



Katalog · Catalogue

250

■ ■ ■ Made in Germany



FRANKEN

Frästechnik
Milling Technology

FRANKEN

Katalog 250

gültig ab 1. März 2015

Catalogue 250

valid from 1 March 2015

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Fabrik für Präzisionswerkzeuge




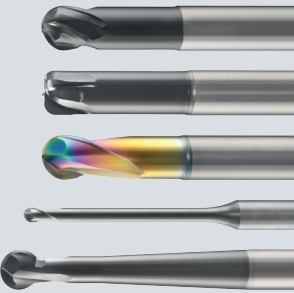

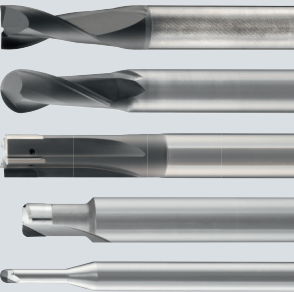

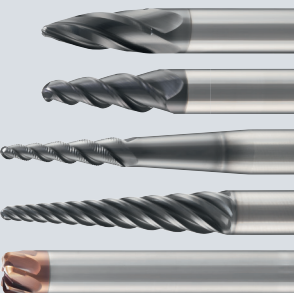

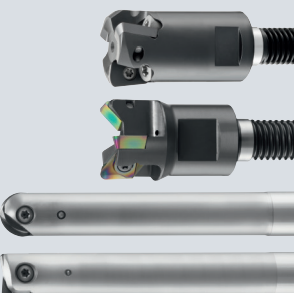
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90607 Rückersdorf
GERMANY

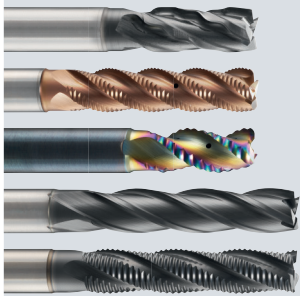

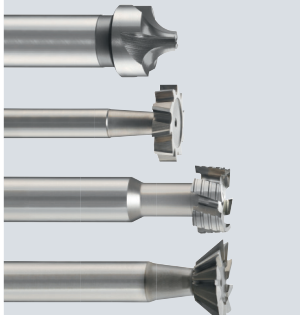

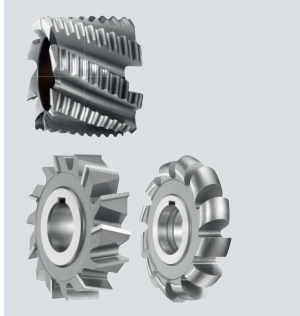

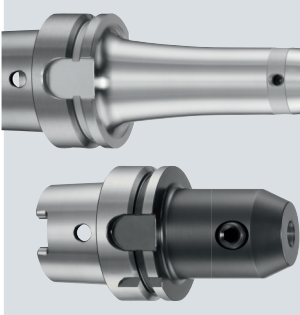

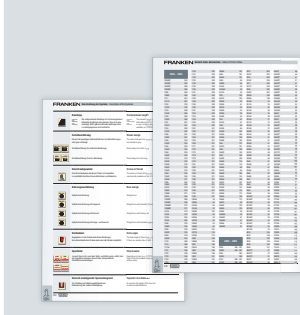

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Rund 100 Jahre Präzision und Innovation. Nearly 100 years of precision and innovation.

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 wendepplattenbestückten 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 Fräsespannmitteln und Zubehör für die verschiedensten Anpassungsmöglichkeiten.

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.



Vertriebsgebiete und Produktionsstandort in Deutschland
Sales areas and production locations in Germany





EMUGE – Unser Schwesterwerk in Lauf a.d. Pegnitz

Als Systemlieferant im Bereich Gewindefrästechnik und Spanntechnik bietet EMUGE ein lückenloses Sortiment an Gewindebohrern, Gewindeformern, Gewindefräsern, Spiralbohrern, Gewindelehren, Gewindefräsefutter und -apparaten, sowie Schneideisen und Walzrollen. Sonderlösungen für speziell vom Kunden geschilderte Anwendungsfälle im Bereich der Werkstückspannung runden das Programm ab.

EMUGE – Our sister company in Lauf a.d. Pegnitz

EMUGE is a system supplier of thread cutting and clamping technology. They offer a comprehensive product range of taps, cold-forming taps, thread milling cutters, twist drills, thread gauges, tap holders and tapping attachments as well as dies and thread rolls.

Individual workpiece clamping tools tailored to special customer applications complete the product range.

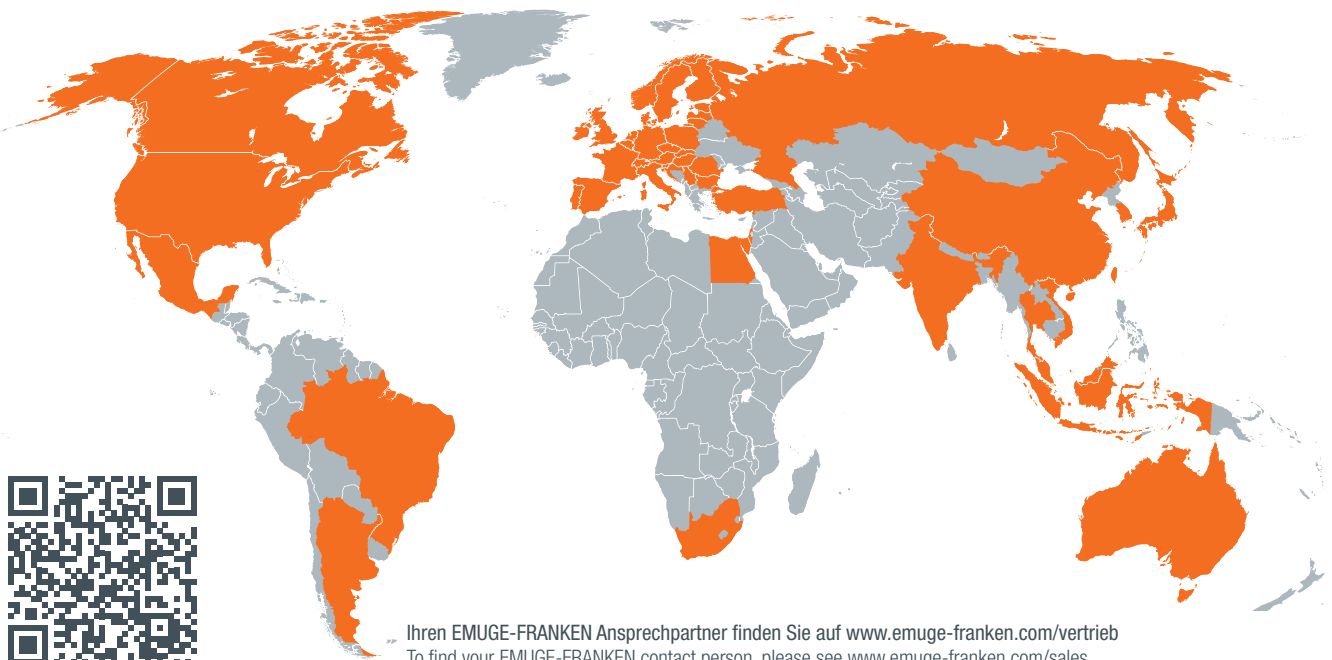
Wir sind in Ihrer Nähe. Weltweit. We are nearby. Throughout the world.

EMUGE-FRANKEN ist heute in allen wichtigen Industrienationen der Erde vertreten. Über 400 Kundenberater stehen weltweit im direkten Kundenkontakt und sorgen flächendeckend für eine individuelle Beratung vor Ort. Neben einer anwendungsspezifischen Beratung bieten wir auch Unterstützung bei der Entwicklung von modernen Frässtrategien auf Maschinen der eigenen Entwicklungsabteilung an.

Ganz gleich, wo unsere Präzisionswerkzeuge und unsere Leistungsvielfalt gefragt sind – wir sind in Ihrer Nähe.

Today EMUGE-FRANKEN is represented in all important industrial nations around the world. More than 400 customer consultants guarantee the direct contact with the customer and provide individual comprehensive consultation on-site. Besides an application-specific guidance we also provide support for the development of modern milling strategies on machines in our own development department.

No matter where our precision tools and our range of services are required – we are nearby.



Ihren EMUGE-FRANKEN Ansprechpartner finden Sie auf www.emuge-franken.com/vertrieb
To find your EMUGE-FRANKEN contact person, please see www.emuge-franken.com/sales

1 Baumaße · Dimensions

2 Ausführung · Design

FRANKEN Hartmetall-Schafffräser · Solid Carbide End Mills

Multi-Cut

Product Finder

NR

NF

N

H

WRI

WF

W

v_c / f_z

HM

- Multifunktionales Hochleistungswerkzeug
- Sehr niedrige Schnittkräfte
- Schneiden zur Mitte
- 2 Bauformen verfügbar

- Multi-functional, high performance tool
- Very low cutting forces
- Centre cutting
- 2 lengths available

Design I_c:

NR fein fine

HM

DIN 6535 HA HB

45°

45°

3-5°

v_c / f_z

70

Optional

Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)
- In fast allen Werkstoffen einsetzbar
- Zum Schruppen bei labilen Verhältnissen hervorragend geeignet

Applications – material (see page 10)
- For almost all materials
- Suitable for roughing under unstable conditions

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

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code	$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.-Code	2896A	2897A			
3	5	9	50	2,9	14	6	14	3	3	.003	●	●			
4	8	12	54	3,8	18	6	18	3	3	.004	●	●			
5	9	16	54	4,8	18	6	18	3	3	.005	●	●			
6	10	16	54	5,8	—	6	18	4	4	.006	●	●			
8	12	20	58	7,7	—	8	22	4	4	.008	●	●			
10	14	24	66	9,7	—	10	26	4	4	.010	●	●			
12	16	26	73	11,6	—	12	28	4	4	.012	●	●			
14	18	28	75	13,6	—	14	30	4	4	.014	●	●			
16	22	32	82	15,5	—	16	34	4	4	.016	●	●			
20	26	40	92	19,5	—	20	42	4	4	.020	●	●			

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code	$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.-Code		2892A	2893A
3	8	14	57	2,9	20	6	21	3	3	.003		●	●
4	11	18	57	3,8	20	6	21	3	3	.004		●	●
5	13	18	57	4,8	20	6	21	3	3	.005		●	●
6	13	20	57	5,8	—	6	21	4	4	.006		●	●
8	19	25	63	7,7	—	8	27	4	4	.008		●	●
10	22	30	72	9,7	—	10	32	4	4	.010		●	●
12	26	35	83	11,6	—	12	38	4	4	.012		●	●
14	26	35	83	13,6	—	14	38	4	4	.014		●	●
16	32	40	92	15,5	—	16	44	4	4	.016		●	●
20	38	50	104	19,5	—	20	54	4	4	.020		●	●

● = Lagerwerkzeug, Preis siehe Preisliste
Stock tool, price see price list

Bei Bestellung bitten wir Sie, den **Dimensions-Code** dem **Bestell-Code** anzufügen.

Beispiel: **2897A.008**

In your order, please add to the **order code** the **dimension code**.

Example: **2897A.008**



Hartmetall-Schaft- und Langlochfräser Solid Carbide End Mills and Slot Drills

Seite · Page

Wegweiser	Product finder	10 - 17
Produktseiten	Product pages	18 - 69
Schnittwerte	Cutting conditions	70 - 92

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

Wegweiser

Bitte beachten:
Die Eignung der Hartmetall-Schaft- und Langlochfräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 70 - 92 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:
The suitability of the solid carbide end mills and slot drills is indicated as follows:

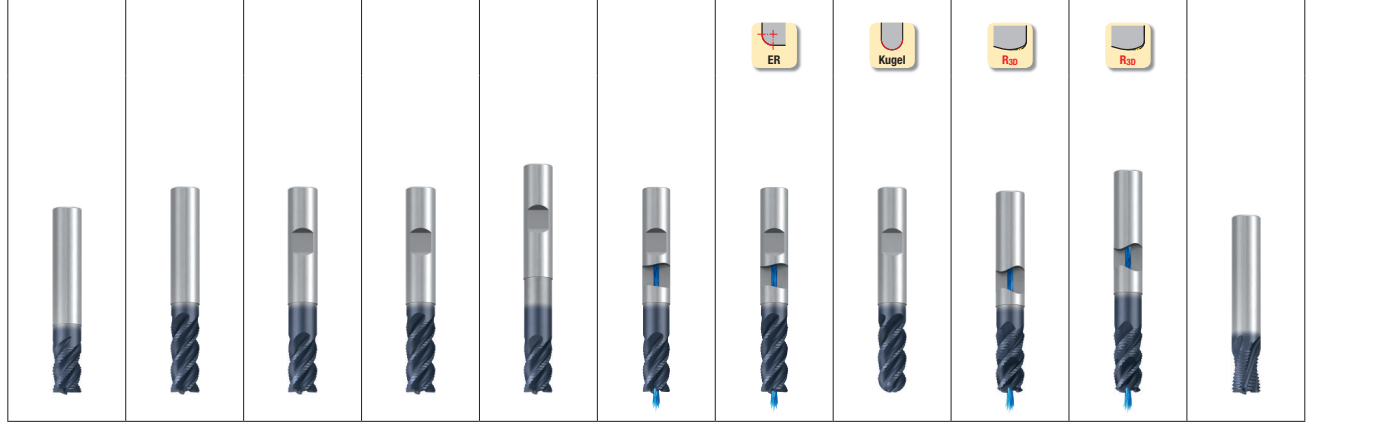
- = very suitable
- = suitable

Please find the cutting conditions on pages 70 - 92.

International comparison of materials, see page 416 - 429.



		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 (S137-2) 1.0037 10SPb20 1.0722 E360 (S170-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1	Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1	Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1	Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	
5.1	Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²		
M	Nichtrostende Stahlwerkstoffe		Stainless steel materials		
	1.1	Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ²	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
4.1	Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ²	X2CrNiMoN25-7-4 1.4410	
K	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
	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	
N	Nichteisenwerkstoffe		Non-ferrous materials		
	Aluminium-Legierungen		Aluminium alloys		
	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 EN CW 004 A
	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	(AMPPO® 8)
	2.8	Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ²	(AMPPO® 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	
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	
S	Spezialwerkstoffe		Special materials		
	Titan-Legierungen		Titanium alloys		
	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	Nickel-Basis-Legierungen	Nickel-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	

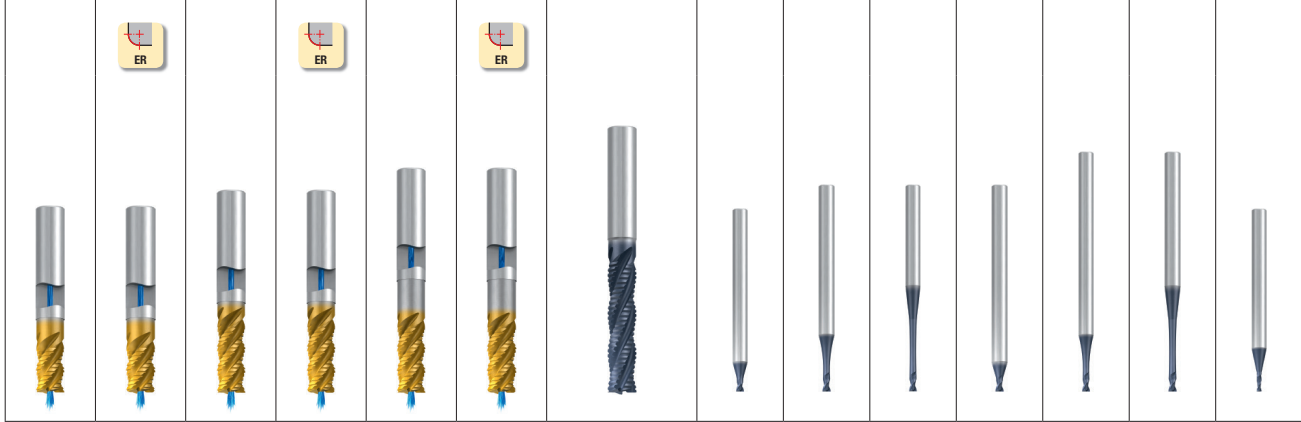


Allround Steel

NR <small>fein · fine</small>											Z (Flutes)
ø3-20 mm	ø3-20 mm	ø1-20 mm dia. 1/8-1"	ø3-20 mm dia. 1/8-1"	ø3-20 mm dia. 1/8-1"	ø3-20 mm dia. 1/8-1"	ø6-20 mm	ø3-20 mm	ø6-16 mm	ø8-16 mm	ø5-20 mm	
3-4	3-4	3-5	3-6	3-5	3-5	4	3-4	4	4	3-4	
2896A	2892A							2614AZ	2616AZ	1929A	
2897A	2893A	2869A	2873A	2875A	2869AZ	2673AZ	2667A	2615AZ	2617AZ	1930A	
18	18	19	20	21	22	23	24	25	25	26	Seite · Page
70	70	71	72	73	71	72	72	74	74	89	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
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						□	□					1.2
						□	□					1.3
						□	□					1.4
												1.5
												1.6
■	■	■	■	■	■	■	■	■			■	2.1
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												3.1
												3.2
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												4.2
												4.3
												4.4
■	■	■	■	■	■	■	■	■	■	■	□	5.1
												5.2
												5.3
■	■					□	□	□				1.1
						□	□	□				1.2
						□	□	□				1.3
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												2.6
□	□	■	■	■	■	■	■	■	■	■	□	1.1
									□	□		1.2
												1.3
												1.4
												1.5

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

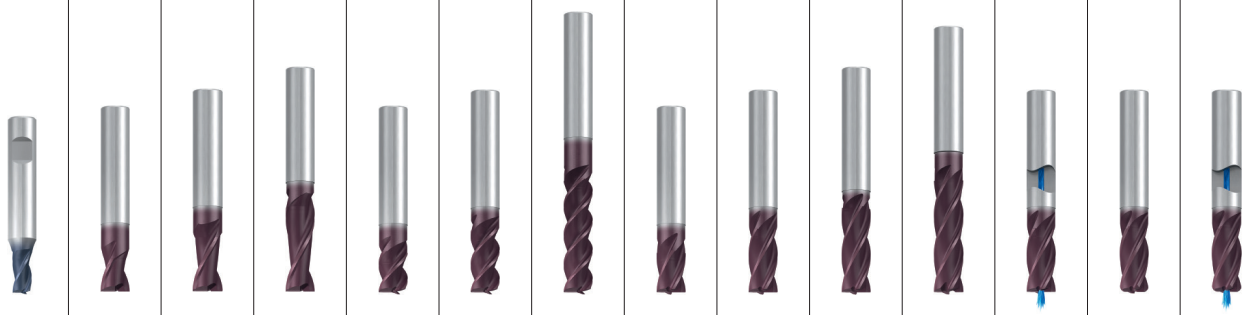


	Inox						Steel	Allround							
	NF <small>fein - fine</small>						NF <small>mittel - medium</small>	N							
	ø6 - 20 mm	ø12 - 20 mm	ø6 - 20 mm dia. 1/4 - 1"	ø12 - 20 mm	ø6 - 20 mm	ø6 - 20 mm	ø6 - 20 mm	ø0,2 - 2 mm	ø0,2 - 2 mm	ø0,2 - 2 mm	ø0,2 - 2 mm	ø0,2 - 2 mm	ø0,2 - 2 mm	ø0,2 - 2 mm	ø0,5 - 2 mm
Z (Flutes)	4	4	4 - 5	4	4	4	4	2	2	2	2	2	2	2	2
	2646TZ	2642TZ	2648TZ	2670TZ	2656TZ	2658TZ	2855A	2760A	2761A	2762A	2763A	2764A	2765A	1819A	
	2647TZ	2643TZ	2649TZ	2671TZ	2657TZ	2659TZ	2854A								
Seite · Page	27	27	28	28	29	29	30	31	31	31	32	32	32	32	33
v_c / f_z	75	75	75	75	75	75	91	83	84	85	83	84	85	89	



P	1.1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
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e8



Allround

N

ø0,5-12mm	ø0,3-20mm	ø2-20mm	ø3-20mm	ø1,5-20mm	ø2-20mm	ø3-20mm	ø3-20mm dia. 1/4-3/4"	ø3-20mm dia. 1/4-1"	ø3-20mm	ø6-20mm	ø3-20mm	ø3-20mm	ø3-20mm	Z (Flutes)
3	2	2	2	3	3	3	4	4	4-5	4-5	4	4	4	
2821A	2510A	2512A	2514A	2516A	2518A	2520A	1916A	1998A	2526A	2528A	1998AZ	2698A	2698AZ	
1805A	2511A	2513A	2515A	2517A	2519A	2521A	1917A	1999A	2527A	2529A	1999AZ	2699A	2699AZ	
34	35	36	36	37	37	38	39	39	40	40	41	42	43	Seite · Page
89	86	87	88	86	87	88	86	87	88	88	87	87	87	v_c / f_z

Product Finder

- NR
- NF
- N
- WR
- WF
- W

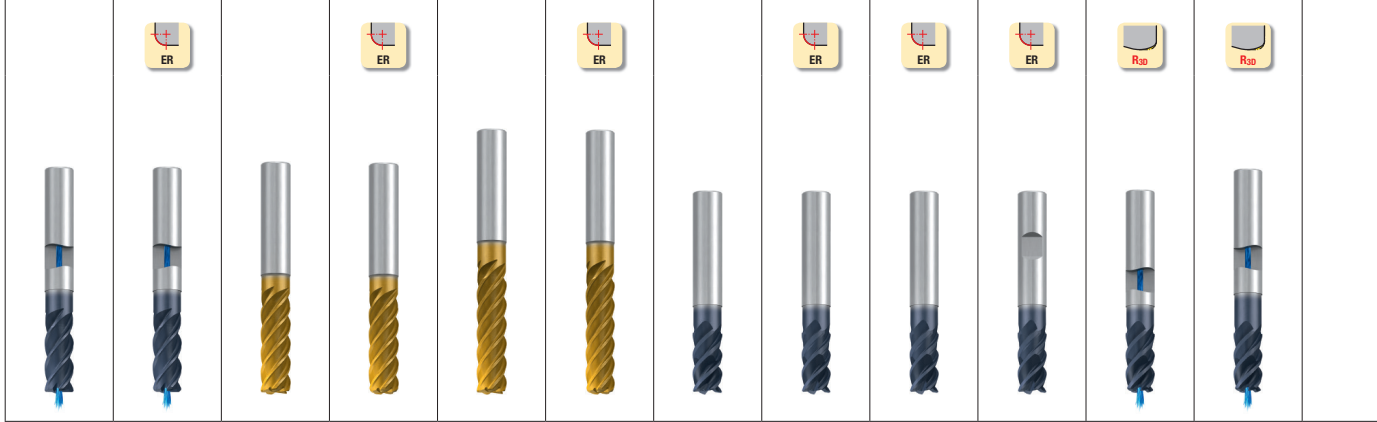
v_c / f_z



■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1.1
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■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	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





Inox Steel

N

	ø6 - 20 mm	ø6 - 20 mm	ø3 - 20 mm	ø12 - 20 mm	ø6 - 20 mm	ø12 - 20 mm	ø3 - 20 mm dia. 3/8 - 3/4"	ø3 - 20 mm dia. 3/16 - 1"	ø3 - 20 mm	ø3 - 20 mm dia. 3/16 - 1"	ø3 - 16 mm	ø8 - 16 mm
Z (Flutes)	4	4	4 - 5	5	4 - 5	5	4	4	4	4	4	4
	2650AZ	2652AZ	2644T	2654T	2645T	2655T	1926A	2815A	2850A		2610AZ	2612AZ
	2651AZ	2653AZ					2820A	2814A	2851A	1987A	2611AZ	2613AZ
Seite · Page	44	44	45	45	46	46	47	47	48	49	50	50
	76	76	77	77	77	77	78	78	78	78	79	79

P	1.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	5.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
M	1.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	2.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	3.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	4.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
K	1.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1											
	1.2			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	1.3			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	1.4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	1.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	1.6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	2.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	2.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.8	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1							<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.2							<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
4.1												
4.2												
4.3												
4.4												
5.1												
5.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3												
S	1.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	1.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	1.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	2.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	2.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
	2.6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
H	1.1						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2						<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3								<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



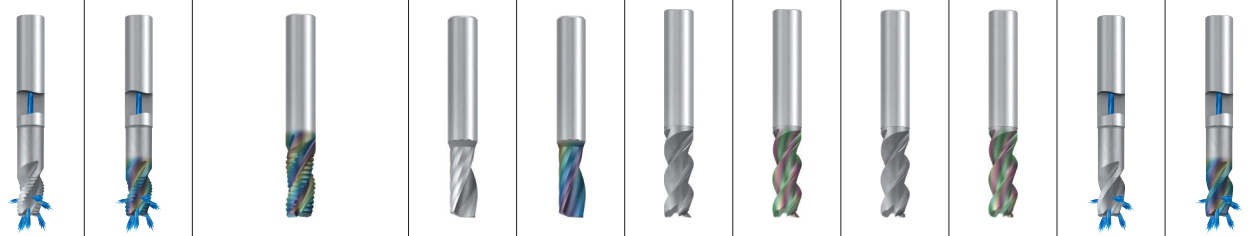
Allround		Hard materials							Al	Al/Cu	Al	Al/Cu	
N		H							WR <small>grob · coarse</small>				
ø5-20 mm	ø6-20 mm	ø5-16 mm	ø6-20 mm dia. 1/4-1"	ø6-25 mm dia. 1/4-1"	ø5-16 mm dia. 1/4-3/4"	ø6-16 mm dia. 9/16-3/4"	ø6-20 mm dia. 1/4-3/4"	ø3-20 mm	ø3-20 mm	ø6-25 mm dia. 1/4-1"	ø6-25 mm dia. 1/4-1"	Z (Flutes)	
6-8	6-8	6-8	6-10	6-10	6-8	6-8	6-18	3	3	3	3		
2522A	2524A	1825A	1827A	1828A	2813A	2817A	2887A	2548	2548K	2888_Z	2888RZ		
2523A	2525A	1925A	1927A	1928A	2812A	2816A	2886A	2549	2549K	2881_Z	2881RZ		
51	51	52	52	53	54	54	55	56	56	57	57	Seite · Page	
87	88	80	80	80	80	80	78	81	81	82	82	v_c / f_z	
												1.1	
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■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



Product Finder

- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z



Al Al/Cu Al/Cu Al Al Al/Cu Al Al/Cu Al Al/Cu

WR *grob · coarse* **WF** *grob · coarse* **W**

ø12 - 25 mm ø12 - 25 mm ø6 - 20 mm ø2 - 12 mm ø2 - 12 mm ø2 - 20 mm ø2 - 20 mm ø6 - 20 mm ø6 - 20 mm ø6 - 25 mm dia. 1/4 - 1" ø6 - 25 mm dia. 1/4 - 1"

Z (Flutes) 3 3 3 1 1 2 - 3 2 - 3 3 3 3 - 4 3 - 4

2890_Z **2890RZ** **2871R** **1909** **1909R** **2544** **2544K** **2546** **2546K** **2889_Z** **2889RZ**

2883_Z **2883RZ** **2870R** **2545** **2545K** **2547** **2547K** **2882_Z** **2882RZ**

Seite · Page 58 58 59 60 60 61 61 62 62 63 63

v_c / f_z 82 82 90 90 90 81 81 81 81 82 82



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		□	□				□		□	□

N	2.2		□	□					□		□
	2.3		□	□					□		□
	2.4		□	□					□		□
	2.5		□	□					□		□
	2.6		□	□					□		□
	2.7		□	□					□		□
	2.8										

N	3.1				■	■					
	3.2				■	■					
	4.1				■	■					
	4.2				■	■					

N	4.3										
	4.4										
	5.1										

N	5.2				□	■					
	5.3										

S	1.1										
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	1.3										
	2.1										
	2.2										
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	2.4										

H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										



ER		ER		Al/Cu		CFK/GFK					W		W		W	
Al	Al/Cu	Al/Cu		CFK/GFK					W		W		W		W	
ø12-25 mm	ø12-25 mm	ø2-20 mm	ø2-20 mm	ø3-20 mm	ø5-12 mm	ø5-12 mm	ø5-12 mm	ø5-12 mm	ø5-12 mm	ø4-8 mm	ø4-8 mm	Z (Flutes)				
4	4	3	3	3	2	2	2	2	2	3	3					
2891_Z	2891RZ	1824A	1818A	1956A	1931	1931A	1932	1932A	1932A	2818	2818A					
2884_Z	2884RZ	1806A	1856A	1957A												
64	64	65	65	66	67	67	68	68	68	69	69	Seite · Page				
82	82	89	90	91	92	92	92	92	92	92	92		v_c / f_z			
												1.1	P			
												2.1				
												3.1				
												4.1				
												5.1				
												1.1	M			
												2.1				
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												1.1	K			
												1.2				
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												1.5				

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

- Product Finder
- NR**
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Multifunktionales Hochleistungswerkzeug
- Sehr niedrige Schnittkräfte
- Schneiden zur Mitte
- 2 Baulängen verfügbar

- Multi-functional, high performance tool
- Very low cutting forces
- Centre cutting
- 2 lengths available

NR

fein
fine

HM

DIN 6535

HA
HB

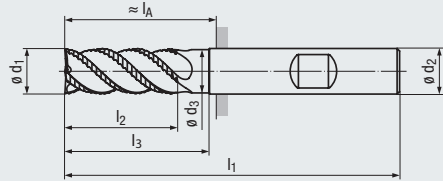
45°

45°

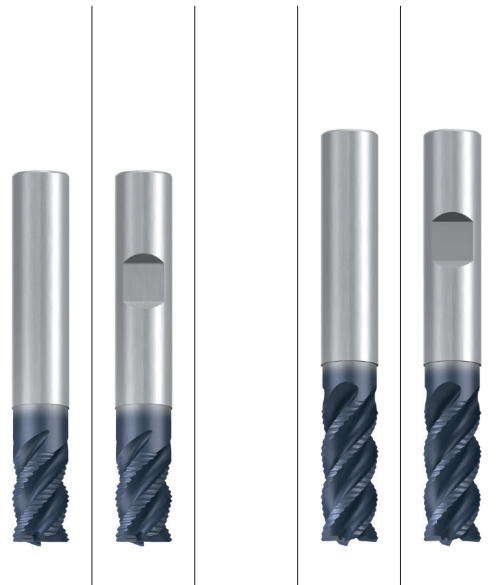
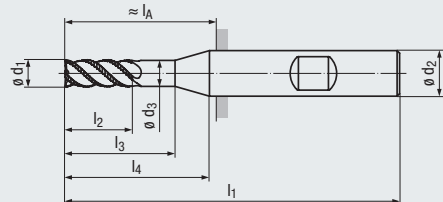
3-5°

v_c / f_z
70

Optional



Design l_4 :



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIALN

TIALN

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

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

DIN 6527 – Kurze Ausführung · Short design

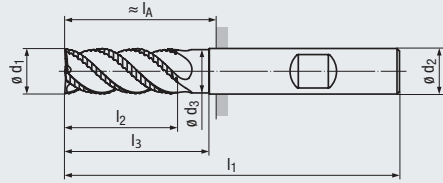
Bestell-Code · Order code										2896A	2897A				
ϕd_1 h11	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A	Z (Flutes)	Dimens.- Code						
3	5	9	50	2,9	14	6	14	3	.003	●	●				
4	8	12	54	3,8	18	6	18	3	.004	●	●				
5	9	16	54	4,8	18	6	18	3	.005	●	●				
6	10	16	54	5,8	–	6	18	4	.006	●	●				
8	12	20	58	7,7	–	8	22	4	.008	●	●				
10	14	24	66	9,7	–	10	26	4	.010	●	●				
12	16	26	73	11,6	–	12	28	4	.012	●	●				
14	18	28	75	13,6	–	14	30	4	.014	●	●				
16	22	32	82	15,5	–	16	34	4	.016	●	●				
20	26	40	92	19,5	–	20	42	4	.020	●	●				

DIN 6527 – Lange Ausführung · Long design

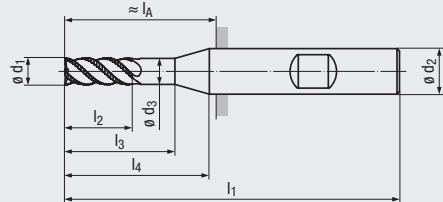
Bestell-Code · Order code												2892A	2893A		
ϕd_1 h11	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A	Z (Flutes)	Dimens.- Code						
3	8	14	57	2,9	20	6	21	3	.003			●	●		
4	11	18	57	3,8	20	6	21	3	.004			●	●		
5	13	18	57	4,8	20	6	21	3	.005			●	●		
6	13	20	57	5,8	–	6	21	4	.006			●	●		
8	19	25	63	7,7	–	8	27	4	.008			●	●		
10	22	30	72	9,7	–	10	32	4	.010			●	●		
12	26	35	83	11,6	–	12	38	4	.012			●	●		
14	26	35	83	13,6	–	14	38	4	.014			●	●		
16	32	40	92	15,5	–	16	44	4	.016			●	●		
20	38	50	104	19,5	–	20	54	4	.020			●	●		

- Multifunktionales Hochleistungswerkzeug
- Niedrige Schnittkräfte
- Kurze Schneidenlänge
- Schneiden zur Mitte
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- Low cutting forces
- Short flute length
- Centre cutting
- 3 lengths available



Design I₄:



NR fein fine

HM

DIN 6535 HA HB

ASME B94.19

45° 45°

3-5°

v_c / f_z 71

Optional



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIALN

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

Lange Ausführung · Long design

Bestell-Code · Order code										2869A			
$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code				
1	1,5	3	38	0,9	9	3 ¹⁾	–	3	.001	●			
2	3	8	57	1,9	15	6	21	3	.002	●			
3	5	14	57	2,9	18	6	21	3	.003	●			
4	8	18	57	3,8	20	6	21	3	.004	●			
5	9	19	57	4,8	20	6	21	3	.005	●			
6	10	20	57	5,8	–	6	21	4	.006	●			
8	12	25	63	7,7	–	8	27	4	.008	●			
10	15	30	72	9,5	–	10	32	4	.010	●			
12	18	35	83	11,5	–	12	38	4	.012	●			
14	21	35	83	13,5	–	14	38	4	.014	●			
16	24	40	92	15,5	–	16	44	4	.016	●			
20	30	50	104	19,5	–	20	54	4	.020	●			
1/8	3/16	5/8	2 1/2	0.118	7/8	3/8	15/16	3	.0125	●			
3/16	9/32	11/16	2 1/2	0.177	7/8	3/8	15/16	3	.01875	●			
1/4	3/8	3/4	2 1/2	0.236	7/8	3/8	15/16	4	.0250	●			
5/16	15/32	7/8	2 1/2	0.295	15/16	3/8	15/16	4	.03125	●			
3/8	9/16	1 1/8	2 3/4	0.358	–	3/8	1 3/16	4	.0375	●			
1/2	3/4	1 3/8	3 1/4	0.480	–	1/2	1 15/32	4	.0500	●			
5/8	7/8	1 1/2	3 1/2	0.605	–	5/8	1 19/32	4	.0625	●			
3/4	1 1/8	1 7/8	4	0.730	–	3/4	1 31/32	4	.0750	●			
1	1 1/2	2 5/8	5	0.969	–	1	2 23/32	5	.1000	●			

¹⁾ Glatter Schaft
Straight shank

Product Finder

NR

NF

N

WR

WF


W

v_c / f_z


HM

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM


- Multifunktionales Hochleistungswerkzeug
- Niedrige Schnittkräfte
- Schneiden zur Mitte
- 3 Baulängen verfügbar
- Multi-functional, high performance tool
- Low cutting forces
- Centre cutting
- 3 lengths available




NR




**fein
fine**




HM




DIN 6535
HA
HB




**ASME
B94.19**




45°



45°




3-5°



v_c / f_z
72

Optional



Design l_4 :

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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


Applications – material (see page 10)

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

TIALN

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

DIN 6527 – Lange Ausführung · Long design

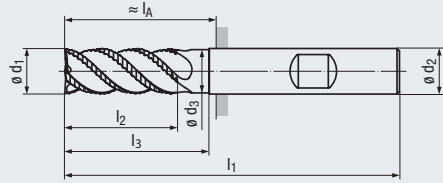
Bestell-Code · Order code										2873A					
[mm]	$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code					
		3	8	14	57	2,9	18	6	21	3	.003	●			
	4	11	18	57	3,8	20	6	21	3	.004	●				
	5	13	19	57	4,8	20	6	21	3	.005	●				
	6	13	20	57	5,8	—	6	21	4	.006	●				
	8	19	25	63	7,7	—	8	27	4	.008	●				
	10	22	30	72	9,5	—	10	32	4	.010	●				
	12	26	35	83	11,5	—	12	38	4	.012	●				
	14	26	35	83	13,5	—	14	38	4	.014	●				
	16	32	40	92	15,5	—	16	44	4	.016	●				
	18	32	40	92	17,5	—	18	44	4	.018	●				
	20	38	50	104	19,5	—	20	54	4	.020	●				
	20	38	50	104	19,5	—	20	54	6	.020006	●				
	1/8	9/32	5/8	2 1/2	0.118	7/8	3/8	15/16	3	.0125	●				
	3/16	3/8	11/16	2 1/2	0.177	7/8	3/8	15/16	3	.01875	●				
	1/4	17/32	3/4	2 1/2	0.236	7/8	3/8	15/16	4	.0250	●				
	5/16	3/4	7/8	2 1/2	0.295	15/16	3/8	15/16	4	.03125	●				
	3/8	7/8	1 1/8	2 3/4	0.358	—	3/8	1 3/16	4	.0375	●				
	1/2	1 1/8	1 3/8	3 1/4	0.480	—	1/2	1 15/32	4	.0500	●				
	5/8	1 1/4	1 1/2	3 1/2	0.605	—	5/8	1 19/32	4	.0625	●				
	3/4	1 1/2	1 7/8	4	0.730	—	3/4	1 31/32	4	.0750	●				
	1	1 3/4	2 5/8	5	0.969	—	1	2 23/32	5	.1000	●				

20

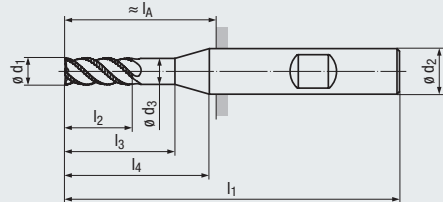
Bestell-Beispiel · Ordering example: **2873A.003**

- Multifunktionales Hochleistungswerkzeug
- Niedrige Schnittkräfte
- Kurze Schneidenlänge
- Schneiden zur Mitte
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- Low cutting forces
- Short flute length
- Centre cutting
- 3 lengths available



Design I₄:



NR fein fine

HM

DIN 6535 HA HB

ASME B94.19

45° 45°

3-5°

v_c / f_z 73

Optional



Allround

Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

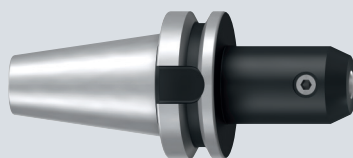
- In vielen Werkstoffen einsetzbar
- Volumenzerspanung
- Zum Schruppen bei labilen Verhältnissen hervorragend geeignet

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

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

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2875A			
	$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code				
[mm]	3	5	19	62	2,9	23	6	26	3	.003	●			
	4	8	23	62	3,8	25	6	26	3	.004	●			
	5	9	24	62	4,8	25	6	26	3	.005	●			
	6	10	25	62	5,8	–	6	26	4	.006	●			
	8	12	30	68	7,7	–	8	32	4	.008	●			
	10	15	35	80	9,5	–	10	40	4	.010	●			
	12	18	45	93	11,5	–	12	48	4	.012	●			
	14	21	50	99	13,5	–	14	54	4	.014	●			
	16	24	55	108	15,5	–	16	60	4	.016	●			
	20	30	70	126	19,5	–	20	76	4	.020	●			
[inch]	1/8	3/16	3/4	3	0.118	1 1/4	3/8	1 7/16	3	.0125	●			
	3/16	9/32	7/8	3	0.177	1 1/4	3/8	1 7/16	3	.01875	●			
	1/4	3/8	1	3	0.236	1 1/4	3/8	1 7/16	4	.0250	●			
	5/16	15/32	1 1/4	3	0.295	1 3/8	3/8	1 7/16	4	.03125	●			
	3/8	9/16	1 5/8	3 1/4	0.358	–	3/8	1 11/16	4	.0375	●			
	1/2	3/4	1 7/8	3 3/4	0.480	–	1/2	1 31/32	4	.0500	●			
	5/8	7/8	2 1/4	4 1/4	0.605	–	5/8	2 11/32	4	.0625	●			
	3/4	1 1/8	2 3/4	5	0.730	–	3/4	2 31/32	4	.0750	●			
	1	1 1/2	3 5/8	6	0.969	–	1	3 23/32	5	.1000	●			



Aufnahmen für Schäfte nach DIN 6535 HB und DIN 1835 B siehe Seite 380 - 382

Holders for shanks according to DIN 6535 HB and DIN 1835 B, see pages 380 - 382

- Product Finder
- NR**
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- Niedrige Schnittkräfte
- Kurze Schneidenlänge
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- Multi-functional, high performance tool
- Low cutting forces
- Short flute length
- Internal coolant supply, axial exit (ICA)

NR

fein
fine

ICA

HM

DIN 6535
HA
HB

ASME B94.19
HA
HB

45°

45°

3-5°

v_c / f_z
71

Design I₄:

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In vielen Werkstoffen einsetzbar
- Volumenzerspanung
- Zum Schrappen bei labilen Verhältnissen hervorragend geeignet

