0,019	0,3	3	43	0,24	12	4	13°	9°	2	2762L.000304	
0,4 -0,020	0,4	4	43	0,32	12,4	4	13,5°	8,5°	2	2762L.000404	
0,5 -0,020	0,5	5	43	0,4	12,8	4	14,5°	8°	2	2762L.000504	
0,6 -0,020	0,6	6	43	0,48	13,8	4	14°	7,5°	2	2762L.000604	
0,7 -0,020	0,7	7	43	0,56	14,7	4	13,5°	7°	2	2762L.000704	
0,8 -0,020	0,8	8	43	0,64	15,8	4	13°	6°	2	2762L.000804	
0,9 -0,020	0,9	9	43	0,72	16,8	4	13°	5,5°	2	2762L.000904	
1,0 -0,020	1,0	10	43	0,8	17,8	4	12,5°	5,5°	2	2762L.001004	
1,1 -0,020	1,1	11	43	0,88	18,3	4	13°	5°	2	2762L.001104	
1,2 -0,020	1,2	12	43	0,96	18,8	4	13°	4,5°	2	2762L.001204	
1,3 -0,020	1,3	13	43	1,04	19,3	4	13,5°	4,5°	2	2762L.001304	
1,4 -0,020	1,4	14	43	1,12	19,7	4	14,5°	4°	2	2762L.001404	
1,5 -0,020	1,5	15	43	1,2	20	4	16°	4°	2	2762L.001504	
1,6 -0,020	1,6	16	43	1,28	20,5	4	17°	4°	2	2762L.001604	
1,7 -0,020	1,7	17	43	1,36	21	4	18°	3,5°	2	2762L.001704	
1,8 -0,020	1,8	18	43	1,44	21,6	4	19°	3,5°	2	2762L.001804	
1,9 -0,020	1,9	19	43	1,52	21,8	4	23°	3°	2	2762L.001904	
2,0 -0,020	2	20	43	1,6	22,8	4	22°	3°	2	2762L.002004	
2,0 -0,020	2	20	50	1,6	25	6	24,5°	5°	2	2762L.002006	


Hartmetall-Schaftfräser „Micro“ – kurze Ausführung
Solid carbide end mills “Micro” – short design

$$l_3 = 10 \times d_1$$

N

Schruppen
Roughing

Schlichten
Finishing

Gültig für · Valid for
 2762L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■	□	■
	2.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■	□	■
	3.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■	□	■
	4.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■	□	■
	5.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■	□	■
M	1.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.1	55	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	55	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	3.1					55	$0,012 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	4.1					45	$0,012 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
K	1.1	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		□
	1.2	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		□
	2.1	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
	2.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
	3.1	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		□
	3.2	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		□
	4.1	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
	4.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
N	1.1	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	1.2	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	1.3	160	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,011 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.4	160	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.5					95	$0,011 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	1.6					55	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.3	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	□	□	■
	2.4	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	2.5	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	2.6	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	□	□	■
	2.7	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	2.8	40	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	40	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	3.1	140	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	3.2	95	$0,007 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	4.1	120	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	4.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	55	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	5.3	120	$0,004 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		■
S	1.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.3	75	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	2.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,009 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					75	$0,013 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		
	1.2					55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

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

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- Centre cutting
- 3 neck lengths available

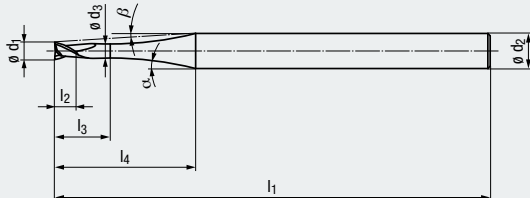
N



HM



$$l_3 = 10 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

Lange Ausführung · Long design

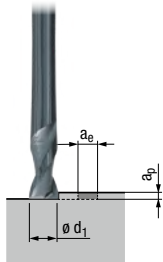
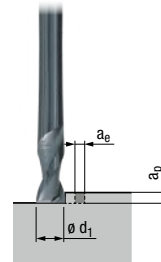
Scharfkantig · Sharp-edged

$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)			
0,2	-0,016	0,2	2	43	0,16	9,2	3	12,5°	9°	2	2765L.000203	
0,5	-0,020	0,5	5	43	0,4	14,5	3	8,5°	5,5°	2	2765L.000503	
0,8	-0,020	0,8	8	43	0,64	15,5	3	9,5°	4,5°	2	2765L.000803	
1,0	-0,020	1,0	10	50	0,8	20,6	3	6,5°	3°	2	2765L.001003	
1,5	-0,020	1,5	15	50	1,2	22	3	7°	2,5°	2	2765L.001503	
1,8	-0,020	1,8	18	50	1,44	22	3	10°	2°	2	2765L.001803	
0,2	-0,016	0,2	2	60	0,16	11,6	4	12,5°	10°	2	2765L.000204	
0,5	-0,020	0,5	5	60	0,4	18	4	9°	6°	2	2765L.000504	
0,8	-0,020	0,8	8	60	0,64	18,7	4	9,5°	5,5°	2	2765L.000804	
1,0	-0,020	1,0	10	60	0,8	25,5	4	6,5°	4°	2	2765L.001004	
1,5	-0,020	1,5	15	60	1,2	26,3	4	7,5°	3°	2	2765L.001504	
1,8	-0,020	1,8	18	60	1,44	25,1	4	10°	3°	2	2765L.001804	
2,0	-0,020	2	20	60	1,6	25	4	13°	2,5°	2	2765L.002004	
2,0	-0,020	2	20	57	1,6	29	6	14°	4,5°	2	2765L.002006	


Hartmetall-Schaftfräser „Micro“ – lange Ausführung
Solid carbide end mills „Micro“ – long design

$$l_3 = 10 \times d_1$$

N

Schruppen
Roughing

Schlichten
Finishing

Gültig für · Valid for
 2765L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	3.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	5.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
M	1.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	55	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	55	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	3.1					55	$0,012 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	4.1					45	$0,012 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
K	1.1	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.2	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	3.1	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.2	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	4.1	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	4.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
N	1.1	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.2	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.3	160	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,011 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.4	160	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.5					95	$0,011 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	1.6					55	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.3	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.4	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.5	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.6	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.7	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.8	40	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	40	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.2	95	$0,007 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	4.1	120	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.3									☐	☒	☐	☒
	4.4									☐	☒	☐	☒
	5.1									☐	☒	☐	☒
	5.2	55	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	5.3	120	$0,004 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
S	1.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.3	75	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,009 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.2									☐	☒	☐	☒
	2.3									☐	☒	☐	☒
	2.4									☐	☒	☐	☒
	2.5									☐	☒	☐	☒
H	1.1					75	$0,013 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.2					55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	1.3									☐	☒	☐	☒
	1.4									☐	☒	☐	☒
	1.5									☐	☒	☐	☒

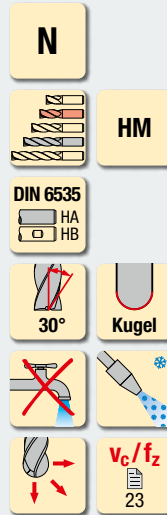
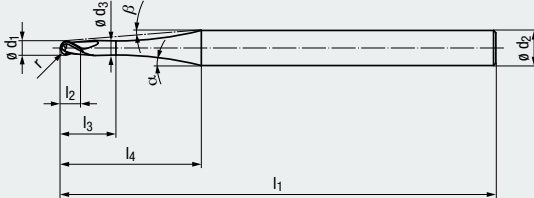
■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Spezielle Halsausführungen
- 3 Halslängen verfügbar

- Multi-functional tool
- Optimized chisel edge
- Special neck designs
- 3 neck lengths available

$$l_3 = 2,2 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

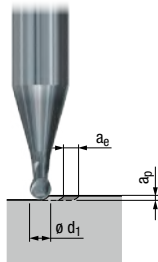
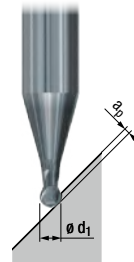
Kurze Ausführung · Short design

Ø d ₁	r	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	α	β	Z (Flutes)				
0,2	-0,016	0,1	-0,008	0,12	0,56	38	0,16	5,7	3	16,5°	14°	2	2770L.000203	
0,3	-0,020	0,15	-0,010	0,18	0,85	38	0,24	5,8	3	16,5°	13,5°	2	2770L.000303	
0,4	-0,020	0,2	-0,010	0,24	1,16	38	0,32	5,8	3	17°	13°	2	2770L.000403	
0,5	-0,020	0,25	-0,010	0,3	1,1	38	0,4	5,8	3	16°	12,5°	2	2770L.000503	
0,6	-0,020	0,3	-0,010	0,36	1,32	38	0,48	5,9	3	16°	12°	2	2770L.000603	
0,7	-0,020	0,35	-0,010	0,42	1,54	38	0,56	5,9	3	16°	11,5°	2	2770L.000703	
0,8	-0,020	0,4	-0,010	0,48	1,76	38	0,64	5,9	3	16°	11°	2	2770L.000803	
0,9	-0,020	0,45	-0,010	0,54	1,98	38	0,72	5,9	3	16°	10,5°	2	2770L.000903	
0,2	-0,016	0,1	-0,008	0,12	0,56	43	0,16	7,5	4	17°	14,5°	2	2770L.000204	
0,3	-0,020	0,15	-0,010	0,18	0,85	43	0,24	7,7	4	16,5°	14°	2	2770L.000304	
0,4	-0,020	0,2	-0,010	0,24	1,16	43	0,32	7,6	4	17°	14°	2	2770L.000404	
0,5	-0,020	0,25	-0,010	0,3	1,1	43	0,4	7,6	4	16,5°	13,5°	2	2770L.000504	
0,6	-0,020	0,3	-0,010	0,36	1,32	43	0,48	7,8	4	16°	12,5°	2	2770L.000604	
0,7	-0,020	0,35	-0,010	0,42	1,54	43	0,56	7,7	4	16°	12,5°	2	2770L.000704	
0,8	-0,020	0,4	-0,010	0,48	1,76	43	0,64	7,7	4	16,5°	12°	2	2770L.000804	
0,9	-0,020	0,45	-0,010	0,54	1,98	43	0,72	7,7	4	16,5°	12°	2	2770L.000904	
1,0	-0,020	0,5	-0,010	0,6	2,2	43	0,8	7,8	4	16°	11,5°	2	2770L.001004	
1,1	-0,020	0,55	-0,010	0,66	2,42	43	0,88	7,9	4	16°	11°	2	2770L.001104	
1,2	-0,020	0,6	-0,010	0,72	2,64	43	0,96	7,9	4	16°	10,5°	2	2770L.001204	
1,3	-0,020	0,65	-0,010	0,78	2,86	43	1,04	8	4	16°	10°	2	2770L.001304	
1,4	-0,020	0,7	-0,010	0,84	3,08	43	1,12	8	4	16°	9,5°	2	2770L.001404	
1,5	-0,020	0,75	-0,010	0,9	3,3	43	1,2	8	4	16°	9,5°	2	2770L.001504	
1,6	-0,020	0,8	-0,010	0,96	3,52	43	1,28	8,1	4	16°	9°	2	2770L.001604	
1,7	-0,020	0,85	-0,010	1,02	3,74	43	1,36	8,1	4	16°	8,5°	2	2770L.001704	
1,8	-0,020	0,9	-0,010	1,08	3,96	43	1,44	8,1	4	16°	8°	2	2770L.001804	
1,9	-0,020	0,95	-0,010	1,14	4,18	43	1,52	8,2	4	16°	7,5°	2	2770L.001904	
2,0	-0,020	1,0	-0,010	1,2	4,4	43	1,6	8,4	4	15°	7°	2	2770L.002004	
2,0	-0,020	1,0	-0,010	1,2	4,4	57	1,6	11,9	6	16°	10°	2	2770L.002006	


Hartmetall-Kugelfräser „Micro“ – kurze Ausführung
 Solid carbide ball nose end mills “Micro” – short design

$$l_3 = 2,2 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2770L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	2.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	3.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	4.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	5.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
M	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	3.1					95	$0,013 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	4.1					75	$0,010 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
K	1.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	1.2	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	2.1	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	2.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	3.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	3.2	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	4.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	4.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
N	1.1	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.2	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.3	195	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	195	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.4	175	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.5					140	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	1.6					95	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.2	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.3	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	2.4	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.5	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.6	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	□	□	■
	2.7	75	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,014 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.8	55	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	3.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	3.2	140	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	4.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	4.2	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	95	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	5.3	120	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		■
S	1.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.2	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,011 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.3	120	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					120	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		
	1.2					75	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

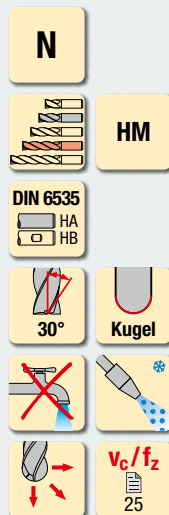
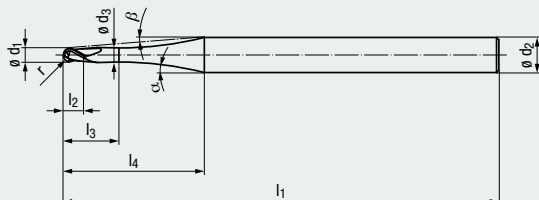
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Spezielle Halsausführungen
- 3 Halslängen verfügbar

- Multi-functional tool
- Optimized chisel edge
- Special neck designs
- 3 neck lengths available

$$l_3 = 2,2 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

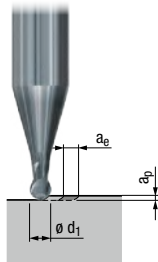
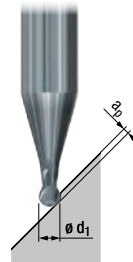
Lange Ausführung · Long design