Applications – material (see page 10)

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

TIALN

P	1.1-5.1	
M		1.1-2.1
K	1.1-4.2	
N	2.1-2.8	1.2-1.4
N	5.2	4.1
S		1.1-1.3
H	1.1	

Lange Ausführung · Long design

Bestell-Code · Order code										2869AZ				
	$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
[mm]	3	5	14	57	2,9	18	6	21	3	.003		●		
	4	8	18	57	3,8	20	6	21	3	.004		●		
	5	9	19	57	4,8	20	6	21	3	.005		●		
	6	10	20	57	5,8	–	6	21	4	.006		●		
	8	12	25	63	7,7	–	8	27	4	.008		●		
	10	15	30	72	9,5	–	10	32	4	.010		●		
	12	18	35	83	11,5	–	12	38	4	.012		●		
	14	21	35	83	13,5	–	14	38	4	.014		●		
[inch]	1/8	3/16	5/8	2 1/2	0.118	7/8	3/8	15/16	3	.0125		●		
	3/16	9/32	11/16	2 1/2	0.177	7/8	3/8	15/16	3	.01875		●		
	1/4	3/8	3/4	2 1/2	0.236	7/8	3/8	15/16	4	.0250		●		
	5/16	15/32	7/8	2 1/2	0.295	15/16	3/8	15/16	4	.03125		●		
	3/8	9/16	1 1/8	2 3/4	0.358	–	3/8	1 3/16	4	.0375		●		
	1/2	3/4	1 3/8	3 1/4	0.480	–	1/2	1 15/32	4	.0500		●		
	5/8	7/8	1 1/2	3 1/2	0.605	–	5/8	1 19/32	4	.0625		●		
	3/4	1 1/8	1 7/8	4	0.730	–	3/4	1 31/32	4	.0750		●		
1	1 1/2	2 5/8	5	0.969	–	1	2 23/32	5	.1000		●			

22

Bestell-Beispiel · Ordering example: **2869AZ.003**

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

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

NR fein fine

ICA

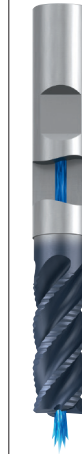
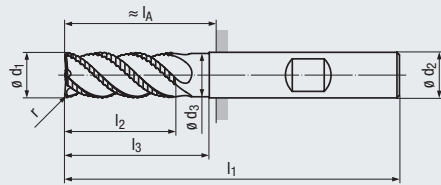
HM

DIN 6535
HA HB

45° **ER**

3-5°

v_c/f_z
72



Allround

Product Finder

NR

NF

N

WR

WF

W

v_c/f_z

HM

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIALN

P	1.1-5.1
M	1.1-2.1
K	1.1-4.2
N	2.1-2.8 1.2-1.4
N	5.2 4.1
S	1.1-1.3
H	1.1

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

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

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Multifunktionales Hochleistungswerkzeug
- Spanteiler auch im Radiusbereich
- 2 Schneiden zur Mitte
- Multi-functional, high performance tool
- Chip-breakers also in the radius section
- 2 centre cutting edges

NR

fein
fine

HM

DIN 6535

HA
HB

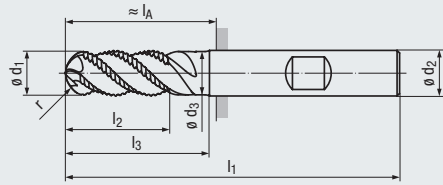
45°

Kugel

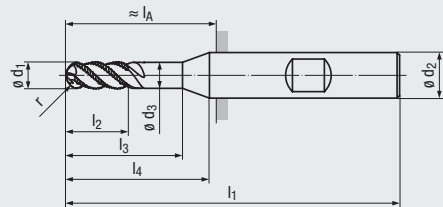
3-5°

v_c / f_z
72

Optional



Design l_4 :



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

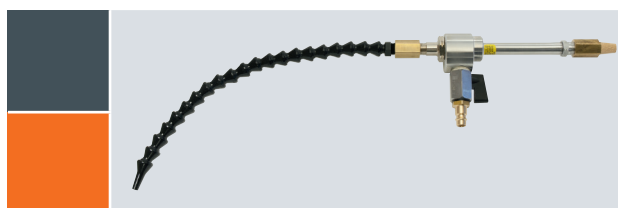
- For almost all materials
- Suitable for roughing under unstable conditions
- Suitable for 3D-roughing

TIALN

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

Lange Ausführung · Long design

Bestell-Code · Order code										2667A				
$\varnothing d_1$ h11	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
3	1,5	8	14	57	2,9	18	6	21	3	.003	●			
4	2	11	18	57	3,8	20	6	21	3	.004	●			
5	2,5	13	19	57	4,8	20	6	21	3	.005	●			
6	3	13	20	57	5,8	–	6	21	4	.006	●			
8	4	19	25	63	7,7	–	8	27	4	.008	●			
10	5	22	30	72	9,5	–	10	32	4	.010	●			
12	6	26	35	83	11,5	–	12	38	4	.012	●			
14	7	26	35	83	13,5	–	14	38	4	.014	●			
16	8	32	40	92	15,5	–	16	44	4	.016	●			
20	10	38	50	104	19,5	–	20	54	4	.020	●			



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Multifunktionales Hochleistungswerkzeug
- Mit DUPLEX-Geometrie
- Kombination aus Schaft- und Hochvorschubfräser
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- Extra lange Ausführung mit langer Schneidenlänge

- Multi-functional, high performance tool
- With DUPLEX geometry
- Combination of HPC- and high-feed end mill
- Internal coolant supply, axial exit (ICA)
- Extra long design with long flute length

NR fein fine

ICA

HM

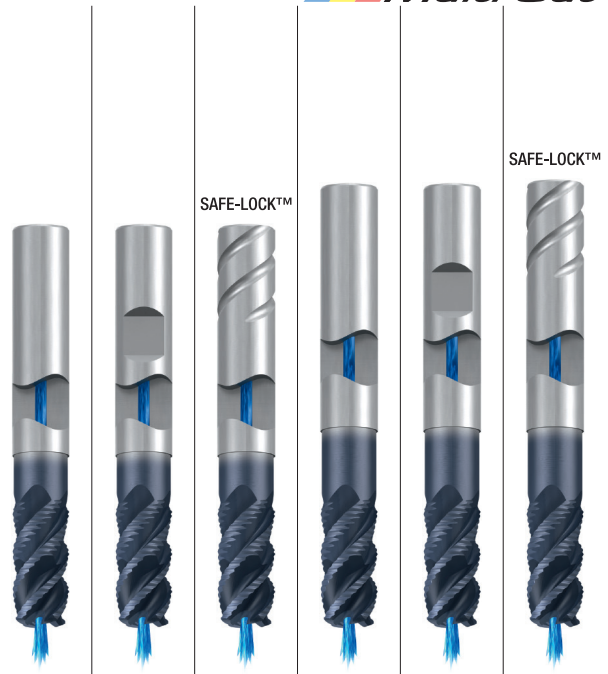
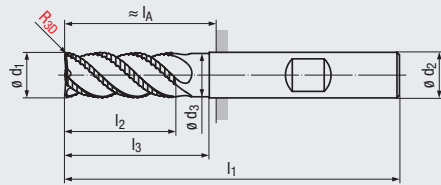
DIN 6535
HA HB

45°

R_{3D}

3-5°

v_c/f_z
74



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen bei labilen Verhältnissen hervorragend geeignet
- 2D-Konturen und 3D-Konturen herstellbar

Applications – material (see page 10)

- For almost all materials
- Suitable for roughing under unstable conditions
- 2D and 3D contours can be produced

TIALN

TIALN

P	1.1-5.1
K	1.1-4.2
N	5.2, 2.3, 2.6
H	1.1, 1.2

P	1.1-5.1
K	1.1-4.2
N	5.2, 2.3, 2.6
H	1.1, 1.2

DIN 6527 – Lange Ausführung · Long design

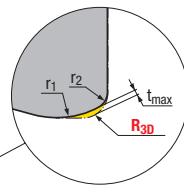
Bestell-Code · Order code

ø d ₁ h11	R _{3D}	r ₁ / r ₂	t _{max}	l ₂	l ₃	l ₁	ø d ₃	ø d ₂ h6	l _A	Z (Flutes)	Dimens.- Code	2614AZ	2615AZ	2614AT
6	0,8	2,9 / 0,6	0,2	13	20	57	5,8	6	21	4	.006	●	●	○
8	1	3,9 / 0,8	0,3	19	25	63	7,7	8	27	4	.008	●	●	○
10	1,2	4,9 / 1	0,4	22	30	72	9,5	10	32	4	.010	●	●	○
12	1,6	5,9 / 1,2	0,4	26	35	83	11,5	12	38	4	.012	●	●	○
16	2,2	7,8 / 1,6	0,5	32	40	92	15,5	16	44	4	.016	●	●	○

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

ø d ₁ h11	R _{3D}	r ₁ / r ₂	t _{max}	l ₂	l ₃	l ₁	ø d ₃	ø d ₂ h6	l _A	Z (Flutes)	Dimens.- Code	2616AZ	2617AZ	2616AT
8	1	3,9 / 0,8	0,3	19	30	68	7,7	8	32	4	.008	●	●	○
10	1,2	4,9 / 1	0,4	22	35	80	9,5	10	40	4	.010	●	●	○
12	1,6	5,9 / 1,2	0,4	26	45	93	11,5	12	48	4	.012	●	●	○
16	2,2	7,8 / 1,6	0,5	32	55	108	15,5	16	60	4	.016	●	●	○



DUPLEX-Geometrie · DUPLEX geometry

t_{max} = Maximal durch Radiusabweichung vom R_{3D} entstehendes Restmaterial
Maximum residual material resulting from radius deviation from R_{3D}

R_{3D} = Im CAM zu programmierender Radius
Radius to be programmed in CAM

r₁ = Stirnradius
Face radius

r₂ = Tangentialradius zwischen Stirnradius und Umfangsschneide
Tangential radius between face radius and circumference cutting edge

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415

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

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Niedrige Schnittkräfte
- Schneiden zur Mitte
- Low cutting forces
- Centre cutting

NR

fein
fine

HM

DIN 6535

HA
HB

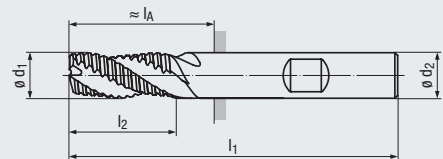
20°

45°

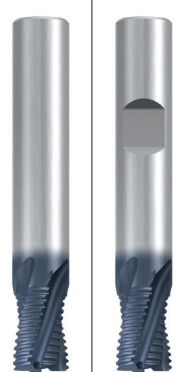
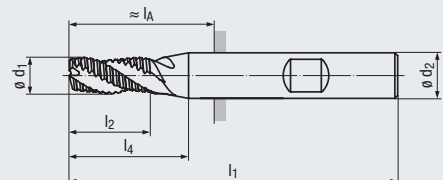
3-5°

v_c / f_z
89

Optional



Design I₄:



Steel

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In Stahl- und Gusswerkstoffen einsetzbar
- Zum Schruppen bei labilen Verhältnissen geeignet

Applications – material (see page 10)

- For steel materials and cast materials
- Suitable for roughing under unstable conditions

TIALN

P	1.1-5.1	
K	1.1-4.2	
N	2.3, 2.6	5.2
H		1.1

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code								1929A	1930A				
$\varnothing d_1$ h11	l_2	l_1	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code						
5	9	54	16	6	18	3	.005	●	●				
6	10	54	–	6	18	4	.006	●	●				
8	12	58	–	8	22	4	.008	●	●				
10	14	66	–	10	26	4	.010	●	●				
12	16	73	–	12	28	4	.012	●	●				
16	22	82	–	16	34	4	.016	●	●				
20	26	92	–	20	42	4	.020	●	●				

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

- High performance tool
- Fine semi-finishing profile for tough materials
- Several corner radii per cutting diameter
- Internal coolant supply, axial exit (ICA)
- 3 lengths available

NF fein fine

ICA

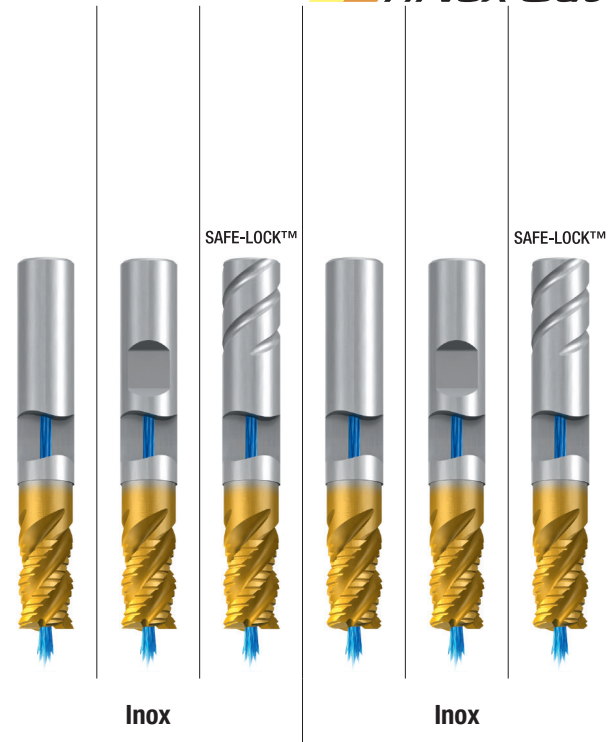
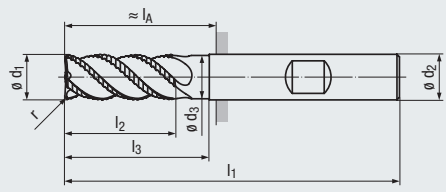
HM

DIN 6535
HA
HB

45° 45°

ER 3-5°

v_c/f_z
75



Product Finder

NR

NF

N

WR

WF

W

v_c/f_z

HM

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIN / TIALN

TIN / TIALN

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

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

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code									2646TZ	2647TZ	2646TT				
∅ d ₁ h11	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code							
6	10	16	54	5,8	6	18	4	.006	●	●	○				
8	12	20	58	7,7	8	22	4	.008	●	●	○				
10	14	24	66	9,5	10	26	4	.010	●	●	○				
12	16	26	73	11,5	12	28	4	.012	●	●	○				
16	22	32	82	15,5	16	34	4	.016	●	●	○				
20	26	40	92	19,5	20	42	4	.020	●	●	○				

DIN 6527 – Kurze Ausführung · Short design

Eckenradius · Corner radius

Bestell-Code · Order code										2642TZ	2643TZ	2642TT
∅ d ₁ h11	r	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code			
12	2,5	16	26	73	11,5	12	28	4	.012025	●	●	○
12	3	16	26	73	11,5	12	28	4	.012030	●	●	○
12	4	16	26	73	11,5	12	28	4	.012040	●	●	○
16	2,5	22	32	82	15,5	16	34	4	.016025	●	●	○
16	3	22	32	82	15,5	16	34	4	.016030	●	●	○
16	4	22	32	82	15,5	16	34	4	.016040	●	●	○
20	2,5	26	40	92	19,5	20	42	4	.020025	●	●	○
20	3	26	40	92	19,5	20	42	4	.020030	●	●	○
20	4	26	40	92	19,5	20	42	4	.020040	●	●	○

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415

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

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

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

- High performance tool
- Fine semi-finishing profile for tough materials
- Several corner radii per cutting diameter
- Internal coolant supply, axial exit (ICA)
- 3 lengths available

NF

fein
fine

ICA

HM

DIN 6535
HA
HB

ASME B94.19
HA
HB

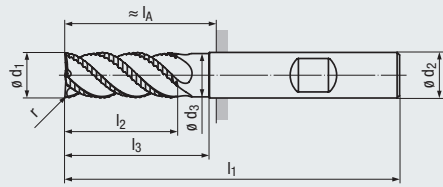
45°

45°

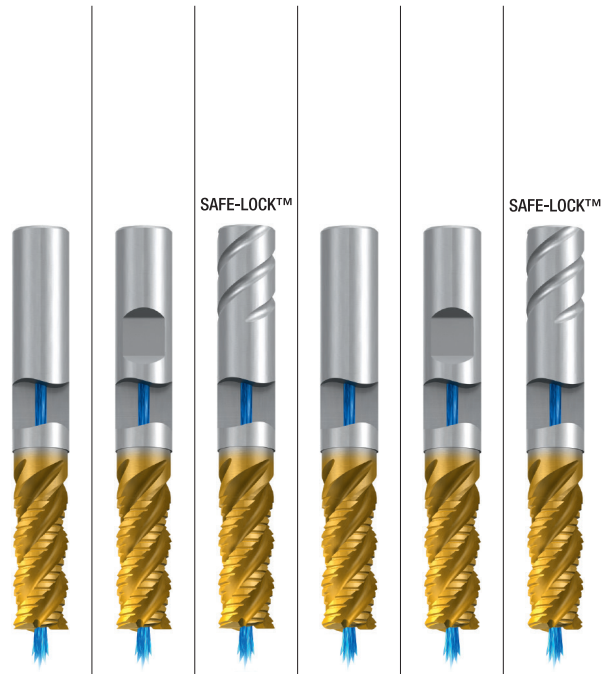
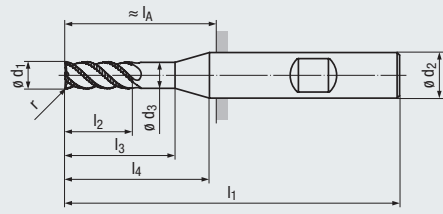
ER

3-5°

v_c / f_z
75



Design l_4 :



Beschichtung - Coating

Einsatzgebiete – Material (siehe Seite 10) Applications – material (see page 10)

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

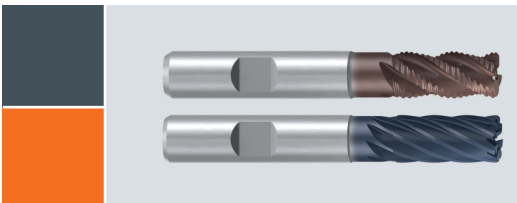
TIN / TIALN	
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2
S	1.1-2.6

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code											2648TZ	2649TZ	2648TT			
[mm]	$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z	Dimens.-Code						
	$\frac{h11}{h11}$						$\frac{h6}{h6}$		(Flutes)							
	6	13	20	57	5,8	–	6	21	4	.006	●	●	○			
	8	19	25	63	7,7	–	8	27	4	.008	●	●	○			
	10	22	30	72	9,5	–	10	32	4	.010	●	●	○			
	12	26	35	83	11,5	–	12	38	4	.012	●	●	○			
	16	32	40	92	15,5	–	16	44	4	.016	●	●	○			
	20	38	50	104	19,5	–	20	54	4	.020	●	●	○			
	1/4	17/32	3/4	2 1/2	0.236	7/8	3/8	15/16	4	.0250	●	●	○			
	5/16	3/4	7/8	2 1/2	0.295	15/16	3/8	15/16	4	.03125	●	●	○			
	3/8	7/8	1 1/8	2 3/4	0.358	–	3/8	1 3/16	4	.0375	●	●	○			
	1/2	1 1/8	1 3/8	3 1/4	0.480	–	1/2	1 15/32	4	.0500	●	●	○			
	5/8	1 1/4	1 1/2	3 1/2	0.605	–	5/8	1 19/32	4	.0625	●	●	○			
	3/4	1 1/2	1 7/8	4	0.730	–	3/4	1 31/32	4	.0750	●	●	○			
	1	1 3/4	2 5/8	5	0.969	–	1	2 23/32	5	.1000	●	●	○			

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code											Eckenradius · Corner radius		
[mm]	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$	l_A	Z	Dimens.-Code	2670TZ	2671TZ	2670TT
	$\frac{h11}{h11}$						$\frac{h6}{h6}$		(Flutes)				
	12	2,5	26	35	83	11,5	12	38	4	.012025	●	●	○
	12	3	26	35	83	11,5	12	38	4	.012030	●	●	○
	12	4	26	35	83	11,5	12	38	4	.012040	●	●	○
	16	2,5	32	40	92	15,5	16	44	4	.016025	●	●	○
	16	3	32	40	92	15,5	16	44	4	.016030	●	●	○
	16	4	32	40	92	15,5	16	44	4	.016040	●	●	○
	20	2,5	38	50	104	19,5	20	54	4	.020025	●	●	○
	20	3	38	50	104	19,5	20	54	4	.020030	●	●	○
	20	4	38	50	104	19,5	20	54	4	.020040	●	●	○



TiNox-Cut HSS-Schafffräser
siehe Seite 264, 271 und 277

TiNox-Cut HSS end mills,
see pages 264, 271 and 277

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

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

NF fein fine

ICA

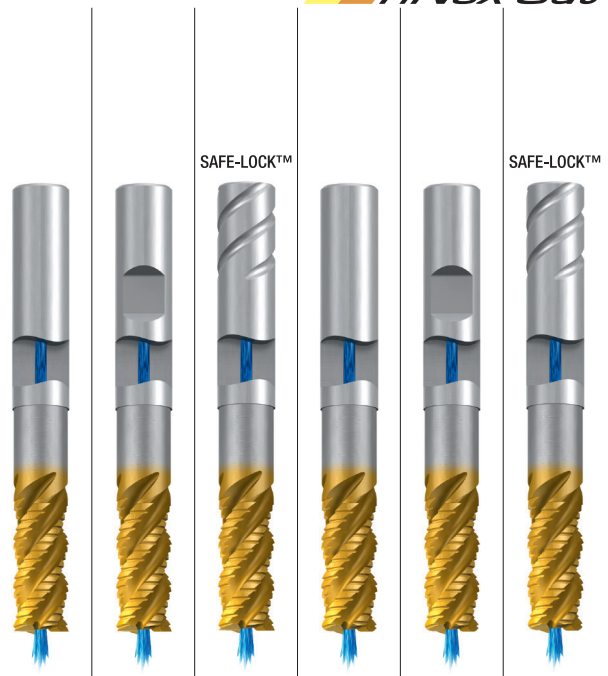
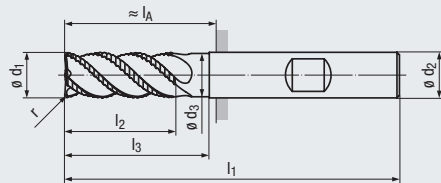
HM

DIN 6535
HA HB

45° 45°

ER 3-5°

v_c / f_z 75



Inox

Inox

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIN / TIALN

TIN / TIALN

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

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

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code	2656TZ	2657TZ	2656TT
6	13	25	62	5,8	6	26	4	.006	●	●	○
8	19	30	68	7,7	8	32	4	.008	●	●	○
10	22	35	80	9,5	10	40	4	.010	●	●	○
12	26	45	93	11,5	12	48	4	.012	●	●	○
16	32	55	108	15,5	16	60	4	.016	●	●	○
20	38	70	126	19,5	20	76	4	.020	●	●	○

Extra lange Ausführung · Extra long design

Eckenradius · Corner radius

Bestell-Code · Order code

$\varnothing d_1$ h11	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code	2658TZ	2659TZ	2658TT
6	0,5	13	25	62	5,8	6	26	4	.006005	●	●	○
6	1	13	25	62	5,8	6	26	4	.006010	●	●	○
8	1	19	30	68	7,7	8	32	4	.008010	●	●	○
8	2	19	30	68	7,7	8	32	4	.008020	●	●	○
10	2	22	35	80	9,5	10	40	4	.010020	●	●	○
10	2,5	22	35	80	9,5	10	40	4	.010025	●	●	○
12	2	26	45	93	11,5	12	48	4	.012020	●	●	○
12	2,5	26	45	93	11,5	12	48	4	.012025	●	●	○
12	3	26	45	93	11,5	12	48	4	.012030	●	●	○
12	4	26	45	93	11,5	12	48	4	.012040	●	●	○
16	2	32	55	108	15,5	16	60	4	.016020	●	●	○
16	2,5	32	55	108	15,5	16	60	4	.016025	●	●	○
16	3	32	55	108	15,5	16	60	4	.016030	●	●	○
16	4	32	55	108	15,5	16	60	4	.016040	●	●	○
20	2	38	70	126	19,5	20	76	4	.020020	●	●	○
20	2,5	38	70	126	19,5	20	76	4	.020025	●	●	○
20	3	38	70	126	19,5	20	76	4	.020030	●	●	○
20	4	38	70	126	19,5	20	76	4	.020040	●	●	○

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415

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

Product Finder

NR

NF

N

H

WR

WF

W

v_c / f_z

HM

- Schruppschicht-Verzahnung
- Schneiden zur Mitte
- Semi-finishing profile
- Centre cutting

NF mittel medium

HM

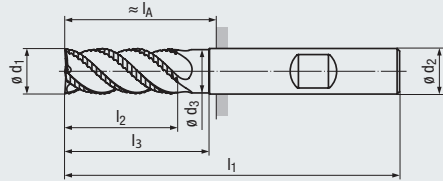
DIN 6535
HA
HB

30° 45°

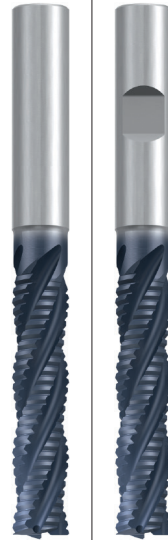
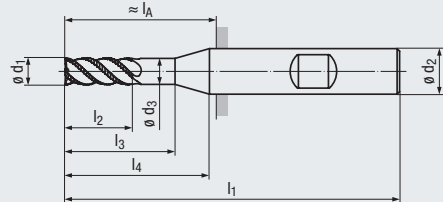
3-5°

v_c / f_z
91

Optional



Design l_4 :



Steel

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- Für Werkstoffe mit einer Zugfestigkeit bis 1000 N/mm²
- Hervorragend geeignet für Schruppschicht-Anwendungen

- For materials with a tensile strength of up to 1000 N/mm²
- Very suitable for semi-finishing applications

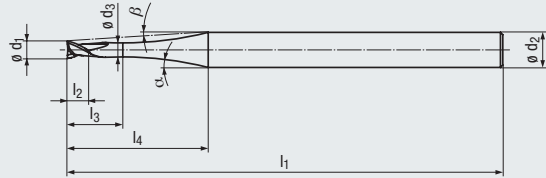
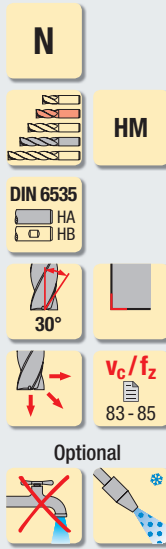
P	1.1-3.1	
M		1.1-2.1
K	1.1-2.2	3.1-4.2
N	2.3, 2.6	

Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2855A	2854A				
$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code						
6	24	30	68	5,8	–	6	32	4	.006	●	●				
7	38	45	88	6,7	50	8	52	4	.007	●	●				
8	38	50	88	7,7	–	8	52	4	.008	●	●				
9	45	50	95	8,7	55	10	55	4	.009	●	●				
10	45	50	95	9,7	–	10	55	4	.010	●	●				
12	53	60	110	11,6	–	12	65	4	.012	●	●				
14	53	60	110	13,6	–	14	65	4	.014	●	●				
16	63	70	123	15,5	–	16	75	4	.016	●	●				
18	63	70	123	17,5	–	18	75	4	.018	●	●				
20	75	90	141	19,5	–	20	91	4	.020	●	●				

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

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



Allround Allround Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

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

l₃ : d₁ = 2,2 : 1 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2760A			
ø d ₁	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)	Dimens.- Code				
0,2	-0,016	0,12	0,44	38	0,16	5,7	3	15°	14°	2	.0002	●		
0,5	-0,025	0,3	1,1	38	0,4	5,8	3	15°	13°	2	.0005	●		
0,8	-0,034	0,48	1,76	38	0,64	5,9	3	15°	11°	2	.0008	●		
1	-0,040	0,6	2,2	38	0,8	5,9	3	15°	10°	2	.001	●		
1,5	-0,040	0,9	3,3	38	1,2	6,1	3	15°	8°	2	.0015	●		
1,8	-0,040	1,08	3,96	38	1,44	6,2	3	15°	6°	2	.0018	●		
2	-0,040	1,2	4,4	50	1,6	11,9	6	15°	10°	2	.002	●		

l₃ : d₁ = 5 : 1 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2761A			
ø d ₁	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)	Dimens.- Code				
0,2	-0,016	0,2	1	38	0,16	6,4	3	15°	13°	2	.0002	●		
0,5	-0,025	0,5	2,5	38	0,4	7,8	3	15°	10°	2	.0005	●		
0,8	-0,034	0,8	4	38	0,64	9	3	15°	8°	2	.0008	●		
1	-0,040	1	5	43	0,8	9,7	3	15°	6°	2	.001	●		
1,5	-0,040	1,5	7,5	43	1,2	11,8	3	14°	4°	2	.0015	●		
1,8	-0,040	1,8	9	43	1,44	12,9	3	12°	3°	2	.0018	●		
2	-0,040	2	10	50	1,6	19,7	6	15°	6°	2	.002	●		

l₃ : d₁ = 10 : 1 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2762A			
ø d ₁	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)	Dimens.- Code				
0,2	-0,016	0,2	2	38	0,16	9,2	3	15°	9°	2	.0002	●		
0,5	-0,025	0,5	5	38	0,4	10,7	3	13°	6°	2	.0005	●		
0,8	-0,034	0,8	8	38	0,64	13,5	3	12°	4°	2	.0008	●		
1	-0,040	1	10	43	0,8	15,3	3	11°	3°	2	.001	●		
1,5	-0,040	1,5	15	43	1,2	18,1	3	14,6°	3°	2	.0015	●		
1,8	-0,040	1,8	18	43	1,44	20	3	19,8°	2°	2	.0018	●		
2	-0,040	2	20	50	1,6	25	6	22,1°	6°	2	.002	●		

Product Finder

- NR
- NF
- N**
- WR
- WF
- W
- v_c / f_z
- HM

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z

- Multifunktionales Werkzeug
- Lange Schaftlängen
- Spezielle Halsausführungen
- Schneiden zur Mitte
- 3 Halslängen verfügbar
- Multi-functional tool
- Long shank lengths
- Special neck designs
- Centre cutting
- 3 neck lengths available

N

HM

DIN 6535

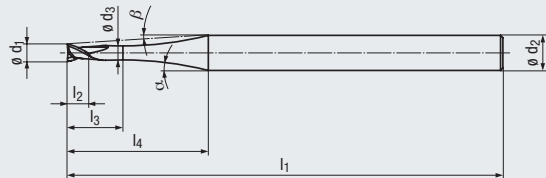
HA

HB

30°

v_c / f_z
83 - 85

Optional



Allround

Allround

Allround

Beschichtung · Coating

TIALN

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

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

$l_3 : d_1 = 2,2 : 1$ – Lange Ausführung · Long design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2763A	
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code		
0,2	-0,016	0,2	0,6	43	0,16	5,7	3	15°	14°	2	.0002	●
0,5	-0,025	0,5	1,1	43	0,4	5,8	3	15°	13°	2	.0005	●
0,8	-0,034	0,8	1,76	43	0,64	5,9	3	15°	11°	2	.0008	●
1	-0,040	1	2,2	43	0,8	5,9	3	15°	10°	2	.001	●
1,5	-0,040	1,5	3,3	43	1,2	6,1	3	15°	8°	2	.0015	●
1,8	-0,040	1,8	3,96	43	1,44	6,2	3	15°	6°	2	.0018	●
2	-0,040	2	4,4	57	1,6	11,9	6	15°	10°	2	.002	●

$l_3 : d_1 = 5 : 1$ – Lange Ausführung · Long design

Scharfkantig · Sharp-edged

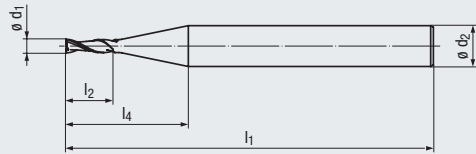
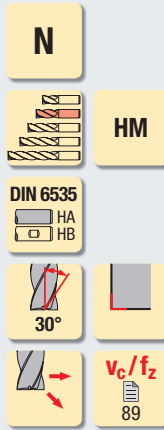
Bestell-Code · Order code											2764A	
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code		
0,2	-0,016	0,2	1	43	0,16	6,4	3	15°	13°	2	.0002	●
0,5	-0,025	0,5	2,5	43	0,4	7,8	3	15°	10°	2	.0005	●
0,8	-0,034	0,8	4	43	0,64	9	3	15°	8°	2	.0008	●
1	-0,040	1	5	50	0,8	9,7	3	15°	6°	2	.001	●
1,5	-0,040	1,5	7,5	50	1,2	11,8	3	14°	4°	2	.0015	●
1,8	-0,040	1,8	9	50	1,44	12,9	3	12°	3°	2	.0018	●
2	-0,040	2	10	57	1,6	19,7	6	15°	6°	2	.002	●

$l_3 : d_1 = 10 : 1$ – Lange Ausführung · Long design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2765A	
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code		
0,2	-0,016	0,2	2	43	0,16	9,2	3	15°	9°	2	.0002	●
0,5	-0,025	0,5	5	43	0,4	14,5	3	13°	6°	2	.0005	●
0,8	-0,034	0,8	8	43	0,64	15,5	3	9,8°	4°	2	.0008	●
1	-0,040	1	10	50	0,8	20,6	3	8,5°	3°	2	.001	●
1,5	-0,040	1,5	15	50	1,2	22	3	6,2°	2°	2	.0015	●
1,8	-0,040	1,8	18	50	1,44	22	3	5,3°	2°	2	.0018	●
2	-0,040	2	20	57	1,6	29	6	7,8°	4°	2	.002	●


- Multifunktionales Werkzeug
- Starker stirnseitiger Hohlchliff
- Schneiden zur Mitte
- Extra lange Schneidenlänge
- Multi-functional tool
- Pronounced hollow face
- Centre cutting
- Extra long flute length



Allround

Product Finder

- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

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

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

P	1.1-5.1
M	1.1-2.1
K	1.1-4.2
N	1.1-1.4
N	2.1-4.2, 5.2-5.3
S	1.1-2.4
H	1.1-1.2

Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code

1819A

ø d ₁ h10	l ₂	l ₁	l ₄	ø d ₂ h6	Z (Flutes)	Dimens.- Code					
0,5	3	38	9	3	2	.0005	●				
0,6	3	38	9	3	2	.0006	●				
0,8	4	38	9	3	2	.0008	●				
1	5	38	9	3	2	.001	●				
1,2	5	38	9	3	2	.0012	●				
1,6	6	38	9	3	2	.0016	●				
2	9	38	9	3	2	.00203	●				



Induktionsschrumpfgerät SHRINK-MASTER HL-2,
Schrumpf-Aufnahmen und -Zubehör
siehe Seite 362 - 374

Induction shrink-fit work station
SHRINK-MASTER HL-2, shrink-fit chucks
and accessories, see pages 362 - 374

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z

- Multifunktionales Werkzeug
- Schneiden zur Mitte
- Extra kurze, stabile Ausführung
- Multi-functional tool
- Centre cutting
- Extra short, stable design

N

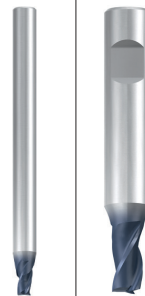
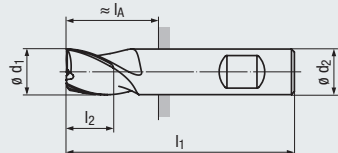
HM

≈ DIN 6535

30°

v_c / f_z
89

Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)
 - In fast allen Werkstoffen einsetzbar
 - Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)
 - For almost all materials
 - Suitable for roughing and finishing

P	1.1-5.1	
M	1.1-2.1	
K	1.1-2.2	3.1-4.2
N	1.1-1.3	1.4-1.6
N	2.1-3.2, 5.2	4.1-4.2
S	1.1	1.2-1.3
S	2.1	2.2, 2.4
H	1.1	

Extra kurze Ausführung · Extra short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code							2821A	1805A			
$\varnothing d_1$ h10	l_2	l_1	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code					
0,5	1,5	38	3	—	3	.0005	●				
0,6	1,5	38	3	—	3	.0006	●				
0,8	2	38	3	—	3	.0008	●				
1	2	38	3	—	3	.001	●				
1,2	2	38	3	—	3	.0012	●				
1,5	2	38	3	—	3	.0015	●				
1,8	2	38	3	—	3	.0018	●				
2	4	35	6	9,5	3	.002		●			
2,5	5	36	6	10,5	3	.0025		●			
3	5	36	6	10,5	3	.003		●			
3,5	6	37	6	12,5	3	.0035		●			
4	7	38	6	12,5	3	.004		●			
4,5	8	38	6	12,5	3	.0045		●			
5	8	39	6	13,5	3	.005		●			
5,5	8	39	6	13,5	3	.0055		●			
5,75	8	39	6	13,5	3	.00575		●			
6	8	39	6	13,5	3	.006		●			
6,75	10	42	8	15,5	3	.00675		●			
7	10	42	8	15,5	3	.007		●			
7,75	10	42	8	15,5	3	.00775		●			
8	11	43	8	16,5	3	.008		●			
8,7	11	48	10	16,5	3	.0087		●			
9	11	48	10	16,5	3	.009		●			
9,7	11	48	10	16,5	3	.0097		●			
10	13	50	10	18,5	3	.010		●			
12	15	55	12	25	3	.012		●			

- Multifunktionales Hochleistungswerkzeug
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available

N

HM

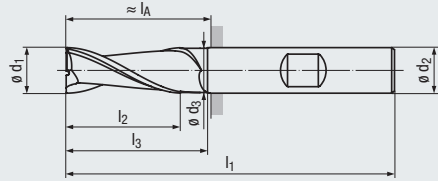
DIN 6535
HA
HB

Ø 0,3 - 1,8 mm:
30°

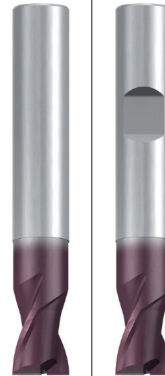
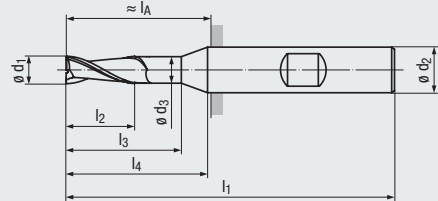
Ø 2 - 20 mm:
35/38° KB x 45°

V_c / f_z
86

Optional



Design I₄:



Allround

Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 10)
- In fast allen Werkstoffen einsetzbar
 - Zum Schruppen und Schlichten geeignet

- Applications – material (see page 10)
- For almost all materials
 - Suitable for roughing and finishing

TIALN

- P** 1.1-5.1
- M** 1.1-4.1
- K** 1.1-4.2
- N** 1.1-1.3 1.4
- N** 2.1-4.2, 5.2
- S** 1.1-2.1 2.2-2.6
- H** 1.1-1.2

DIN 6527 – Kurze Ausführung · Short design


Bestell-Code · Order code											2510A	2511A				
$\varnothing d_1$ e8	h_{10}	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A □	KB	Z (Flutes)	Dimens.- Code					
0,3	1	8	38	-	-	3	-	-	-	2	.0003	●				
0,5	1,5	9	38	-	-	3	-	-	-	2	.0005	●				
1	3	10	38	-	-	3	-	-	-	2	.001	●				
1,2	4	10	38	-	-	3	-	-	-	2	.0012	●				
1,3	4	10	38	-	-	3	-	-	-	2	.0013	●				
1,4	4	10	38	-	-	3	-	-	-	2	.0014	●				
1,5	4	10	38	-	-	3	-	-	-	2	.0015	●				
1,6	4	10	38	-	-	3	-	-	-	2	.0016	●				
1,8	5	10	38	-	-	3	-	-	-	2	.0018	●				
$\varnothing d_1$ e8	h_{10}	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A □	KB	Z (Flutes)	Dimens.- Code					
2		3	5	50	1,9	14	6	14	0,04	2	.002	●	●			
2,5		3	5	50	2,4	14	6	14	0,07	2	.0025	●	●			
	2,8	4	7	50	2,7	14	6	14	0,07	2	.0028	●	●			
3		4	7	50	2,9	14	6	14	0,07	2	.003	●	●			
	3,5	4	7	50	3,3	14	6	14	0,07	2	.0035	●	●			
	3,8	5	9	54	3,6	18	6	18	0,07	2	.0038	●	●			
4		5	9	54	3,8	18	6	18	0,07	2	.004	●	●			
	4,5	5	9	54	4,3	18	6	18	0,12	2	.0045	●	●			
	4,8	6	11	54	4,6	18	6	18	0,12	2	.0048	●	●			
5		6	11	54	4,8	18	6	18	0,12	2	.005	●	●			
	5,75	7	16	54	5,55	-	6	18	0,12	2	.00575	●	●			
6		7	16	54	5,8	-	6	18	0,12	2	.006	●	●			
7		8	18	58	6,7	20	8	22	0,12	2	.007	●	●			
8		9	20	58	7,7	-	8	22	0,12	2	.008	●	●			
	9	10	22	66	8,7	24	10	26	0,2	2	.009	●	●			
10		11	24	66	9,5	-	10	26	0,2	2	.010	●	●			
12		12	26	73	11,5	-	12	28	0,2	2	.012	●	●			
14		14	28	75	13,5	-	14	30	0,2	2	.014	●	●			
16		16	32	82	15,5	-	16	34	0,2	2	.016	●	●			
18		18	34	84	17,5	-	18	36	0,2	2	.018	●	●			
20		20	40	92	19,5	-	20	42	0,3	2	.020	●	●			