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)				
0,2	-0,016	0,1	-0,008	0,12	0,6	50	0,16	5,7	3	17°	14°	2	2773L.000203	
0,5	-0,020	0,25	-0,010	0,3	1,1	50	0,4	5,8	3	16°	12,5°	2	2773L.000503	
0,8	-0,020	0,4	-0,010	0,48	1,76	50	0,64	5,9	3	16°	11°	2	2773L.000803	
0,2	-0,016	0,1	-0,008	0,12	0,6	60	0,16	7,5	4	17°	14,5°	2	2773L.000204	
0,5	-0,020	0,25	-0,010	0,3	1,1	60	0,4	7,6	4	16,5°	13,5°	2	2773L.000504	
0,8	-0,020	0,4	-0,010	0,48	1,76	60	0,64	7,7	4	16,5°	12°	2	2773L.000804	
1,0	-0,020	0,5	-0,010	0,6	2,2	60	0,8	7,8	4	16°	11,5°	2	2773L.001004	
1,2	-0,020	0,6	-0,010	0,72	2,64	60	0,96	7,9	4	16°	10,5°	2	2773L.001204	
1,5	-0,020	0,75	-0,010	0,9	3,3	60	1,2	8	4	16°	9,5°	2	2773L.001504	
1,8	-0,020	0,9	-0,010	1,08	3,96	60	1,44	8,1	4	16°	8°	2	2773L.001804	
2,0	-0,020	1,0	-0,010	1,2	4,4	60	1,6	8,4	4	15°	7°	2	2773L.002004	
2,0	-0,020	1,0	-0,010	1,2	4,4	70	1,6	11,9	6	16°	10°	2	2773L.002006	


Hartmetall-Kugelfräser „Micro“ – lange Ausführung
Solid carbide ball nose end mills “Micro” – long design

$$l_3 = 2,2 \times d_1$$

N

Schruppen
Roughing

Schlichten
Finishing

Gültig für · Valid for
2773L

Achtung:
Berechnung der Vorschub-
geschwindigkeit (v_f) mit der
effektiven Spindeldrehzahl (n),
siehe Seite 5.

Please note:
Calculation of the feed
rate (v_f) with the effective
spindle speed (n),
see page 5.

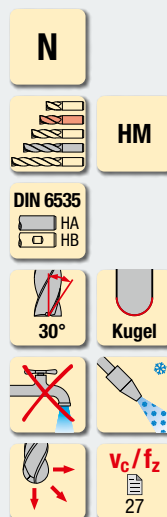
		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	2.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	3.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	4.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	5.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
M	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	3.1					95	$0,013 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	4.1					75	$0,010 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
K	1.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	1.2	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	2.1	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	2.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	3.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	3.2	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	4.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	4.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
N	1.1	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.2	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.3	195	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	195	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.4	175	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.5					140	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	1.6					95	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.2	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.3	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	2.4	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.5	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.6	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	□	□	■
	2.7	75	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,014 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.8	55	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	3.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	3.2	140	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	4.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	4.2	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	4.3												
	4.4												
	5.1												
	5.2	95	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	5.3	120	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		■
S	1.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.2	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,011 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.3	120	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.2												
	2.3												
H	1.1					120	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		
	1.2					75	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

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

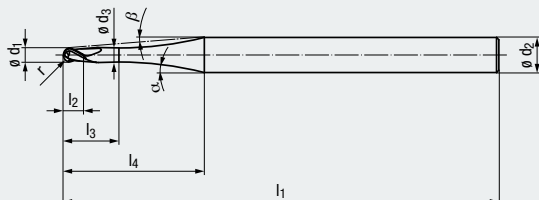
 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Spezielle Halsausführungen
- 3 Halslängen verfügbar

- Multi-functional tool
- Optimized chisel edge
- Special neck designs
- 3 neck lengths available



$$l_3 = 5 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

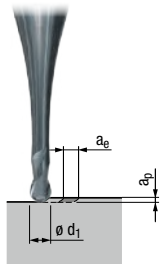
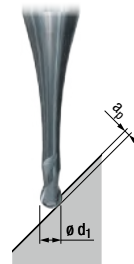
Kurze Ausführung · Short design

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h ₅	α	β	Z (Flutes)				
0,2	-0,016	0,1	-0,008	0,2	1	38	0,16	6,4	3	16°	13°	2	2771L.000203	
0,3	-0,020	0,15	-0,010	0,3	1,5	38	0,24	6,9	3	15,5°	11,5°	2	2771L.000303	
0,4	-0,020	0,2	-0,010	0,4	2	38	0,32	7,4	3	15°	10,5°	2	2771L.000403	
0,5	-0,020	0,25	-0,010	0,5	2,5	38	0,4	7,8	3	15°	9,5°	2	2771L.000503	
0,6	-0,020	0,3	-0,010	0,6	3	38	0,48	8,3	3	14,5°	8,5°	2	2771L.000603	
0,7	-0,020	0,35	-0,010	0,7	3,5	38	0,56	8,8	3	13,5°	8°	2	2771L.000703	
0,8	-0,020	0,4	-0,010	0,8	4	38	0,64	9	3	14°	7,5°	2	2771L.000803	
0,9	-0,020	0,45	-0,010	0,9	4,5	38	0,72	9,5	3	13,5°	7°	2	2771L.000903	
0,2	-0,016	0,1	-0,008	0,2	1	43	0,16	8,2	4	16,5°	13,5°	2	2771L.000204	
0,3	-0,020	0,15	-0,010	0,3	1,5	43	0,24	8,8	4	16°	12,5°	2	2771L.000304	
0,4	-0,020	0,2	-0,010	0,4	2	43	0,32	9,4	4	15,5°	11,5°	2	2771L.000404	
0,5	-0,020	0,25	-0,010	0,5	2,5	43	0,4	9,8	4	15°	10,5°	2	2771L.000504	
0,6	-0,020	0,3	-0,010	0,6	3	43	0,48	10,4	4	14,5°	9,5°	2	2771L.000604	
0,7	-0,020	0,35	-0,010	0,7	3,5	43	0,56	11	4	14°	9°	2	2771L.000704	
0,8	-0,020	0,4	-0,010	0,8	4	43	0,64	11,1	4	14°	8,5°	2	2771L.000804	
0,9	-0,020	0,45	-0,010	0,9	4,5	43	0,72	11,7	4	13,5°	8°	2	2771L.000904	
1,0	-0,020	0,5	-0,010	1,0	5	43	0,8	11,6	4	14,5°	8°	2	2771L.001004	
1,1	-0,020	0,55	-0,010	1,1	5,5	43	0,88	12	4	14°	7,5°	2	2771L.001104	
1,2	-0,020	0,6	-0,010	1,2	6	43	0,96	12,4	4	14°	7°	2	2771L.001204	
1,3	-0,020	0,65	-0,010	1,3	6,5	43	1,04	12,8	4	13,5°	6,5°	2	2771L.001304	
1,4	-0,020	0,7	-0,010	1,4	7	43	1,12	13,2	4	13°	6°	2	2771L.001404	
1,5	-0,020	0,75	-0,010	1,5	7,5	43	1,2	13,7	4	13°	5,5°	2	2771L.001504	
1,6	-0,020	0,8	-0,010	1,6	8	43	1,28	14,1	4	12,5°	5,5°	2	2771L.001604	
1,7	-0,020	0,85	-0,010	1,7	8,5	43	1,36	14,5	4	12°	5°	2	2771L.001704	
1,8	-0,020	0,9	-0,010	1,8	9	43	1,44	15	4	11,5°	4,5°	2	2771L.001804	
1,9	-0,020	0,95	-0,010	1,9	9,5	43	1,52	15,5	4	11°	4,5°	2	2771L.001904	
2,0	-0,020	1,0	-0,010	2,0	10	43	1,6	15,3	4	12°	4°	2	2771L.002004	
2,0	-0,020	1,0	-0,010	2,0	10	57	1,6	19,7	6	13°	6,5°	2	2771L.002006	