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar


- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available

N




HM


DIN 6535




HA
HB



35/38°




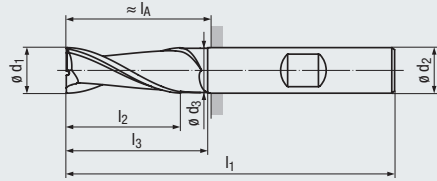
KB x 45°



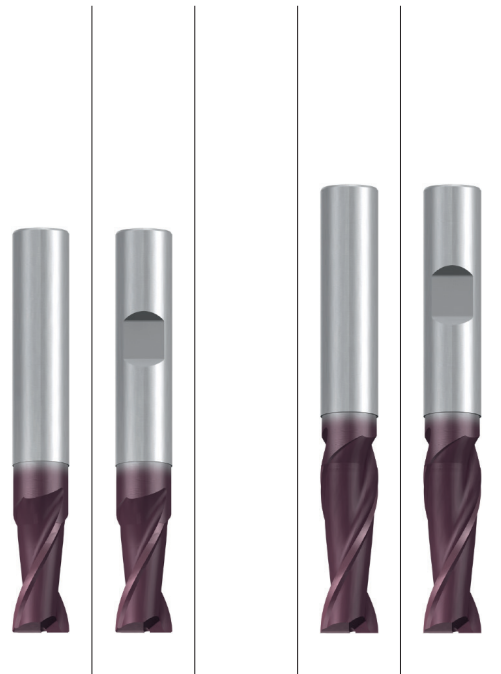
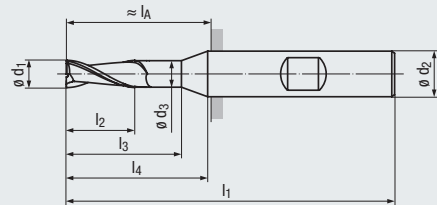
v_c / f_z
87-88

Optional





Design l_4 :



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)
 - In fast allen Werkstoffen einsetzbar
 - Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)
 - For almost all materials
 - Suitable for roughing and finishing


TIALN

TIALN


P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.3 1.4
N	2.1-4.2, 5.2
S	1.1-2.1 2.2-2.6
H	1.1-1.2

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.3 1.4-1.6
N	2.1-2.8, 5.2
S	1.1-2.1 2.2-2.6

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code											2512A	2513A			
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A 	KB	Z (Flutes)	Dimens.- Code					
2	6	8	57	1,9	20	6	21	0,04	2	.002	●	●			
3	7	10	57	2,9	20	6	21	0,07	2	.003	●	●			
4	8	12	57	3,8	20	6	21	0,07	2	.004	●	●			
5	10	15	57	4,8	20	6	21	0,12	2	.005	●	●			
6	10	20	57	5,8	–	6	21	0,12	2	.006	●	●			
7	13	23	63	6,7	25	8	27	0,12	2	.007	●	●			
8	16	25	63	7,7	–	8	27	0,12	2	.008	●	●			
10	19	30	72	9,5	–	10	32	0,2	2	.010	●	●			
12	22	35	83	11,5	–	12	38	0,2	2	.012	●	●			
16	26	40	92	15,5	–	16	44	0,2	2	.016	●	●			
20	32	50	104	19,5	–	20	54	0,3	2	.020	●	●			

Extra lange Ausführung · Extra long design

Bestell-Code · Order code													2514A	2515A	
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A 	KB	Z (Flutes)	Dimens.- Code					
3	9	12	62	2,9	23	6	26	0,07	2	.003			●	●	
4	12	16	62	3,8	25	6	26	0,07	2	.004			●	●	
5	15	20	62	4,8	25	6	26	0,12	2	.005			●	●	
6	18	25	62	5,8	–	6	26	0,12	2	.006			●	●	
8	24	30	68	7,7	–	8	32	0,12	2	.008			●	●	
10	30	40	80	9,5	–	10	40	0,2	2	.010			●	●	
12	36	45	93	11,5	–	12	48	0,2	2	.012			●	●	
16	48	55	108	15,5	–	16	60	0,2	2	.016			●	●	
20	60	70	126	19,5	–	20	76	0,3	2	.020			●	●	

- Multifunktionales Hochleistungswerkzeug
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available

N

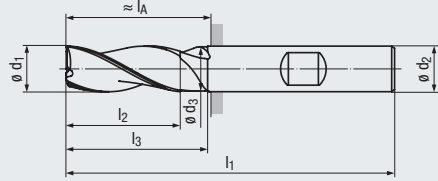
HM

DIN 6535
HA
HB

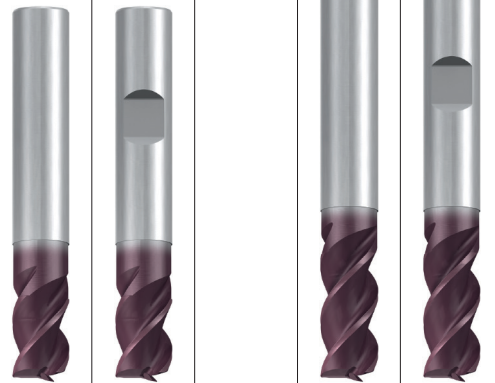
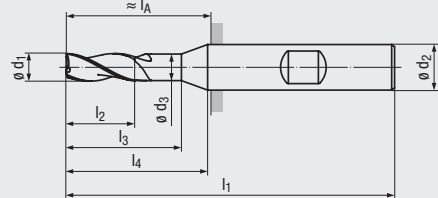
34-38° KB x 45°

V_c/f_z
86 - 87

Optional



Design I₄:



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)

- For almost all materials
- Suitable for roughing and finishing

TIALN

TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.4
N	2.1-2.8, 5.2 4.1-4.2
S	1.1 1.2-1.3
S	2.1 2.2-2.6
H	1.1-1.2

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.4
N	2.1-2.8, 5.2 4.1-4.2
S	1.1 1.2-1.3
S	2.1 2.2-2.6
H	1.1-1.2

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code											2516A	2517A			
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A 	KB	Z (Flutes)	Dimens.- Code					
1,5	3	—	50	—	14	6	14	0,04	3	.0015	●	●			
2	3	5	50	1,9	14	6	14	0,04	3	.002	●	●			
2,5	3	5	50	2,4	14	6	14	0,07	3	.0025	●	●			
2,8	4	7	50	2,7	14	6	14	0,07	3	.0028	●	●			
3	4	7	50	2,9	14	6	14	0,07	3	.003	●	●			
3,5	4	7	50	3,3	14	6	14	0,07	3	.0035	●	●			
3,8	5	9	54	3,6	18	6	18	0,07	3	.0038	●	●			
4	5	9	54	3,8	18	6	18	0,07	3	.004	●	●			
4,5	5	9	54	4,3	18	6	18	0,12	3	.0045	●	●			
4,8	6	11	54	4,6	18	6	18	0,12	3	.0048	●	●			
5	6	11	54	4,8	18	6	18	0,12	3	.005	●	●			
5,5	7	12	54	5,3	18	6	18	0,12	3	.0055	●	●			
5,75	7	16	54	5,55	18	6	18	0,12	3	.00575	●	●			
6	7	16	54	5,8	—	6	18	0,12	3	.006	●	●			
7,75	9	18	58	7,45	20	8	22	0,12	3	.00775	●	●			
8	9	20	58	7,7	—	8	22	0,12	3	.008	●	●			
9,7	11	22	66	9,4	24	10	26	0,2	3	.0097	●	●			
10	11	24	66	9,5	—	10	26	0,2	3	.010	●	●			
11,7	12	24	73	11,2	26	12	28	0,2	3	.0117	●	●			
12	12	26	73	11,5	—	12	28	0,2	3	.012	●	●			
16	16	32	82	15,5	—	16	34	0,2	3	.016	●	●			
20	20	40	92	19,5	—	20	42	0,3	3	.020	●	●			

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code													2518A	2519A	
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A 	KB	Z (Flutes)	Dimens.- Code					
2	6	8	57	1,9	20	6	21	0,04	3	.002			●	●	
3	7	10	57	2,9	20	6	21	0,07	3	.003			●	●	
4	8	12	57	3,8	20	6	21	0,07	3	.004			●	●	
5	10	15	57	4,8	20	6	21	0,12	3	.005			●	●	
6	10	20	57	5,8	—	6	21	0,12	3	.006			●	●	
7	13	23	63	6,7	25	8	27	0,12	3	.007			●	●	
8	16	25	63	7,7	—	8	27	0,12	3	.008			●	●	
10	19	30	72	9,5	—	10	32	0,2	3	.010			●	●	
12	22	35	83	11,5	—	12	38	0,2	3	.012			●	●	
16	26	40	92	15,5	—	16	44	0,2	3	.016			●	●	
20	32	50	104	19,5	—	20	54	0,3	3	.020			●	●	

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

Product Finder

- NR
- NF
- N**
- WR
- WF
- W
- v_c/f_z

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Multifunktionales Hochleistungswerkzeug
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- Schneidlänge 3 x d_1
- 3 Baulängen verfügbar
- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- Flute length 3 x d_1
- 3 lengths available

N

HM

DIN 6535
HA HB

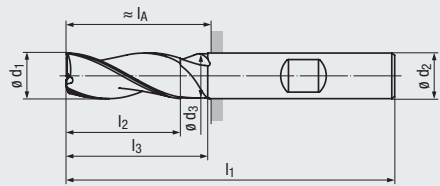
34-38°

KB x 45°

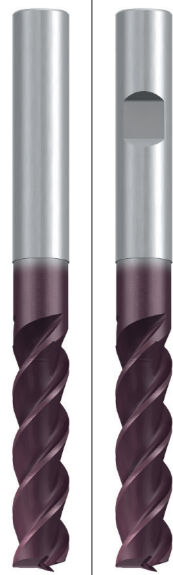
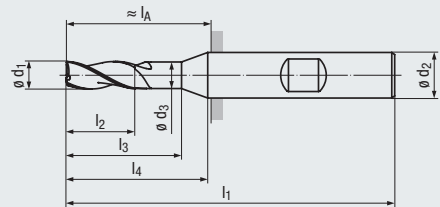
1-2°

v_c / f_z
88

Optional



Design l₄:



Allround

Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 10)** **Applications – material (see page 10)**
- In fast allen Werkstoffen einsetzbar
 - Zum Schlichten geeignet
 - For almost all materials
 - Suitable for finishing

TIALN

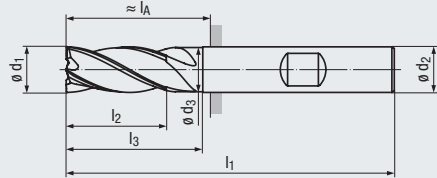
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-2.8, 5.2
S	1.1 1.2-1.3
S	2.1 2.2, 2.4

Extra lange Ausführung · Extra long design

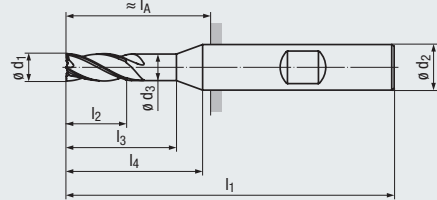
Bestell-Code · Order code											2520A	2521A				
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A 	KB	Z (Flutes)	Dimens.- Code						
3	9	12	62	2,9	23	6	26	0,07	3	.003	●	●				
4	12	16	62	3,8	25	6	26	0,07	3	.004	●	●				
5	15	20	62	4,8	25	6	26	0,12	3	.005	●	●				
6	18	25	62	5,8	–	6	26	0,12	3	.006	●	●				
8	24	30	68	7,7	–	8	32	0,12	3	.008	●	●				
10	30	40	80	9,5	–	10	40	0,2	3	.010	●	●				
12	36	45	93	11,5	–	12	48	0,2	3	.012	●	●				
16	48	55	108	15,5	–	16	60	0,2	3	.016	●	●				
20	60	70	126	19,5	–	20	76	0,3	3	.020	●	●				

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available



Design I₄:



N **HM**

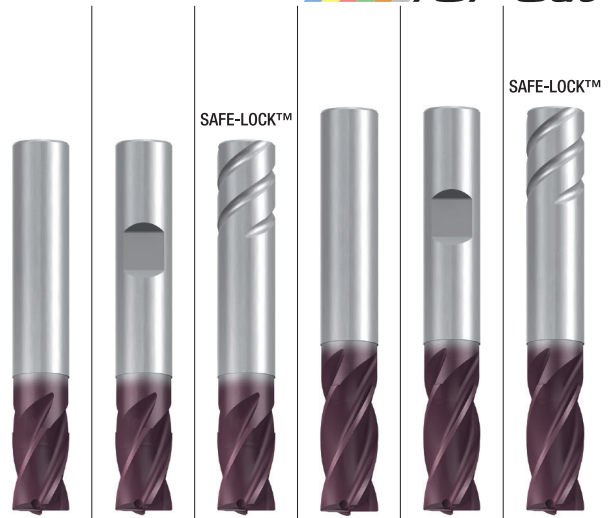
DIN 6535 HA HB

ASME B94.19

35-38° **KB x 45°**

V_c/f_z 86 - 87

Optional



Allround

Allround

Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 10)**
- In fast allen Werkstoffen einsetzbar
 - Zum Schruppen und Schlichten geeignet

- Applications – material (see page 10)**
- For almost all materials
 - Suitable for roughing and finishing

TIALN

TIALN

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

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

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code											1916A	1917A	1916AS			
∅ d ₁ f8	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h5	l _A	KB	Z (Flutes)	Dimens.- Code						
3	5	9	50	2,9	14	6	14	0,07	4	.003	●	●	○			
4	8	12	54	3,8	18	6	18	0,07	4	.004	●	●	○			
5	9	16	54	4,8	18	6	18	0,07	4	.005	●	●	○			
6	10	16	54	5,8	—	6	18	0,12	4	.006	●	●	○			
8	12	20	58	7,7	—	8	22	0,12	4	.008	●	●	○			
10	15	24	66	9,5	—	10	26	0,2	4	.010	●	●	○			
12	18	26	73	11,5	—	12	28	0,2	4	.012	●	●	○			
16	24	32	82	15,5	—	16	34	0,2	4	.016	●	●	○			
18	27	34	84	17,5	—	18	36	0,2	4	.018	●	●	○			
20	30	40	92	19,5	—	20	42	0,3	4	.020	●	●	○			
						h10	h6									
1/4	13/32	5/8	2 1/8	0.242	—	1/4	—	0.005	4	.0250	●	●	○			
5/16	1/2	3/4	2 1/4	0.301	—	5/16	—	0.005	4	.03125	●	●	○			
3/8	17/32	7/8	2 1/2	0.358	—	3/8	15/16	0.008	4	.0375	●	●	○			
1/2	5/8	1	2 7/8	0.480	—	1/2	1 3/32	0.008	4	.0500	●	●	○			
5/8	7/8	1 1/4	3 1/4	0.605	—	5/8	1 11/32	0.008	4	.0625	●	●	○			
3/4	1	1 3/8	3 1/2	0.730	—	3/4	1 15/32	0.012	4	.0750	●	●	○			

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code														1998A	1999A	1998AS
∅ d ₁ f8	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h5	l _A	KB	Z (Flutes)	Dimens.- Code						
3	8	14	57	2,9	20	6	21	0,07	4	.003				●	●	○
4	11	18	57	3,8	20	6	21	0,07	4	.004				●	●	○
5	13	19	57	4,8	20	6	21	0,12	4	.005				●	●	○
6	13	20	57	5,8	—	6	21	0,12	4	.006				●	●	○
8	19	25	63	7,7	—	8	27	0,12	4	.008				●	●	○
10	22	30	72	9,5	—	10	32	0,2	4	.010				●	●	○
12	26	35	83	11,5	—	12	38	0,2	4	.012				●	●	○
14	26	35	83	13,5	—	14	38	0,2	4	.014				●	●	○
16	32	40	92	15,5	—	16	44	0,2	4	.016				●	●	○
18	32	50	100	17,5	—	18	52	0,2	4	.018				●	●	○
20	38	50	104	19,5	—	20	54	0,3	4	.020				●	●	○
						h10	h6									
1/4	17/32	3/4	2 1/4	0.242	—	1/4	1 1/8	0.005	4	.0250				●	●	○
5/16	3/4	1	2 1/2	0.301	—	5/16	1 1/8	0.005	4	.03125				●	●	○
3/8	7/8	1 1/8	2 3/4	0.358	—	3/8	1 3/16	0.008	4	.0375				●	●	○
1/2	1 1/8	1 3/8	3 1/4	0.480	—	1/2	1 15/32	0.008	4	.0500				●	●	○
5/8	1 1/4	1 1/2	3 1/2	0.605	—	5/8	1 19/32	0.008	4	.0625				●	●	○
3/4	1 1/2	1 7/8	4	0.730	—	3/4	1 31/32	0.012	4	.0750				●	●	○
1	1 1/2	2 5/8	4	0.968	—	1	1 23/32	0.012	4	.1000				●	●	○

SAFE-LOCK™ Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For Information on the SAFE-LOCK™ clamping system, see page 415

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


- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z
- HM


- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar


- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available

N


HM

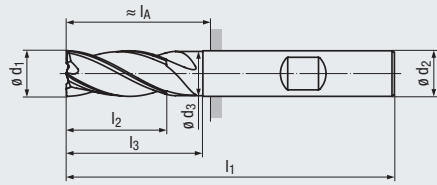




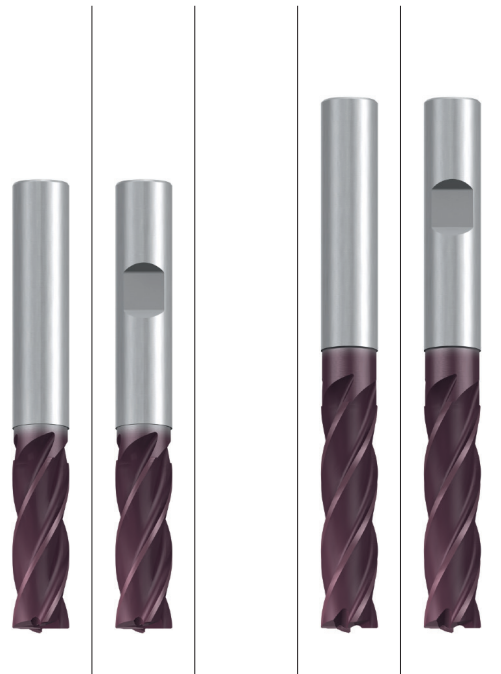
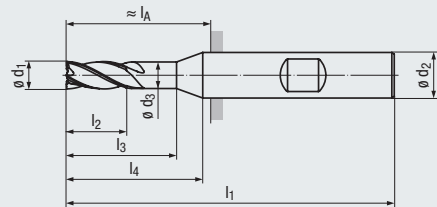


Optional





Design I₄:



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)
 - In fast allen Werkstoffen einsetzbar
 - Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)
 - For almost all materials
 - Suitable for roughing and finishing


TIALN

TIALN


P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.4 1.5-1.6
N	2.1-2.8, 5.2
S	1.1-1.3 2.1-2.6

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.4 1.5-1.6
N	2.1-2.8, 5.2
S	1.1-1.3 2.1-2.6

3 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2526A	2527A			
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code					
3	9	12	62	2,9	23	6	26	0,07	4	.003	●	●			
4	12	16	62	3,8	25	6	26	0,07	4	.004	●	●			
5	15	20	62	4,8	25	6	26	0,12	4	.005	●	●			
6	18	25	62	5,8	–	6	26	0,12	4	.006	●	●			
8	24	30	68	7,7	–	8	32	0,12	5	.008	●	●			
10	30	35	80	9,5	–	10	40	0,2	5	.010	●	●			
12	36	45	93	11,5	–	12	48	0,2	5	.012	●	●			
16	48	60	112	15,5	–	16	64	0,2	5	.016	●	●			
20	60	75	130	19,5	–	20	80	0,3	5	.020	●	●			

4 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code													2528A	2529A	
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code					
6	24	30	68	5,8	–	6	32	0,12	4	.006			●	●	
8	32	40	80	7,7	–	8	44	0,12	5	.008			●	●	
10	40	50	95	9,5	–	10	55	0,2	5	.010			●	●	
12	48	60	107	11,5	–	12	62	0,2	5	.012			●	●	
16	64	75	128	15,5	–	16	80	0,2	5	.016			●	●	
20	80	90	150	19,5	–	20	100	0,3	5	.020			●	●	

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

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Internal coolant supply, axial exit (ICA)

N **ICA**

HM

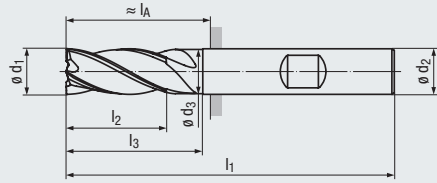
DIN 6535
HA
HB

3-5°

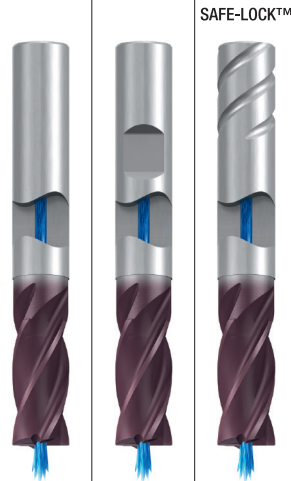
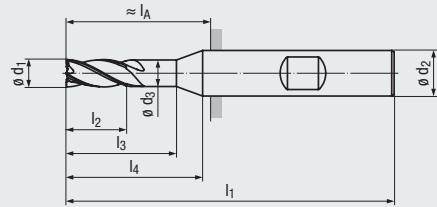
35-38°

KB x 45°

v_c / f_z
87



Design I₄:



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In fast allen Werkstoffen, inklusive zähe Werkstoffe, einsetzbar
- Zum Schrumpen und Schlichten geeignet

Applications – material (see page 10)

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

TIALN

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

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code											1998AZ	1999AZ	1998AT			
$\varnothing d_1$ f8	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A h5	KB	Z (Flutes)	Dimens.- Code						
3	8	14	57	2,9	20	6	21	0,07	4	.003	●	●	○			
4	11	18	57	3,8	20	6	21	0,07	4	.004	●	●	○			
5	13	19	57	4,8	20	6	21	0,12	4	.005	●	●	○			
6	13	20	57	5,8	–	6	21	0,12	4	.006	●	●	○			
8	19	25	63	7,7	–	8	27	0,12	4	.008	●	●	○			
10	22	30	72	9,5	–	10	32	0,2	4	.010	●	●	○			
12	26	35	83	11,5	–	12	38	0,2	4	.012	●	●	○			
16	32	40	92	15,5	–	16	44	0,2	4	.016	●	●	○			
20	38	50	104	19,5	–	20	54	0,3	4	.020	●	●	○			

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For Information on the SAFE-LOCK™ clamping system, see page 415

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

Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

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

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

N

HM

DIN 6535
HA
HB

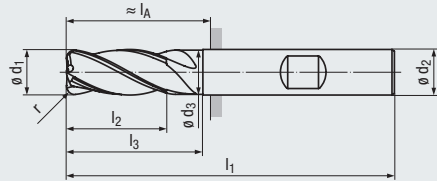
3-5°

35-38°

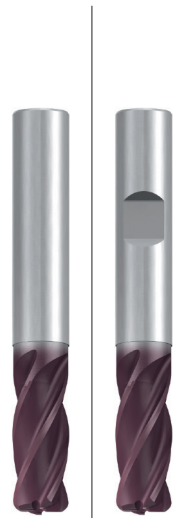
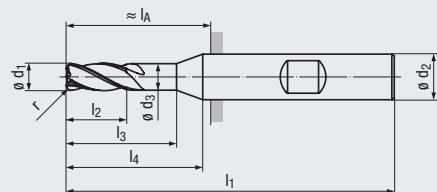
ER

v_c / f_z
87

Optional



Design l_4 :



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

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

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

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

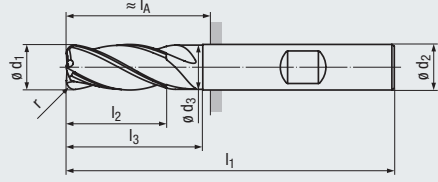
DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

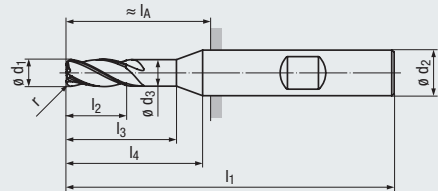
Bestell-Code · Order code											2698A	2699A				
$\varnothing d_1$	r	$\pm 0,01$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	h_5	l_A	Z	Dimens.-Code				
$\varnothing f_8$										(Flutes)						
3	0,1		8	14	57	2,9	20	6	21	4	4	.003001	●	●		
3	0,3		8	14	57	2,9	20	6	21	4	4	.003003	●	●		
3	0,5		8	14	57	2,9	20	6	21	4	4	.003005	●	●		
4	0,1		11	18	57	3,8	20	6	21	4	4	.004001	●	●		
4	0,3		11	18	57	3,8	20	6	21	4	4	.004003	●	●		
4	0,4		11	18	57	3,8	20	6	21	4	4	.004004	●	●		
4	0,5		11	18	57	3,8	20	6	21	4	4	.004005	●	●		
5	0,1		13	19	57	4,8	20	6	21	4	4	.005001	●	●		
5	0,3		13	19	57	4,8	20	6	21	4	4	.005003	●	●		
5	0,5		13	19	57	4,8	20	6	21	4	4	.005005	●	●		
5	1		13	19	57	4,8	20	6	21	4	4	.005010	●	●		
6	0,1		13	20	57	5,8	–	6	21	4	4	.006001	●	●		
6	0,5		13	20	57	5,8	–	6	21	4	4	.006005	●	●		
6	1,0		13	20	57	5,8	–	6	21	4	4	.006010	●	●		
6	1,5		13	20	57	5,8	–	6	21	4	4	.006015	●	●		
8	0,15		19	25	63	7,7	–	8	27	4	4	.008001	●	●		
8	0,5		19	25	63	7,7	–	8	27	4	4	.008005	●	●		
8	1		19	25	63	7,7	–	8	27	4	4	.008010	●	●		
8	1,5		19	25	63	7,7	–	8	27	4	4	.008015	●	●		
8	2		19	25	63	7,7	–	8	27	4	4	.008020	●	●		
10	0,15		22	30	72	9,5	–	10	32	4	4	.010001	●	●		
10	0,5		22	30	72	9,5	–	10	32	4	4	.010005	●	●		
10	1		22	30	72	9,5	–	10	32	4	4	.010010	●	●		
10	1,5		22	30	72	9,5	–	10	32	4	4	.010015	●	●		
10	2		22	30	72	9,5	–	10	32	4	4	.010020	●	●		
12	0,2		26	35	83	11,5	–	12	38	4	4	.012002	●	●		
12	0,5		26	35	83	11,5	–	12	38	4	4	.012005	●	●		
12	1		26	35	83	11,5	–	12	38	4	4	.012010	●	●		
12	1,5		26	35	83	11,5	–	12	38	4	4	.012015	●	●		
12	2		26	35	83	11,5	–	12	38	4	4	.012020	●	●		
12	3		26	35	83	11,5	–	12	38	4	4	.012030	●	●		
14	1		26	35	83	13,5	–	14	38	4	4	.014010	●	●		
16	0,3		32	40	92	15,5	–	16	44	4	4	.016003	●	●		
16	0,5		32	40	92	15,5	–	16	44	4	4	.016005	●	●		
16	1		32	40	92	15,5	–	16	44	4	4	.016010	●	●		
16	1,5		32	40	92	15,5	–	16	44	4	4	.016015	●	●		
16	2		32	40	92	15,5	–	16	44	4	4	.016020	●	●		
16	3		32	40	92	15,5	–	16	44	4	4	.016030	●	●		
16	4		32	40	92	15,5	–	16	44	4	4	.016040	●	●		
20	0,3		38	50	104	19,5	–	20	54	4	4	.020003	●	●		
20	0,5		38	50	104	19,5	–	20	54	4	4	.020005	●	●		
20	1		38	50	104	19,5	–	20	54	4	4	.020010	●	●		
20	1,5		38	50	104	19,5	–	20	54	4	4	.020015	●	●		
20	2		38	50	104	19,5	–	20	54	4	4	.020020	●	●		
20	3		38	50	104	19,5	–	20	54	4	4	.020030	●	●		

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

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



Design I₄:



N

ICA

HM

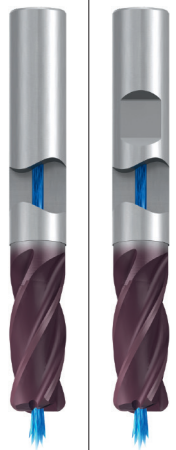
DIN 6535
HA HB

3-5°

35-38°

ER

v_c/f_z
87



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIALN

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

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code											2698AZ	2699AZ			
$\varnothing d_1$ f8	r ±0,01	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A	Z (Flutes)	Dimens.- Code					
3	0,3	8	14	57	2,9	20	6	21	4	.003003	●	●			
3	0,5	8	14	57	2,9	20	6	21	4	.003005	●	●			
4	0,3	11	18	57	3,8	20	6	21	4	.004003	●	●			
4	0,5	11	18	57	3,8	20	6	21	4	.004005	●	●			
5	0,3	13	19	57	4,8	20	6	21	4	.005003	●	●			
5	0,5	13	19	57	4,8	20	6	21	4	.005005	●	●			
6	0,5	13	20	57	5,8	–	6	21	4	.006005	●	●			
6	1,0	13	20	57	5,8	–	6	21	4	.006010	●	●			
6	1,5	13	20	57	5,8	–	6	21	4	.006015	●	●			
8	0,5	19	25	63	7,7	–	8	27	4	.008005	●	●			
8	1	19	25	63	7,7	–	8	27	4	.008010	●	●			
8	1,5	19	25	63	7,7	–	8	27	4	.008015	●	●			
8	2	19	25	63	7,7	–	8	27	4	.008020	●	●			
10	1	22	30	72	9,5	–	10	32	4	.010010	●	●			
10	1,5	22	30	72	9,5	–	10	32	4	.010015	●	●			
10	2	22	30	72	9,5	–	10	32	4	.010020	●	●			
12	1	26	35	83	11,5	–	12	38	4	.012010	●	●			
12	1,5	26	35	83	11,5	–	12	38	4	.012015	●	●			
12	2	26	35	83	11,5	–	12	38	4	.012020	●	●			
12	3	26	35	83	11,5	–	12	38	4	.012030	●	●			
16	1	32	40	92	15,5	–	16	44	4	.016010	●	●			
16	1,5	32	40	92	15,5	–	16	44	4	.016015	●	●			
16	2	32	40	92	15,5	–	16	44	4	.016020	●	●			
16	3	32	40	92	15,5	–	16	44	4	.016030	●	●			
20	1,5	38	50	104	19,5	–	20	54	4	.020015	●	●			
20	2	38	50	104	19,5	–	20	54	4	.020020	●	●			
20	3	38	50	104	19,5	–	20	54	4	.020030	●	●			

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

Product Finder

NR

NF

N

WR

WF

W

v_c/f_z

HM

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z

- Hochleistungswerkzeug
- Schlicht-Verzahnung für zähe Werkstoffe
- Keine Vibrationen durch spezielle Geometrie
- Verschiedene Eckenradien pro Schneidendurchmesser
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- Lange Schneidenlänge

- High performance tool
- Finishing end mill for tough materials
- Special geometry prevents vibration
- Several corner radii per cutting diameter
- Internal coolant supply, axial exit (ICA)
- Long flute length

N

ICA

HM

DIN 6535
HA
HB

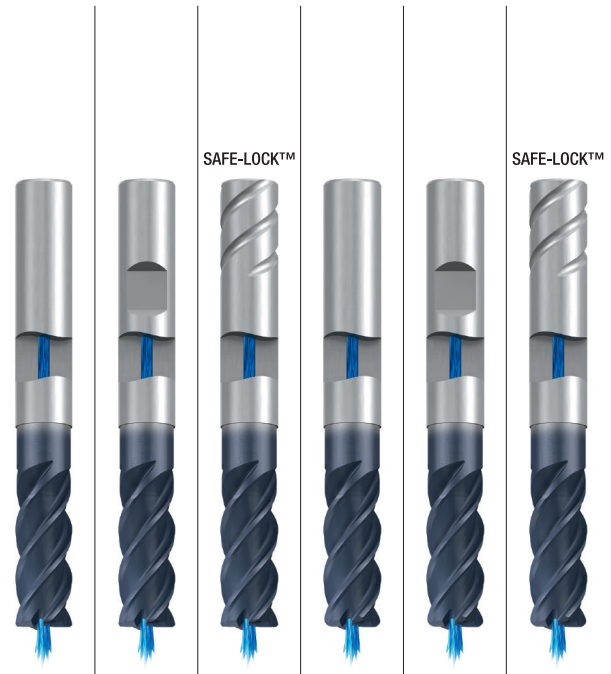
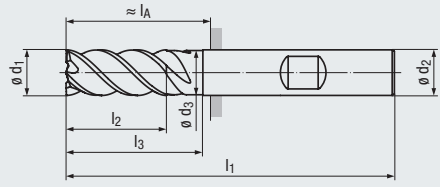
$38-40^\circ$

$KB \times 45^\circ$

ER

$3-5^\circ$

v_c / f_z
76



Inox

Inox

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIALN

TIALN

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.5-2.8, 5.2 1.4
S	1.1-2.6

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.5-2.8, 5.2 1.4
S	1.1-2.6

Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2650AZ	2651AZ	2650AT				
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code							
6	13	25	62	5,8	6	26	0,12	4	.006	●	●	○				
8	19	30	68	7,7	8	32	0,12	4	.008	●	●	○				
10	22	35	80	9,5	10	40	0,2	4	.010	●	●	○				
12	26	45	93	11,5	12	48	0,2	4	.012	●	●	○				
16	32	55	108	15,5	16	60	0,2	4	.016	●	●	○				
20	38	70	126	19,5	20	76	0,3	4	.020	●	●	○				

Extra lange Ausführung · Extra long design

Eckenradius · Corner radius

Bestell-Code · Order code													2652AZ	2653AZ	2652AT	
$\varnothing d_1$ h10	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code							
6	0,5	13	25	62	5,8	6	26	4	.006005				●	●	○	
6	1	13	25	62	5,8	6	26	4	.006010				●	●	○	
8	1	19	30	68	7,7	8	32	4	.008010				●	●	○	
8	2	19	30	68	7,7	8	32	4	.008020				●	●	○	
10	2	22	35	80	9,5	10	40	4	.010020				●	●	○	
10	2,5	22	35	80	9,5	10	40	4	.010025				●	●	○	
12	2	26	45	93	11,5	12	48	4	.012020				●	●	○	
12	2,5	26	45	93	11,5	12	48	4	.012025				●	●	○	
12	3	26	45	93	11,5	12	48	4	.012030				●	●	○	
12	4	26	45	93	11,5	12	48	4	.012040				●	●	○	
16	2	32	55	108	15,5	16	60	4	.016020				●	●	○	
16	2,5	32	55	108	15,5	16	60	4	.016025				●	●	○	
16	3	32	55	108	15,5	16	60	4	.016030				●	●	○	
16	4	32	55	108	15,5	16	60	4	.016040				●	●	○	
20	2	38	70	126	19,5	20	76	4	.020020				●	●	○	
20	2,5	38	70	126	19,5	20	76	4	.020025				●	●	○	
20	3	38	70	126	19,5	20	76	4	.020030				●	●	○	
20	4	38	70	126	19,5	20	76	4	.020040				●	●	○	

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

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

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

N

HM

DIN 6535
HA
HB


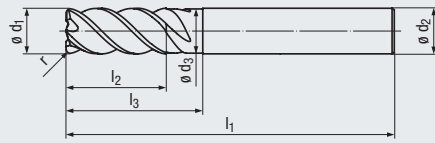
38-42°

KB x 45°

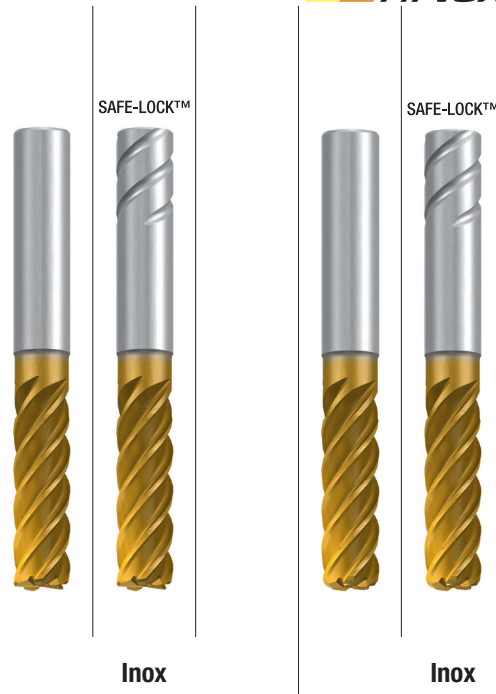
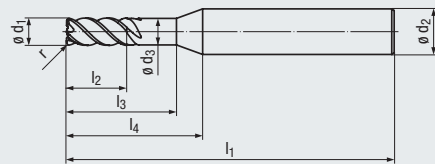
ER

v_c/f_z
77

Optional

Design I₄:



Product Finder

NR

NF

N

WR

WF

W

v_c/f_z



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIN / TIALN

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

TIN / TIALN

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

3 x d₁ – Extra lange Ausführung · Extra long design

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

3 x d₁ – Extra lange Ausführung · Extra long design

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

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415

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

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z

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

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

N

HM

DIN 6535
HA
HB

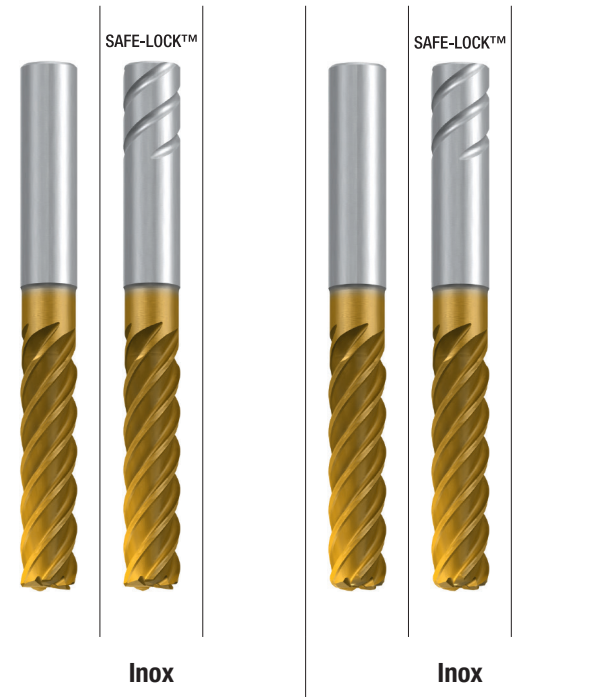
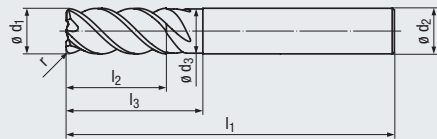
38-42°

KB x 45°

ER

v_c / f_z
77

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

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

TIN / TIALN

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

TIN / TIALN

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

4 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2645T	2645TS			
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	KB	Z (Flutes)	Dimens.- Code						
6	24	30	68	5,8	6	0,12	4	.006	●	○				
8	32	40	80	7,7	8	0,12	5	.008	●	○				
10	40	50	95	9,5	10	0,2	5	.010	●	○				
12	48	60	107	11,5	12	0,2	5	.012	●	○				
16	64	75	128	15,5	16	0,2	5	.016	●	○				
20	80	90	150	19,5	20	0,3	5	.020	●	○				

4 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code										Eckenradius · Corner radius				
$\varnothing d_1$ h10	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			2655T	2655TS		
12	2,5	48	60	107	11,5	12	5	.012025			●	○		
12	3	48	60	107	11,5	12	5	.012030			●	○		
12	4	48	60	107	11,5	12	5	.012040			●	○		
16	2,5	64	75	128	15,5	16	5	.016025			●	○		
16	3	64	75	128	15,5	16	5	.016030			●	○		
16	4	64	75	128	15,5	16	5	.016040			●	○		
20	2,5	80	90	150	19,5	20	5	.020025			●	○		
20	3	80	90	150	19,5	20	5	.020030			●	○		
20	4	80	90	150	19,5	20	5	.020040			●	○		

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For Information on the SAFE-LOCK™ clamping system, see page 415

- Hochleistungswerkzeug
- Spanwinkel +10°
- Abgesetzter Spanraum
- Ungleiche Teilung
- Eingeschränkte Schneidendurchmesser-Toleranz
- Schneiden zur Mitte
- High performance tool
- Rake angle +10°
- Modified chip space
- Variable spacing
- Tighter cutting diameter tolerance
- Centre cutting