Hartmetall-Kugelfräser „Micro“ – kurze Ausführung
 Solid carbide ball nose end mills “Micro” – short design

$$l_3 = 5 \times d_1$$

N

 Schrappen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2771L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	4.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
	5.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
M	1.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	3.1					75	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1					40	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
K	1.1	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	1.2	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	2.1	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	2.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	3.1	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	3.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	4.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,012 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	4.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
N	1.1	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.2	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.3	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.4	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.5					120	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	1.6					75	$0,014 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.2	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.3	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☐	☐	☒
	2.4	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.5	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.6	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☐	☐	☒
	2.7	70	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	70	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.8	45	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	45	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	3.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	3.2	120	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1	140	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,016 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.3												
	4.4												
	5.1												
	5.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	5.3	120	$0,004 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☒
S	1.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.2	95	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.3	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		
	1.2					70	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		
	1.3												
	1.4												
	1.5												

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

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Spezielle Halsausführungen
- 3 Halslängen verfügbar

- Multi-functional tool
- Optimized chisel edge
- Special neck designs
- 3 neck lengths available

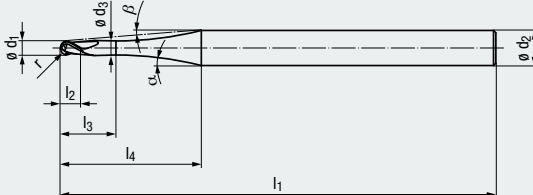
N

HM

Kugel

 v_c/f_z
29


$$l_3 = 5 \times d_1$$


Beschichtung · Coating
ALCR
Einsatzgebiete – Material (siehe Seite 6)
Applications – material (see page 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

- For almost all materials
- For machining smallest engravings and components

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

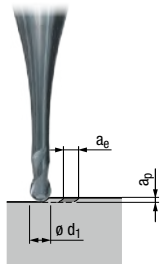
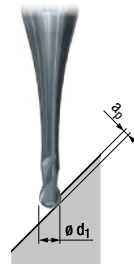
Lange Ausführung · Long design

$\emptyset d_1$	r	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h5	α	β	Z (Flutes)				
0,2	-0,016	0,1	-0,008	0,2	1	50	0,16	6,4	3	16°	13°	2	2774L.000203	
0,5	-0,020	0,25	-0,010	0,5	2,5	50	0,4	7,8	3	15°	9,5°	2	2774L.000503	
0,8	-0,020	0,4	-0,010	0,8	4	50	0,64	9	3	14°	7,5°	2	2774L.000803	
0,2	-0,016	0,1	-0,008	0,2	1	60	0,16	8,2	4	16,5°	13,5°	2	2774L.000204	
0,5	-0,020	0,25	-0,010	0,5	2,5	60	0,4	9,8	4	15°	10,5°	2	2774L.000504	
0,8	-0,020	0,4	-0,010	0,8	4	60	0,64	11,1	4	14°	8,5°	2	2774L.000804	
1,0	-0,020	0,5	-0,010	1,0	5	60	0,8	11,6	4	14,5°	8°	2	2774L.001004	
1,2	-0,020	0,6	-0,010	1,2	6	60	0,96	12,4	4	14°	7°	2	2774L.001204	
1,5	-0,020	0,75	-0,010	1,5	7,5	60	1,2	13,7	4	13°	5,5°	2	2774L.001504	
1,8	-0,020	0,9	-0,010	1,8	9	60	1,44	15	4	11,5°	4,5°	2	2774L.001804	
2,0	-0,020	1,0	-0,010	2,0	10	60	1,6	15,3	4	12°	4°	2	2774L.002004	
2,0	-0,020	1,0	-0,010	2,0	10	70	1,6	19,7	6	13°	6,5°	2	2774L.002006	


Hartmetall-Kugelfräser „Micro“ – lange Ausführung
 Solid carbide ball nose end mills “Micro” – long design

$$l_3 = 5 \times d_1$$

N

 Schrappen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2774L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	4.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
	5.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
M	1.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	3.1					75	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1					40	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
K	1.1	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	1.2	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	2.1	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	2.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	3.1	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	3.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	4.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,012 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	4.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
N	1.1	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.2	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.3	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.4	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.5					120	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	1.6					75	$0,014 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.2	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.3	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☐	☐	☒
	2.4	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.5	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.6	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☐	☐	☒
	2.7	70	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	70	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.8	45	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	45	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	3.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	3.2	120	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1	140	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,016 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.3												
	4.4												
	5.1												
	5.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	5.3	120	$0,004 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☒
S	1.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.2	95	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.3	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.2												
	2.3												
H	1.1					95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		
	1.2					70	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		
	1.3												
	1.4												
	1.5												

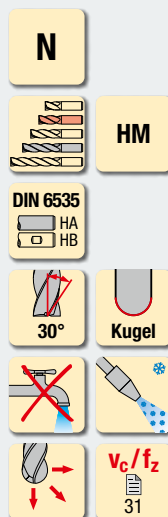
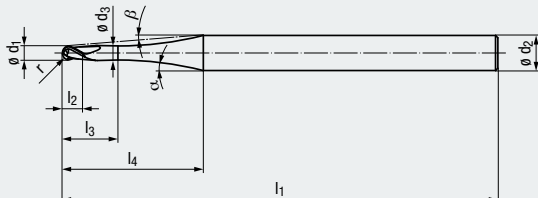
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Spezielle Halsausführungen
- 3 Halslängen verfügbar

- Multi-functional tool
- Optimized chisel edge
- Special neck designs
- 3 neck lengths available

$$l_3 = 10 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

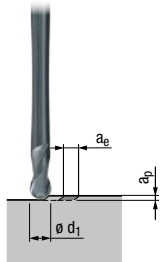
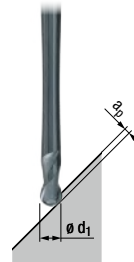
Kurze Ausführung · Short design

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)				
0,2	-0,016	0,1	-0,008	0,2	2	38	0,16	9,2	3	12,5°	9°	2	2772L.000203	
0,3	-0,020	0,15	-0,010	0,3	3	38	0,24	9,7	3	13°	8,5°	2	2772L.000303	
0,4	-0,020	0,2	-0,010	0,4	4	38	0,32	10,2	3	13,5°	7,5°	2	2772L.000403	
0,5	-0,020	0,25	-0,010	0,5	5	38	0,4	10,7	3	14°	7°	2	2772L.000503	
0,6	-0,020	0,3	-0,010	0,6	6	38	0,48	10,6	3	16,5°	7°	2	2772L.000603	
0,7	-0,020	0,35	-0,010	0,7	7	38	0,56	10,6	3	20°	6,5°	2	2772L.000703	
0,8	-0,020	0,4	-0,010	0,8	8	38	0,64	10,5	3	26,5°	6,5°	2	2772L.000803	
0,9	-0,020	0,45	-0,010	0,9	9	38	0,72	10,5	3	38,5°	6°	2	2772L.000903	
0,2	-0,016	0,1	-0,008	0,2	2	43	0,16	11,6	4	12,5°	10°	2	2772L.000204	
0,3	-0,020	0,15	-0,010	0,3	3	43	0,24	12	4	13°	9°	2	2772L.000304	
0,4	-0,020	0,2	-0,010	0,4	4	43	0,32	12,4	4	13,5°	8,5°	2	2772L.000404	
0,5	-0,020	0,25	-0,010	0,5	5	43	0,4	12,8	4	14,5°	8°	2	2772L.000504	
0,6	-0,020	0,3	-0,010	0,6	6	43	0,48	12,4	4	17°	8,5°	2	2772L.000604	
0,7	-0,020	0,35	-0,010	0,7	7	43	0,56	12,1	4	20°	8°	2	2772L.000704	
0,8	-0,020	0,4	-0,010	0,8	8	43	0,64	11,6	4	26,5°	8,5°	2	2772L.000804	
0,9	-0,020	0,45	-0,010	0,9	9	43	0,72	11,2	4	39°	8,5°	2	2772L.000904	
1,0	-0,020	0,5	-0,010	1,0	10	43	0,8	18,3	4	11,5°	5°	2	2772L.001004	
1,1	-0,020	0,55	-0,010	1,1	11	43	0,88	18,3	4	13°	5°	2	2772L.001104	
1,2	-0,020	0,6	-0,010	1,2	12	43	0,96	18,2	4	14,5°	5°	2	2772L.001204	
1,3	-0,020	0,65	-0,010	1,3	13	43	1,04	18,2	4	16,5°	4,5°	2	2772L.001304	
1,4	-0,020	0,7	-0,010	1,4	14	43	1,12	18,1	4	20°	4,5°	2	2772L.001404	
1,5	-0,020	0,75	-0,010	1,5	15	43	1,2	18,1	4	24,5°	4,5°	2	2772L.001504	
1,6	-0,020	0,8	-0,010	1,6	16	43	1,28	18,5	4	28,5°	4°	2	2772L.001604	
1,7	-0,020	0,85	-0,010	1,7	17	43	1,36	18,9	4	34,5°	4°	2	2772L.001704	
1,8	-0,020	0,9	-0,010	1,8	18	43	1,44	19,5	4	40°	3,5°	2	2772L.001804	
1,9	-0,020	0,95	-0,010	1,9	19	43	1,52	20,6	4	37°	3,5°	2	2772L.001904	
2,0	-0,020	1,0	-0,010	2,0	20	43	1,6	21,9	4	31°	3°	2	2772L.002004	
2,0	-0,020	1,0	-0,010	2,0	20	57	1,6	32	6	11°	4°	2	2772L.002006	


Hartmetall-Kugelfräser „Micro“ – kurze Ausführung
 Solid carbide ball nose end mills “Micro” – short design

$$l_3 = 10 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2772L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	3.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	5.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
M	1.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	55	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	55	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	3.1					55	$0,012 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	4.1					45	$0,012 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
K	1.1	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.2	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	3.1	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.2	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	4.1	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	4.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
N	1.1	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.2	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.3	160	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,011 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.4	160	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.5					95	$0,011 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	1.6					55	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.3	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.4	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.5	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.6	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.7	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.8	40	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	40	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.2	95	$0,007 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	4.1	120	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.3									☐	☒	☐	☒
	4.4									☐	☒	☐	☒
	5.1									☐	☒	☐	☒
	5.2	55	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	5.3	120	$0,004 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
S	1.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.3	75	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,009 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.2									☐	☒	☐	☒
	2.3									☐	☒	☐	☒
	2.4									☐	☒	☐	☒
	2.5									☐	☒	☐	☒
H	1.1					75	$0,013 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.2					55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	1.3									☐	☒	☐	☒
	1.4									☐	☒	☐	☒
	1.5									☐	☒	☐	☒

 ■ = sehr gut geeignet · very suitable
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 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Spezielle Halsausführungen
- 3 Halslängen verfügbar

- Multi-functional tool
- Optimized chisel edge
- Special neck designs
- 3 neck lengths available

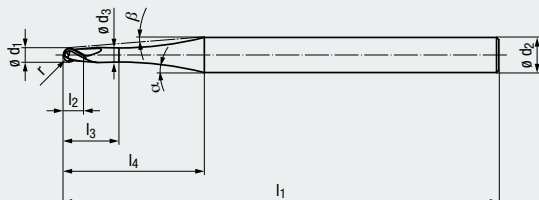
N

HM
DIN 6535

30°
Kugel

 v_c/f_z
33


$$l_3 = 10 \times d_1$$



Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 6)

Applications – material (see page 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

- For almost all materials
- For machining smallest engravings and components

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-4.2	
N	1.1-4.2, 5.2-5.3	
S		1.1-2.1
H		1.1-1.2

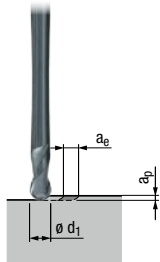
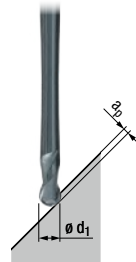
Lange Ausführung · Long design

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)				
0,2	-0,016	0,1	-0,008	0,2	2	50	0,16	9,2	3	12,5°	9°	2	2775L.000203	
0,5	-0,020	0,25	-0,010	0,5	5	50	0,4	14,5	3	8,5°	5,5°	2	2775L.000503	
0,8	-0,020	0,4	-0,010	0,8	8	50	0,64	18,7	3	7°	4°	2	2775L.000803	
0,2	-0,016	0,1	-0,008	0,2	2	60	0,16	11,6	4	12,5°	10°	2	2775L.000204	
0,5	-0,020	0,25	-0,010	0,5	5	60	0,4	18	4	9°	6°	2	2775L.000504	
0,8	-0,020	0,4	-0,010	0,8	8	60	0,64	23,2	4	7°	4,5°	2	2775L.000804	
1,0	-0,020	0,5	-0,010	1,0	10	60	0,8	23,7	4	7°	4°	2	2775L.001004	
1,2	-0,020	0,6	-0,010	1,2	12	60	0,96	26,1	4	6,5°	3,5°	2	2775L.001204	
1,5	-0,020	0,75	-0,010	1,5	15	60	1,2	29,2	4	6°	3°	2	2775L.001504	
1,8	-0,020	0,9	-0,010	1,8	18	60	1,44	31,9	4	5,5°	2,5°	2	2775L.001804	
2,0	-0,020	1,0	-0,010	2,0	20	60	1,6	31,6	4	6°	2,5°	2	2775L.002004	
2,0	-0,020	1,0	-0,010	2,0	20	70	1,6	41,4	6	6°	3°	2	2775L.002006	


Hartmetall-Kugelfräser „Micro“ – lange Ausführung
 Solid carbide ball nose end mills “Micro” – long design

$$l_3 = 10 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing

 Gültig für · Valid for
 2775L

Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.

Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	3.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	5.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
M	1.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	55	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	55	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	3.1					55	$0,012 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	4.1					45	$0,012 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
K	1.1	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.2	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.1	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	3.1	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.2	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	4.1	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	4.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
N	1.1	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.2	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	1.3	160	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,011 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.4	160	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.5					95	$0,011 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	1.6					55	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.3	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	2.4	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.5	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.6	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.7	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.8	40	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	40	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	3.2	95	$0,007 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	4.1	120	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒	☐	☒
	4.3									☐	☒	☐	☒
	4.4									☐	☒	☐	☒
	5.1									☐	☒	☐	☒
	5.2	55	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	5.3	120	$0,004 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
S	1.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.3	75	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	2.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,009 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	2.2									☐	☒	☐	☒
	2.3									☐	☒	☐	☒
	2.4									☐	☒	☐	☒
	2.5									☐	☒	☐	☒
H	1.1					75	$0,013 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	☐	☒	☐	☒
	1.2					55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	☐	☒	☐	☒
	1.3									☐	☒	☐	☒
	1.4									☐	☒	☐	☒
	1.5									☐	☒	☐	☒

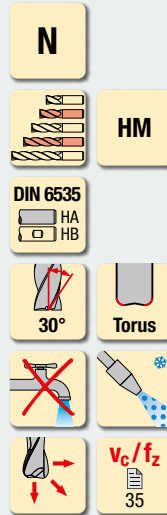
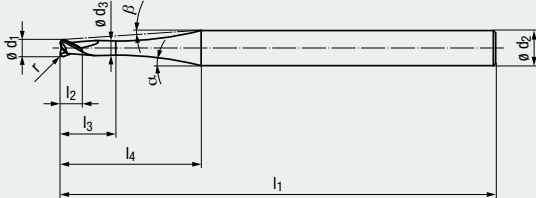
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Hochgenauer Eckenradius
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- High-precision corner radius
- 3 neck lengths available

$$l_3 = 2,2 \times d_1$$


Beschichtung · Coating
Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
N	1.1-4.2, 5.2-5.3
S	1.1-2.1
H	1.1-1.2

ALCR

P	1.1-5.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
N	1.1-4.2, 5.2-5.3
S	1.1-2.1
H	1.1-1.2

Kurze Ausführung · Short design

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)			
0,5	-0,020	0,1 ±0,005	0,3	1,1	38	0,4	5,8	3	16°	12,5°	2	2780L.000503	
0,6	-0,020	0,1 ±0,005	0,36	1,32	38	0,48	5,9	3	16°	12°	2	2780L.000603	
0,8	-0,020	0,2 ±0,005	0,48	1,76	38	0,64	5,9	3	16°	11°	2	2780L.000803	
0,5	-0,020	0,1 ±0,005	0,3	1,1	43	0,4	7,6	4	16,5°	13,5°	2	2780L.000504	
0,6	-0,020	0,1 ±0,005	0,36	1,32	43	0,48	7,8	4	16°	12,5°	2	2780L.000604	
0,8	-0,020	0,2 ±0,005	0,48	1,76	43	0,64	7,7	4	16,5°	12°	2	2780L.000804	
1,0	-0,020	0,2 ±0,005	0,6	2,2	43	0,8	7,8	4	16°	11,5°	2	2780L.001004	
1,2	-0,020	0,2 ±0,005	0,72	2,64	43	0,96	7,9	4	16°	10,5°	2	2780L.001204	
1,5	-0,020	0,3 ±0,005	0,9	3,3	43	1,2	8	4	16°	9,5°	2	2780L.001504	
1,6	-0,020	0,3 ±0,005	0,96	3,52	43	1,28	8,1	4	16°	9°	2	2780L.001604	
1,8	-0,020	0,4 ±0,005	1,08	3,96	43	1,44	8,1	4	16°	8°	2	2780L.001804	
2,0	-0,020	0,5 ±0,005	1,2	4,4	43	1,6	8,4	4	15°	7°	2	2780L.002004	
2,0	-0,020	0,5 ±0,005	1,2	4,4	57	1,6	11,9	6	16°	10°	2	2780L.002006	

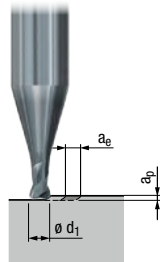
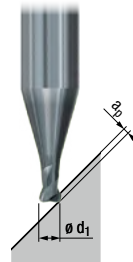
Lange Ausführung · Long design

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)			
0,5	-0,020	0,1 ±0,005	0,3	1,1	50	0,4	5,8	3	16°	12,5°	2		2783L.000503
0,5	-0,020	0,1 ±0,005	0,3	1,1	60	0,4	7,6	4	16,5°	13,5°	2		2783L.000504
1,0	-0,020	0,2 ±0,005	0,6	2,2	60	0,8	7,8	4	16°	11,5°	2		2783L.001004
1,5	-0,020	0,3 ±0,005	0,9	3,3	60	1,2	8	4	16°	9,5°	2		2783L.001504
2,0	-0,020	0,5 ±0,005	1,2	4,4	60	1,6	8,4	4	15°	7°	2		2783L.002004
2,0	-0,020	0,5 ±0,005	1,2	4,4	70	1,6	11,9	6	16°	10°	2		2783L.002006


Hartmetall-Torusfräser „Micro“ – kurze und lange Ausführung
Solid carbide torus end mills “Micro” – short and long design

$$l_3 = 2,2 \times d_1$$

N

Schruppen
 Roughing

Schlichten
 Finishing


Gültig für · Valid for

2780L
2783L**Achtung:**
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.
Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	2.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	3.1	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■	□	■
	4.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
	5.1	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■	□	■
M	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	3.1					95	$0,013 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
	4.1					75	$0,010 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			□	■
K	1.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	1.2	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	■		□
	2.1	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	2.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	3.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	3.2	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		□
	4.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
	4.2	120	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		□
N	1.1	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.2	240	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	240	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	1.3	195	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	195	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.4	175	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.5					140	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	1.6					95	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.2	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	2.3	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$	□	□	□	■
	2.4	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.5	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.6	120	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	□	□	■
	2.7	75	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,014 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.8	55	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	3.1	175	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	3.2	140	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	4.1	175	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	4.2	160	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,015 \times d_1$	$0,060 \times d_1$	$0,060 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	95	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	5.3	120	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	120	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$	□	■		■
S	1.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.2	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,011 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	1.3	120	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			□	■
	2.1	180	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	180	$0,010 \times d_1$	$0,050 \times d_1$	$0,050 \times d_1$			□	■
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					120	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	□	■		
	1.2					75	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

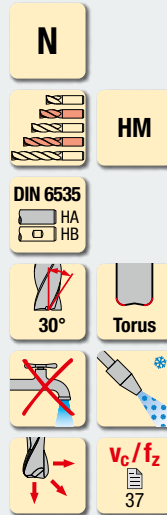
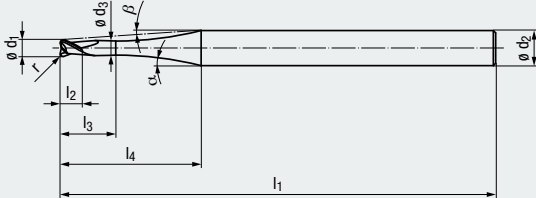
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Hochgenauer Eckenradius
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- High-precision corner radius
- 3 neck lengths available

$$l_3 = 5 \times d_1$$


Beschichtung · Coating
Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
N	1.1-4.2, 5.2-5.3
S	1.1-2.1
H	1.1-1.2

ALCR

P	1.1-5.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
N	1.1-4.2, 5.2-5.3
S	1.1-2.1
H	1.1-1.2