N

HM

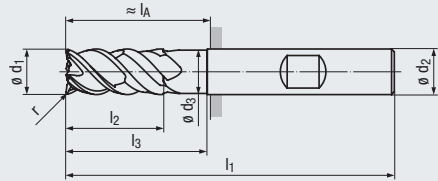
DIN 6535 HA HB ASME B94.19

50° KB x 45°

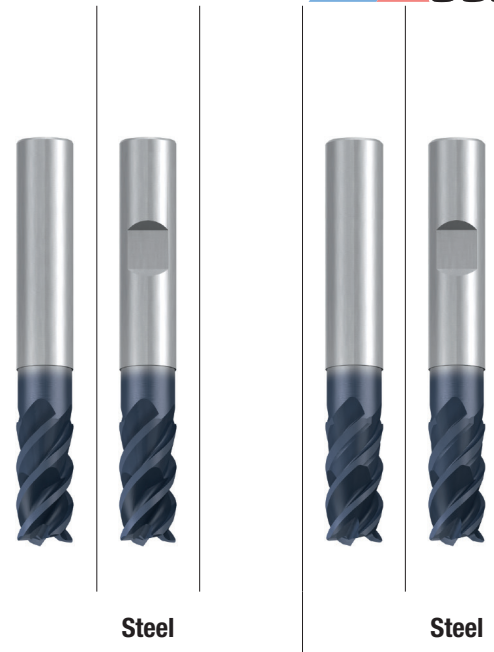
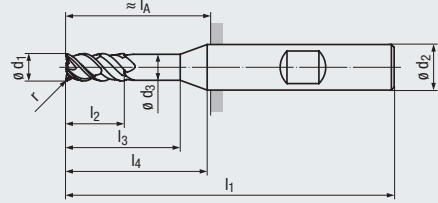
ER 3-5°

v_c / f_z 78

Optional



Design I₄:



Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Sehr gut in zähen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

Applications – material (see page 10)

- Very good for tough materials
- Suitable for HSC finishing

TIALN

TIALN

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
N	1.3-1.4	1.2
N	2.1-3.2, 5.2	
S	1.1-1.2, 2.1	1.3
H	1.1	1.2

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
N	1.3-1.4	1.2
N	2.1-3.2, 5.2	
S	1.1-1.2, 2.1	1.3
H	1.1	1.2

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code												1926A	2820A			
	$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	KB	Z (Flutes)	Dimens.-Code					
[mm]	3	-0,02	8	14	57	2,9	20	6	21	0,04	4	.003	●	●		
	4	-0,02	11	18	57	3,8	20	6	21	0,04	4	.004	●	●		
	5	-0,02	13	18	57	4,8	20	6	21	0,05	4	.005	●	●		
	6	-0,02	13	20	57	5,8	-	6	21	0,06	4	.006	●	●		
	8	-0,04	19	25	63	7,7	-	8	27	0,1	4	.008	●	●		
	10	-0,04	22	30	72	9,5	-	10	32	0,12	4	.010	●	●		
	12	-0,04	26	35	83	11,5	-	12	38	0,14	4	.012	●	●		
	16	-0,04	32	40	92	15,5	-	16	44	0,18	4	.016	●	●		
	20	-0,04	38	50	104	19,5	-	20	54	0,22	4	.020	●	●		
[inch]	3/8	-0.0016	7/8	-	2 1/2	-	3/8	15/16	0.005	4	.0375	●	●			
	1/2	-0.0016	1	-	3	-	1/2	1 7/32	0.006	4	.0500	●	●			
	5/8	-0.0016	1 1/4	-	3 1/2	-	5/8	1 19/32	0.007	4	.0625	●	●			
	3/4	-0.0016	1 1/2	-	4	-	3/4	1 31/32	0.008	4	.0750	●	●			

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code														2815A	2814A	
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z (Flutes)	Dimens.-Code					
[mm]	3	-0,02	0,3	8	14	57	2,9	20	6	21	4	.003	●	●		
	4	-0,02	0,4	11	18	57	3,8	20	6	21	4	.004	●	●		
	5	-0,02	0,5	13	18	57	4,8	20	6	21	4	.005	●	●		
	6	-0,02	0,5	13	20	57	5,8	-	6	21	4	.006	●	●		
	8	-0,04	0,5	19	25	63	7,7	-	8	27	4	.008	●	●		
	10	-0,04	0,5	22	30	72	9,5	-	10	32	4	.010	●	●		
	12	-0,04	1	26	35	83	11,5	-	12	38	4	.012	●	●		
	14	-0,04	1	26	35	83	13,5	-	14	38	4	.014	●	●		
	16	-0,04	1	32	40	92	15,5	-	16	44	4	.016	●	●		
	20	-0,04	1	38	50	104	19,5	-	20	54	4	.020	●	●		
[inch]	3/16	-0.0008	0.0050	3/8	1/2	2	-	1/4	-	4	.01875	●	●			
	1/4	-0.0016	0.0078	3/8	-	2	-	1/4	-	4	.0250	●	●			
	5/16	-0.0016	0.0156	3/4	-	2 1/2	-	5/16	-	4	.03125	●	●			
	3/8	-0.0016	0.0250	7/8	-	2 1/2	-	3/8	15/16	4	.0375	●	●			
	1/2	-0.0016	0.0375	1	-	3	-	1/2	1 7/32	4	.0500	●	●			
	5/8	-0.0016	0.0437	1 1/4	-	3 1/2	-	5/8	1 19/32	4	.0625	●	●			
	3/4	-0.0016	0.0500	1 1/2	-	4	-	3/4	1 31/32	4	.0750	●	●			
	1	-0.0016	0.0500	1 1/2	-	4	-	1	1 23/32	4	.1000	●	●			

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Product Finder
- NR
- NF
- N**
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Hochleistungswerkzeug
- Spanwinkel 0°
- Abgesetzter Spanraum
- Ungleiche Teilung
- Eingeschränkte Schneidendurchmesser-Toleranz
- Schneiden zur Mitte

- High performance tool
- Rake angle 0°
- Modified chip space
- Variable spacing
- Tighter cutting diameter tolerance
- Centre cutting

N

HM

DIN 6535
 HA HB

50°

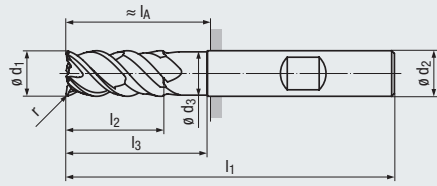
ER

3-5°

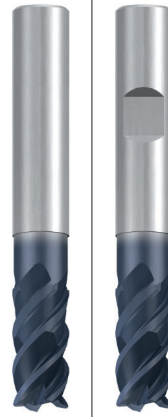
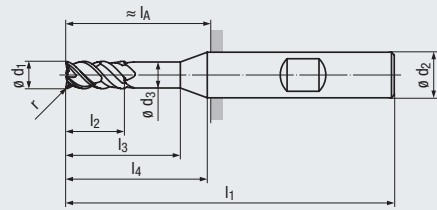
v_c / f_z
78

Optional

≤ 55
HRC



Design I₄:



Steel

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)
 - Für HPC-Bearbeitungen geeignet auch zum HSC-Schlichten einsetzbar

Applications – material (see page 10)
 - Suitable for HPC machining also suitable for HSC finishing

- P** 1.1-5.1
- K** 1.1-4.2
- N** 2.3, 2.6
- H** 1.1-1.2 1.3-1.4

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code											2850A	2851A			
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	h_5	l_A	Z (Flutes)	Dimens.-Code				
3	-0,02	0,3	8	14	57	2,9	20	6	21	4	.003	●	●		
4	-0,02	0,4	11	18	57	3,8	20	6	21	4	.004	●	●		
5	-0,02	0,5	13	18	57	4,8	20	6	21	4	.005	●	●		
6	-0,02	0,5	13	20	57	5,8	–	6	21	4	.006	●	●		
8	-0,04	0,5	19	25	63	7,7	–	8	27	4	.008	●	●		
10	-0,04	0,5	22	30	72	9,5	–	10	32	4	.010	●	●		
12	-0,04	1	26	35	83	11,5	–	12	38	4	.012	●	●		
14	-0,04	1	26	35	83	13,5	–	14	38	4	.014	●	●		
16	-0,04	1	32	40	92	15,5	–	16	44	4	.016	●	●		
20	-0,04	1	38	50	104	19,5	–	20	54	4	.020	●	●		

Andere Eckenradien auf Anfrage lieferbar
 Other corner radii available on request



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- Hochleistungswerkzeug
- Spanwinkel -10°
- Abgesetzter Spanraum
- Ungleiche Teilung
- Eingeschränkte Schneidendurchmesser-Toleranz
- Schneiden zur Mitte
- High performance tool
- Rake angle -10°
- Modified chip space
- Variable spacing
- Tighter cutting diameter tolerance
- Centre cutting

N

HM

DIN 6535 HA HB ASME B94.19

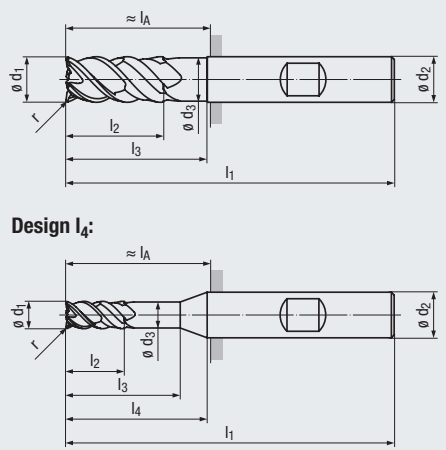
50° ER

3-5°

v_c / f_z 78

Optional

≤ 60 HRC



Steel

Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10) Applications – material (see page 10)

- Sehr gut in hochfesten Werkstoffen einsetzbar
- Für HPC-Bearbeitungen geeignet
- Very good for highly resistant materials
- Suitable for HPC machining

- P** 1.1-5.1
- K** 1.1-4.2
- N** 2.3, 2.6
- H** 1.1-1.3 1.4-1.5

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code											1987A				
ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	h_5	l_A	Z (Flutes)	Dimens.-Code				
3	-0,02	0,3	8	14	57	2,9	20	6	21	4	.003	●			
4	-0,02	0,4	11	18	57	3,8	20	6	21	4	.004	●			
5	-0,02	0,5	13	18	57	4,8	20	6	21	4	.005	●			
6	-0,02	0,5	13	20	57	5,8	–	6	21	4	.006	●			
8	-0,04	0,5	19	25	63	7,7	–	8	27	4	.008	●			
10	-0,04	0,5	22	30	72	9,5	–	10	32	4	.010	●			
12	-0,04	1	26	35	83	11,5	–	12	38	4	.012	●			
14	-0,04	1	26	35	83	13,5	–	14	38	4	.014	●			
16	-0,04	1	32	40	92	15,5	–	16	44	4	.016	●			
20	-0,04	1	38	50	104	19,5	–	20	54	4	.020	●			
3/16	-0,0008	0,0050	5/8	1 1/8	2 3/4	–	–	3/8	1 3/16	4	.01875	●			
1/4	-0,0016	0,0078	3/4	1 1/8	2 3/4	–	–	3/8	1 3/16	4	.0250	●			
5/16	-0,0016	0,0156	3/4	1 1/8	2 3/4	–	–	3/8	1 3/16	4	.03125	●			
3/8	-0,0016	0,0250	7/8	–	2 3/4	–	–	3/8	1 3/16	4	.0375	●			
7/16	-0,0016	0,0315	1	1 3/16	3	–	–	1/2	1 7/32	4	.04375	●			
1/2	-0,0016	0,0375	1	–	3 1/4	–	–	1/2	1 15/32	4	.0500	●			
5/8	-0,0016	0,0500	1 1/4	–	3 1/2	–	–	5/8	1 19/32	4	.0625	●			
3/4	-0,0016	0,0500	1 1/2	–	4	–	–	3/4	1 31/32	4	.0750	●			
1	-0,0016	0,0500	1 1/2	–	4	–	–	1	1 23/32	4	.1000	●			

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

- Hochleistungswerkzeug
- Mit DUPLEX-Geometrie
- Kombination aus Schaft- und Hochvorschubfräser
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- Extra lange Ausführung mit langer Schneidenlänge

- High performance tool
- With DUPLEX geometry
- Combination of HPC- and high-feed end mill
- Internal coolant supply, axial exit (ICA)
- Extra long design with long flute length

N

ICA

HM

DIN 6535
HA
HB

3-5°

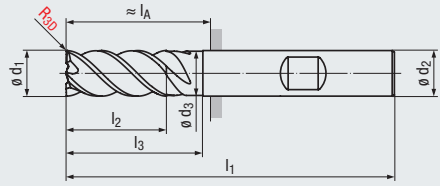
50°

R_{3D}

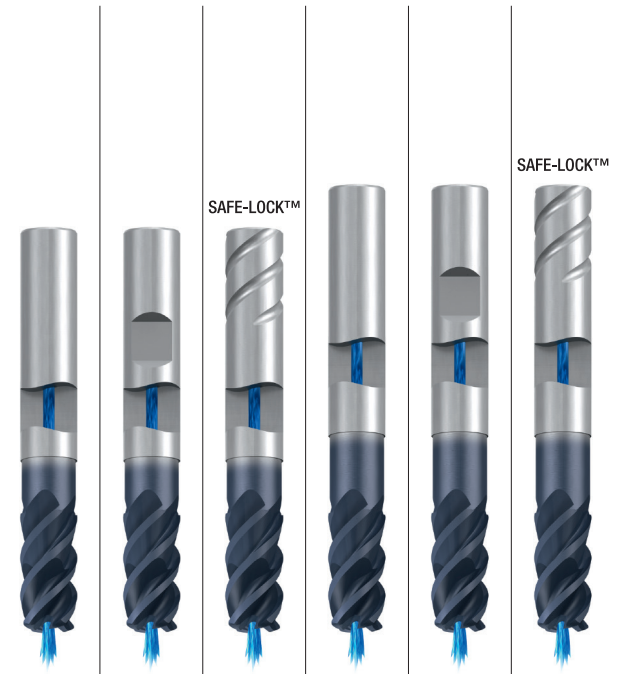
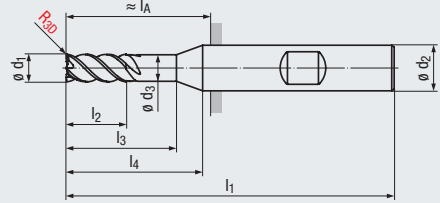
v_c / f_z
79

Optional

≤ 60
HRC



Design I₄:



Steel

Steel

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen bei labilen Verhältnissen einsetzbar
- 2D-Konturen und 3D-Konturen herstellbar

Applications – material (see page 10)

- For almost all materials
- Suitable for roughing in unstable conditions
- 2D and 3D contours can be produced

TIALN

TIALN

P	1.1-5.1	
K	1.1-4.2	
N	5.2	2.3, 2.6
H	1.1-1.3	1.4-1.5

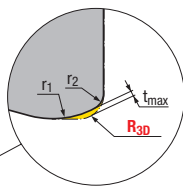
P	1.1-5.1	
K	1.1-4.2	
N	5.2	2.3, 2.6
H	1.1-1.3	1.4-1.5

Lange Ausführung · Long design

Bestell-Code · Order code												2610AZ	2611AZ	2610AT		
$\varnothing d_1$ -0,04	R_{3D}	r_1 / r_2	t_{max}	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A ⊖	Z (Flutes)	Dimens.- Code				
3	0,4	1,5 / 0,3	0,1	3	14	57	2,9	20	6	21	4	.103	●	●	○	
4	0,5	2 / 0,4	0,15	4	18	57	3,8	20	6	21	4	.104	●	●	○	
5	0,6	2,5 / 0,5	0,2	5	18	57	4,8	20	6	21	4	.105	●	●	○	
6	0,8	2,9 / 0,6	0,2	13	20	57	5,8	-	6	21	4	.006	●	●	○	
8	1,0	3,9 / 0,8	0,3	19	25	63	7,7	-	8	27	4	.008	●	●	○	
10	1,2	4,9 / 1	0,4	22	30	72	9,5	-	10	32	4	.010	●	●	○	
12	1,6	5,9 / 1,2	0,4	26	35	83	11,5	-	12	38	4	.012	●	●	○	
16	2,2	7,8 / 1,6	0,5	32	40	92	15,5	-	16	44	4	.016	●	●	○	

Extra lange Ausführung · Extra long design

Bestell-Code · Order code														2612AZ	2613AZ	2612AT
$\varnothing d_1$ -0,04	R_{3D}	r_1 / r_2	t_{max}	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A ⊖	Z (Flutes)	Dimens.- Code				
8	1,0	3,9 / 0,8	0,3	19	30	68	7,7	-	8	32	4	.008			●	●
10	1,2	4,9 / 1,0	0,4	22	35	80	9,5	-	10	40	4	.010			●	●
12	1,6	5,9 / 1,2	0,4	26	45	93	11,5	-	12	47	4	.012			●	●
16	2,2	7,8 / 1,6	0,5	32	55	108	15,5	-	16	60	4	.016			●	●



DUPLEX-Geometrie · DUPLEX geometry

- t_{max} = Maximal durch Radiusabweichung vom R_{3D} entstehendes Restmaterial
Maximum residual material resulting from radius deviation from R_{3D}
- R_{3D} = Im CAM zu programmierender Radius
Radius to be programmed in CAM
- r_1 = Stirnradius
Face radius
- r_2 = Tangentialradius zwischen Stirnradius und Umfangsschneide
Tangential radius between face radius and circumference cutting edge

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For Information on the SAFE-LOCK™ clamping system, see page 415

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Schneidnlänge bis 3 x d₁
- 2 Baulängen verfügbar

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Flute length up to 3 x d₁
- 2 lengths available

N

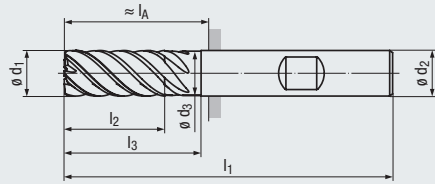
HM

DIN 6535
HA
HB

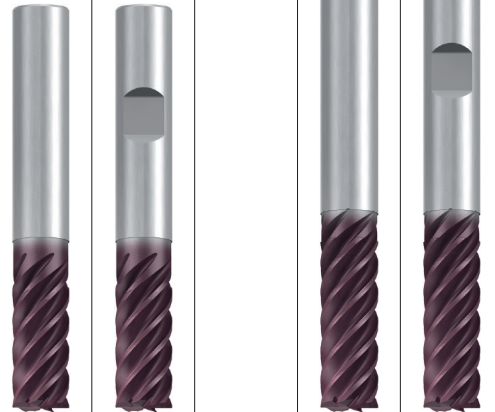
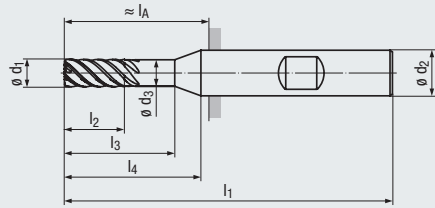
35-38° **KB x 45°**

V_c/f_z
87 - 88

Optional



Design I₄:



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

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

Applications – material (see page 10)

- For all tough materials
- Suitable for HSC finishing

TIALN

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

TIALN

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-2.1	2.2
K	3.1-4.1	4.2
N	1.2-1.4	1.5-1.6
N	2.1-2.8	5.2
S	1.1-2.2	2.3
S	2.4	2.5-2.6

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code											2522A	2523A			
∅ d ₁ f8	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h5	l _A h6	KB	Z (Flutes)	Dimens.-Code					
5	13	18	57	4,8	20	6	21	0,12	6	.005	●	●			
6	13	20	57	5,8	–	6	21	0,12	6	.006	●	●			
8	19	25	63	7,7	–	8	27	0,12	6	.008	●	●			
10	22	30	72	9,7	–	10	32	0,2	6	.010	●	●			
12	26	35	83	11,6	–	12	38	0,2	6	.012	●	●			
16	32	40	92	15,5	–	16	44	0,2	6	.016	●	●			
20	38	50	104	19,5	–	20	54	0,3	8	.020	●	●			

Extra lange Ausführung · Extra long design

Bestell-Code · Order code													2524A	2525A	
∅ d ₁ h10	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	l _A h6	KB	Z (Flutes)	Dimens.-Code					
6	18	25	62	5,8	–	6	26	0,12	6	.006			●	●	
8	24	30	68	7,7	–	8	32	0,12	6	.008			●	●	
10	30	35	80	9,7	–	10	40	0,2	6	.010			●	●	
12	36	45	93	11,6	–	12	48	0,2	6	.012			●	●	
16	48	55	108	15,5	–	16	60	0,2	6	.016			●	●	
20	60	70	126	19,5	–	20	76	0,3	8	.020			●	●	

- Product Finder
- NR
- NF
- N
- H**
- WR
- WF
- W
- v_c / f_z
- HM

- Hochleistungswerkzeug
- Spezielle Geometrie zum Hartfräsen
- Sehr stabile Werkzeugausführung
- Eingeschränkte Schneidendurchmesser-Toleranz
- 3 Baulängen verfügbar
- High performance tool
- Special geometry for hard milling
- Very stable tool design
- Tighter cutting diameter tolerance
- 3 lengths available

H

HM

DIN 6535
HA HB

≈ ASME B94.19

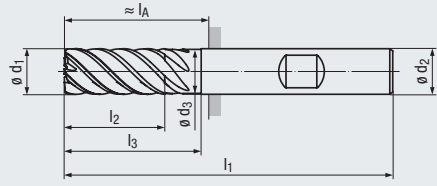
50°

KB x 45°

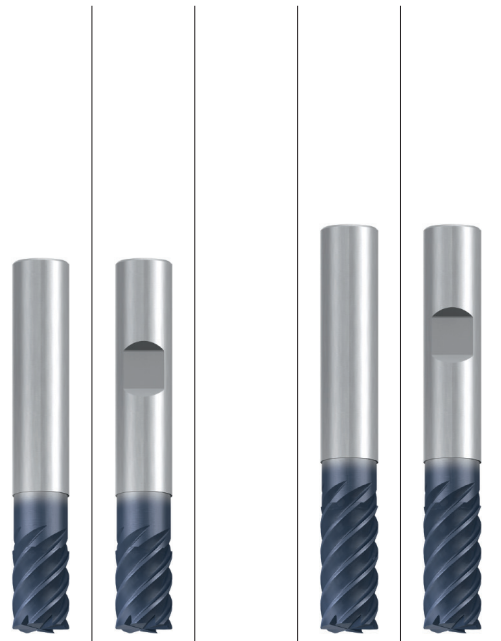
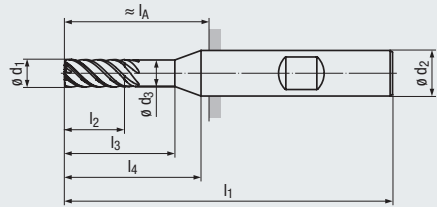
v_c / f_z
80

Optional

44-66 HRC



Design I₄:



Hard materials

Hard materials

Beschichtung - Coating

Einsatzgebiete – Material (siehe Seite 10)

- In allen hochfesten Werkstoffen einsetzbar
- Hartbearbeitung bis 66 HRC möglich
- Zum HSC-Schlichten geeignet

Applications – material (see page 10)

- For all high-strength materials
- Hard machining of up to 66 HRC
- Suitable for HSC finishing

TIALN

TIALN

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.5	

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.5	

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code											1825A	1925A			
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	KB	Z	Dimens.-Code					
[mm]						h5			(Flutes)						
5	-0.02	9	16	54	4,8	18	6	18	0,08	6	.005	●	●		
6	-0.02	10	16	54	5,8	6	18	0,08	6	.006	●	●			
8	-0.04	12	20	58	7,7	8	22	0,1	6	.008	●	●			
10	-0.04	14	24	66	9,5	10	26	0,12	6	.010	●	●			
12	-0.04	16	26	73	11,5	12	28	0,14	6	.012	●	●			
16	-0.04	22	32	82	15,5	16	34	0,18	8	.016	●	●			

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code													1827A	1927A	
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	KB	Z	Dimens.-Code					
[mm]						h5			(Flutes)						
6	-0.02	13	20	57	5,8	6	21	0,08	6	.006			●	●	
8	-0.04	19	25	63	7,7	8	27	0,1	6	.008			●	●	
10	-0.04	22	30	72	9,5	10	32	0,12	6	.010			●	●	
12	-0.04	26	35	83	11,5	12	38	0,14	6	.012			●	●	
14	-0.04	26	35	83	13,5	14	38	0,16	6	.014			●	●	
16	-0.04	32	40	92	15,5	16	44	0,18	8	.016			●	●	
18	-0.04	32	40	92	17,5	18	44	0,2	8	.018			●	●	
20	-0.04	38	50	104	19,5	20	54	0,22	8	.020			●	●	

Bestell-Code · Order code															
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	KB	Z	Dimens.-Code					
[inch]															
1/4	-0.0016	3/8	–	2	–	1/4	–	0.003	6	.0250			●		
3/8	-0.0016	7/8	–	2 3/4	–	3/8	–	0.004	6	.0375			●		
1/2	-0.0016	1	–	3 1/4	–	1/2	–	0.005	6	.0500			●		
5/8	-0.0016	1 1/4	–	3 1/2	–	5/8	–	0.007	8	.0625			●		
3/4	-0.0016	1 1/2	–	4	–	3/4	–	0.008	8	.0750			●		
1	-0.0016	1 3/4	–	4 1/2	–	1	–	0.010	10	.1000			●		

- Hochleistungswerkzeug
- Spezielle Geometrie zum Hartfräsen
- Sehr stabile Werkzeugausführung
- Eingeschränkte Schneidendurchmesser-Toleranz
- 3 Baulängen verfügbar

- High performance tool
- Special geometry for hard milling
- Very stable tool design
- Tighter cutting diameter tolerance
- 3 lengths available

H

HM

DIN 6535
HA
HB

≈ ASME B94.19

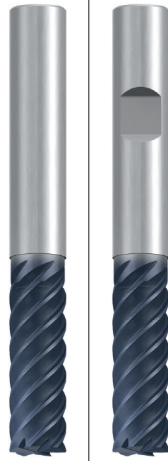
50°

KB x 45°

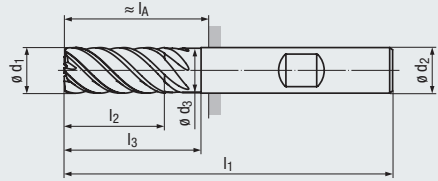
v_c / f_z
80

Optional

44-66 HRC



Hard materials



Product Finder

NR

NF

N

H

WR

WF

W

v_c / f_z

HM

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- In allen hochfesten Werkstoffen einsetzbar
- Hartbearbeitung bis 66 HRC möglich
- Zum HSC-Schlichten geeignet

- For all high-strength materials
- Hard machining of up to 66 HRC
- Suitable for HSC finishing

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.5	

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											1828A	1928A				
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$	l_A	KB	Z	Dimens.-Code							
										(Flutes)						
6	-0,02	18	25	62	5,8	6	26	0,08	6	.006	●	●				
8	-0,04	24	30	68	7,7	8	32	0,1	6	.008	●	●				
10	-0,04	30	35	80	9,5	10	40	0,12	6	.010	●	●				
12	-0,04	36	45	93	11,5	12	48	0,14	6	.012	●	●				
14	-0,04	42	50	99	13,5	14	54	0,16	6	.014	●	●				
16	-0,04	48	55	108	15,5	16	60	0,18	8	.016	●	●				
18	-0,04	54	60	114	17,5	18	66	0,2	8	.018	●	●				
20	-0,04	60	70	126	19,5	20	76	0,22	8	.020	●	●				
25	-0,04	75	90	150	24,2	25	94	0,27	10	.025	●	●				
1/4	-0.0016	7/8	—	2 1/2	—	1/4	—	0.003	6	.0250	●					
3/8	-0.0016	1 3/8	—	3 1/4	—	3/8	—	0.004	6	.0375	●					
1/2	-0.0016	1 1/2	—	3 3/4	—	1/2	—	0.005	6	.0500	●					
5/8	-0.0016	2	—	4 1/4	—	5/8	—	0.007	8	.0625	●					
3/4	-0.0016	2 1/2	—	5	—	3/4	—	0.008	8	.0750	●					
1	-0.0016	3	—	6	—	1	—	0.010	10	.1000	●					




Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Product Finder
- NR
- NF
- N
- H**
- WR
- WF
- W
- v_c / f_z
- HM

- Hochleistungswerkzeug
- Spezielle Geometrie zum Hartfräsen
- Sehr stabile Werkzeugausführung
- Eingeschränkte Schneidendurchmesser-Toleranz
- 2 Baulängen verfügbar
- High performance tool
- Special geometry for hard milling
- Very stable tool design
- Tighter cutting diameter tolerance
- 2 lengths available

H



HM

DIN 6535
HA HB


ASME
B94.19

50°

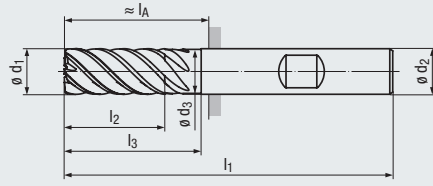
ER

v_c / f_z
80

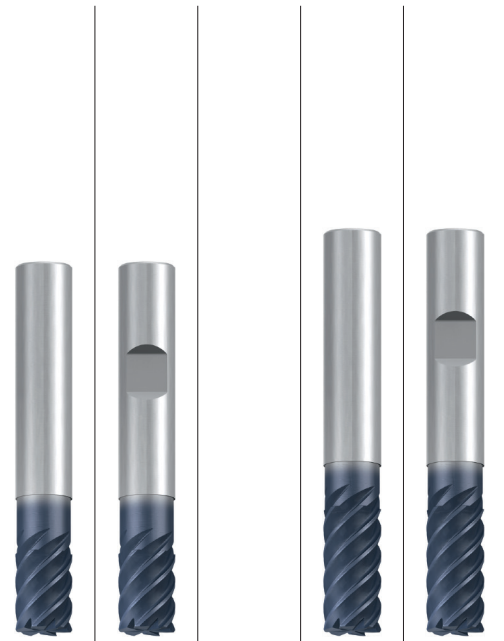
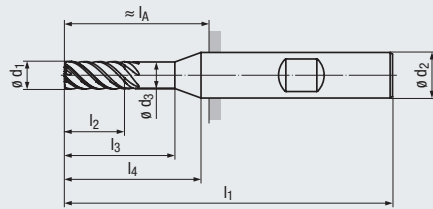
Optional



44-66 HRC



Design I₄:



Hard materials

Hard materials

Beschichtung - Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- In allen hochfesten Werkstoffen einsetzbar
- Hartbearbeitung bis 66 HRC möglich
- Zum HSC-Schlichten geeignet

- For all high-strength materials
- Hard machining of up to 66 HRC
- Suitable for HSC finishing

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.5	

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.5	

DIN 6527 – Kurze Ausführung · Short design

Eckenradius · Corner radius

Bestell-Code · Order code											2813A	2812A				
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z (Flutes)	Dimens.-Code					
[mm]	5	-0.02	0,5	9	16	54	4,8	18	6	18	6	.005	●	●		
	6	-0.02	0,5	10	16	54	5,8	–	6	18	6	.006	●	●		
	8	-0.04	0,5	12	20	58	7,7	–	8	22	6	.008	●	●		
	10	-0.04	0,5	14	24	66	9,5	–	10	26	6	.010	●	●		
	12	-0.04	1	16	26	73	11,5	–	12	28	6	.012	●	●		
	16	-0.04	1	22	32	82	15,5	–	16	34	8	.016	●	●		
[inch]	1/4	-0.0016	0.025	1/2	–	2	–	–	1/4	–	6	.0250	●			
	5/16	-0.0016	0.025	1/2	–	2	–	–	5/16	–	6	.03125	●			
	3/8	-0.0016	0.025	5/8	–	2 1/4	–	–	3/8	–	6	.0375	●			
	7/16	-0.0016	0.025	5/8	–	2 1/2	–	–	7/16	–	6	.04375	●			
	1/2	-0.0016	0.050	5/8	–	2 1/2	–	–	1/2	–	6	.0500	●			
	5/8	-0.0016	0.050	3/4	–	3	–	–	5/8	–	8	.0625	●			
	3/4	-0.0016	0.050	7/8	–	3	–	–	3/4	–	8	.0750	●			

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code													2817A	2816A		
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z (Flutes)	Dimens.-Code					
[mm]	6	-0.02	0,5	13	20	57	5,8	–	6	21	6	.006			●	●
	8	-0.04	0,5	19	25	63	7,7	–	8	27	6	.008			●	●
	10	-0.04	0,5	22	30	72	9,5	–	10	32	6	.010			●	●
	12	-0.04	1	26	35	83	11,5	–	12	38	6	.012			●	●
	16	-0.04	1	32	40	92	15,5	–	16	44	8	.016			●	●
[inch]	5/16	-0.0016	0.025	3/4	–	2 1/2	–	–	5/16	–	6	.03125			●	
	3/8	-0.0016	0.025	7/8	–	2 3/4	–	–	3/8	–	6	.0375			●	
	7/16	-0.0016	0.025	15/16	–	3	–	–	7/16	–	6	.04375			●	
	1/2	-0.0016	0.050	1	–	3 1/4	–	–	1/2	–	6	.0500			●	
	5/8	-0.0016	0.050	1 1/4	–	3 1/2	–	–	5/8	–	8	.0625			●	
	3/4	-0.0016	0.050	1 1/2	–	4	–	–	3/4	–	8	.0750			●	

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Hochleistungswerkzeug
- Vielzahnfräser
- Neuentwickelte, vibrationsarme Geometrie
- Sehr stabile Werkzeugausführung
- Eingeschränkte Schneidendurchmesser-Toleranz

- High performance tool
- Multi-tooth end mill
- Newly developed, low-vibration geometry
- Very stable tool design
- Tighter cutting diameter tolerance

H

HM

DIN 6535 HA HB

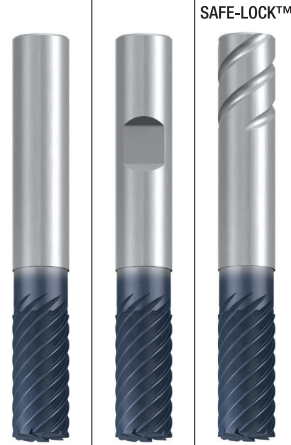
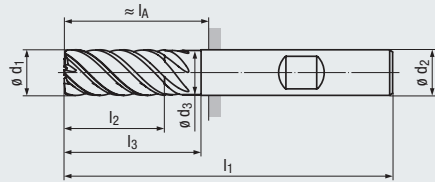
≈ ASME B94.19

40° KB x 45°

v_c / f_z 78

Optional

44-66 HRC



Hard materials

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- In fast allen Werkstoffen einsetzbar
- Hartbearbeitung bis 66 HRC möglich
- Sehr gut zum HSC-Schichten geeignet

Applications – material (see page 10)

- For almost all materials
- Hard machining of up to 66 HRC
- Very suitable for HSC finishing

TIALN

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-2.1	2.2
K	3.1-4.1	4.2
S	1.1-2.6	
H	1.1-1.5	

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code		2887A	2886A	2887AS										
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$	l_A	KB	Z (Flutes)	Dimens.-Code					
[mm]					h5									
	6	-0,02	13	20	57	5,8	6	21	0,08	6	.006	●	●	○
	8	-0,04	19	25	63	7,7	8	27	0,08	8	.008	●	●	○
	10	-0,04	22	30	72	9,5	10	32	0,08	10	.010	●	●	○
	12	-0,04	26	35	83	11,5	12	38	0,08	12	.012	●	●	○
	16	-0,04	32	40	92	15,5	16	44	0,1	16	.016	●	●	○
	20	-0,04	38	50	104	19,5	20	54	0,1	20	.020	●	●	○
[inch]														
	1/4	-0.0016	17/32	3/4	2 1/4	0.242	1/4	–	0.003	6	.0250	●		○
	5/16	-0.0016	3/4	1	2 1/2	0.301	5/16	–	0.003	8	.03125	●		○
	3/8	-0.0016	7/8	1 1/8	2 3/4	0.358	3/8	–	0.003	10	.0375	●		○
	1/2	-0.0016	1 1/8	1 3/8	3 1/4	0.480	1/2	–	0.004	12	.0500	●		○
	5/8	-0.0016	1 1/4	1 1/2	3 1/2	0.605	5/8	–	0.004	16	.0625	●		○
	3/4	-0.0016	1 1/2	1 7/8	4	0.730	3/4	–	0.004	18	.0750	●		○

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For Information on the SAFE-LOCK™ clamping system, see page 415

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

Product Finder

- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Product Finder
- NR
- NF
- N
- H
- WR**
- WF
- W
- v_c / f_z

- Hochleistungswerkzeug
- Spezielle Geometrie für die Aluminiumzerspanung
- Schneiden zur Mitte

- High performance tool
- Special geometry for the machining of aluminium
- Centre cutting

WR

grob
coarse

HM

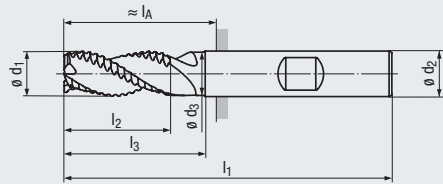
DIN 6535
HA
HB

40°

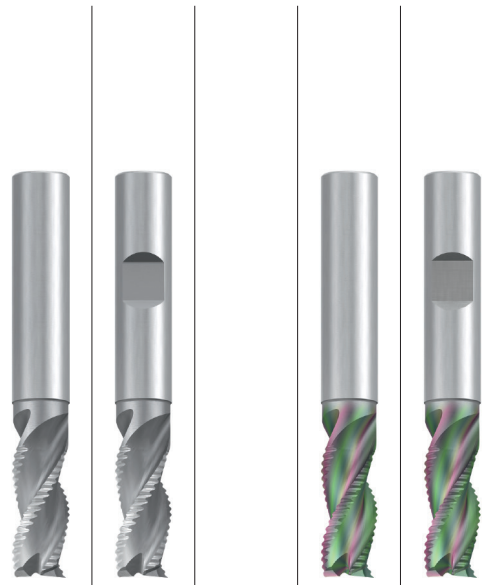
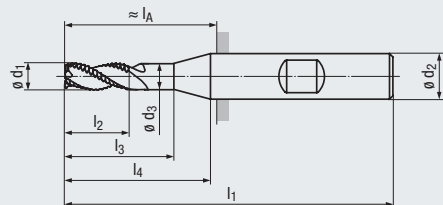
45°

3-5°

v_c / f_z
81



Design l_4 :



AI

AI/Cu

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit GLT-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With GLT coating also for copper alloys

GLT

N 1.1-1.3 1.4

N 1.1-1.4 2.1-2.7

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code										2548	2549	2548K	2549K
$\varnothing d_1$ h11	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
3	7	14	57	2,9	20	6	21	3	.003	●	●	●	●
4	8	18	57	3,8	20	6	21	3	.004	●	●	●	●
5	10	19	57	4,8	20	6	21	3	.005	●	●	●	●
6	13	20	57	5,8	—	6	21	3	.006	●	●	●	●
8	19	25	63	7,7	—	8	34	3	.008	●	●	●	●
10	22	30	72	9,5	—	10	32	3	.010	●	●	●	●
12	26	35	83	11,5	—	12	38	3	.012	●	●	●	●
16	32	40	92	15,5	—	16	44	3	.016	●	●	●	●
20	38	50	104	19,5	—	20	54	3	.020	●	●	●	●

- Hochleistungswerkzeug
- Spezielle Geometrie für die Volumenzerspanung von Aluminium
- Vibrationsarme Bearbeitung
- Sehr glatte CRN-Beschichtung
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Kurze Schneidenlänge

- High performance tool
- Special geometry for high-volume machining of aluminium
- Low-vibration machining
- Very smooth CRN coating
- Internal coolant supply, radial and axial exit (ICRA)
- Short flute length

WR **grob coarse**

ICRA

HM

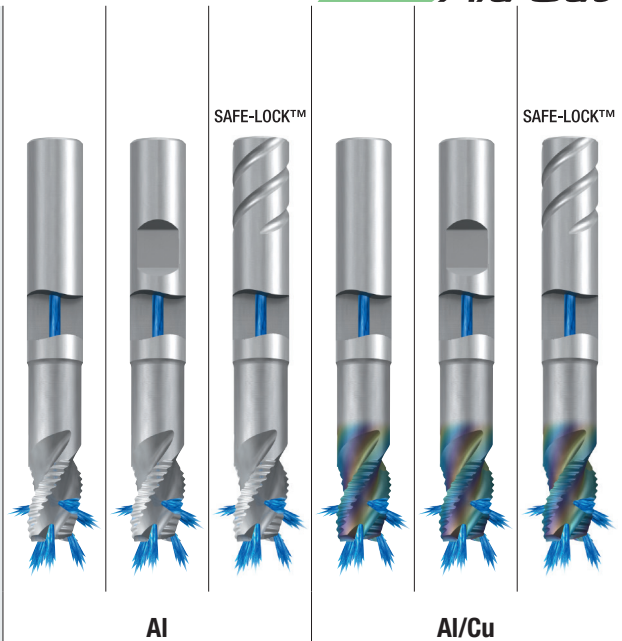
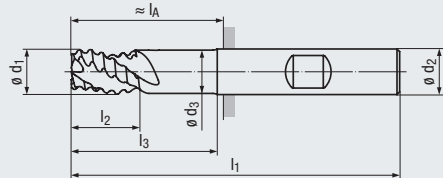
DIN 6535 HA HB

~ ASME B94.19

40° **45°**

n max. **3-5°**

v_c/f_z **82**



Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

N 1.1-1.3 1.4

CRN

N 1.1-1.4 2.1-2.7

Lange Ausführung · Long design

Bestell-Code · Order code

										2888_Z	2881_Z	2888_T	2888RZ	2881RZ	2888RT	
[mm]	ø d ₁ h11	l ₂	l ₃	l ₁	ø d ₃	ø d ₂ h5	l _A 	n _{max.} ²⁾ min ⁻¹	Z (Flutes)	Dimens.- Code						
	6 1)	8	20	57	5,6	6	21	30000	3	.006	●	●	○	●	●	○
8	10	25	63	7,6	8	27	25000	3	.008	●	●	○	●	●	○	
10	13	30	72	9,5	10	32	20000	3	.010	●	●	○	●	●	○	
12	15	35	83	11,4	12	38	15000	3	.012	●	●	○	●	●	○	
16	20	46	96	15,2	16	48	12500	3	.016	●	●	○	●	●	○	
20	25	58	110	19	20	60	10000	3	.020	●	●	○	●	●	○	
25	30	73	125	24	25 ³⁾	69	8000	3	.025	●	●	○	●	●	○	
[inch]	1/4 1)	11/32	13/16	2 1/4	0.234	1/4	–	–	3	.0250	●	●	○	●	●	○
	5/16	25/64	1	2 1/2	0.297	5/16	–	–	3	.03125	●	●	○	●	●	○
	3/8	7/16	1 1/8	2 3/4	0.354	3/8	–	–	3	.0375	●	●	○	●	●	○
	1/2	5/8	1 3/8	3 1/4	0.476	1/2	–	–	3	.0500	●	●	○	●	●	○
	5/8	3/4	1 7/8	3 3/4	0.594	5/8	–	–	3	.0625	●	●	○	●	●	○
	3/4	15/16	2	4 1/4	0.711	3/4	–	–	3	.0750	●	●	○	●	●	○
1	1 1/4	2 5/8	5	0.960	1	–	–	3	.1000	●	●	○	●	●	○	

1) Kühlschmierstoffaustritt axial (ICA)
Internal coolant supply, axial exit (ICA)

2) Maximal zulässige Drehzahl für Hartmetall-Schafffräser mit seitlicher Mitnahmefläche nach DIN 6535 HB
Maximum permissible revolution of solid carbide end mills with clamping flat according to DIN 6535 HB

3) Schaftlänge 50 mm
Shank length 50 mm

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Hochleistungswerkzeug
- Spezielle Geometrie für die Volumenzerspanung von Aluminium
- Vibrationsarme Bearbeitung
- Sehr glatte CRN-Beschichtung
- Verschiedene Eckenradien pro Schneiddurchmesser
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Kurze Schneidlänge

- High performance tool
- Special geometry for high-volume machining of aluminium
- Low-vibration machining
- Very smooth CRN coating
- Several corner radii per cutting diameter
- Internal coolant supply, radial and axial exit (ICRA)
- Short flute length

WR

grob
coarse

ICRA

HM

DIN 6535

HA
HB

40°

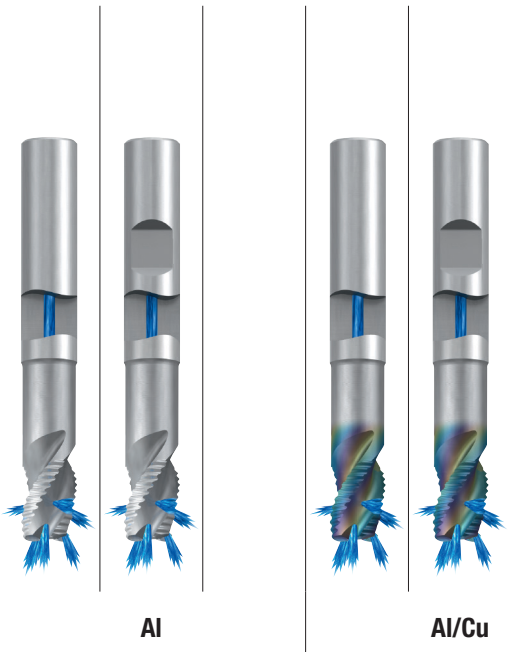
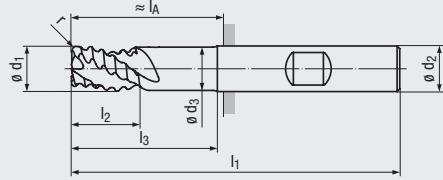
ER

n max.