Kurze Ausführung · Short design

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)			
0,5	-0,020	0,1 ±0,005	0,5	2,5	38	0,4	7,8	3	15°	9,5°	2	2781L.000503	
0,6	-0,020	0,1 ±0,005	0,6	3	38	0,48	8,3	3	14,5°	8,5°	2	2781L.000603	
0,8	-0,020	0,2 ±0,005	0,8	4	38	0,64	9	3	14°	7,5°	2	2781L.000803	
0,5	-0,020	0,1 ±0,005	0,5	2,5	43	0,4	9,8	4	15°	10,5°	2	2781L.000504	
0,6	-0,020	0,1 ±0,005	0,6	3	43	0,48	10,4	4	14,5°	9,5°	2	2781L.000604	
0,8	-0,020	0,2 ±0,005	0,8	4	43	0,64	11,1	4	14°	8,5°	2	2781L.000804	
1,0	-0,020	0,2 ±0,005	1	5	43	0,8	11,6	4	14,5°	8°	2	2781L.001004	
1,2	-0,020	0,2 ±0,005	1,2	6	43	0,96	12,4	4	14°	7°	2	2781L.001204	
1,5	-0,020	0,3 ±0,005	1,5	7,5	43	1,2	13,7	4	13°	5,5°	2	2781L.001504	
1,6	-0,020	0,3 ±0,005	1,6	8	43	1,28	14,1	4	12,5°	5,5°	2	2781L.001604	
1,8	-0,020	0,4 ±0,005	1,8	9	43	1,44	15	4	11,5°	4,5°	2	2781L.001804	
2,0	-0,020	0,5 ±0,005	2	10	43	1,6	15,3	4	12°	4°	2	2781L.002004	
2,0	-0,020	0,5 ±0,005	2	10	57	1,6	19,7	6	13°	6,5°	2	2781L.002006	

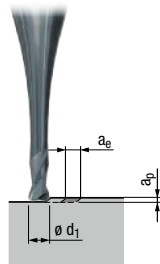
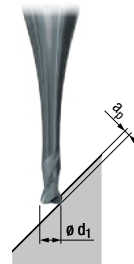
Lange Ausführung · Long design

$\emptyset d_1$	r	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h5	α	β	Z (Flutes)			
0,5	-0,020	0,1 ±0,005	0,5	2,5	50	0,4	7,8	3	15°	9,5°	2		2784L.000503
0,5	-0,020	0,1 ±0,005	0,5	2,5	60	0,4	9,8	4	15°	10,5°	2		2784L.000504
1,0	-0,020	0,2 ±0,005	1	5	60	0,8	11,6	4	14,5°	8°	2		2784L.001004
1,5	-0,020	0,3 ±0,005	1,5	7,5	60	1,2	13,7	4	13°	5,5°	2		2784L.001504
2,0	-0,020	0,5 ±0,005	2	10	60	1,6	15,3	4	12°	4°	2		2784L.002004
2,0	-0,020	0,5 ±0,005	2	10	70	1,6	19,7	6	13°	6,5°	2		2784L.002006


Hartmetall-Torusfräser „Micro“ – kurze und lange Ausführung
 Solid carbide torus end mills “Micro” – short and long design

$$l_3 = 5 \times d_1$$

N

 Schruppen
 Roughing

 Schlichten
 Finishing


Gültig für · Valid for

 2781L
 2784L
Achtung:
 Berechnung der Vorschubgeschwindigkeit (v_f) mit der effektiven Spindeldrehzahl (n), siehe Seite 5.
Please note:
 Calculation of the feed rate (v_f) with the effective spindle speed (n), see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	2.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	3.1	140	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒	☐	☒
	4.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
	5.1	95	$0,008 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒	☐	☒
M	1.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	3.1					75	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1					40	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
K	1.1	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	1.2	160	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	160	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☒		☐
	2.1	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	2.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	3.1	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	3.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		☐
	4.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,012 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
	4.2	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☐
N	1.1	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.2	195	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	195	$0,014 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	1.3	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.4	175	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	1.5					120	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	1.6					75	$0,014 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.2	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$			☐	☒
	2.3	120	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$	☐	☐	☐	☒
	2.4	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.5	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	2.6	95	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,015 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☐	☐	☒
	2.7	70	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	70	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.8	45	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	45	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	3.1	160	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	160	$0,013 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	3.2	120	$0,007 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	4.1	140	$0,007 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,015 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,016 \times d_1$	$0,045 \times d_1$	$0,045 \times d_1$		☐	☐	☒
	4.3												
	4.4												
	5.1												
	5.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$			☐	☒
	5.3	120	$0,004 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		☒
S	1.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.2	95	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,012 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	1.3	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			☐	☒
	2.1	120	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,011 \times d_1$	$0,040 \times d_1$	$0,040 \times d_1$			☐	☒
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					95	$0,014 \times d_1$	$0,035 \times d_1$	$0,035 \times d_1$	☐	☒		
	1.2					70	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	☐	☒		
	1.3												
	1.4												
	1.5												

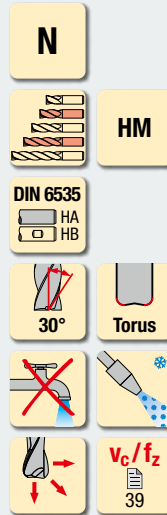
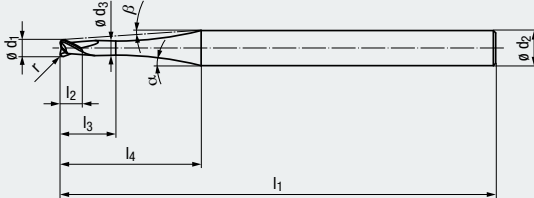
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

 v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Hochgenauer Eckenradius
- 3 Halslängen verfügbar

- Multi-functional tool
- Special neck designs
- High-precision corner radius
- 3 neck lengths available

$$l_3 = 10 \times d_1$$



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 6)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile

Applications – material (see page 6)

- For almost all materials
- For machining smallest engravings and components

ALCR

P	1.1-5.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
N	1.1-4.2, 5.2-5.3
S	1.1-2.1
H	1.1-1.2

ALCR

P	1.1-5.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
N	1.1-4.2, 5.2-5.3
S	1.1-2.1
H	1.1-1.2

Kurze Ausführung · Short design

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h ₅	α	β	Z (Flutes)			
0,5	-0,020	0,1 ±0,005	0,5	5	38	0,4	10,7	3	14°	7°	2	2782L.000503	
0,6	-0,020	0,1 ±0,005	0,6	6	38	0,48	10,6	3	16,5°	7°	2	2782L.000603	
0,8	-0,020	0,2 ±0,005	0,8	8	38	0,64	10,5	3	26,5°	6,5°	2	2782L.000803	
0,5	-0,020	0,1 ±0,005	0,5	5	43	0,4	12,8	4	14,5°	8°	2	2782L.000504	
0,6	-0,020	0,1 ±0,005	0,6	6	43	0,48	12,4	4	17°	8,5°	2	2782L.000604	
0,8	-0,020	0,2 ±0,005	0,8	8	43	0,64	11,6	4	26,5°	8,5°	2	2782L.000804	
1,0	-0,020	0,2 ±0,005	1	10	43	0,8	18,3	4	11,5°	5°	2	2782L.001004	
1,2	-0,020	0,2 ±0,005	1,2	12	43	0,96	18,2	4	14,5°	5°	2	2782L.001204	
1,5	-0,020	0,3 ±0,005	1,5	15	43	1,2	18,1	4	24,5°	4,5°	2	2782L.001504	
1,6	-0,020	0,3 ±0,005	1,6	16	43	1,28	18,5	4	28,5°	4°	2	2782L.001604	
1,8	-0,020	0,4 ±0,005	1,8	18	43	1,44	19,5	4	40°	3,5°	2	2782L.001804	
2,0	-0,020	0,5 ±0,005	2	20	43	1,6	21,9	4	31°	3°	2	2782L.002004	
2,0	-0,020	0,5 ±0,005	2	20	57	1,6	32	6	11°	4°	2	2782L.002006	