3-5°

v_c / f_z

82



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

N 1.1-1.3 1.4

CRN
N 1.1-1.4 2.1-2.7

Lange Ausführung · Long design

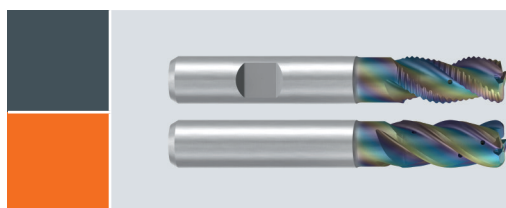
Eckenradius · Corner radius

Bestell-Code · Order code											2890_Z	2883_Z	2890RZ	2883RZ
$\varnothing d_1$ h11	r	l ₂	l ₃	l ₁	$\varnothing d_3$	$\varnothing d_2$ h5	l _A	n _{max.} ²⁾ min ⁻¹	Z (Flutes)	Dimens.- Code				
12	2	15	35	83	11,4	12	38	15000	3	.012020	●	●	●	●
12	2,5	15	35	83	11,4	12	38	15000	3	.012025	●	●	●	●
12	3	15	35	83	11,4	12	38	15000	3	.012030	●	●	●	●
12	4	15	35	83	11,4	12	38	15000	3	.012040	●	●	●	●
16	2	20	46	96	15,2	16	48	12500	3	.016020	●	●	●	●
16	2,5	20	46	96	15,2	16	48	12500	3	.016025	●	●	●	●
16	3	20	46	96	15,2	16	48	12500	3	.016030	●	●	●	●
16	4	20	46	96	15,2	16	48	12500	3	.016040	●	●	●	●
20	2	25	58	110	19	20	60	10000	3	.020020	●	●	●	●
20	2,5	25	58	110	19	20	60	10000	3	.020025	●	●	●	●
20	3	25	58	110	19	20	60	10000	3	.020030	●	●	●	●
20	4	25	58	110	19	20	60	10000	3	.020040	●	●	●	●
25	2	30	73	125	24	25 ³⁾	69	8000	3	.025020	●	●	●	●
25	2,5	30	73	125	24	25 ³⁾	69	8000	3	.025025	●	●	●	●
25	3	30	73	125	24	25 ³⁾	69	8000	3	.025030	●	●	●	●
25	4	30	73	125	24	25 ³⁾	69	8000	3	.025040	●	●	●	●

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

2) Maximal zulässige Drehzahl für Hartmetall-Schafffräser mit seitlicher Mitnahmefläche nach DIN 6535 HB
Maximum permissible revolution of solid carbide end mills with clamping flat according to DIN 6535 HB

3) Schaftlänge 50 mm
Shank length 50 mm



Alu-Cut HSS-Schafffräser
siehe Seite 280 und 283

Alu-Cut HSS end mills,
see pages 280 and 283

- Schruppschlicht-Verzahnung
- Flexibel einsetzbar
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte

- Semi-finishing profile
- Versatile usage
- Low-vibration machining
- Centre cutting

WF **grob coarse**

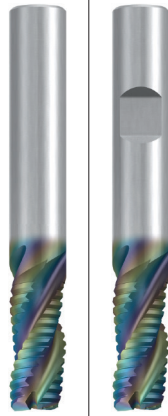
HM

DIN 6535
HA
HB

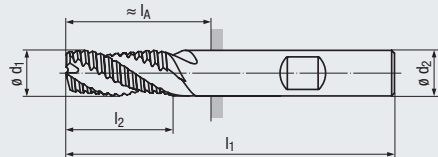
36° 45°

3-5°

v_c / f_z
90



Al/Cu



Beschichtung · Coating

CRN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Auch in Kupfer-Legierungen einsetzbar

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- Also applicable in copper alloys

N 1.1-1.4 2.1-2.7

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code							2871R	2870R			
$\varnothing d_1$ h11	l_2	l_1	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code					
6	13	57	6	21	3	.006	●	●			
8	19	63	8	27	3	.008	●	●			
10	22	72	10	32	3	.010	●	●			
12	26	83	12	38	3	.012	●	●			
14	26	83	14	38	3	.014	●	●			
16	32	92	16	44	3	.016	●	●			
18	32	92	18	44	3	.018	●	●			
20	38	104	20	54	3	.020	●	●			

Lieferbar solange vorrätig
Available while stocks last

Product Finder

NR

NF

N

H

WR

WF

W

v_c / f_z

HM

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W**
- v_c / f_z

- Bohrschneide über Mitte
- Geringste Schnittkräfte
- Sehr glatte CRN-Beschichtung
- Drilling edge over centre
- Lowest cutting forces
- Very smooth CRN coating

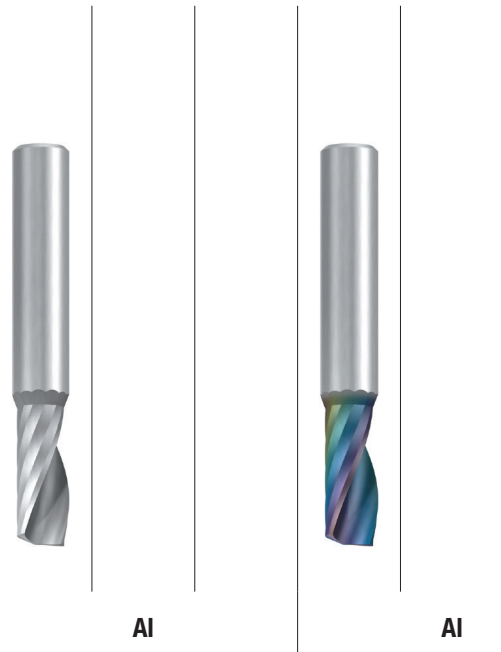
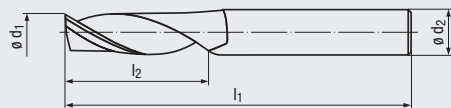
W

HM

DIN 6535
HA HB

25°

v_c / f_z
90



AI

AI

Stirnausführung · Face design



Beschichtung · Coating

CRN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Bohren und Fräsen in Aluminium-Profilen
- Zum Schruppen und Schlichten geeignet
- Gratfreie Bearbeitung

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- Drilling and milling in aluminium profiles
- Suitable for roughing and finishing
- Burr-free machining

N	1.1-1.3	1.4
N	3.1-4.2	5.3

N	1.1-1.4
N	3.1-4.2, 5.3

Lange Ausführung · Long design

Bestell-Code · Order code						1909			1909R		
$\varnothing d_1$ h10	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code						
2	10	40	2	1	.002	●			●		
3	12	40	3	1	.003	●			●		
4	15	40	4	1	.004	●			●		
5	16	50	5	1	.005	●			●		
6	20	60	6	1	.006	●			●		
8	22	63	8	1	.008	●			●		
10	25	72	10	1	.010	●			●		
12	30	83	12	1	.012	●			●		

- Hochleistungswerkzeug
- Spezielle Geometrie für die Aluminiumzerspanung
- Vibrationsarme Bearbeitung
- Mit 2 und 3 Schneiden
- Schneiden zur Mitte

- High performance tool
- Special geometry for the machining of aluminium
- Low-vibration machining
- With 2 and 3 flutes
- Centre cutting

W

HM

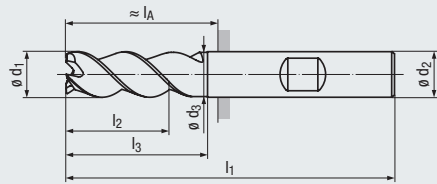
DIN 6535
HA
HB

Z2
45°

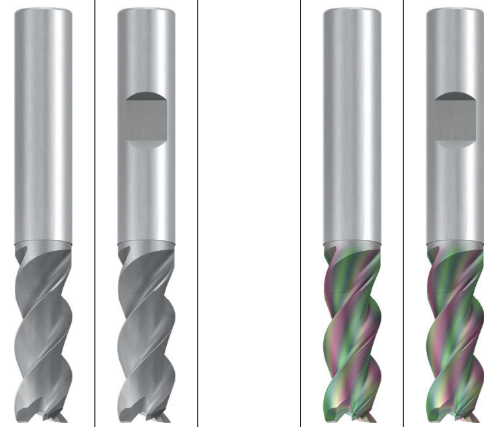
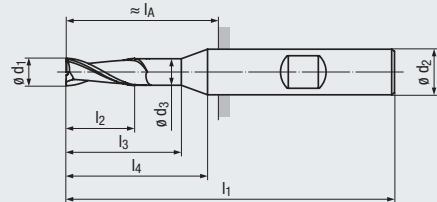
Z3
38-40°

KB x 45°

v_c/f_z
81



Design I₄:



Al

Al/Cu

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit GLT-Beschichtung auch in Kupfer-Legierungen einsetzbar
- Zum Bohrfräsen geeignet
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With GLT coating also for copper alloys
- Suitable for z-axis milling
- Suitable for roughing and finishing

N 1.1-1.3 1.4

N 1.1-1.4 2.1-2.7

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code											2544	2545	2544K	2545K
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	KB	Z (Flutes)	Dimens.- Code				
2	6	10	57	1,9	20	6	21	0,06	2	.002	●	●	●	●
3	7	14	57	2,9	20	6	21	0,1	2	.003	●	●	●	●
4	8	18	57	3,8	20	6	21	0,1	2	.004	●	●	●	●
5	10	19	57	4,8	20	6	21	0,15	2	.005	●	●	●	●
6	13	20	57	5,8	–	6	21	0,125	3	.006	●	●	●	●
8	19	25	63	7,7	–	8	34	0,125	3	.008	●	●	●	●
10	22	30	72	9,5	–	10	32	0,2	3	.010	●	●	●	●
12	26	35	83	11,5	–	12	38	0,2	3	.012	●	●	●	●
16	32	40	92	15,5	–	16	44	0,2	3	.016	●	●	●	●
20	38	50	104	19,5	–	20	54	0,3	3	.020	●	●	●	●

Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

HM

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

- Hochleistungswerkzeug
- Spezielle Geometrie für die Aluminiumzerspanung
- Vibrationsarme Bearbeitung
- Verschiedene Eckenradien pro Schneiddurchmesser
- Schneiden zur Mitte
- High performance tool
- Special geometry for the machining of aluminium
- Low-vibration machining
- Several corner radii per cutting diameter
- Centre cutting

W

HM

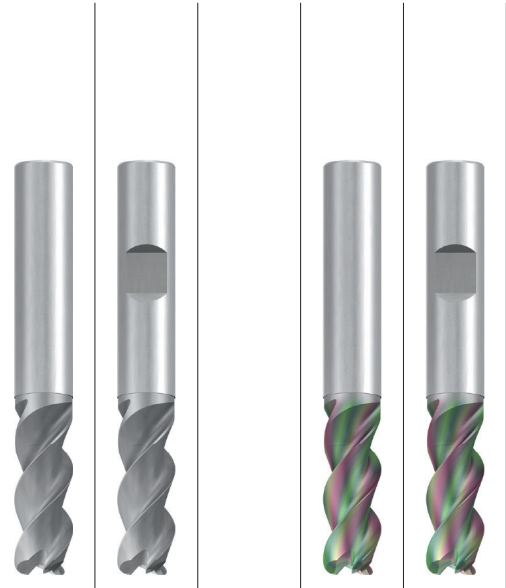
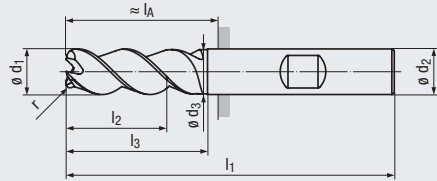
DIN 6535

HA
HB

38-40°

ER

v_c / f_z
81



Al

Al/Cu

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit GLT-Beschichtung auch in Kupfer-Legierungen einsetzbar
- Zum Bohrfräsen geeignet
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With GLT coating also for copper alloys
- Suitable for z-axis milling
- Suitable for roughing and finishing

GLT

N 1.1-1.3 1.4

N 1.1-1.4 2.1-2.7

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code										2546	2547	2546K	2547K
$\varnothing d_1$ h10	r $\pm 0,02$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
6	0,5	13	20	57	5,8	6	21	3	.006005	●	●	●	●
6	1	13	20	57	5,8	6	21	3	.006010	●	●	●	●
8	1	19	25	63	7,7	8	27	3	.008010	●	●	●	●
8	1,5	19	25	63	7,7	8	27	3	.008015	●	●	●	●
8	2	19	25	63	7,7	8	27	3	.008020	●	●	●	●
10	1	22	30	72	9,5	10	32	3	.010010	●	●	●	●
10	1,5	22	30	72	9,5	10	32	3	.010015	●	●	●	●
10	2	22	30	72	9,5	10	32	3	.010020	●	●	●	●
12	1	26	35	83	11,5	12	38	3	.012010	●	●	●	●
12	1,5	26	35	83	11,5	12	38	3	.012015	●	●	●	●
12	2	26	35	83	11,5	12	38	3	.012020	●	●	●	●
12	2,5	26	35	83	11,5	12	38	3	.012025	●	●	●	●
12	3	26	35	83	11,5	12	38	3	.012030	●	●	●	●
12	4	26	35	83	11,5	12	38	3	.012040	●	●	●	●
16	1	32	40	92	15,5	16	44	3	.016010	●	●	●	●
16	1,5	32	40	92	15,5	16	44	3	.016015	●	●	●	●
16	2	32	40	92	15,5	16	44	3	.016020	●	●	●	●
16	2,5	32	40	92	15,5	16	44	3	.016025	●	●	●	●
16	3	32	40	92	15,5	16	44	3	.016030	●	●	●	●
16	4	32	40	92	15,5	16	44	3	.016040	●	●	●	●
20	1	38	50	104	19,5	20	54	3	.020010	●	●	●	●
20	1,5	38	50	104	19,5	20	54	3	.020015	●	●	●	●
20	2	38	50	104	19,5	20	54	3	.020020	●	●	●	●
20	2,5	38	50	104	19,5	20	54	3	.020025	●	●	●	●
20	3	38	50	104	19,5	20	54	3	.020030	●	●	●	●
20	4	38	50	104	19,5	20	54	3	.020040	●	●	●	●

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

- Hochleistungswerkzeug
- Spezielle Geometrie für die Volumenzerspanung von Aluminium
- Vibrationsarme Bearbeitung
- Sehr glatte CRN-Beschichtung
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Kurze Schneidenlänge

- High performance tool
- Special geometry for high-volume machining of aluminium
- Low-vibration machining
- Very smooth CRN coating
- Internal coolant supply, radial and axial exit (ICRA)
- Short flute length

W

ICRA

HM

DIN 6535 HA HB

~ ASME B94.19

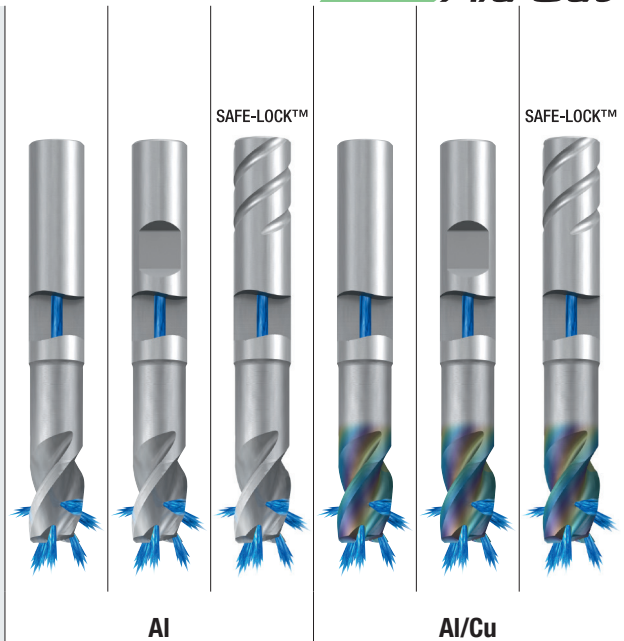
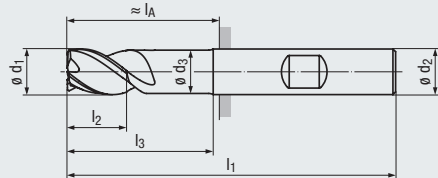
40°

KB x 45°

n max.

3-5°

v_c/f_z 82



Product Finder

NR

NF

N

WR

WF

W

v_c/f_z

HM

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

N 1.1-1.3 1.4

CRN

N 1.1-1.4 2.1-2.7

Lange Ausführung · Long design

Bestell-Code · Order code		2889_Z	2882_Z	2889_T	2889RZ	2882RZ	2889RT									
Ø d ₁	l ₂ l ₃ l ₁	Ø d ₃	Ø d ₂ h ₅	l _A	n _{max.} ²⁾ min ⁻¹	KB	Z (Flutes)	Dimens.-Code								
[mm]	6 1)	-0,02	8 20 57	5,6	6 21	30000	0,12	3	.006	●	●	○	●	●	○	
	8	-0,04	10 25 63	7,6	8 27	25000	0,12	3	.008	●	●	○	●	●	○	
	10	-0,04	13 30 72	9,5	10 32	20000	0,2	3	.010	●	●	○	●	●	○	
	12	-0,04	15 35 83	11,4	12 38	15000	0,2	4	.012	●	●	○	●	●	○	
	16	-0,04	20 46 96	15,2	16 48	12500	0,2	4	.016	●	●	○	●	●	○	
	20	-0,04	25 58 110	19	20 60	10000	0,3	4	.020	●	●	○	●	●	○	
25	-0,04	30 73 125	24	25 3)	69	8000	0,3	4	.025	●	●	○	●	●	○	
[inch]	1/4 1)	-0,0016	11/32 13/16 2 1/4	0,234	1/4	–	–	0,005	3	.0250	●	●	○	●	●	○
	5/16	-0,0016	25/64 1 2 1/2	0,297	5/16	–	–	0,005	3	.03125	●	●	○	●	●	○
	3/8	-0,0016	7/16 1 1/8 2 3/4	0,354	3/8	–	–	0,008	3	.0375	●	●	○	●	●	○
	1/2	-0,0016	5/8 1 3/8 3 1/4	0,476	1/2	–	–	0,008	4	.0500	●	●	○	●	●	○
	5/8	-0,0016	3/4 1 7/8 3 3/4	0,594	5/8	–	–	0,008	4	.0625	●	●	○	●	●	○
	3/4	-0,0016	15/16 2 4 1/4	0,711	3/4	–	–	0,012	4	.0750	●	●	○	●	●	○
	1	-0,0016	1 1/4 2 5/8 5	0,960	1	–	–	0,012	4	.1000	●	●	○	●	●	○

- 1) Kühlschmierstoffaustritt axial (ICA)
Internal coolant supply, axial exit (ICA)
- 2) Maximal zulässige Drehzahl für Hartmetall-Schafffräser mit seitlicher Mitnahmeffläche nach DIN 6535 HB
Maximum permissible revolution of solid carbide end mills with clamping flat according to DIN 6535 HB
- 3) Schaftlänge 50 mm
Shank length 50 mm

SAFE-LOCK™

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415

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

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM

- Hochleistungswerkzeug
- Spezielle Geometrie für die Volumenzerspanung von Aluminium
- Vibrationsarme Bearbeitung
- Sehr glatte CRN-Beschichtung
- Verschiedene Eckenradien pro Schneiddurchmesser
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Kurze Schneidlänge

- High performance tool
- Special geometry for high-volume machining of aluminium
- Low-vibration machining
- Very smooth CRN coating
- Several corner radii per cutting diameter
- Internal coolant supply, radial and axial exit (ICRA)
- Short flute length

W

ICRA

DIN 6535
HA
HB

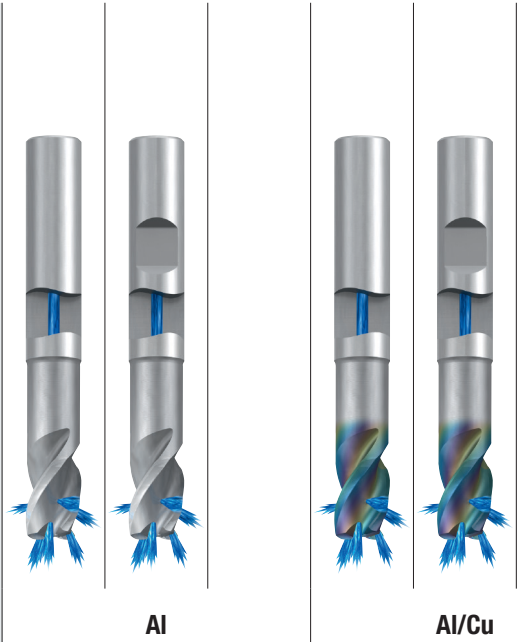
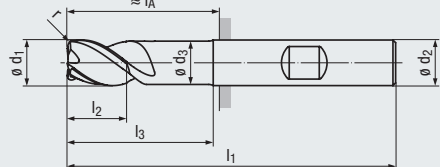
40°

ER

n
max.

3-5°

v_c / f_z
82



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 10)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

N 1.1-1.3 1.4

CRN
N 1.1-1.4 2.1-2.7

Lange Ausführung · Long design

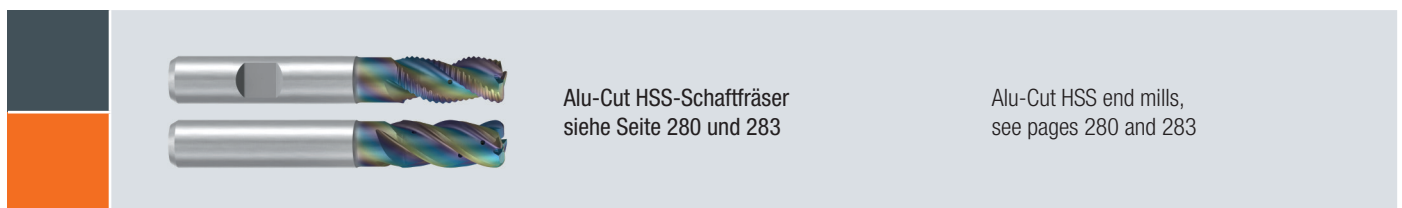
Eckenradius · Corner radius

Bestell-Code · Order code											2891_Z	2884_Z	2891RZ	2884RZ
$\varnothing d_1$ -0,04	r	l_2	l_3	l_1	$\varnothing d_3$	h_5	l_A	$n_{max.}^{2)}$ min ⁻¹	Z (Flutes)	Dimens.- Code				
12	2	15	35	83	11,4	12	38	15000	4	.012020	●	●	●	●
12	2,5	15	35	83	11,4	12	38	15000	4	.012025	●	●	●	●
12	3	15	35	83	11,4	12	38	15000	4	.012030	●	●	●	●
12	4	15	35	83	11,4	12	38	15000	4	.012040	●	●	●	●
16	2	20	46	96	15,2	16	48	12500	4	.016020	●	●	●	●
16	2,5	20	46	96	15,2	16	48	12500	4	.016025	●	●	●	●
16	3	20	46	96	15,2	16	48	12500	4	.016030	●	●	●	●
16	4	20	46	96	15,2	16	48	12500	4	.016040	●	●	●	●
20	2	25	58	110	19	20	60	10000	4	.020020	●	●	●	●
20	2,5	25	58	110	19	20	60	10000	4	.020025	●	●	●	●
20	3	25	58	110	19	20	60	10000	4	.020030	●	●	●	●
20	4	25	58	110	19	20	60	10000	4	.020040	●	●	●	●
25	2	30	73	125	24	25 ³⁾	69	8000	4	.025020	●	●	●	●
25	2,5	30	73	125	24	25 ³⁾	69	8000	4	.025025	●	●	●	●
25	3	30	73	125	24	25 ³⁾	69	8000	4	.025030	●	●	●	●
25	4	30	73	125	24	25 ³⁾	69	8000	4	.025040	●	●	●	●

Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request

2) Maximal zulässige Drehzahl für Hartmetall-Schafffräser mit seitlicher Mitnahmefläche nach DIN 6535 HB
Maximum permissible revolution of solid carbide end mills with clamping flat according to DIN 6535 HB

3) Schaftlänge 50 mm
Shank length 50 mm



Alu-Cut HSS-Schafffräser
siehe Seite 280 und 283

Alu-Cut HSS end mills,
see pages 280 and 283

- Kurze und lange Ausführung
- Schneiden zur Mitte
- 3 Baulängen verfügbar
- Short and long design
- Centre cutting
- 3 lengths available

W

HM

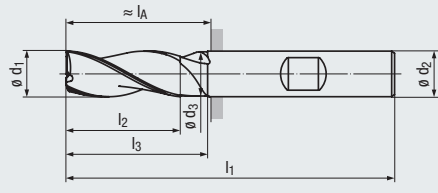
DIN 6535
HA
HB

45°

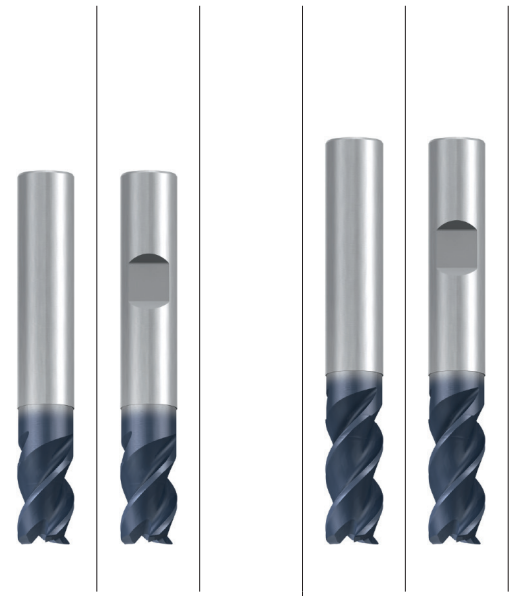
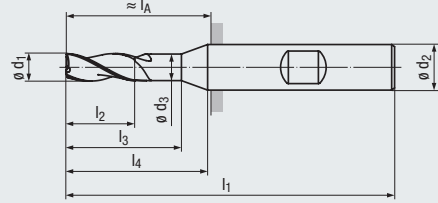
KB x 45°

V_c/f_z
89 - 90

Optional



Design I₄:



Al/Cu

Al/Cu

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

- Für alle langspanenden Werkstoffe
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 10)

- For all long-chipping materials
- Suitable for roughing and finishing

TIALN

TIALN

P	1.1-2.1	
M	1.1-2.1	
N	1.1-1.3	1.4-1.6
N	2.1-4.2	
S	1.1, 2.1	1.2-1.3

P	1.1-2.1	
M	1.1-2.1	
N	1.1-1.3	1.4-1.6
N	2.1-4.2	
S	1.1, 2.1	1.2-1.3

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code											1824A	1806A			
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code					
2	4	8	54	1,9	18	6	18	0,04	3	.002	●	●			
2,5	5	8	54	2,4	18	6	18	0,07	3	.0025	●	●			
3	6	9	54	2,9	18	6	18	0,07	3	.003	●	●			
4	8	12	54	3,8	18	6	18	0,07	3	.004	●	●			
5	9	16	54	4,8	18	6	18	0,12	3	.005	●	●			
6	10	16	54	5,8	–	6	18	0,12	3	.006	●	●			
7	12	18	58	6,7	20	8	22	0,12	3	.007	●	●			
8	12	20	58	7,7	–	8	22	0,12	3	.008	●	●			
9	14	22	66	8,7	24	10	26	0,2	3	.009	●	●			
10	14	24	66	9,7	–	10	26	0,2	3	.010	●	●			
12	16	26	73	11,6	–	12	28	0,2	3	.012	●	●			
14	18	28	75	13,6	–	14	30	0,2	3	.014	●	●			
16	22	32	82	15,5	–	16	34	0,2	3	.016	●	●			
18	24	34	84	17,5	–	18	36	0,2	3	.018	●	●			
20	26	40	92	19,5	–	20	42	0,3	3	.020	●	●			

DIN 6527 – Lange Ausführung · Long design

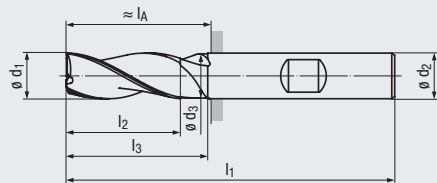
Bestell-Code · Order code														1818A	1856A
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code					
2	7	10	57	1,9	20	6	21	0,04	3	.002			●	●	
3	10	14	57	2,9	20	6	21	0,07	3	.003			●	●	
4	13	18	57	3,8	20	6	21	0,07	3	.004			●	●	
5	15	19	57	4,8	20	6	21	0,12	3	.005			●	●	
6	16	20	57	5,8	–	6	21	0,12	3	.006			●	●	
7	20	23	70	6,7	26	8	34	0,12	3	.007			●	●	
8	22	26	70	7,7	–	8	34	0,12	3	.008			●	●	
9	23	28	72	8,7	31	10	32	0,2	3	.009			●	●	
10	25	31	72	9,7	–	10	32	0,2	3	.010			●	●	
12	28	37	83	11,6	–	12	38	0,2	3	.012			●	●	
14	30	37	83	13,6	–	14	38	0,2	3	.014			●	●	
16	35	43	92	15,5	–	16	44	0,2	3	.016			●	●	
18	35	43	92	17,5	–	18	44	0,2	3	.018			●	●	
20	40	52	104	19,5	–	20	54	0,3	3	.020			●	●	

Product Finder

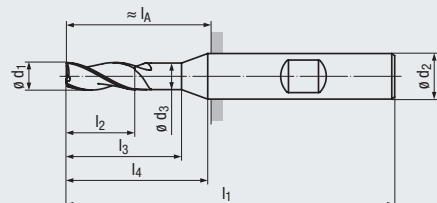
- NR
- NF
- N
- WR
- WF
- W**
- v_c / f_z

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W**
- v_c / f_z
- HM

- Extra lange Ausführung
- Schneiden zur Mitte
- 3 Baulängen verfügbar
- Extra long design
- Centre cutting
- 3 lengths available



Design l_4 :



W

HM

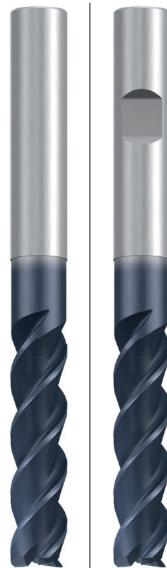
DIN 6535
 HA
 HB

45°

KB x 45°

v_c / f_z
 91

Optional



Al/Cu

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10) Applications – material (see page 10)
 - Für alle langspannenden Werkstoffe - For all long-chipping materials


P	1.1-2.1	
M	1.1-2.1	
N	1.1-1.3	1.4-1.6
N	2.1-4.2	
S	1.1, 2.1	1.2


Extra lange Ausführung · Extra long design


Bestell-Code · Order code											1956A	1957A			
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code					
3	20	24	60	—	—	6	24	0,07	3	.003	●	●			
4	30	35	75	3,8	38	6	39	0,07	3	.004	●	●			
5	30	35	75	4,8	38	6	39	0,12	3	.005	●	●			
6	40	60	100	5,8	—	6	64	0,12	3	.006	●	●			
8	40	60	100	7,7	—	8	64	0,12	3	.008	●	●			
10	40	55	100	9,7	—	10	60	0,2	3	.010	●	●			
12	45	50	100	11,6	—	12	55	0,2	3	.012	●	●			
14	45	50	100	13,6	—	14	55	0,2	3	.014	●	●			
16	65	90	150	15,5	—	16	102	0,2	3	.016	●	●			
18	65	90	150	17,5	—	18	102	0,2	3	.018	●	●			
20	65	90	150	19,5	—	20	100	0,3	3	.020	●	●			


- Ohne Stirnverzahnung
- Gegenläufiger Scherenschnitt
- Keine Gratbildung
- Kein Faserausreißen


- Without cutting face
- Alternating tooth helix direction
- No burr formation
- No delamination

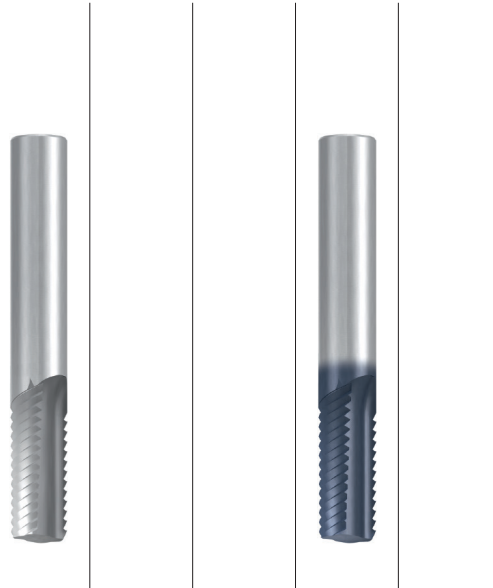
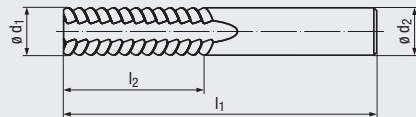
W 

HM 

DIN 6535
HA
HB 

0° 

v_c / f_z
92 



CFK/GFK

CFK/GFK

Stirnausführung · Face design



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- Für faserverstärkte Kunststoffe
- Für Thermo- und Duroplaste
- Zum Besäumen und Beschnittfräsen

- For fibre-reinforced synthetics
- For thermoplastics and duroplastics
- For periphery milling and trimming

N 4.3-4.4 4.1-4.2
N 5.3

N 4.3-4.4 4.1-4.2
N 5.3

Lange Ausführung · Long design

Bestell-Code · Order code						1931			1931A		
$\varnothing d_1$ h10	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code						
5	20	75	5	2	.005	●			●		
6	25	75	6	2	.006	●			●		
8	25	75	8	2	.008	●			●		
10	25	75	10	2	.010	●			●		
12	25	75	12	2	.012	●			●		

Product Finder

- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z
- HM 

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

- Mit Bohrerspitze
- Gegenläufiger Scherenschnitt
- Keine Gratbildung
- Kein Faserausreißen

- With drill tip
- Alternating tooth helix direction
- No burr formation
- No delamination

W

HM

DIN 6535

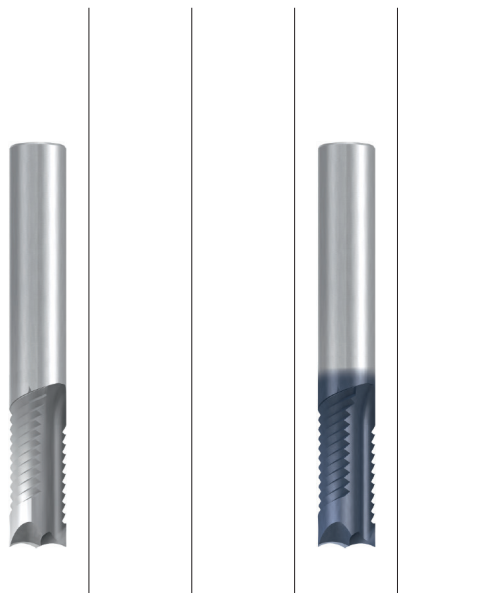
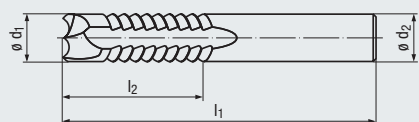
HA

HB

0°

v_c / f_z

92



CFK/GFK

CFK/GFK

Stirnausführung · Face design



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 10)

Applications – material (see page 10)

- Für faserverstärkte Kunststoffe
- Für Thermo- und Duroplaste
- Zum Bohren, Besäumen und Beschnittfräsen

- For fibre-reinforced synthetics
- For thermoplastics and duroplastics
- For drilling, periphery milling and trimming

N 4.3-4.4 4.1-4.2
N 5.3

TIALN
N 4.3-4.4 4.1-4.2
N 5.3

Lange Ausführung · Long design

Bestell-Code · Order code						1932			1932A		
$\varnothing d_1$ h10	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code						
5	25	75	5	2	.005	●			●		
6	30	75	6	2	.006	●			●		
8	30	75	8	2	.008	●			●		
10	30	75	10	2	.010	●			●		
12	30	75	12	2	.012	●			●		

- Linksspiralig, rechtsschneidend
- Spanabfuhr in Richtung Fräserstirn
- Eingeschränkte Schneidendurchmesser-Toleranz
- Schneiden zur Mitte
- Left-hand spiral flutes, right-hand cutting
- Chip evacuation towards cutting face
- Tighter cutting diameter tolerance
- Centre cutting

W

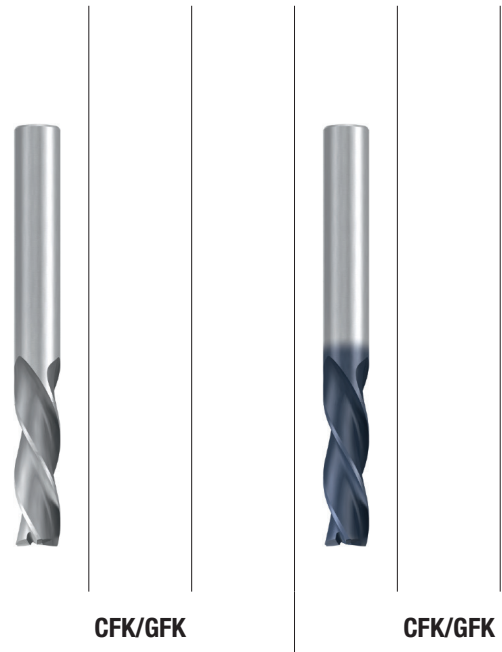
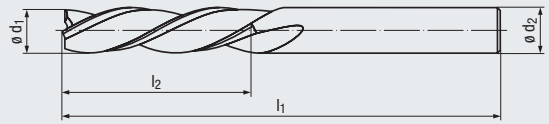
HM