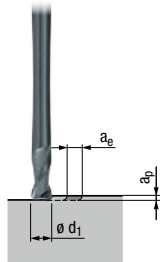
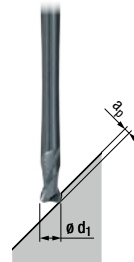
Lange Ausführung · Long design

$\emptyset d_1$	r	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h5	α	β	Z (Flutes)			
0,5	-0,020	0,1 ±0,005	0,5	5	50	0,4	14,5	3	8,5°	5,5°	2		2785L.000503
0,5	-0,020	0,1 ±0,005	0,5	5	60	0,4	18	4	9°	6°	2		2785L.000504
1,0	-0,020	0,2 ±0,005	1	10	60	0,8	23,7	4	7°	4°	2		2785L.001004
1,5	-0,020	0,3 ±0,005	1,5	15	60	1,2	29,2	4	6°	3°	2		2785L.001504
2,0	-0,020	0,5 ±0,005	2	20	60	1,6	31,6	4	6°	2,5°	2		2785L.002004
2,0	-0,020	0,5 ±0,005	2	20	70	1,6	41,4	6	6°	3°	2		2785L.002006


Hartmetall-Torusfräser „Micro“ – kurze und lange Ausführung
Solid carbide torus end mills “Micro” – short and long design

$$l_3 = 10 \times d_1$$

N

 Schrappen
 Roughing

 Schlichten
 Finishing


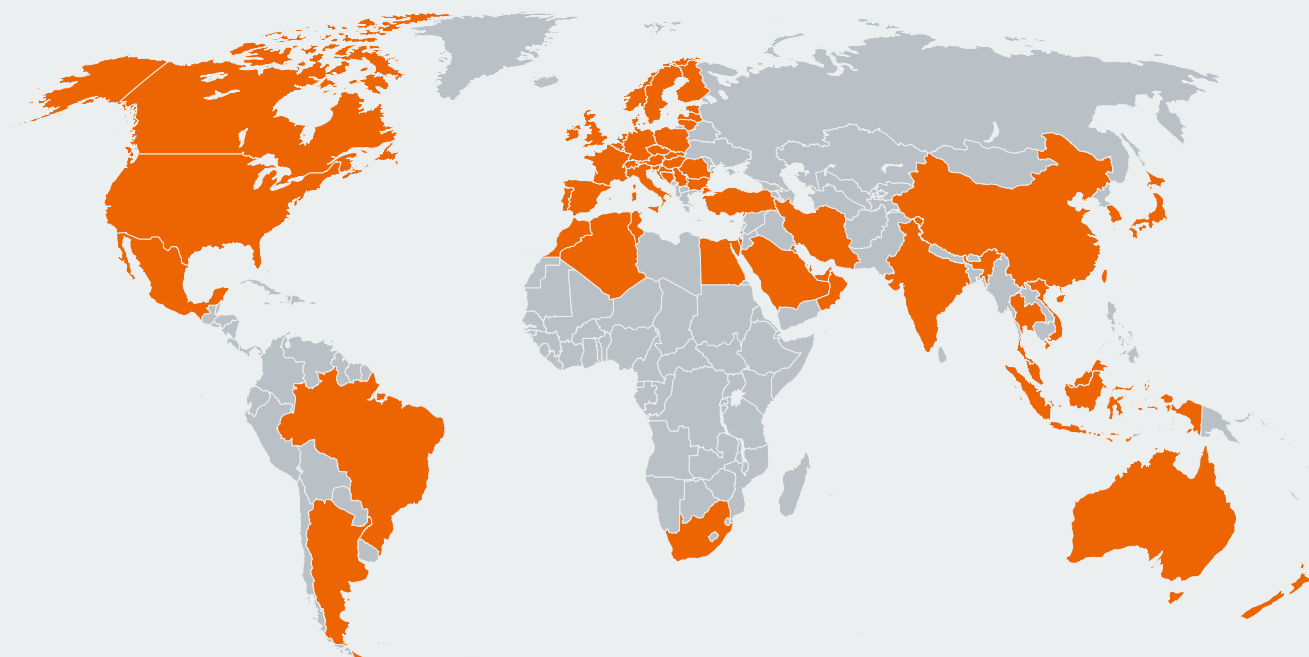
Gültig für · Valid for

 2782L
 2785L
Achtung:
 Berechnung der Vorschub-
 geschwindigkeit (v_f) mit der
 effektiven Spindeldrehzahl (n),
 siehe Seite 5.
Please note:
 Calculation of the feed
 rate (v_f) with the effective
 spindle speed (n),
 see page 5.

		v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]				
P	1.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■	□	■
	2.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■	□	■
	3.1	120	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	120	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■	□	■
	4.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■	□	■
	5.1	75	$0,008 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■	□	■
M	1.1	75	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.1	55	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	55	$0,015 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	3.1					55	$0,012 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	4.1					45	$0,012 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
K	1.1	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		□
	1.2	140	$0,005 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	■		□
	2.1	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
	2.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
	3.1	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		□
	3.2	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		□
	4.1	140	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
	4.2	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		□
N	1.1	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	1.2	175	$0,006 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	175	$0,011 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	1.3	160	$0,006 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,011 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.4	160	$0,005 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	160	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.5					95	$0,011 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	1.6					55	$0,015 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	2.1	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.2	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	2.3	95	$0,008 \times d_1$	$0,030 \times d_1$	$0,3 - 1 \times d_1$	95	$0,017 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$	□	□	□	■
	2.4	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	2.5	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	2.6	75	$0,007 \times d_1$	$0,025 \times d_1$	$0,3 - 1 \times d_1$	75	$0,015 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	□	□	■
	2.7	55	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	2.8	40	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	40	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	3.1	140	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	140	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	3.2	95	$0,007 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	95	$0,014 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	4.1	120	$0,006 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	120	$0,012 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	4.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,030 \times d_1$	$0,030 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	55	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	5.3	120	$0,004 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	120	$0,008 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		■
S	1.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.2	75	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	1.3	75	$0,005 \times d_1$	$0,010 \times d_1$	$0,3 - 1 \times d_1$	75	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$			□	■
	2.1	95	$0,005 \times d_1$	$0,020 \times d_1$	$0,3 - 1 \times d_1$	95	$0,009 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$			□	■
	2.2												
	2.3												
	2.4												
	2.5												
H	1.1					75	$0,013 \times d_1$	$0,025 \times d_1$	$0,025 \times d_1$	□	■		
	1.2					55	$0,010 \times d_1$	$0,020 \times d_1$	$0,020 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

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EMUGE-Werk Richard Glimpel GmbH & Co. KG
Fabrik für Präzisionswerkzeuge

🏠 Nürnberger Straße 96-100
91207 Lauf
GERMANY

☎ +49 9123 186-0
🖨 +49 9123 14313

FRANKEN GmbH & Co. KG
Fabrik für Präzisionswerkzeuge

🏠 Frankenstraße 7/9a
90607 Rückersdorf
GERMANY

☎ +49 911 9575-5
🖨 +49 911 9575-327

✉ info@emuge-franken.com 🌐 www.emuge-franken.com