DIN 6535

LH 30°

KB x 45°

v_c / f_z



CFK/GFK

CFK/GFK

Beschichtung · Coating			TIALN												
Einsatzgebiete – Material (siehe Seite 10)	Applications – material (see page 10)														
<ul style="list-style-type: none"> - Für faserverstärkte Kunststoffe - Auch für Verbundwerkstoffe geeignet - Speziell zum Beschnittfräsen mit Robotern 	<ul style="list-style-type: none"> - For fibre-reinforced synthetics - Also suitable for composite materials - Especially for trimming with robots 	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">N</td> <td style="width: 30%;">4.3-4.4</td> <td style="width: 10%;">4.1</td> </tr> <tr> <td>N</td> <td>5.3</td> <td></td> </tr> </table>	N	4.3-4.4	4.1	N	5.3		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">N</td> <td style="width: 30%;">4.3-4.4</td> <td style="width: 10%;">4.1</td> </tr> <tr> <td>N</td> <td>5.3</td> <td></td> </tr> </table>	N	4.3-4.4	4.1	N	5.3	
N	4.3-4.4	4.1													
N	5.3														
N	4.3-4.4	4.1													
N	5.3														

Lange Ausführung · Long design

Bestell-Code · Order code								2818			2818A			
$\varnothing d_1$	l_2	l_1	$\varnothing d_2$ h5	KB	Z (Flutes)	Dimens.-Code								
4	-0,02	20	75	6	0,08	3	.004	●			●			
5	-0,02	22	75	6	0,08	3	.005	●			●			
6	-0,02	25	75	6	0,08	3	.006	●			●			
8	-0,04	30	75	8	0,12	3	.008	●			●			

Product Finder

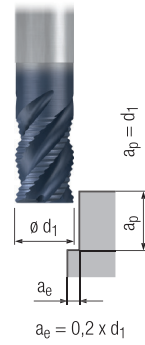
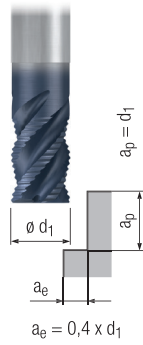
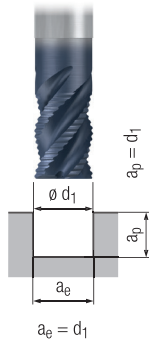
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

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

NR

Gültig für · Valid for

2892A 2896A
2893A 2897A



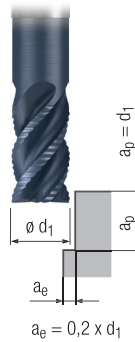
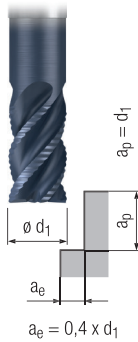
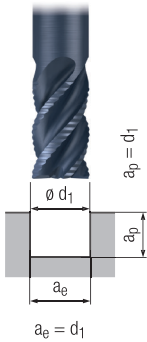
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P										
1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$		□		■
2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$		□		■
3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,005 \times d_1$	□	■		■
4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		
5.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	□	■		
M										
1.1	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
2.1	50	$0,003 \times d_1$	60	$0,004 \times d_1$	70	$0,004 \times d_1$				■
3.1										
4.1										
K										
1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	■	■		
1.2	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	■	■		
2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	■	■		
2.2	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	■	■		
3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$	■	■		
3.2	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$	■	■		
4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	■	■		
4.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	■	■		
N										
1.1										
1.2										
1.3										
1.4										
1.5										
1.6										
2.1	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$				■
2.2	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$				■
2.3	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$		□		■
2.4	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$				■
2.5	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$				■
2.6	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$		□		■
2.7										
2.8										
3.1										
3.2										
4.1	240	$0,008 \times d_1$	290	$0,009 \times d_1$	340	$0,011 \times d_1$		□		■
4.2										
4.3										
4.4										
5.1										
5.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
5.3										
S										
1.1	60	$0,004 \times d_1$	70	$0,004 \times d_1$	80	$0,005 \times d_1$				■
1.2										
1.3										
2.1										
2.2										
2.3										
2.4										
2.5										
2.6										
H										
1.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	□	■		
1.2										
1.3										
1.4										
1.5										

Hartmetall-Schafffräser – lange Ausführung mit kurzer Schneidenlänge
Solid carbide end mills – long design with short flute length

NR

Gültig für · Valid for
2869A 2869AZ

- NR
- NF
- N
- WR
- WF
- W



v_c / f_z

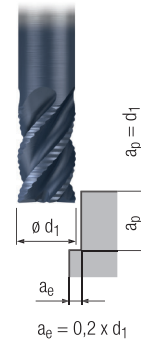
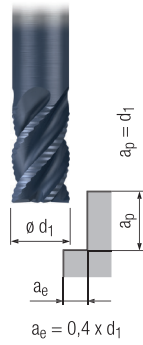
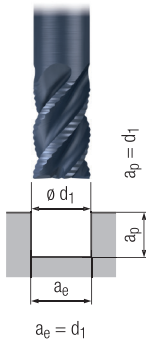
	V _c [m/min]	f _z [mm]	V _c [m/min]	f _z [mm]	V _c [m/min]	f _z [mm]	MMS MQL				
P	1.1	160	0,007 x d ₁	180	0,008 x d ₁	200	0,009 x d ₁	☐	☐	☐	■
	2.1	150	0,006 x d ₁	170	0,007 x d ₁	190	0,008 x d ₁	☐	☐	☐	■
	3.1	140	0,005 x d ₁	160	0,006 x d ₁	180	0,007 x d ₁	☐	■	☐	■
	4.1	120	0,004 x d ₁	140	0,005 x d ₁	150	0,005 x d ₁	☐	■		
	5.1	100	0,004 x d ₁	120	0,004 x d ₁	130	0,005 x d ₁	☐	■		
M	1.1	80	0,004 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁				■
	2.1	60	0,004 x d ₁	70	0,005 x d ₁	80	0,005 x d ₁				■
	3.1										
	4.1										
K	1.1	160	0,007 x d ₁	180	0,008 x d ₁	200	0,009 x d ₁	☐	■		
	1.2	160	0,007 x d ₁	180	0,008 x d ₁	200	0,009 x d ₁	☐	■		
	2.1	140	0,006 x d ₁	160	0,006 x d ₁	180	0,007 x d ₁	☐	■		
	2.2	140	0,006 x d ₁	160	0,006 x d ₁	180	0,007 x d ₁	☐	■		
	3.1	120	0,006 x d ₁	140	0,006 x d ₁	150	0,007 x d ₁	☐	■		
	3.2	120	0,006 x d ₁	140	0,006 x d ₁	150	0,007 x d ₁	☐	■		
	4.1	100	0,004 x d ₁	120	0,005 x d ₁	130	0,005 x d ₁	☐	■		
	4.2	80	0,004 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁	☐	■		
N	1.1										
	1.2	480	0,009 x d ₁	550	0,010 x d ₁	600	0,011 x d ₁				■
	1.3	480	0,009 x d ₁	550	0,010 x d ₁	600	0,012 x d ₁				■
	1.4	320	0,009 x d ₁	370	0,010 x d ₁	400	0,011 x d ₁				■
	1.5										
	1.6										
	2.1	140	0,007 x d ₁	160	0,008 x d ₁	180	0,009 x d ₁			☐	■
	2.2	140	0,007 x d ₁	160	0,008 x d ₁	180	0,009 x d ₁			☐	■
	2.3	140	0,007 x d ₁	160	0,008 x d ₁	180	0,009 x d ₁		☐	☐	■
	2.4	130	0,006 x d ₁	150	0,006 x d ₁	160	0,007 x d ₁			☐	■
	2.5	130	0,006 x d ₁	150	0,006 x d ₁	160	0,007 x d ₁			☐	■
	2.6	130	0,006 x d ₁	150	0,006 x d ₁	160	0,007 x d ₁			☐	■
	2.7	80	0,004 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁		☐	☐	■
	2.8	80	0,004 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁				■
	3.1										
	3.2										
4.1	320	0,011 x d ₁	370	0,012 x d ₁	400	0,014 x d ₁		☐	☐	■	
4.2											
4.3											
4.4											
5.1											
5.2	80	0,004 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁				■	
5.3											
S	1.1	80	0,005 x d ₁	90	0,006 x d ₁	100	0,006 x d ₁				■
	1.2	60	0,004 x d ₁	70	0,005 x d ₁	80	0,005 x d ₁				■
	1.3	40	0,004 x d ₁	50	0,004 x d ₁	50	0,005 x d ₁				■
	2.1										
	2.2										
	2.3										
	2.4										
2.5											
2.6											
H	1.1	80	0,004 x d ₁	90	0,004 x d ₁	100	0,005 x d ₁	☐	■		
	1.2										
	1.3										
	1.4										
	1.5										



Hartmetall-Schafffräser – extra lange Ausführung mit kurzer Schneidenlänge
Solid carbide end mills – extra long design with short flute length

NR

Gültig für · Valid for
2875A



		V_c	f_z	V_c	f_z	V_c	f_z			MMS MQL		
		[m/min]	[mm]	[m/min]	[mm]	[m/min]	[mm]					
P	1.1	130	$0,005 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1	110	$0,004 \times d_1$	120	$0,004 \times d_1$	130	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	5.1	80	$0,003 \times d_1$	90	$0,003 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
M	1.1											
	2.1											
	3.1											
	4.1											
K	1.1	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.2	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.1	120	$0,004 \times d_1$	130	$0,004 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.2	120	$0,004 \times d_1$	130	$0,004 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.1	100	$0,004 \times d_1$	110	$0,004 \times d_1$	120	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.2	100	$0,004 \times d_1$	110	$0,004 \times d_1$	120	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.1	80	$0,003 \times d_1$	90	$0,003 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
N	1.1											
	1.2											
	1.3											
	1.4											
	1.5											
	1.6											
	2.1	120	$0,005 \times d_1$	130	$0,006 \times d_1$	140	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.2	120	$0,005 \times d_1$	130	$0,006 \times d_1$	140	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.3	120	$0,005 \times d_1$	130	$0,006 \times d_1$	140	$0,006 \times d_1$		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4	110	$0,004 \times d_1$	120	$0,004 \times d_1$	130	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.5	110	$0,004 \times d_1$	120	$0,004 \times d_1$	130	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.6	110	$0,004 \times d_1$	120	$0,004 \times d_1$	130	$0,005 \times d_1$		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.7	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$				<input checked="" type="checkbox"/>	
	2.8	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$				<input checked="" type="checkbox"/>	
	3.1											
	3.2											
4.1	270	$0,008 \times d_1$	300	$0,008 \times d_1$	320	$0,009 \times d_1$		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.2												
4.3												
4.4												
5.1												
5.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$					<input checked="" type="checkbox"/>	
5.3												
S	1.1											
	1.2											
	1.3											
	2.1											
	2.2											
	2.3											
	2.4											
2.5												
2.6												
H	1.1	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.2											
	1.3											
	1.4											
	1.5											

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



Product Finder

NR

NF

N

H

WR

WF

W

v_c / f_z

HM

Hartmetall-Schafffräser „DUPLEX“ – lange und extra lange Ausführung

Solid carbide end mills "DUPLEX" – long and extra long design

Gültig für · Valid for

2614AT 2615AZ 2616AZ
2614AZ 2616AT 2617AZ



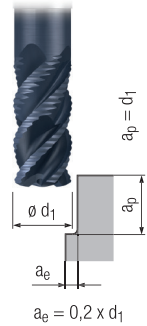
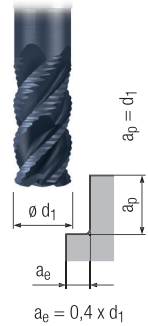
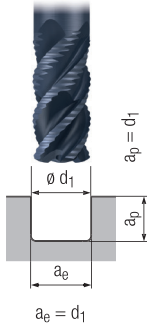
NR

HPC

Shruppbearbeitung mit der Umfangsschneide
Roughing with circumference cutting edge

HSC

Hochvorschubbearbeitung mit der Stirnschneide
High feed roughing with face cutting edge



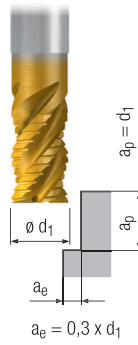
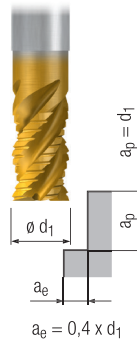
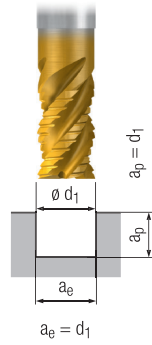
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	a_e [mm]					
P	1.1	170	0,005 x d_1	190	0,006 x d_1	200	0,007 x d_1	220	0,038 x d_1	0,05 x d_1	0,5 x d_1	□	■	□	■
	2.1	150	0,005 x d_1	170	0,005 x d_1	180	0,006 x d_1	200	0,034 x d_1	0,05 x d_1	0,5 x d_1	□	■	□	■
	3.1	130	0,004 x d_1	140	0,005 x d_1	160	0,005 x d_1	170	0,030 x d_1	0,04 x d_1	0,4 x d_1	□	■	□	□
	4.1	120	0,003 x d_1	130	0,004 x d_1	140	0,004 x d_1	160	0,024 x d_1	0,03 x d_1	0,3 x d_1	□	■	□	□
	5.1	110	0,003 x d_1	120	0,003 x d_1	130	0,004 x d_1	140	0,022 x d_1	0,03 x d_1	0,3 x d_1	□	■	□	□
M	1.1														
	2.1														
	3.1														
	4.1														
K	1.1	170	0,006 x d_1	190	0,006 x d_1	200	0,007 x d_1	220	0,040 x d_1	0,06 x d_1	0,6 x d_1	□	■	□	□
	1.2	170	0,006 x d_1	190	0,006 x d_1	200	0,007 x d_1	220	0,040 x d_1	0,06 x d_1	0,6 x d_1	□	■	□	□
	2.1	150	0,005 x d_1	170	0,005 x d_1	180	0,006 x d_1	200	0,032 x d_1	0,05 x d_1	0,5 x d_1	□	■	□	□
	2.2	150	0,005 x d_1	170	0,005 x d_1	180	0,006 x d_1	200	0,032 x d_1	0,05 x d_1	0,5 x d_1	□	■	□	□
	3.1	130	0,005 x d_1	140	0,005 x d_1	160	0,006 x d_1	170	0,032 x d_1	0,05 x d_1	0,5 x d_1	□	■	□	□
	3.2	130	0,005 x d_1	140	0,005 x d_1	160	0,006 x d_1	170	0,032 x d_1	0,05 x d_1	0,5 x d_1	□	■	□	□
	4.1	100	0,003 x d_1	110	0,004 x d_1	120	0,004 x d_1	130	0,024 x d_1	0,03 x d_1	0,3 x d_1	□	■	□	□
4.2	80	0,003 x d_1	90	0,004 x d_1	100	0,004 x d_1	100	0,024 x d_1	0,03 x d_1	0,3 x d_1	□	■	□	□	
N	1.1														
	1.2														
	1.3														
	1.4														
	1.5														
	1.6														
	2.1														
	2.2														
	2.3	150	0,006 x d_1	170	0,006 x d_1	180	0,007 x d_1	200	0,040 x d_1	0,06 x d_1	0,6 x d_1			□	■
	2.4														
	2.5														
	2.6	130	0,005 x d_1	140	0,005 x d_1	160	0,006 x d_1	170	0,032 x d_1	0,05 x d_1	0,5 x d_1			□	■
	2.7														
	2.8														
	3.1														
	3.2														
4.1															
4.2															
4.3															
4.4															
5.1															
5.2	80	0,003 x d_1	90	0,004 x d_1	100	0,004 x d_1	100	0,024 x d_1	0,03 x d_1	0,3 x d_1			□	■	
5.3															
S	1.1														
	1.2														
	1.3														
	2.1														
	2.2														
	2.3														
	2.4														
2.5															
2.6															
H	1.1	80	0,003 x d_1	90	0,003 x d_1	100	0,004 x d_1	100	0,022 x d_1	0,03 x d_1	0,3 x d_1	□	■		
	1.2	80	0,003 x d_1	90	0,003 x d_1	100	0,004 x d_1	100	0,020 x d_1	0,03 x d_1	0,3 x d_1	□	■		
	1.3														
	1.4														
	1.5														

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

NF

Gültig für · Valid for

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



		V _c [m/min]		f _z [mm]		MMS MQL	Coolant	Chipbreaker	V _c / f _z	
		V _c	f _z	V _c	f _z					
P	1.1	120	0,005 x d ₁	140	0,006 x d ₁					
	2.1	110	0,004 x d ₁	130	0,005 x d ₁					
	3.1	90	0,004 x d ₁	110	0,005 x d ₁					
	4.1	70	0,003 x d ₁	80	0,004 x d ₁					
	5.1	60	0,003 x d ₁	70	0,003 x d ₁					
M	1.1	100	0,004 x d ₁	120	0,004 x d ₁					
	2.1	80	0,004 x d ₁	100	0,004 x d ₁					
	3.1	50	0,003 x d ₁	60	0,003 x d ₁					
	4.1	40	0,003 x d ₁	50	0,003 x d ₁					
K	1.1	120	0,005 x d ₁	140	0,006 x d ₁					
	1.2	120	0,005 x d ₁	140	0,006 x d ₁					
	2.1	110	0,004 x d ₁	130	0,005 x d ₁					
	2.2	110	0,004 x d ₁	130	0,005 x d ₁					
	3.1	90	0,004 x d ₁	110	0,005 x d ₁					
	3.2	90	0,004 x d ₁	110	0,005 x d ₁					
	4.1	70	0,003 x d ₁	80	0,004 x d ₁					
	4.2	60	0,003 x d ₁	70	0,004 x d ₁					
N	1.1									
	1.2									
	1.3									
	1.4									
	1.5									
	1.6									
	2.1	110	0,005 x d ₁	130	0,006 x d ₁	150	0,007 x d ₁	180	0,008 x d ₁	
	2.2	110	0,005 x d ₁	130	0,006 x d ₁	150	0,007 x d ₁	180	0,008 x d ₁	
	2.3	110	0,005 x d ₁	130	0,006 x d ₁	150	0,007 x d ₁	180	0,008 x d ₁	
	2.4	100	0,004 x d ₁	120	0,005 x d ₁	140	0,006 x d ₁	160	0,006 x d ₁	
	2.5	100	0,004 x d ₁	120	0,005 x d ₁	140	0,006 x d ₁	160	0,006 x d ₁	
	2.6	100	0,004 x d ₁	120	0,005 x d ₁	140	0,006 x d ₁	160	0,006 x d ₁	
	2.7	60	0,003 x d ₁	70	0,004 x d ₁	80	0,004 x d ₁	100	0,005 x d ₁	
	2.8	60	0,003 x d ₁	70	0,004 x d ₁	80	0,004 x d ₁	100	0,005 x d ₁	
	3.1									
	3.2									
4.1										
4.2										
4.3										
4.4										
5.1										
5.2	60	0,003 x d ₁	70	0,004 x d ₁	80	0,004 x d ₁	100	0,005 x d ₁		
5.3										
S	1.1	70	0,005 x d ₁	80	0,005 x d ₁	100	0,006 x d ₁	110	0,007 x d ₁	
	1.2	60	0,004 x d ₁	70	0,004 x d ₁	80	0,005 x d ₁	100	0,006 x d ₁	
	1.3	30	0,003 x d ₁	40	0,003 x d ₁	40	0,004 x d ₁	50	0,004 x d ₁	
	2.1	70	0,004 x d ₁	80	0,004 x d ₁	100	0,005 x d ₁	110	0,006 x d ₁	
	2.2	20	0,003 x d ₁	20	0,004 x d ₁	25	0,004 x d ₁	30	0,005 x d ₁	
	2.3	10	0,002 x d ₁	15	0,002 x d ₁	15	0,003 x d ₁	20	0,003 x d ₁	
2.4	20	0,003 x d ₁	25	0,003 x d ₁	35	0,004 x d ₁	30	0,004 x d ₁		
2.5	10	0,002 x d ₁	10	0,002 x d ₁	10	0,003 x d ₁	20	0,003 x d ₁		
2.6	10	0,003 x d ₁	10	0,003 x d ₁	10	0,004 x d ₁	20	0,004 x d ₁		
H	1.1									
	1.2									
	1.3									
	1.4									
	1.5									

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



- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

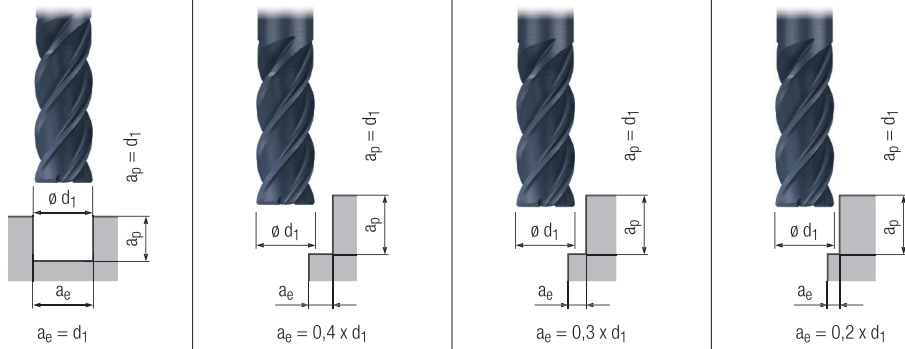


Hartmetall-Schafffräser – extra lange Ausführung
 Solid carbide end mills – extra long design

N

Gültig für · Valid for

2650AT 2651AZ 2652AZ
 2650AZ 2652AT 2653AZ



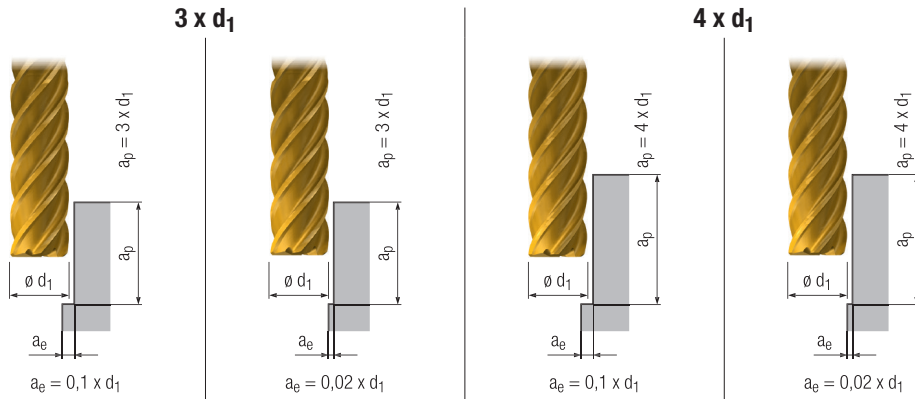
		Vc		fz		Vc		fz					
		[m/min]	[mm]	[m/min]	[mm]	[m/min]	[mm]	[m/min]	[mm]				
P	1.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,005 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	100	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	80	$0,003 \times d_1$	100	$0,004 \times d_1$	110	$0,004 \times d_1$	130	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	50	$0,003 \times d_1$	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
M	1.1	90	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,004 \times d_1$	60	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	30	$0,002 \times d_1$	40	$0,003 \times d_1$	40	$0,003 \times d_1$	50	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	100	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	100	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	80	$0,003 \times d_1$	100	$0,004 \times d_1$	110	$0,004 \times d_1$	130	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	80	$0,003 \times d_1$	100	$0,004 \times d_1$	110	$0,004 \times d_1$	130	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	60	$0,002 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	50	$0,002 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1												
	1.2												
	1.3												
	1.4	290	$0,006 \times d_1$	350	$0,008 \times d_1$	410	$0,009 \times d_1$	460	$0,010 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	230	$0,006 \times d_1$	280	$0,007 \times d_1$	320	$0,008 \times d_1$	370	$0,009 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6	140	$0,005 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	220	$0,008 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	90	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	90	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	90	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	50	$0,002 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	50	$0,002 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1												
	3.2												
	4.1												
	4.2												
4.3													
4.4													
5.1													
5.2	50	$0,002 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$				<input checked="" type="checkbox"/>	
5.3													
S	1.1	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	50	$0,002 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	30	$0,002 \times d_1$	40	$0,002 \times d_1$	40	$0,003 \times d_1$	50	$0,003 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	20	$0,002 \times d_1$	20	$0,003 \times d_1$	25	$0,003 \times d_1$	30	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	10	$0,002 \times d_1$	15	$0,002 \times d_1$	15	$0,003 \times d_1$	20	$0,003 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	20	$0,002 \times d_1$	25	$0,003 \times d_1$	35	$0,003 \times d_1$	30	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	10	$0,002 \times d_1$	10	$0,002 \times d_1$	10	$0,003 \times d_1$	20	$0,003 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.6	10	$0,002 \times d_1$	10	$0,003 \times d_1$	10	$0,003 \times d_1$	20	$0,004 \times d_1$	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

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

Gültig für · Valid for

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

N



		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	120	0,005 x d ₁	140	0,006 x d ₁	100	0,005 x d ₁	120	0,005 x d ₁	☐	■	☐	■
	2.1	110	0,004 x d ₁	130	0,005 x d ₁	90	0,004 x d ₁	110	0,005 x d ₁	☐	■	☐	■
	3.1	90	0,004 x d ₁	110	0,005 x d ₁	70	0,004 x d ₁	90	0,004 x d ₁	☐	■	☐	■
	4.1	70	0,003 x d ₁	80	0,004 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁	☐	■		
	5.1	60	0,003 x d ₁	70	0,003 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁	☐	■		
M	1.1	120	0,003 x d ₁	140	0,004 x d ₁	100	0,003 x d ₁	120	0,003 x d ₁				■
	2.1	100	0,003 x d ₁	120	0,004 x d ₁	80	0,003 x d ₁	100	0,003 x d ₁				■
	3.1	70	0,003 x d ₁	80	0,003 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁				■
	4.1	50	0,003 x d ₁	60	0,003 x d ₁	40	0,003 x d ₁	50	0,003 x d ₁				■
K	1.1	120	0,005 x d ₁	140	0,006 x d ₁	100	0,005 x d ₁	120	0,006 x d ₁	☐	■		
	1.2	120	0,005 x d ₁	140	0,006 x d ₁	100	0,005 x d ₁	120	0,006 x d ₁	☐	■		
	2.1	110	0,004 x d ₁	130	0,005 x d ₁	90	0,004 x d ₁	110	0,004 x d ₁	☐	■		
	2.2	110	0,004 x d ₁	130	0,005 x d ₁	90	0,004 x d ₁	110	0,004 x d ₁	☐	■		
	3.1	90	0,004 x d ₁	110	0,005 x d ₁	70	0,004 x d ₁	90	0,004 x d ₁	☐	■		
	3.2	90	0,004 x d ₁	110	0,005 x d ₁	70	0,004 x d ₁	90	0,004 x d ₁	☐	■		
	4.1	70	0,003 x d ₁	80	0,004 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁	☐	■		
	4.2	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁	☐	■		
N	1.1	360	0,009 x d ₁	430	0,011 x d ₁	300	0,009 x d ₁	430	0,009 x d ₁			☐	■
	1.2	360	0,008 x d ₁	430	0,010 x d ₁	300	0,008 x d ₁	430	0,009 x d ₁			☐	■
	1.3	360	0,007 x d ₁	430	0,008 x d ₁	300	0,007 x d ₁	430	0,008 x d ₁			☐	■
	1.4	240	0,008 x d ₁	290	0,010 x d ₁	200	0,008 x d ₁	290	0,009 x d ₁			☐	■
	1.5	230	0,007 x d ₁	280	0,008 x d ₁	180	0,007 x d ₁	280	0,008 x d ₁			☐	■
	1.6	160	0,006 x d ₁	190	0,007 x d ₁	130	0,006 x d ₁	190	0,007 x d ₁			☐	■
	2.1	110	0,005 x d ₁	130	0,006 x d ₁	90	0,005 x d ₁	110	0,006 x d ₁			☐	■
	2.2	110	0,005 x d ₁	130	0,006 x d ₁	90	0,005 x d ₁	110	0,006 x d ₁			☐	■
	2.3	110	0,005 x d ₁	130	0,006 x d ₁	90	0,005 x d ₁	110	0,006 x d ₁	☐	■		
	2.4	100	0,004 x d ₁	120	0,005 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁			☐	■
	2.5	100	0,004 x d ₁	120	0,005 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁			☐	■
	2.6	100	0,004 x d ₁	120	0,005 x d ₁	80	0,004 x d ₁	100	0,004 x d ₁			☐	■
	2.7	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁			☐	■
	2.8	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁			☐	■
	3.1												
	3.2												
4.1													
4.2													
4.3													
4.4													
5.1													
5.2	60	0,003 x d ₁	70	0,004 x d ₁	50	0,003 x d ₁	60	0,003 x d ₁				■	
5.3													
S	1.1	90	0,004 x d ₁	100	0,005 x d ₁	70	0,004 x d ₁	80	0,004 x d ₁				■
	1.2	70	0,003 x d ₁	80	0,004 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁				■
	1.3	70	0,003 x d ₁	80	0,003 x d ₁	60	0,003 x d ₁	70	0,003 x d ₁				■
	2.1	70	0,004 x d ₁	80	0,004 x d ₁	60	0,004 x d ₁	70	0,004 x d ₁				■
	2.2	30	0,003 x d ₁	40	0,004 x d ₁	15	0,003 x d ₁	30	0,003 x d ₁				■
	2.3	20	0,002 x d ₁	25	0,002 x d ₁	25	0,002 x d ₁	20	0,002 x d ₁				■
	2.4	30	0,003 x d ₁	45	0,003 x d ₁	25	0,003 x d ₁	30	0,003 x d ₁				■
2.5	20	0,002 x d ₁	20	0,002 x d ₁	20	0,002 x d ₁	20	0,002 x d ₁				■	
2.6	20	0,003 x d ₁	20	0,003 x d ₁	20	0,003 x d ₁	20	0,003 x d ₁				■	
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

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

Hartmetall-Schafffräser „DUPLEX“ – lange und extra lange Ausführung
Solid carbide end mills “DUPLEX” – long and extra long design

Gültig für · Valid for

2610AT 2611AZ 2612AZ
2610AZ 2612AT 2613AZ

NR

NF

N

WR

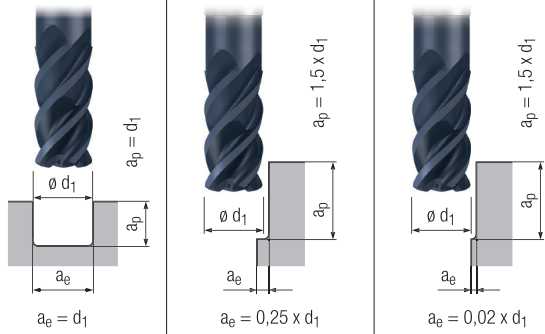
WF

W

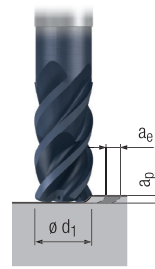
v_c / f_z



HPC / HSC
Bearbeitung mit der Umfangsschneide
Roughing with circumference cutting edge



HSC
Hochvorschubbearbeitung mit der Stirnschneide
High feed roughing with face cutting edge



N

		HPC / HSC		N		HSC		a_p [mm]	a_e [mm]							
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			v_c [m/min]	f_z [mm]					
P	1.1	170	0,005 x d_1	190	0,006 x d_1	200	0,007 x d_1	240	0,038 x d_1	0,05 x d_1	0,6 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1	160	0,005 x d_1	180	0,005 x d_1	190	0,006 x d_1	220	0,034 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1	150	0,004 x d_1	170	0,005 x d_1	180	0,005 x d_1	210	0,030 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	4.1	140	0,003 x d_1	150	0,004 x d_1	170	0,004 x d_1	200	0,024 x d_1	0,03 x d_1	0,4 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	5.1	130	0,003 x d_1	140	0,003 x d_1	160	0,004 x d_1	180	0,022 x d_1	0,03 x d_1	0,3 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
M	1.1															
	2.1															
	3.1															
	4.1															
K	1.1	170	0,006 x d_1	190	0,006 x d_1	200	0,007 x d_1	240	0,040 x d_1	0,05 x d_1	0,6 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	1.2	170	0,006 x d_1	190	0,006 x d_1	200	0,007 x d_1	240	0,040 x d_1	0,05 x d_1	0,6 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2.1	150	0,005 x d_1	170	0,005 x d_1	180	0,006 x d_1	210	0,032 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2.2	150	0,005 x d_1	170	0,005 x d_1	180	0,006 x d_1	210	0,032 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3.1	130	0,005 x d_1	140	0,005 x d_1	160	0,006 x d_1	180	0,032 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3.2	130	0,005 x d_1	140	0,005 x d_1	160	0,006 x d_1	180	0,032 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	4.1	100	0,003 x d_1	110	0,004 x d_1	120	0,004 x d_1	140	0,024 x d_1	0,03 x d_1	0,4 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	80	0,003 x d_1	90	0,004 x d_1	100	0,004 x d_1	110	0,024 x d_1	0,03 x d_1	0,4 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
N	1.1															
	1.2															
	1.3															
	1.4															
	1.5															
	1.6															
	2.1															
	2.2															
	2.3	150	0,006 x d_1	170	0,006 x d_1	180	0,007 x d_1	210	0,040 x d_1	0,05 x d_1	0,6 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4															
	2.5															
	2.6	130	0,005 x d_1	140	0,005 x d_1	160	0,006 x d_1	180	0,032 x d_1	0,04 x d_1	0,5 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.7															
	2.8															
	3.1															
3.2																
4.1																
4.2																
4.3																
4.4																
5.1																
5.2	80	0,003 x d_1	90	0,004 x d_1	100	0,004 x d_1	110	0,024 x d_1	0,03 x d_1	0,4 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5.3																
S	1.1															
	1.2															
	1.3															
	2.1															
	2.2															
	2.6															
H	1.1	100	0,003 x d_1	110	0,004 x d_1	120	0,004 x d_1	140	0,024 x d_1	0,03 x d_1	0,4 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2	80	0,003 x d_1	90	0,003 x d_1	100	0,004 x d_1	110	0,020 x d_1	0,03 x d_1	0,3 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3	70	0,002 x d_1	80	0,003 x d_1	80	0,003 x d_1	100	0,016 x d_1	0,02 x d_1	0,3 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.4			80	0,002 x d_1	80	0,003 x d_1	100	0,014 x d_1	0,02 x d_1	0,2 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.5			70	0,002 x d_1	70	0,002 x d_1	80	0,012 x d_1	0,02 x d_1	0,2 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

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

HM



- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W

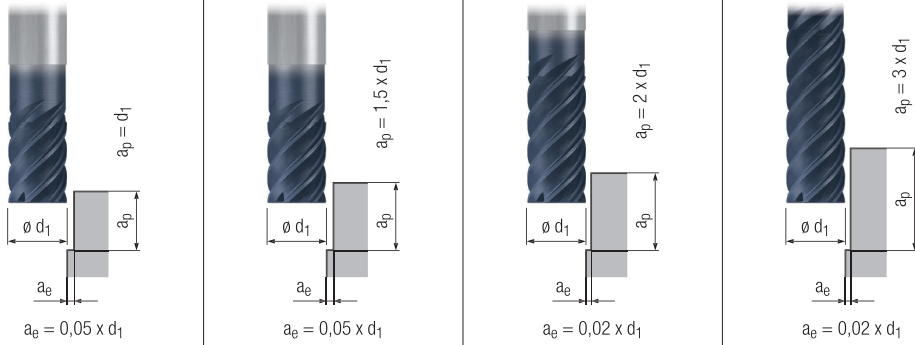


Hartmetall-Schafffräser – kurze, lange und extra lange Ausführung Solid carbide end mills – short, long and extra long design

H

Gültig für · Valid for

1825A	1927A	2816A
1827A	1928A	2817A
1828A	2812A	
1925A	2813A	



		Vc [m/min]		fz [mm]								
		Vc	fz	Vc	fz							
P	1.1	210	0,005 x d ₁	170	0,004 x d ₁	240	0,005 x d ₁	150	0,005 x d ₁	□	■	□
	2.1	190	0,004 x d ₁	150	0,004 x d ₁	220	0,005 x d ₁	130	0,004 x d ₁	□	■	□
	3.1	170	0,004 x d ₁	140	0,003 x d ₁	200	0,004 x d ₁	120	0,004 x d ₁	□	■	□
	4.1	150	0,003 x d ₁	120	0,003 x d ₁	170	0,003 x d ₁	110	0,003 x d ₁	□	■	□
	5.1	130	0,003 x d ₁	100	0,003 x d ₁	150	0,003 x d ₁	90	0,003 x d ₁	□	■	□
M	1.1											
	2.1											
	3.1											
	4.1											
K	1.1	210	0,005 x d ₁	170	0,005 x d ₁	240	0,006 x d ₁	150	0,005 x d ₁	□	■	
	1.2	210	0,005 x d ₁	170	0,005 x d ₁	240	0,006 x d ₁	150	0,005 x d ₁	□	■	
	2.1	180	0,004 x d ₁	140	0,004 x d ₁	210	0,004 x d ₁	130	0,004 x d ₁	□	■	
	2.2	180	0,004 x d ₁	140	0,004 x d ₁	210	0,004 x d ₁	130	0,004 x d ₁	□	■	
	3.1	160	0,004 x d ₁	130	0,004 x d ₁	180	0,004 x d ₁	110	0,004 x d ₁	□	■	
	3.2	160	0,004 x d ₁	130	0,004 x d ₁	180	0,004 x d ₁	110	0,004 x d ₁	□	■	
	4.1	130	0,003 x d ₁	100	0,003 x d ₁	150	0,003 x d ₁	90	0,003 x d ₁	□	■	
	4.2	110	0,003 x d ₁	90	0,003 x d ₁	130	0,003 x d ₁	80	0,003 x d ₁	□	■	
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												
2.6												
H	1.1	130	0,004 x d ₁	100	0,003 x d ₁	150	0,004 x d ₁	90	0,004 x d ₁	□	■	
	1.2	110	0,003 x d ₁	90	0,003 x d ₁	130	0,003 x d ₁	80	0,003 x d ₁	□	■	
	1.3	90	0,003 x d ₁	70	0,002 x d ₁	100	0,003 x d ₁	60	0,003 x d ₁	□	■	
	1.4	80	0,002 x d ₁	60	0,002 x d ₁	90	0,002 x d ₁	60	0,002 x d ₁	□	■	
	1.5	70	0,002 x d ₁	60	0,001 x d ₁	80	0,002 x d ₁	50	0,002 x d ₁	□	■	

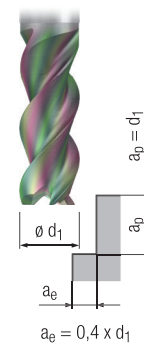
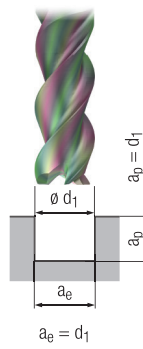
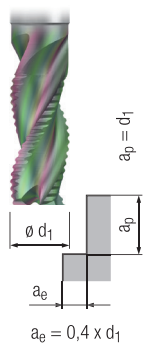
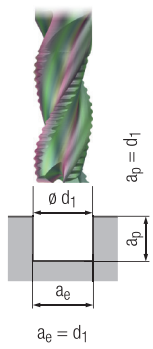




Hartmetall-Schaftfräser – lange Ausführung
Solid carbide end mills – long design

WR

W



Gültig für · Valid for

2544	2546	2548
2544K	2546K	2548K
2545	2547	2549
2545K	2547K	2549K

Achtung:
Bei unbeschichteter Ausführung ist die Schnittgeschwindigkeit v_c um 30% zu reduzieren!

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!

v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]
------------------	---------------	------------------	---------------	------------------	---------------	------------------	---------------



Material Group	Series	WR		W		Coolant	MMS MQL	Tap					
		v_c	f_z	v_c	f_z				v_c	f_z			
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	300	0,009 x d_1	420	0,011 x d_1	300	0,006 x d_1	420	0,011 x d_1		□	■	
	1.2	430	0,008 x d_1	620	0,010 x d_1	430	0,005 x d_1	620	0,010 x d_1		□	■	
	1.3	385	0,007 x d_1	550	0,008 x d_1	385	0,005 x d_1	550	0,008 x d_1		□	■	
	1.4	270	0,008 x d_1	380	0,010 x d_1	270	0,005 x d_1	380	0,010 x d_1		□	■	
	1.5												
	1.6												
	2.1	100	0,005 x d_1	160	0,006 x d_1	100	0,005 x d_1	160	0,006 x d_1		□	□	■
	2.2	100	0,005 x d_1	160	0,006 x d_1	100	0,005 x d_1	160	0,006 x d_1		□	□	■
	2.3	100	0,005 x d_1	160	0,006 x d_1	100	0,005 x d_1	160	0,006 x d_1		□	□	■
	2.4	80	0,004 x d_1	140	0,005 x d_1	80	0,004 x d_1	140	0,005 x d_1		□	□	■
	2.5	80	0,004 x d_1	140	0,005 x d_1	80	0,004 x d_1	140	0,005 x d_1		□	□	■
	2.6	80	0,004 x d_1	140	0,005 x d_1	80	0,004 x d_1	140	0,005 x d_1		□	□	■
	2.7	60	0,003 x d_1	100	0,004 x d_1	60	0,003 x d_1	100	0,004 x d_1		□	□	■
	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													
2.6													
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

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



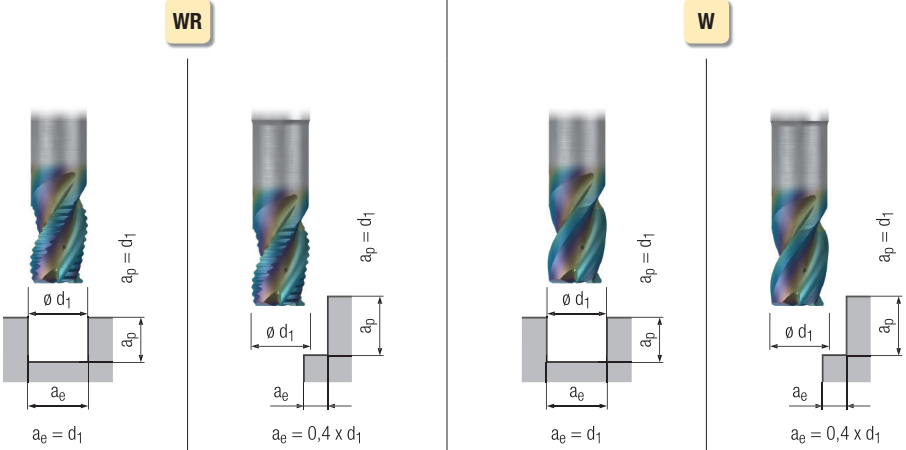
v_c / f_z

- Product Finder
- NR
- NF
- N
- WR
- WF
- W

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z**



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

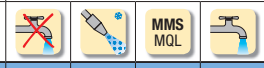


Gültig für · Valid for

2881_Z	2884RZ	2889RT
2881RZ	2888_T	2889RZ
2882_Z	2888_Z	2890_Z
2882RZ	2888RT	2890RZ
2883_Z	2888RZ	2891_Z
2883RZ	2889_T	2891RZ
2884_Z	2889_Z	

Achtung:
Bei unbeschichteter Ausführung ist die Schnittgeschwindigkeit v_c um 30% zu reduzieren!

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!



	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1											
	2.1											
	3.1											
	4.1											
	5.1											
M	1.1											
	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	420	$0,009 \times d_1$	630	$0,011 \times d_1$	420	$0,008 \times d_1$	760	$0,011 \times d_1$	■	
1.2		620	$0,008 \times d_1$	930	$0,010 \times d_1$	620	$0,007 \times d_1$	1120	$0,010 \times d_1$	■		
1.3		550	$0,007 \times d_1$	830	$0,008 \times d_1$	550	$0,006 \times d_1$	990	$0,008 \times d_1$	■		
1.4		380	$0,008 \times d_1$	570	$0,010 \times d_1$	380	$0,007 \times d_1$	680	$0,010 \times d_1$	■		
1.5												
1.6												
N		2.1	120	$0,005 \times d_1$	180	$0,006 \times d_1$	120	$0,005 \times d_1$	220	$0,006 \times d_1$	■	
		2.2	120	$0,005 \times d_1$	180	$0,006 \times d_1$	120	$0,005 \times d_1$	220	$0,006 \times d_1$	■	
		2.3	120	$0,005 \times d_1$	180	$0,006 \times d_1$	120	$0,005 \times d_1$	220	$0,006 \times d_1$	■	
		2.4	110	$0,004 \times d_1$	170	$0,005 \times d_1$	110	$0,004 \times d_1$	200	$0,005 \times d_1$	■	
		2.5	110	$0,004 \times d_1$	170	$0,005 \times d_1$	110	$0,004 \times d_1$	200	$0,005 \times d_1$	■	
		2.6	110	$0,004 \times d_1$	170	$0,005 \times d_1$	110	$0,004 \times d_1$	200	$0,005 \times d_1$	■	
		2.7	70	$0,003 \times d_1$	110	$0,004 \times d_1$	70	$0,003 \times d_1$	130	$0,004 \times d_1$	■	
		2.8										
	N	3.1										
		3.2										
		N	4.1									
			4.2									
			4.3									
			4.4									
N		5.1										
		5.2										
		5.3										
S		1.1										
		1.2										
		1.3										
	S	2.1										
		2.2										
		2.3										
2.4												
2.5												
2.6												
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

Hartmetall-Micro- und Mini-Schaftfräser – kurze und lange Ausführung
Solid carbide micro and mini end mills – short and long design

$l_3 : d_1 = 10 : 1$

N

Gültig für · Valid for

2762A 2765A



Richtwerte für die Schruppbearbeitung
Standard values for roughing

Richtwerte für die Schlichtbearbeitung
Standard values for finishing

Achtung:
Beim Schruppen ist die Vorschubgeschwindigkeit v_f zu halbieren

Please note:
For roughing, please reduce feed speed v_f by half

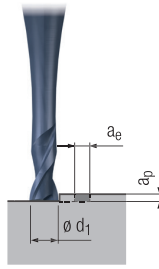


Table with columns for material (P, M, K, N, S, H), feed rate (vf), axial depth of cut (ae), radial depth of cut (ap), spindle speed (n), and feed per revolution (vf), along with suitability icons (checkboxes and squares).

Product Finder

- NR
NF
N
WR
WF
W

Vc / fz



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

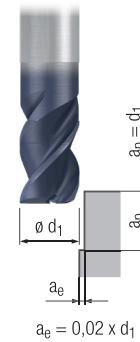
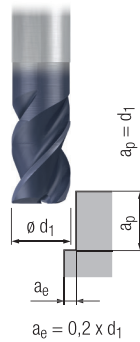
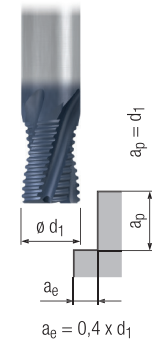
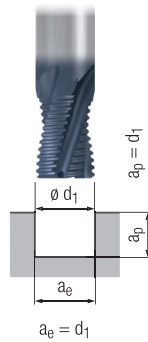


Hartmetall-Schaft- und Langlochfräser – extra kurze und kurze Ausführung

Solid carbide end mills and slot drills – extra short and short design

NR N W

N W



Gültig für · Valid for
1805A 1824A 2821A
1806A 1929A
1819A 1930A

Product Finder

NR

NF

N

WR

WF

W

v_c / f_z

	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
--	---------------	------------	---------------	------------	---------------	------------	---------------	------------	--	--	---------	--

P	1.1	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$	200	$0,008 \times d_1$	□	■	□	■
	2.1	120	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	170	$0,007 \times d_1$	□	■	□	■
	3.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	150	$0,006 \times d_1$	□	■	□	■
	4.1	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■	□	■
	5.1	70	$0,003 \times d_1$	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■	□	■
M	1.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■
	2.1	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	80	$0,005 \times d_1$			□	■
	3.1												
	4.1												
K	1.1	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$	200	$0,008 \times d_1$	□	■	□	■
	1.2	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$	200	$0,008 \times d_1$	□	■	□	■
	2.1	120	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	170	$0,006 \times d_1$	□	■	□	■
	2.2	120	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	170	$0,006 \times d_1$	□	■	□	■
	3.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	150	$0,006 \times d_1$	□	■	□	■
	3.2	110	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	150	$0,006 \times d_1$	□	■	□	■
	4.1	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■	□	■
4.2	70	$0,003 \times d_1$	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$	□	■	□	■	
N	1.1	630	$0,009 \times d_1$	720	$0,011 \times d_1$	820	$0,013 \times d_1$	880	$0,014 \times d_1$				■
	1.2	630	$0,008 \times d_1$	720	$0,010 \times d_1$	820	$0,011 \times d_1$	880	$0,013 \times d_1$				■
	1.3	630	$0,007 \times d_1$	720	$0,008 \times d_1$	820	$0,010 \times d_1$	880	$0,011 \times d_1$				■
	1.4	380	$0,008 \times d_1$	440	$0,010 \times d_1$	490	$0,011 \times d_1$	530	$0,013 \times d_1$				■
	1.5	300	$0,007 \times d_1$	350	$0,008 \times d_1$	390	$0,010 \times d_1$	420	$0,011 \times d_1$				■
	1.6	190	$0,006 \times d_1$	220	$0,007 \times d_1$	250	$0,008 \times d_1$	270	$0,010 \times d_1$				■
	2.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,007 \times d_1$	170	$0,008 \times d_1$			□	■
	2.2	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,007 \times d_1$	170	$0,008 \times d_1$			□	■
	2.3	120	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,007 \times d_1$	170	$0,008 \times d_1$	□	□	□	■
	2.4	110	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	150	$0,006 \times d_1$			□	■
	2.5	110	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	150	$0,006 \times d_1$			□	■
	2.6	110	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	150	$0,006 \times d_1$	□	□	□	■
	2.7	70	$0,003 \times d_1$	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■
	2.8	70	$0,003 \times d_1$	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■
	3.1	280	$0,009 \times d_1$	320	$0,011 \times d_1$	360	$0,013 \times d_1$	390	$0,014 \times d_1$	□	□	□	■
	3.2	280	$0,007 \times d_1$	320	$0,008 \times d_1$	360	$0,010 \times d_1$	390	$0,011 \times d_1$	□	□	□	■
4.1	280	$0,008 \times d_1$	320	$0,009 \times d_1$	360	$0,011 \times d_1$	390	$0,012 \times d_1$		□	□	■	
4.2	420	$0,008 \times d_1$	480	$0,009 \times d_1$	550	$0,011 \times d_1$	590	$0,012 \times d_1$		□	□	■	
4.3													
4.4													
5.1													
5.2	70	$0,003 \times d_1$	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■	
5.3	140	$0,006 \times d_1$	160	$0,007 \times d_1$	180	$0,008 \times d_1$	200	$0,010 \times d_1$	□	■			
S	1.1	70	$0,004 \times d_1$	80	$0,004 \times d_1$	90	$0,005 \times d_1$	100	$0,006 \times d_1$				■
	1.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	80	$0,005 \times d_1$				■
	1.3	40	$0,003 \times d_1$	50	$0,003 \times d_1$	50	$0,004 \times d_1$	60	$0,004 \times d_1$				■
	2.1	60	$0,002 \times d_1$	70	$0,002 \times d_1$	80	$0,003 \times d_1$	80	$0,003 \times d_1$				■
	2.2	20	$0,002 \times d_1$	20	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.3	15	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	20	$0,003 \times d_1$				■
2.4	20	$0,002 \times d_1$	25	$0,002 \times d_1$	35	$0,003 \times d_1$	30	$0,003 \times d_1$				■	
2.5													
2.6													
H	1.1	80	$0,003 \times d_1$	90	$0,003 \times d_1$	100	$0,004 \times d_1$	110	$0,004 \times d_1$	□	■		
	1.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		
	1.3												
	1.4												
	1.5												

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

- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z

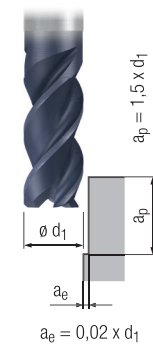
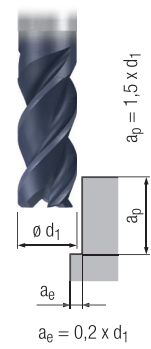
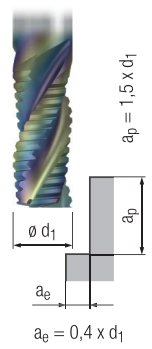
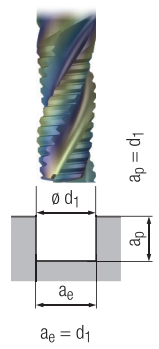


Hartmetall-Schafffräser – lange Ausführung
Solid carbide end mills – long design

WF

W

W



Gültig für · Valid for
1818A 1909 2870R
1856A 1909R 2871R

Achtung:
Bei unbeschichteter Ausführung ist die Schnittgeschwindigkeit v_c um 30% zu reduzieren!

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!



		WF		W		W		v_c [m/min]	f_z [mm]			MMS MQL	
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]						
P	1.1	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	170	$0,007 \times d_1$	□	■	□	■
	2.1	110	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,005 \times d_1$	150	$0,006 \times d_1$	□	■	□	■
	3.1												
	4.1												
	5.1												
M	1.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$			□	■
	2.1	50	$0,003 \times d_1$	60	$0,003 \times d_1$	60	$0,004 \times d_1$	70	$0,004 \times d_1$			□	■
	3.1												
	4.1												
K	1.1												
	1.2												
	2.1												
	2.2												
	3.1												
	3.2												
	4.1												
	4.2												
N	1.1	540	$0,009 \times d_1$	590	$0,010 \times d_1$	680	$0,011 \times d_1$	760	$0,013 \times d_1$				■
	1.2	540	$0,008 \times d_1$	590	$0,009 \times d_1$	680	$0,010 \times d_1$	760	$0,011 \times d_1$				■
	1.3	540	$0,007 \times d_1$	590	$0,008 \times d_1$	680	$0,009 \times d_1$	760	$0,010 \times d_1$				■
	1.4	320	$0,008 \times d_1$	350	$0,009 \times d_1$	400	$0,010 \times d_1$	450	$0,011 \times d_1$				■
	1.5	260	$0,007 \times d_1$	290	$0,008 \times d_1$	330	$0,009 \times d_1$	360	$0,010 \times d_1$				■
	1.6	160	$0,006 \times d_1$	180	$0,007 \times d_1$	200	$0,008 \times d_1$	220	$0,008 \times d_1$				■
	2.1	110	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,006 \times d_1$	150	$0,007 \times d_1$			□	■
	2.2	110	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,006 \times d_1$	150	$0,007 \times d_1$			□	■
	2.3	110	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,006 \times d_1$	150	$0,007 \times d_1$	□	□	□	■
	2.4	100	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$			□	■
	2.5	100	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$			□	■
	2.6	100	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,005 \times d_1$	140	$0,006 \times d_1$	□	□	□	■
	2.7	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$			□	■
	2.8	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$			□	■
	3.1	240	$0,009 \times d_1$	260	$0,010 \times d_1$	300	$0,011 \times d_1$	340	$0,013 \times d_1$	□	□	□	■
	3.2	240	$0,007 \times d_1$	260	$0,008 \times d_1$	300	$0,009 \times d_1$	340	$0,010 \times d_1$	□	□	□	■
4.1	240	$0,008 \times d_1$	260	$0,009 \times d_1$	300	$0,009 \times d_1$	340	$0,011 \times d_1$		□	□	■	
4.2	360	$0,008 \times d_1$	400	$0,009 \times d_1$	450	$0,009 \times d_1$	500	$0,011 \times d_1$			□	■	
4.3													
4.4													
5.1													
5.2													
5.3	120	$0,006 \times d_1$	130	$0,007 \times d_1$	150	$0,008 \times d_1$	170	$0,008 \times d_1$	□	■			
S	1.1	60	$0,004 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	80	$0,005 \times d_1$				■
	1.2	50	$0,003 \times d_1$	60	$0,003 \times d_1$	60	$0,004 \times d_1$	70	$0,004 \times d_1$				■
	1.3	30	$0,003 \times d_1$	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,004 \times d_1$				■
	2.1	50	$0,002 \times d_1$	60	$0,002 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$				■
	2.2												
	2.3												
2.4													
2.5													
2.6													
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

- NR
- NF
- N
- WR
- WF
- W

v_c / f_z

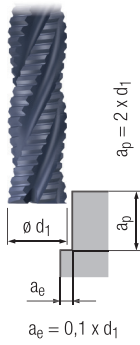
Hartmetall-Schaffräser – extra lange Ausführung
Solid carbide end mills – extra long design

Gültig für · Valid for

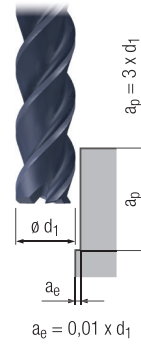
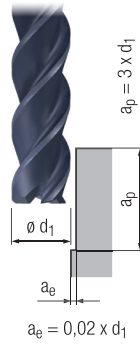
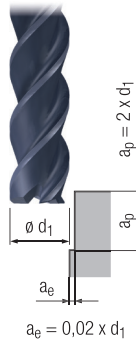
- | | |
|-------|-------|
| 1956A | 2854A |
| 1957A | 2855A |



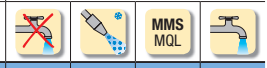
NF



W



		NF		W									
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]								v_c [m/min]
P	1.1	100	0,005 x d ₁	120	0,006 x d ₁	110	0,006 x d ₁	130	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	90	0,004 x d ₁	110	0,005 x d ₁	100	0,005 x d ₁	120	0,005 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	80	0,004 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1												
	5.1												
M	1.1	50	0,003 x d ₁	60	0,004 x d ₁	60	0,004 x d ₁	70	0,004 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	40	0,003 x d ₁	50	0,004 x d ₁	40	0,004 x d ₁	50	0,004 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1												
	4.1												
K	1.1	100	0,005 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2	100	0,005 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1	90	0,004 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.2	90	0,004 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1	80	0,004 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.2	80	0,004 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.1	60	0,003 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.2	50	0,003 x d ₁							<input type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1			540	0,011 x d ₁	500	0,011 x d ₁	590	0,011 x d ₁				<input checked="" type="checkbox"/>
	1.2			540	0,010 x d ₁	500	0,010 x d ₁	590	0,010 x d ₁				<input checked="" type="checkbox"/>
	1.3			540	0,008 x d ₁	500	0,008 x d ₁	590	0,008 x d ₁				<input checked="" type="checkbox"/>
	1.4			320	0,010 x d ₁	300	0,010 x d ₁	350	0,010 x d ₁				<input checked="" type="checkbox"/>
	1.5			260	0,008 x d ₁	240	0,008 x d ₁	290	0,008 x d ₁				<input checked="" type="checkbox"/>
	1.6			160	0,007 x d ₁	140	0,007 x d ₁	170	0,007 x d ₁				<input checked="" type="checkbox"/>
	2.1			110	0,006 x d ₁	100	0,006 x d ₁	120	0,006 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2			110	0,006 x d ₁	100	0,006 x d ₁	120	0,006 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3			110	0,006 x d ₁	100	0,006 x d ₁	120	0,006 x d ₁	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4			100	0,005 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5			100	0,005 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6			100	0,005 x d ₁	90	0,005 x d ₁	100	0,005 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7			60	0,004 x d ₁	60	0,004 x d ₁	70	0,004 x d ₁	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8			60	0,004 x d ₁	60	0,004 x d ₁	70	0,004 x d ₁			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1			240	0,011 x d ₁	220	0,011 x d ₁	260	0,011 x d ₁	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2			240	0,008 x d ₁	220	0,008 x d ₁	260	0,008 x d ₁	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1			240	0,009 x d ₁	220	0,009 x d ₁	260	0,009 x d ₁		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.2			360	0,009 x d ₁	330	0,009 x d ₁	390	0,009 x d ₁		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1			60	0,004 x d ₁	60	0,004 x d ₁	70	0,004 x d ₁				<input checked="" type="checkbox"/>
	1.2			50	0,004 x d ₁	40	0,004 x d ₁	50	0,004 x d ₁				<input checked="" type="checkbox"/>
	1.3												
	2.1			50	0,002 x d ₁	40	0,002 x d ₁	50	0,002 x d ₁				<input checked="" type="checkbox"/>
	2.2												
	2.3												
	2.4												
2.5													
2.6													
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												



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

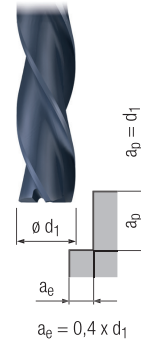
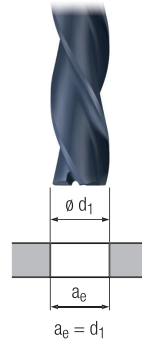
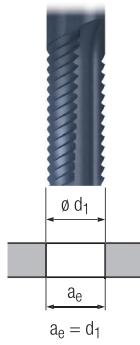
- Product Finder
- NR
- NF
- N
- H
- WR
- WF
- W
- v_c / f_z**



Hartmetall-Schafffräser – lange Ausführung

Solid carbide end mills – long design

W



Gültig für · Valid for

1931	1932	2818
1931A	1932A	2818A

Achtung:
Bei unbeschichteter Ausführung ist die Schnittgeschwindigkeit v_c um 30% zu reduzieren!

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!



	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1							
	2.1							
	3.1							
	4.1							
	5.1							
M	1.1							
	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	210	$0,008 \times d_1$	250	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.2	280	$0,007 \times d_1$	340	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>		<input checked="" type="checkbox"/>
4.3	110	$0,006 \times d_1$	130	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.4	80	$0,006 \times d_1$	100	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5.1								
5.2								
5.3	140	$0,006 \times d_1$	170	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
S	1.1							
	1.2							
	1.3							
	2.1							
	2.2							
	2.3							
	2.6							
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							



Hartmetall-Kugel- und Torusfräser Solid Carbide Ball Nose and Torus End Mills

Seite · Page

Wegweiser	Product finder	94 - 99
Produktseiten	Product pages	100 - 131
Schnittwerte	Cutting conditions	132 - 140

Product Finder

N

H

W

v_c / f_z

Wegweiser

Bitte beachten:

Die Eignung der Hartmetall-Kugel- und Torusfräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 132 - 139 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:

The suitability of the solid carbide ball nose and torus end mills is indicated as follows:

- = very suitable
- = suitable

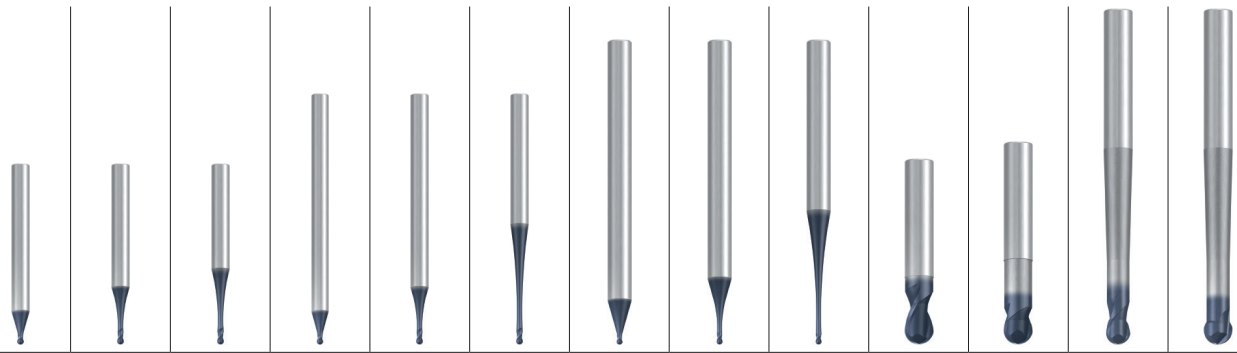
Please find the cutting conditions on pages 132 - 139.

International comparison of materials, see page 416 - 429.



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 (S137-2) 1.0037 10SPb20 1.0722 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ² 20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ² X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²
5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	
M	Nichtrostende Stahlwerkstoffe Stainless steel materials		
	1.1 Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ² 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
4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ² X2CrNiMoN25-7-4 1.4410	
K	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
	3.1 Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	300-400 N/mm ² GJV 300 400-500 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	
N	Nichteisenwerkstoffe Non-ferrous materials		
	1.1 Aluminium-Legierungen	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-307 G
	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
	2.1 Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	≤ 400 N/mm ² E-Cu 57 EN CW 004 A
	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 (AMPPO® 8)
	2.8 Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ² (AMPPO® 45)
	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	
S	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
	5.1 Graphit	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		
	1.1 Titan-Legierungen	Titanium alloys	≤ 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	
2.1 Nickel-, Kobalt- und Eisen-Legierungen	Nickel alloys, cobalt alloys and iron alloys		
2.2 Reinnickel	Pure nickel	≤ 600 N/mm ² Ni 99.6 2.4060	
2.3 Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1000 N/mm ² Monel 400 2.4360	
2.4 Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm ² Inconel 718 2.4668	
2.5 Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1000 N/mm ² Udimet 605	
2.6 Eisen-Basis-Legierungen	Iron-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-Kugelfräser
Solid carbide ball nose end mills



Allround

N

ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-2mm	ø0,2-20mm	ø0,5-16mm dia. 1/64 - 1/2"	ø1-16mm dia. 1/64 - 1/2"	ø2-12mm	Z (Flutes)
2	2	2	2	2	2	2	2	2	2	2	2	2	
2770A	2771A	2772A	2773A	2774A	2775A	2776A	2777A	2778A	1820A	1966A	1960A	1935A	
100	100	100	101	101	101	102	102	102	103	104	105	106	Seite - Page
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Product Finder

N

H

W

v_c / f_z

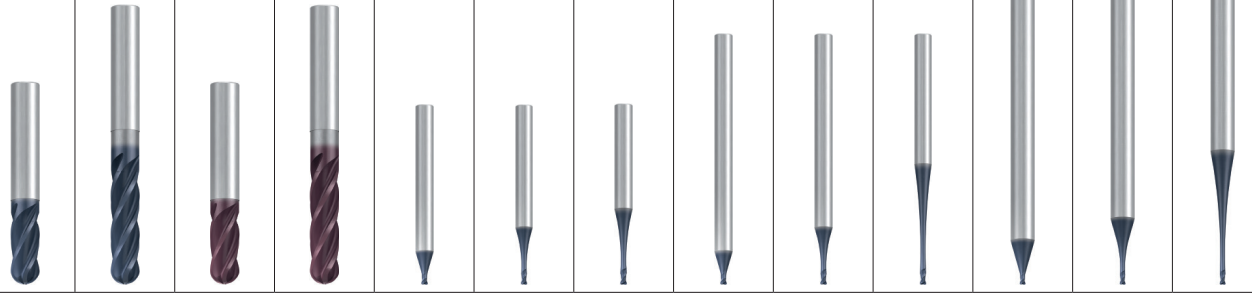
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□	□	□	□	□	□	□	□	□	□	■	■	■	3.1
□	□	□	□	□	□	□	□	□	□	■	■	■	4.1
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■	■	■	■	■	■	■	■	■	■	■	■	■	4.3
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■	■	■	■	■	■	■	■	■	■	■	■	□	5.2
■	■	■	■	■	■	■	■	■	■	■	■	■	5.3
□	□	□	□	□	□	□	□	□	■	■	■	■	1.1
□	□	□	□	□	□	□	□	□	■	■	■	■	1.2
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□	□	□	□	□	□	□	□	□	■	■	■	■	2.1
□	□	□	□	□	□	□	□	□	□	■	■	■	2.2
□	□	□	□	□	□	□	□	□	□	■	■	■	2.3
□	□	□	□	□	□	□	□	□	□	□	■	■	2.4
□	□	□	□	□	□	□	□	□	□	□	□	■	2.5
□	□	□	□	□	□	□	□	□	□	□	□	■	2.6
□	□	□	□	□	□	□	□	□	□	■	■	■	1.1
□	□	□	□	□	□	□	□	□	□	■	■	■	1.2
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□	□	□	□	□	□	□	□	□	□	■	■	■	1.4
□	□	□	□	□	□	□	□	□	□	■	■	■	1.5



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

Hartmetall-Kugelfräser
Solid carbide ball nose end mills

Hartmetall-Torusfräser
Solid carbide torus end mills



Allround

N

	ø2-16mm	ø6-16mm	ø2-16mm	ø6-16mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm	ø0,5-2mm
Z (Flutes)	4	4	3 - 4	4	2	2	2	2	2	2	2	2	2
	1867A	1967A	2502A	2504A	2780A	2781A	2782A	2783A	2784A	2785A	2786A	2787A	2788A
Seite · Page	107	107	108	108	109	109	109	110	110	110	111	111	111
v_c / f_z	139	139	139	139	135	136	137	135	136	137	135	136	137

P	1.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	3.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	4.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	5.1	■	■	■	■	■	■	■	■	■	■	■	■	■
M	1.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■	■	■	■	■
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	4.1	□	□	□	□	□	□	□	□	□	□	□	□	□
K	1.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	1.2	■	■	■	■	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■	■	■	■	■
	2.2	■	■	■	■	■	■	■	■	■	■	■	■	■
	3.1	□	□	□	□	■	■	■	■	■	■	■	■	■
	3.2	□	□	□	□	■	■	■	■	■	■	■	■	■
	4.1	□	□	□	□	■	■	■	■	■	■	■	■	■
	4.2	□	□	□	□	■	■	■	■	■	■	■	■	■
N	1.1				■	■	■	■	■	■	■	■	■	■
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	1.3				■	■	■	■	■	■	■	■	■	■
	1.4				■	■	■	■	■	■	■	■	■	■
	1.5				■	■	■	■	■	■	■	■	■	■
	1.6				■	■	■	■	■	■	■	■	■	■
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	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	□	□	□	□	□	□	□	□	□	□	□	□	□
H	1.1					□	□	□	□	□	□	□	□	□
	1.2					□	□	□	□	□	□	□	□	□
	1.3													
	1.4													
	1.5													

Product Finder

N

H

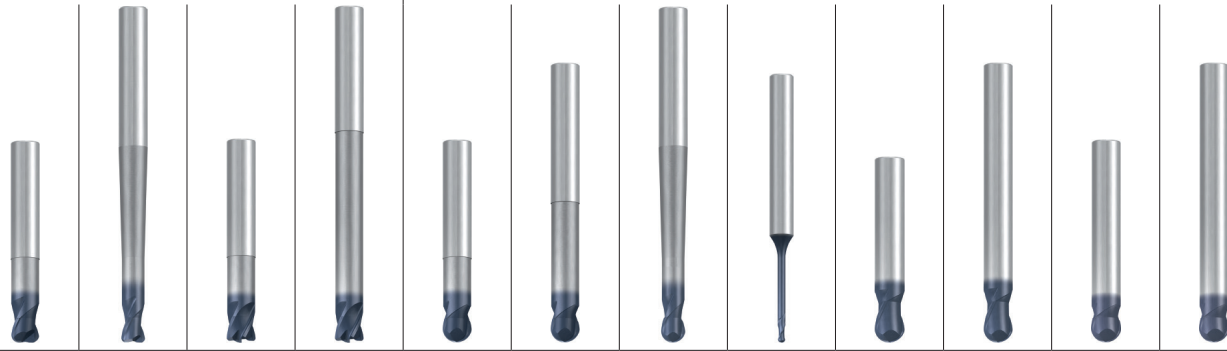
W

v_c / f_z



Hartmetall-Torusfräser
Solid carbide torus end mills

Hartmetall-Kugelfräser
Solid carbide ball nose end mills



Product Finder

N
H
W
v_c / f_z

Allround

Hard materials

N

H

Ø0,5 - 16 mm dia. 1/64 - 1/2"	Ø1 - 16 mm dia. 1/64 - 1/2"	Ø3 - 12 mm	Ø3 - 12 mm	Ø0,5 - 16 mm dia. 1/4 - 1/2"	Ø8 - 16 mm	Ø1 - 16 mm dia. 1/4 - 1/2"	Ø0,4 - 6 mm	Ø1 - 20 mm dia. 1/8 - 3/4"	Ø2 - 20 mm	Ø2 - 12 mm dia. 3/32 - 1/2"	Ø6 - 12 mm	Z (Flutes)
1986A	1980A	1945A	1947A	1976A	1974A	1963A	2806A	1877A	1879A	1973A	2819A	
112	113	114	114	115	115	116	117	118	118	119	119	Seite · Page
138	138	138	138	132	132	132	132	132	132	132	132	v _c / f _z
■	■	■	■	□	□	□	□					1.1
■	■	■	■	□	□	□	□					2.1
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				■	■	■	■	■	■	■	■	1.4
				■	■	■	■	■	■	■	■	1.5

P

M

K

N

S

H



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

Product Finder

N

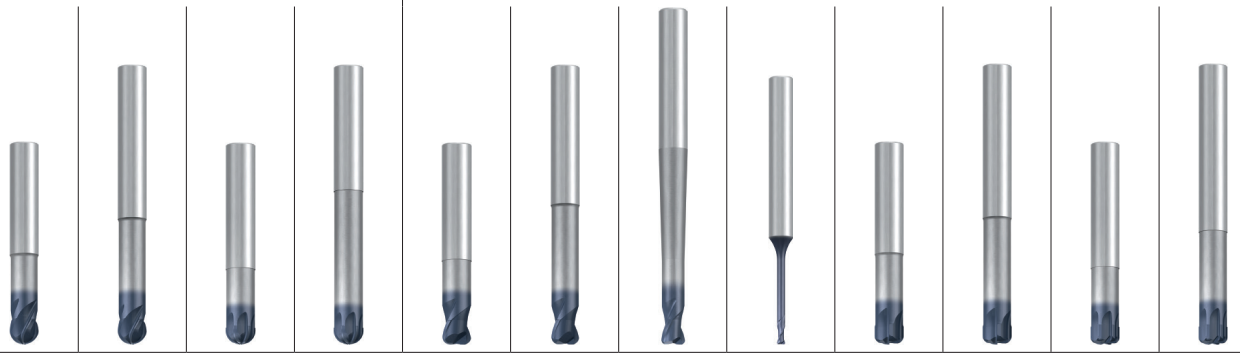
H

W

v_c / f_z

Hartmetall-Kugelfräser
Solid carbide ball nose end mills

Hartmetall-Torusfräser
Solid carbide torus end mills



Hard materials

H

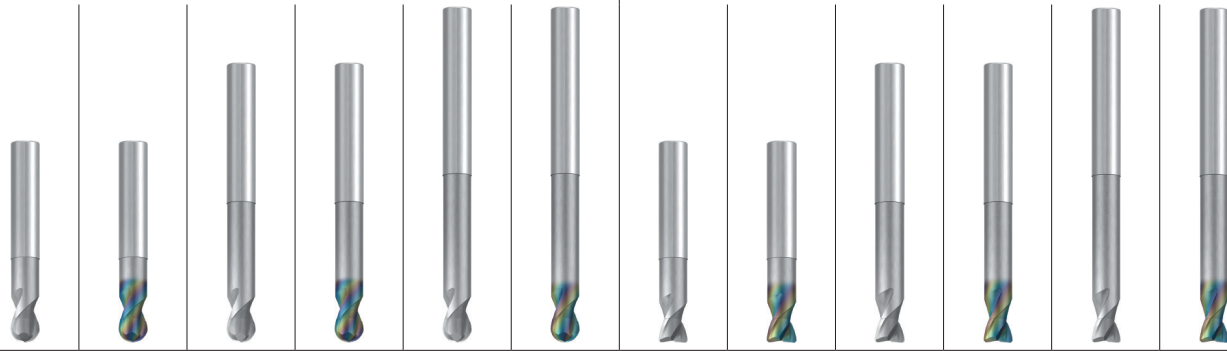
	Ø3-12 mm dia. 1/8-1/2"	Ø6-12 mm dia. 1/8-1/2"	Ø10-12 mm	Ø10-16 mm	Ø0,5-16 mm dia. 1/4-1/2"	Ø8-16 mm	Ø1-16 mm dia. 1/4-1/2"	Ø0,5-6 mm	Ø3-16 mm dia. 3/32-1"	Ø6-16 mm	Ø10-12 mm	Ø10-16 mm
Z (Flutes)	4	4	6-8	6-8	2	2	2	2	4	4	6-8	6-8
	2834A / 2942A	2842A / 2943A	2836A	2837A	1996A	1993A	1983A	2807A	1936A	2832A	2876A	2877A
Seite · Page	120	121	122	122	123	123	124	125	126	126	127	127
v_c / f_z	133	133	133	133	132	132	132	132	133	133	133	133



P	1.1	□	□			□	□	□	□	■	■		
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	3.1	■	■	□	□	■	■	■	■	■	■	□	□
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	5.1	■	■	□	□	■	■	■	■	■	■	□	□
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K	1.1	■	■	■	■	■	■	■	■	■	■	■	■
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	2.4	□	□					□	□	□			
	2.5	□	□					□	□	□			
	2.6	■	■	□	□			□	■	■	□	□	□
	2.7	■	■					□	■	■			
2.8	■	■					□	■	■				
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S	1.1	■	■	■	■	■	■	■	■	■	■	■	■
	1.2	■	■	■	■	■	■	■	■	■	■	■	■
	1.3	■	■	■	■	■	■	■	■	■	■	■	■
	2.1	■	■	■	■	■	■	■	■	■	■	■	■
	2.2	■	■	■	■	■	■	■	■	■	■	■	■
	2.3	■	■	■	■	■	■	■	■	■	■	■	■
2.4	■	■	■	■	■	■	■	■	■	■	■	■	
2.5	■	■	■	■	■	■	■	■	■	■	■	■	
2.6	■	■	■	■	■	■	■	■	■	■	■	■	
H	1.1	■	■	■	■	■	■	■	■	■	■	■	■
	1.2	■	■	■	■	■	■	■	■	■	■	■	■
	1.3	■	■	■	■	■	■	■	■	■	■	■	■
	1.4	■	■	■	■	■	■	■	■	■	■	■	■
	1.5	■	■	■	■	■	■	■	■	■	■	■	■

Hartmetall-Kugelfräser
Solid carbide ball nose end mills

Hartmetall-Torusfräser
Solid carbide torus end mills



Product Finder

N

H

W

v_c / f_z

W

Ø0,5 - 12 mm dia. 3/32 - 3/4"	Ø0,5 - 12 mm dia. 3/32 - 3/4"	Ø8 - 16 mm	Ø8 - 16 mm	Ø3 - 12 mm	Ø3 - 12 mm	Ø0,5 - 12 mm dia. 3/32 - 3/4"	Ø0,5 - 12 mm dia. 3/32 - 3/4"	Ø8 - 16 mm	Ø8 - 16 mm	Ø3 - 12 mm	Ø3 - 12 mm	Z (Flutes)
2	2	2	2	2	2	2	2	2	2	2	2	
1921	1921R	2830	2830R	1943	1943R	1942	1942R	2838	2838R	1941	1941R	
128	128	129	129	129	129	130	130	131	131	131	131	Seite · Page
134	134	134	134	134	134	134	134	134	134	134	134	v_c / f_z

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												2.1
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P

M

K

N

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H

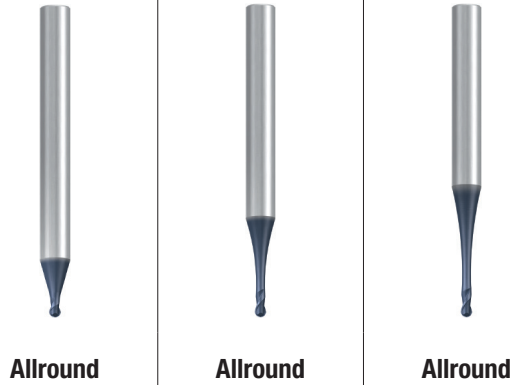
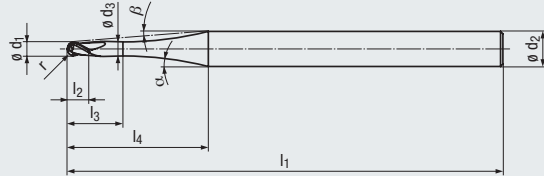
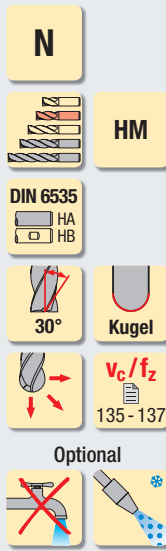


■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

- Product Finder
- N
- H
- W
- v_c / f_z

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

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



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

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

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

$l_3 : d_1 = 2,2 : 1$ – Kurze Ausführung · Short design

Bestell-Code · Order code											2770A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,2	0,1	0,12	0,44	38	0,16	5,7	3	15°	14°	2	.0002	●	
0,5	0,25	0,3	1,1	38	0,4	5,8	3	15°	13°	2	.0005	●	
0,8	0,4	0,48	1,76	38	0,64	5,9	3	15°	11°	2	.0008	●	
1	0,5	0,6	2,2	43	0,8	7,8	4	15°	11°	2	.001	●	
1,2	0,6	0,72	2,64	43	0,96	7,9	4	15°	11°	2	.0012	●	
1,5	0,75	0,9	3,3	43	1,2	8	4	15°	9°	2	.0015	●	
1,8	0,9	1,08	3,96	43	1,44	8,1	4	15°	8°	2	.0018	●	
2	1	1,2	4,4	57	1,6	11,9	6	15°	10°	2	.002	●	

$l_3 : d_1 = 5 : 1$ – Kurze Ausführung · Short design

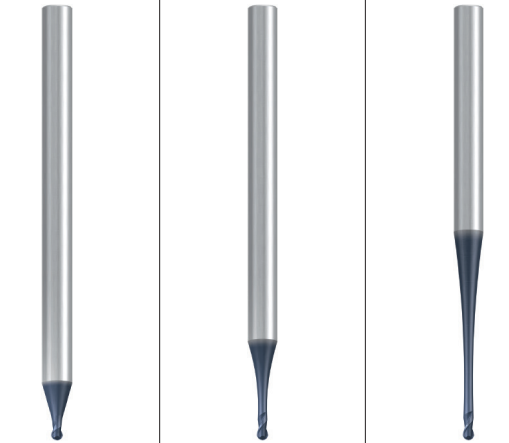
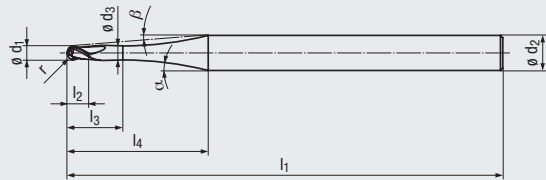
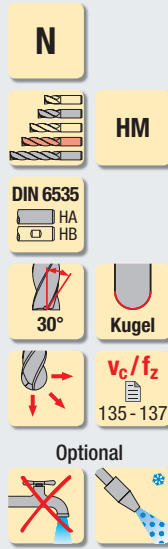
Bestell-Code · Order code											2771A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,2	0,1	0,2	1	38	0,16	6,4	3	15°	13°	2	.0002	●	
0,5	0,25	0,5	2,5	38	0,4	7,8	3	15°	10°	2	.0005	●	
0,8	0,4	0,8	4	38	0,64	9	3	15°	8°	2	.0008	●	
1	0,5	1	5	43	0,8	11,6	4	15°	8°	2	.001	●	
1,2	0,6	1,2	6	43	0,96	12,4	4	15°	7°	2	.0012	●	
1,5	0,75	1,5	7,5	43	1,2	13,7	4	15°	6°	2	.0015	●	
1,8	0,9	1,8	9	43	1,44	15	4	15°	5°	2	.0018	●	
2	1	2	10	57	1,6	19,7	6	15°	6°	2	.002	●	

$l_3 : d_1 = 10 : 1$ – Kurze Ausführung · Short design

Bestell-Code · Order code											2772A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,2	0,1	0,2	2	38	0,16	9,2	3	15°	9°	2	.0002	●	
0,5	0,25	0,5	5	38	0,4	10,7	3	13°	6°	2	.0005	●	
0,8	0,4	0,8	8	38	0,64	10,5	3	8,2°	4°	2	.0008	●	
1	0,5	1	10	43	0,8	18,3	4	8°	5°	2	.001	●	
1,2	0,6	1,2	12	43	0,96	18,2	4	9,3°	4°	2	.0012	●	
1,5	0,75	1,5	15	43	1,2	18,1	4	13,5°	4°	2	.0015	●	
1,8	0,9	1,8	18	43	1,44	19,5	4	31,1°	3°	2	.0018	●	
2	1	2	20	57	1,6	32	6	9,5°	4°	2	.002	●	

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

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



Allround Allround Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

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

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

$l_3 : d_1 = 2,2 : 1$ – Lange Ausführung · Long design

Bestell-Code · Order code												2773A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code			
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)				
0,2	0,1	0,12	0,6	50	0,16	5,7	3	15°	14°	2	.0002	●		
0,5	0,25	0,3	1,1	50	0,4	5,8	3	15°	13°	2	.0005	●		
0,8	0,4	0,48	1,76	50	0,64	5,9	3	15°	11°	2	.0008	●		
1	0,5	0,6	2,2	60	0,8	7,8	4	15°	11°	2	.001	●		
1,2	0,6	0,72	2,64	60	0,96	7,9	4	15°	11°	2	.0012	●		
1,5	0,75	0,9	3,3	60	1,2	8	4	15°	9°	2	.0015	●		
1,8	0,9	1,08	3,96	60	1,44	8,1	4	15°	8°	2	.0018	●		
2	1	1,2	4,4	70	1,6	11,9	6	15°	10°	2	.002	●		

$l_3 : d_1 = 5 : 1$ – Lange Ausführung · Long design

Bestell-Code · Order code												2774A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code			
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)				
0,2	0,1	0,2	1	50	0,16	6,4	3	15°	13°	2	.0002	●		
0,5	0,25	0,5	2,5	50	0,4	7,8	3	15°	10°	2	.0005	●		
0,8	0,4	0,8	4	50	0,64	9	3	15°	8°	2	.0008	●		
1	0,5	1	5	60	0,8	11,6	4	15°	8°	2	.001	●		
1,2	0,6	1,2	6	60	0,96	12,4	4	15°	7°	2	.0012	●		
1,5	0,75	1,5	7,5	60	1,2	13,7	4	15°	6°	2	.0015	●		
1,8	0,9	1,8	9	60	1,44	15	4	15°	5°	2	.0018	●		
2	1	2	10	70	1,6	19,7	6	15°	6°	2	.002	●		

$l_3 : d_1 = 10 : 1$ – Lange Ausführung · Long design

Bestell-Code · Order code												2775A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code			
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)				
0,2	0,1	0,2	2	50	0,16	9,2	3	15°	9°	2	.0002	●		
0,5	0,25	0,5	5	50	0,4	14,5	3	13°	6°	2	.0005	●		
0,8	0,4	0,8	8	50	0,64	18,7	3	9,8°	4°	2	.0008	●		
1	0,5	1	10	60	0,8	23,7	4	10,2°	4°	2	.001	●		
1,2	0,6	1,2	12	60	0,96	26,1	4	9,1°	4°	2	.0012	●		
1,5	0,75	1,5	15	60	1,2	29,2	4	7,8°	3°	2	.0015	●		
1,8	0,9	1,8	18	60	1,44	31,9	4	6,8°	2°	2	.0018	●		
2	1	2	20	70	1,6	41,4	6	8,5°	3°	2	.002	●		

- Product Finder
- N
- H
- W
- v_c / f_z

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

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

N

HM

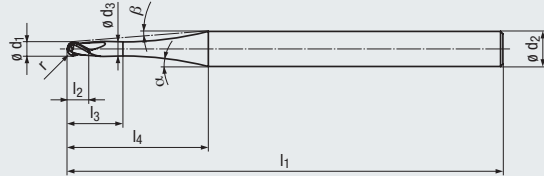
DIN 6535
HA
HB

30°

Kugel

v_c / f_z
135 - 137

Optional



Allround



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

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

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

$l_3 : d_1 = 2,2 : 1$ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2776A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5						
0,2	0,1	0,12	0,6	80	0,16	11,3	6	15°	15°	2	.0002	●	
0,5	0,25	0,3	1,1	80	0,4	11,4	6	15°	14°	2	.0005	●	
0,8	0,4	0,48	1,76	80	0,64	11,5	6	15°	13°	2	.0008	●	
1	0,5	0,6	2,2	80	0,8	11,5	6	15°	13°	2	.001	●	
1,2	0,6	0,72	2,64	80	0,96	11,6	6	15°	12°	2	.0012	●	
1,5	0,75	0,9	3,3	80	1,2	11,7	6	15°	11°	2	.0015	●	
1,8	0,9	1,08	3,96	80	1,44	11,8	6	15°	11°	2	.0018	●	
2	1	1,2	4,4	80	1,6	11,9	6	15°	10°	2	.002	●	

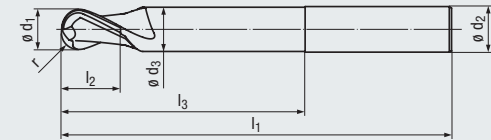
$l_3 : d_1 = 5 : 1$ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2777A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5						
0,2	0,1	0,2	1	80	0,16	12	6	15°	14°	2	.0002	●	
0,5	0,25	0,5	2,5	80	0,4	13,4	6	15°	12°	2	.0005	●	
0,8	0,4	0,8	4	80	0,64	14,6	6	15°	11°	2	.0008	●	
1	0,5	1	5	80	0,8	15,3	6	15°	10°	2	.001	●	
1,2	0,6	1,2	6	80	0,96	16,2	6	15°	9°	2	.0012	●	
1,5	0,75	1,5	7,5	80	1,2	17,4	6	15°	8°	2	.0015	●	
1,8	0,9	1,8	9	80	1,44	18,7	6	15°	7°	2	.0018	●	
2	1	2	10	80	1,6	19,7	6	15°	6°	2	.002	●	

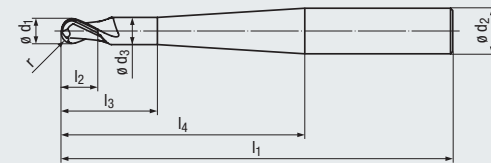
$l_3 : d_1 = 10 : 1$ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2778A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5						
0,2	0,1	0,2	2	80	0,16	14,8	6	15°	12°	2	.0002	●	
0,5	0,25	0,5	5	80	0,4	20,2	6	15°	8°	2	.0005	●	
0,8	0,4	0,8	8	80	0,64	25,9	6	14,8°	6°	2	.0008	●	
1	0,5	1	10	80	0,8	28,7	6	13°	6°	2	.001	●	
1,2	0,6	1,2	12	80	0,96	31,8	6	11,7°	5°	2	.0012	●	
1,5	0,75	1,5	15	80	1,2	35,8	6	10,2°	4°	2	.0015	●	
1,8	0,9	1,8	18	80	1,44	39,3	6	9,1°	4°	2	.0018	●	
2	1	2	20	80	1,6	41,4	6	8,5°	3°	2	.002	●	

- Multifunktionales Werkzeug
- Optimierte Querschnitte
- Extra kurze, stabile Ausführung
- Multi-functional tool
- Optimized chisel edge
- Extra short, stable design



Design I₄:



N

HM

DIN 6535
HA
HB

30° Kugel

v_c/f_z
139

Optional



Allround

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleiner Gravuren und Bauteile
- Zum HSC-Schlichten geeignet

Applications – material (see page 94)

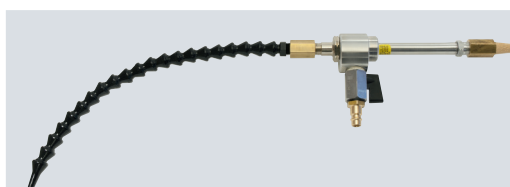
- For almost all materials
- For machining small engravings and components
- Suitable for HSC finishing

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

Extra kurze Ausführung · Extra short design

Bestell-Code · Order code										1820A			
∅ d ₁ h10	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	Z (Flutes)	Dimens.- Code				
0,2	0,1	0,3	5	38	–	–	3	2	.0002	●			
0,3	0,15	0,5	8	38	–	–	3	2	.0003	●			
0,4	0,2	1,4	8	38	–	–	3	2	.0004	●			
0,5	0,25	1,5	8	38	–	–	3	2	.0005	●			
0,6	0,3	1,6	8	38	–	–	3	2	.0006	●			
0,8	0,4	1,8	8	38	–	–	3	2	.0008	●			
1	0,5	2	7	38	–	–	3	2	.001	●			
1,2	0,6	2,2	7	38	–	–	3	2	.0012	●			
1,4	0,7	2,4	7	38	–	–	3	2	.0014	●			
1,5	0,75	2,5	7	38	–	–	3	2	.0015	●			
2	1	3	8	38	1,9	10	3	2	.002	●			
2,5	1,25	4	8	38	2,4	10	3	2	.0025	●			
3	1,5	5	10	38	2,9	–	3	2	.00303	●			
3	1,5	5	9	50	2,9	14	6	2	.003	●			
3,5	1,75	6	20	50	3,3	22	4	2	.0035	●			
4	2	8	12	54	3,8	18	6	2	.004	●			
5	2,5	9	16	54	4,8	18	6	2	.005	●			
6	3	10	16	54	5,8	–	6	2	.006	●			
8	4	12	20	58	7,7	–	8	2	.008	●			
10	5	14	24	66	9,7	–	10	2	.010	●			
12	6	16	26	73	11,6	–	12	2	.012	●			
14	7	18	28	75	13,6	–	14	2	.014	●			
16	8	22	32	82	15,5	–	16	2	.016	●			
18	9	24	34	84	17,5	–	18	2	.018	●			
20	10	26	40	92	19,5	–	20	2	.020	●			

Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1821A
Tool with side-lock clamping: order code 1821A



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Product Finder
- N
- H
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- Patentierte Querschneide
- 2 Baulängen verfügbar
- Multi-functional, high performance tool
- Patented chisel edge
- 2 lengths available

N

HM

DIN 6535 HA HB ≈ ASME B94.19

30° Kugel

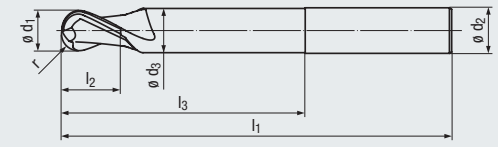
v_c / f_z 138

Optional

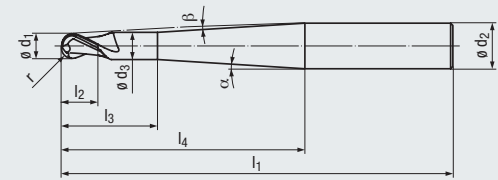
≤ 55 HRC



Allround



Design I₄:



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- In fast allen Werkstoffen einsetzbar
- Zum Schrumpfen, Schichten sowie zum HSC-Schlichten geeignet

- For almost all materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2 1.2-1.4
S	2.1-2.3 2.4-2.6
H	1.1-1.2

Kurze Ausführung · Short design

Bestell-Code · Order code												1966A			
[mm]	ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code			
	±0,01	±0,005						h5			(Flutes)				
0,5	0,25	1	2	57	0,45	20	6	10°	8,5°	2	.0005	●			
1	0,5	2	4	57	0,95	20	6	10°	8°	2	.001	●			
1,5	0,75	2,5	7,5	57	1,4	20	6	12,5°	7°	2	.0015	●			
2	1	3	8	57	1,8	20	6	12°	6,5°	2	.002	●			
3	1,5	3,5	10	57	2,8	20	6	11,5°	5°	2	.003	●			
4	2	4	12	57	3,8	20	6	11°	3,5°	2	.004	●			
5	2,5	5	14	57	4,7	20	6	10°	2°	2	.005	●			
6	3	6	20	57	5,6	—	6	—	—	2	.006	●			
8	4	7	25	63	7,6	—	8	—	—	2	.008	●			
10	5	8	30	72	9,6	—	10	—	—	2	.010	●			
12	6	10	35	83	11,5	—	12	—	—	2	.012	●			
12	6	10	35	92	11,5	40	16	35°	3,5°	2	.01216	●			
16	8	12	40	92	15,5	—	16	—	—	2	.016	●			
[inch]	ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code			
	±0,0004	±0,0002													
1/64	0.0078	1/32	1/16	2	0.0142	1/2	1/4	18.5°	14.5°	2	.00156	●			
1/32	0.0156	1/16	1/8	2	0.0295	1/2	1/4	20.5°	14°	2	.003125	●			
1/16	0.0313	3/32	5/16	2	0.0551	1/2	1/4	42°	12.5°	2	.00625	●			
3/32	0.0468	1/8	3/8	2	0.0866	1/2	1/4	60.5°	11°	2	.009375	●			
1/8	0.0625	5/32	7/16	2	0.1181	1/2	1/4	—	9°	2	.0125	●			
3/16	0.0938	3/16	1/2	2	0.1771	1/2	1/4	—	5°	2	.01875	●			
1/4	0.1250	1/4	1/2	2	0.2362	—	1/4	—	—	2	.0250	●			
5/16	0.1562	9/32	1	2	0.2953	—	5/16	—	—	2	.03125	●			
3/8	0.1875	5/16	1 1/8	2	0.3583	—	3/8	—	—	2	.0375	●			
7/16	0.2188	11/32	1 1/8	3	0.4173	—	7/16	—	—	2	.04375	●			
1/2	0.2500	3/8	1 3/8	3	0.4803	—	1/2	—	—	2	.0500	●			

Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1965A
 Tool with side-lock clamping: order code 1965A

- Multifunktionales Hochleistungswerkzeug
- Patentierte Querschneide
- 2 Baulängen verfügbar

- Multi-functional, high performance tool
- Patented chisel edge
- 2 lengths available

- N**
- HM**
- DIN 6535 HA HB ≈ ASME B94.19
- 30° Kugel
- v_c / f_z 138
- Optional
- ≤ 55 HRC



Allround

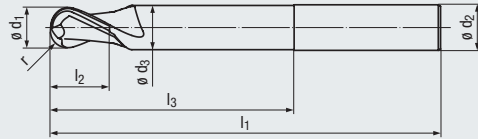
Product Finder

N

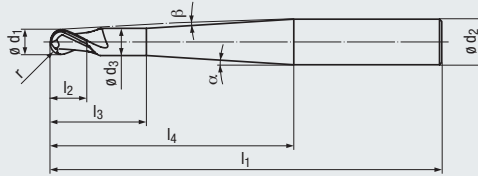
H

W

v_c / f_z



Design I₄:



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For almost all materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	2.1-2.8, 5.2 1.2-1.4
S	2.1-2.3 2.4-2.6
H	1.1-1.2



Extra lange Ausführung · Extra long design

Bestell-Code · Order code

1960A

[mm]	ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z (Flutes)	Dimens.-Code			
	±0.01	±0.005						h5							
1		0,5	2	4	80	0,95	40	6	4,5°	4°	2	.001	●		
1.5		0,75	2,5	7,5	80	1,4	40	6	4,5°	3,5°	2	.0015	●		
2		1	3	8	80	1,8	40	6	4°	3°	2	.002	●		
3		1,5	3,5	12	80	2,8	40	6	3,5°	2,5°	2	.003	●		
4		2	4	20	80	3,8	40	6	4°	1,5°	2	.004	●		
5		2,5	5	25	80	4,7	40	6	3°	1°	2	.005	●		
6		3	6	40	80	5,6	-	6	-	-	2	.006	●		
6		3	6	25	100	5,6	60	8	2°	1°	2	.00608	●		
6		3	6	25	100	5,6	50	8	3°	1,5°	2	.10608	●		
8		4	7	60	100	7,6	-	8	-	-	2	.008	●		
8		4	7	30	120	7,6	75	10	2°	1°	2	.00810	●		
8		4	7	32	120	7,6	60	10	2,5°	1°	2	.10810	●		
10		5	8	75	120	9,6	-	10	-	-	2	.010	●		
10		5	8	50	100	9,6	-	10	-	-	2	.110	●		
10		5	8	40	160	9,6	110	12	1°	1°	2	.01012	●		
10		5	8	30	120	9,6	70	12	2°	1°	2	.11012	●		
12		6	10	70	160	11,5	-	12	-	-	2	.012	●		
12		6	10	70	120	11,5	-	12	-	-	2	.112	●		
12		6	10	50	200	11,5	150	16	1,5°	1°	2	.01216	●		
12		6	10	35	150	11,5	70	16	4°	2°	2	.11216	●		
16		8	12	80	200	15,5	-	16	-	-	2	.016	●		
±0.0004 ±0.0002															
1/64		0.0078	1/32	1/16	3 1/2	0.0142	2	1/4	3.5°	3.5°	2	.00156	●		
1/32		0.0156	1/16	1/8	3 1/2	0.0295	2	1/4	3.5°	3.5°	2	.003125	●		
1/16		0.0313	3/32	5/16	3 1/2	0.0551	2	1/4	3.5°	3°	2	.00625	●		
3/32		0.0468	1/8	3/8	3 1/2	0.0866	2	1/4	3°	2.5°	2	.009375	●		
1/8		0.0625	5/32	7/16	3 1/2	0.1181	2	1/4	2.5°	2°	2	.0125	●		
3/16		0.0938	3/16	1/2	3 1/2	0.1771	2	1/4	1.5°	1°	2	.01875	●		
1/4		0.1250	1/4	2	3 1/2	0.2362	-	1/4	-	-	2	.0250	●		
5/16		0.1562	9/32	2 1/2	4	0.2953	-	5/16	-	-	2	.03125	●		
3/8		0.1875	5/16	2 7/8	4 1/2	0.3583	-	3/8	-	-	2	.0375	●		
7/16		0.2188	11/32	3 1/8	5	0.4173	-	7/16	-	-	2	.04375	●		
1/2		0.2500	3/8	4 1/8	6	0.4803	-	1/2	-	-	2	.0500	●		

Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1961A
Tool with side-lock clamping: order code 1961A

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

- Product Finder
- N
- H
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- Patentierte Querschneide
- Mit 220-240° Kugelschneide
- Multi-functional, high performance tool
- Patented chisel edge
- With 220-240° ball nose

N

HM

DIN 6535
HA
HB

15°

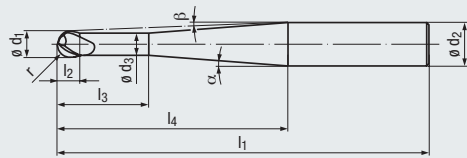
220-240°

v_c / f_z
138

≤ 55 HRC



Allround



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

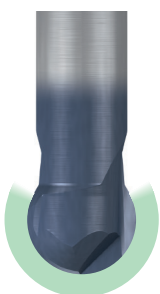
- In vielen Werkstoffen einsetzbar
- Zum Schruppen und Schlichten geeignet
- Hinterschnittige Bearbeitung möglich

- For many materials
- Suitable for roughing and finishing
- Machining of undercuts

P	1.1-5.1
K	1.1-4.2
N	2.1-2.8 1.2-1.4, 5.2
H	1.1-1.2

Extra lange Ausführung · Extra long design

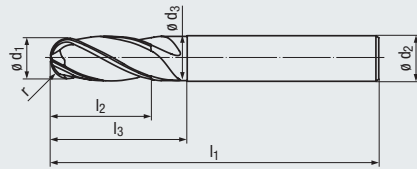
Bestell-Code · Order code												1935A			
$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code				
2	1	1,3	17	80	1,8	40	6	6°	3°	2	.002	●			
3	1,5	2	17	80	2,7	40	6	4,5°	2,5°	2	.003	●			
4	2	2,8	18	80	3,2	40	6	4°	1,5°	2	.004	●			
6	3	4,3	20	80	5	40	6	2°	–	2	.006	●			
8	4	5,7	26	100	6,8	60	8	1,5°	–	2	.008	●			
10	5	7	28	120	8	75	10	1,5°	–	2	.010	●			
12	6	9	30	120	8	75	12	3°	–	2	.012	●			
12	6	9	40	160	8	110	12	2°	–	2	.012160	●			



Kugel auf bis zu 240° schneidend einsetzbar
Ball nose with fully functional cutting edge up to 240°

- Multifunktionales Werkzeug
- 2 Schneiden zur Mitte
- 2 Baulängen verfügbar

- Multi-functional tool
- 2 centre cutting edges
- 2 lengths available



N

HM

DIN 6535
HA
HB

30° Kugel

3-5°

v_c / f_z
139

Optional



Allround



Allround

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

- For almost all materials
- Suitable for HSC finishing

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



Lange Ausführung · Long design

Bestell-Code · Order code

1867A

$\varnothing d_1$ h10	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
2	1	6	–	38	–	2	4	.002	●		
3	1,5	10	–	38	–	3	4	.003	●		
4	2	10	–	40	–	4	4	.004	●		
5	2,5	13	20	50	4,8	5	4	.005	●		
6	3	13	20	57	5,8	6	4	.006	●		
8	4	19	25	63	7,7	8	4	.008	●		
10	5	22	30	72	9,7	10	4	.010	●		
12	6	26	35	83	11,6	12	4	.012	●		
14	7	26	35	83	13,6	14	4	.014	●		
16	8	32	40	92	15,5	16	4	.016	●		

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

1967A

$\varnothing d_1$ h10	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
6	3	40	60	100	5,8	6	4	.006		●	
8	4	40	60	100	7,7	8	4	.008		●	
10	5	40	55	100	9,7	10	4	.010		●	
12	6	45	50	100	11,6	12	4	.012		●	
14	7	45	50	100	13,6	14	4	.014		●	
16	8	65	90	150	15,5	16	4	.016		●	



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

Alle Ausführungen lieferbar solange vorrätig
All designs available while stocks last

- Product Finder
- N
- H
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- 2 Schneiden zur Mitte
- 2 Baulängen verfügbar
- Multi-functional, high performance tool
- 2 centre cutting edges
- 2 lengths available

N

HM

DIN 6535
HA
HB

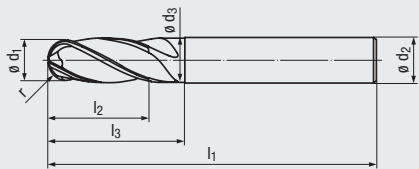
35-38°

Kugel

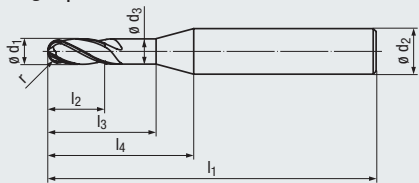
3-5°

v_c / f_z
139

Optional



Design I₄:



Allround



Allround

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

- For almost all materials
- Suitable for HSC finishing

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

Lange Ausführung · Long design

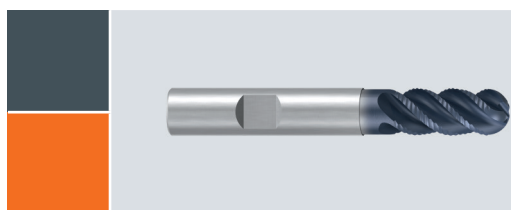
Bestell-Code · Order code

ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	Z (Flutes)	Dimens.- Code	2502A		
2	1	6	10	57	1,9	20	6	3	.002	●		
3	1,5	8	14	57	2,9	20	6	3	.003	●		
4	2	11	18	57	3,8	20	6	3	.004	●		
5	2,5	13	19	57	4,8	20	6	3	.005	●		
6	3	13	20	57	5,8	–	6	4	.006	●		
8	4	19	25	63	7,7	–	8	4	.008	●		
10	5	22	30	72	9,5	–	10	4	.010	●		
12	6	26	35	83	11,5	–	12	4	.012	●		
16	8	32	40	92	15,5	–	16	4	.016	●		

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	Z (Flutes)	Dimens.- Code			2504A
6	3	40	60	100	5,8	–	6	4	.006			●
8	4	40	60	100	7,7	–	8	4	.008			●
10	5	40	55	100	9,5	–	10	4	.010			●
12	6	45	50	100	11,5	–	12	4	.012			●
16	8	65	90	150	15,5	–	16	4	.016			●

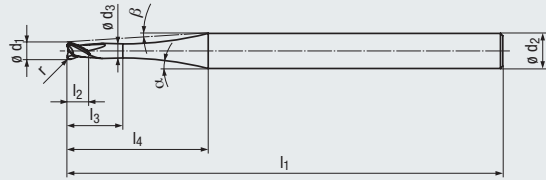
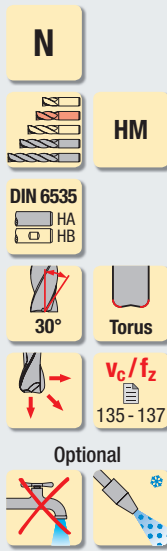


Multi-Cut Hartmetall-Kugelfräser
siehe Seite 24

Multi-Cut solid carbide ball nose end mills,
see pages 24

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

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



Allround



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

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

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

$l_3 : d_1 = 2,2 : 1$ – Kurze Ausführung · Short design

Bestell-Code · Order code												2780A	
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,5	0,1	0,3	1,1	38	0,4	5,8	3	15°	13°	2	.0005	●	
1	0,2	0,6	2,2	43	0,8	7,8	4	15°	11°	2	.001	●	
1,5	0,3	0,9	3,3	43	1,2	8	4	15°	9°	2	.0015	●	
2	0,5	1,2	4,4	57	1,6	11,9	6	15°	10°	2	.002	●	

$l_3 : d_1 = 5 : 1$ – Kurze Ausführung · Short design

Bestell-Code · Order code												2781A	
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,5	0,1	0,5	2,5	38	0,4	7,8	3	15°	10°	2	.0005	●	
1	0,2	1	5	43	0,8	11,6	4	15°	8°	2	.001	●	
1,5	0,3	1,5	7,5	43	1,2	13,7	4	15°	6°	2	.0015	●	
2	0,5	2	10	57	1,6	19,7	6	15°	6°	2	.002	●	

$l_3 : d_1 = 10 : 1$ – Kurze Ausführung · Short design

Bestell-Code · Order code												2782A	
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,5	0,1	0,5	5	38	0,4	10,7	3	13°	6°	2	.0005	●	
1	0,2	1	10	43	0,8	18,3	4	8°	5°	2	.001	●	
1,5	0,3	1,5	15	43	1,2	18,1	4	13,5°	4°	2	.0015	●	
2	0,5	2	20	57	1,6	32	6	9,5°	4°	2	.002	●	

- Product Finder
- N
- H
- W
- v_c / f_z

- Multifunktionales Werkzeug
- Spezielle Halsausführungen
- Hochgenauer Eckenradius
- 3 Halslängen verfügbar
- Multi-functional tool
- Special neck designs
- High-precision corner radius
- 3 neck lengths available

N

HM

DIN 6535

**HA
HB**

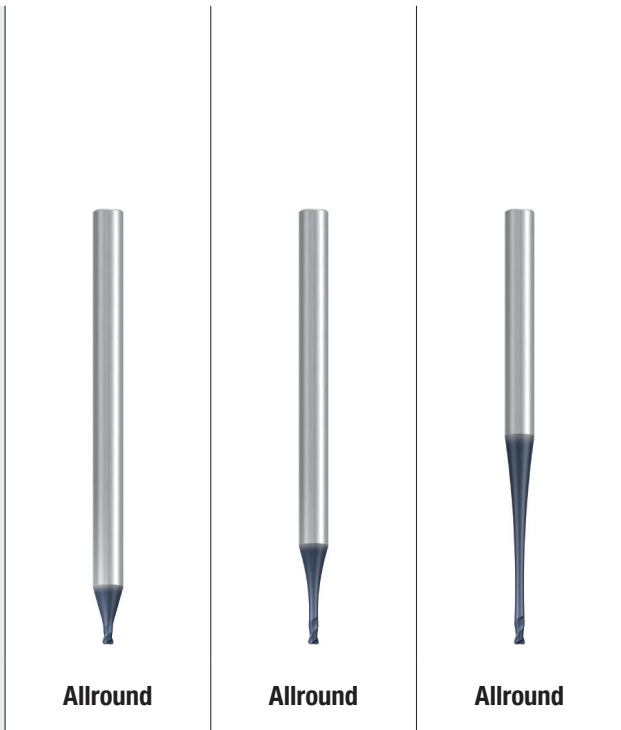
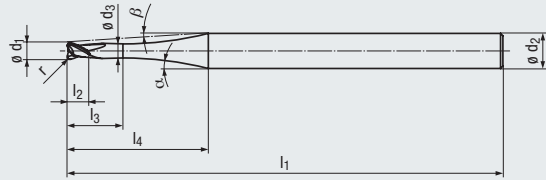
30°

Torus

v_c / f_z

135 - 137

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94) Applications – material (see page 94)

- In fast allen Werkstoffen einsetzbar
- Zum Bearbeiten kleinster Gravuren und Bauteile
- For almost all materials
- For machining smallest engravings and components

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

$l_3 : d_1 = 2,2 : 1$ – Lange Ausführung · Long design

Bestell-Code · Order code											2783A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,5	0,1	0,3	1,1	50	0,4	5,8	3	15°	13°	2	.0005	●	
1	0,2	0,6	2,2	60	0,8	7,8	4	15°	11°	2	.001	●	
1,5	0,3	0,9	3,3	60	1,2	8	4	15°	9°	2	.0015	●	
2	0,5	1,2	4,4	70	1,6	11,9	6	15°	10°	2	.002	●	

$l_3 : d_1 = 5 : 1$ – Lange Ausführung · Long design

Bestell-Code · Order code											2784A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,5	0,1	0,5	2,5	50	0,4	7,8	3	15°	10°	2	.0005	●	
1	0,2	1	5	60	0,8	11,6	4	15°	8°	2	.001	●	
1,5	0,3	1,5	7,5	60	1,2	13,7	4	15°	6°	2	.0015	●	
2	0,5	2	10	70	1,6	19,7	6	15°	6°	2	.002	●	

$l_3 : d_1 = 10 : 1$ – Lange Ausführung · Long design

Bestell-Code · Order code											2785A		
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)			
0,5	0,1	0,5	5	50	0,4	14,5	3	13°	6°	2	.0005	●	
1	0,2	1	10	60	0,8	23,7	4	10,2°	4°	2	.001	●	
1,5	0,3	1,5	15	60	1,2	29,2	4	7,8°	3°	2	.0015	●	
2	0,5	2	20	70	1,6	41,4	6	8,5°	3°	2	.002	●	

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

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

N

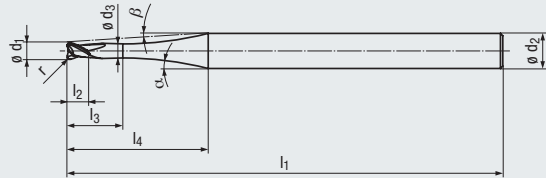
HM

DIN 6535
HA
HB

30°
Torus

V_c / f_z
135 - 137

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

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

Applications – material (see page 94)

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

Allround

Allround

Allround

TIALN

TIALN

TIALN

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

l₃ : d₁ = 2,2 : 1 – Extra lange Ausführung · Extra long design

Bestell-Code · Order code													2786A		
ϕd_1	r	l ₂	l ₃	l ₁	ϕd_3	l ₄	ϕd_2	α	β	Z	Dimens.-Code				
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)					
0,5	0,1	0,3	1,1	80	0,4	11,4	6	15°	14°	2	.0005	●			
1	0,2	0,6	2,2	80	0,8	11,5	6	15°	13°	2	.001	●			
1,5	0,3	0,9	3,3	80	1,2	11,7	6	15°	11°	2	.0015	●			
2	0,5	1,2	4,4	80	1,6	11,9	6	15°	10°	2	.002	●			

l₃ : d₁ = 5 : 1 – Extra lange Ausführung · Extra long design

Bestell-Code · Order code													2787A		
ϕd_1	r	l ₂	l ₃	l ₁	ϕd_3	l ₄	ϕd_2	α	β	Z	Dimens.-Code				
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)					
0,5	0,1	0,5	2,5	80	0,4	13,4	6	15°	12°	2	.0005	●			
1	0,2	1	5	80	0,8	15,3	6	15°	10°	2	.001	●			
1,5	0,3	1,5	7,5	80	1,2	17,4	6	15°	8°	2	.0015	●			
2	0,5	2	10	80	1,6	19,7	6	15°	6°	2	.002	●			

l₃ : d₁ = 10 : 1 – Extra lange Ausführung · Extra long design

Bestell-Code · Order code													2788A		
ϕd_1	r	l ₂	l ₃	l ₁	ϕd_3	l ₄	ϕd_2	α	β	Z	Dimens.-Code				
$\pm 0,01$	$\pm 0,005$						h5			(Flutes)					
0,5	0,1	0,5	5	80	0,4	20,2	6	15°	8°	2	.0005	●			
1	0,2	1	10	80	0,8	28,7	6	13°	6°	2	.001	●			
1,5	0,3	1,5	15	80	1,2	35,8	6	10,2°	4°	2	.0015	●			
2	0,5	2	20	80	1,6	41,4	6	8,5°	3°	2	.002	●			

Product Finder

- N
- H
- W
- v_c / f_z



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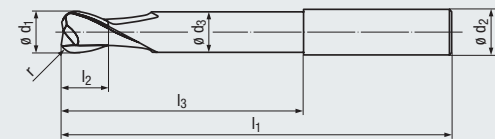
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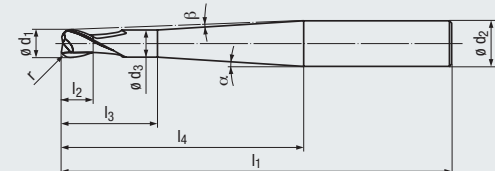
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- Product Finder
- N
- H
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- Hochgenauer Eckenradius
- Multi-functional, high performance tool
- High-precision corner radius



Design I₄:



- N
- HM
- DIN 6535 HA HB
- ≈ ASME B94.19
- 30°
- Torus
- v_c / f_z 138
- Optional
- ≤ 55 HRC



Allround

Beschichtung - Coating

TIALN

Einsatzgebiete - Material (siehe Seite 94)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

Applications - material (see page 94)

- For almost all materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1	
M	1.1-4.1	
K	1.1-4.2	
N	2.1-2.8, 5.2	1.2-1.4
S	2.1-2.3	2.4-2.6
H	1.1-1.2	

Kurze Ausführung · Short design

Bestell-Code · Order code												1986A				
	ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code				
[mm]	0,5	0,1	1	2	57	0,45	20	6	10°	8,5°	2	.0005	●			
	1	0,25	2	4	57	0,95	20	6	10°	8°	2	.001	●			
	1,5	0,3	2,5	7,5	57	1,4	20	6	12,5°	7°	2	.0015	●			
	2	0,5	3	8	57	1,8	20	6	12°	6,5°	2	.002	●			
	3	0,5	3,5	10	57	2,8	20	6	11,5°	5°	2	.003	●			
	4	1	4	12	57	3,8	20	6	11°	3,5°	2	.004	●			
	4	0,5	4	12	57	3,8	20	6	11°	3,5°	2	.104	●			
	5	1,5	5	14	57	4,7	20	6	10°	2°	2	.005	●			
	5	1	5	14	57	4,7	20	6	10°	2°	2	.105	●			
	6	2	6	20	57	5,6	-	6	-	-	2	.006	●			
	6	1	6	20	57	5,6	-	6	-	-	2	.106	●			
	8	2	7	25	63	7,6	-	8	-	-	2	.008	●			
	8	1	7	25	63	7,6	-	8	-	-	2	.208	●			
	10	3	8	30	72	9,6	-	10	-	-	2	.010	●			
	10	1,5	8	30	72	9,6	-	10	-	-	2	.210	●			
	12	4	10	35	83	11,5	-	12	-	-	2	.012	●			
	12	1,5	10	35	83	11,5	-	12	-	-	2	.112	●			
	12	4	10	35	92	11,5	40	16	35°	3,5°	2	.01216	●			
	16	5	12	40	92	15,5	-	16	-	-	2	.016	●			
	±0,0004	±0,0002														
[inch]	1/64	0.0039	1/32	1/16	2	0.0142	1/2	1/4	18,5°	14,5°	2	.00156	●			
	1/32	0.0078	1/16	1/8	2	0.0295	1/2	1/4	20,5°	14°	2	.003125	●			
	1/16	0.0156	3/32	5/16	2	0.0551	1/2	1/4	42°	12,5°	2	.00625	●			
	3/32	0.0234	1/8	3/8	2	0.0866	1/2	1/4	60,5°	11°	2	.009375	●			
	1/8	0.0312	5/32	7/16	2	0.1181	1/2	1/4	-	9°	2	.0125	●			
	3/16	0.0469	3/16	1/2	2	0.1771	1/2	1/4	-	5°	2	.01875	●			
	1/4	0.0625	1/4	1/2	2	0.2362	-	1/4	-	-	2	.0250	●			
	5/16	0.0781	9/32	1	2 1/2	0.2953	-	5/16	-	-	2	.03125	●			
	3/8	0.0937	5/16	1 1/8	2 3/4	0.3583	-	3/8	-	-	2	.0375	●			
	7/16	0.1094	11/32	1 1/8	3	0.4173	-	7/16	-	-	2	.04375	●			
	1/2	0.1250	3/8	1 3/8	3 1/4	0.4803	-	1/2	-	-	2	.0500	●			

Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1985A
 Tool with side-lock clamping: order code 1985A

- Multifunktionales Hochleistungswerkzeug
- Hochgenauer Eckenradius

- Multi-functional, high performance tool
- High-precision corner radius

N

HM

DIN 6535 HA HB ≈ ASME B94.19

30° **Torus**

v_c / f_z
138

Optional

≤ 55 HRC



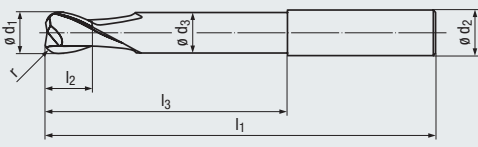
Product Finder

N

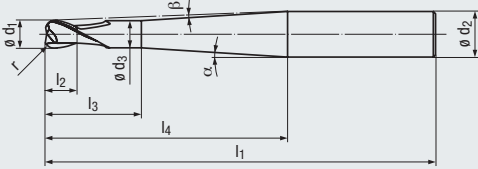
H

W

v_c / f_z



Design I₄:



Allround

Beschichtung · Coating
Einsatzgebiete – Material (siehe Seite 94)
- In fast allen Werkstoffen einsetzbar
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

Applications – material (see page 94)
- For almost all materials
- Suitable for roughing, finishing and HSC finishing

TIALN

P 1.1-5.1

M 1.1-4.1

K 1.1-4.2

N 2.1-2.8, 5.2 1.2-1.4

S 2.1-2.3 2.4-2.6

H 1.1-1.2



Extra lange Ausführung · Extra long design

Bestell-Code · Order code												1980A				
$\varnothing d_1$ ±0,01	r ±0,005	l ₂	l ₃	l ₁	$\varnothing d_3$	l ₄	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code					
1	0,25	2	4	80	0,95	40	6	4,5°	4°	2	.001	●				
1,5	0,3	2,5	7,5	80	1,4	40	6	4,5°	3,5°	2	.0015	●				
2	0,5	3	8	80	1,8	40	6	4°	3°	2	.002	●				
3	0,5	3,5	12	80	2,8	40	6	3,5°	2,5°	2	.003	●				
4	1	4	20	80	3,8	40	6	4°	1,5°	2	.004	●				
4	0,5	4	20	80	3,8	40	6	4°	1,5°	2	.104	●				
5	1,5	5	25	80	4,7	40	6	3°	1°	2	.005	●				
5	1	5	25	80	4,7	40	6	3°	1°	2	.105	●				
6	2	6	40	80	5,6	–	6	–	–	2	.006	●				
6	1	6	40	80	5,6	–	6	–	–	2	.106	●				
6	2	6	25	100	5,6	60	8	2°	1°	2	.00608	●				
6	2	6	25	100	5,6	50	8	3°	1,5°	2	.10608	●				
8	2	7	60	100	7,6	–	8	–	–	2	.008	●				
8	2,5	7	60	100	7,6	–	8	–	–	2	.108	●				
8	1	7	60	100	7,6	–	8	–	–	2	.208	●				
8	2	7	30	120	7,6	75	10	2°	1°	2	.00810	●				
8	2	4	32	120	7,6	60	10	2,5°	1°	2	.10810	●				
10	3	8	75	120	9,6	–	10	–	–	2	.010	●				
10	2,5	8	75	120	9,6	–	10	–	–	2	.110	●				
10	1,5	8	75	120	9,6	–	10	–	–	2	.210	●				
10	3	8	50	100	9,6	–	10	–	–	2	.310	●				
10	3	8	40	160	9,6	110	12	1°	1°	2	.01012	●				
10	3	6	30	120	9,6	70	12	2°	1°	2	.11012	●				
12	4	10	70	160	11,5	–	12	–	–	2	.012	●				
12	1,5	10	70	160	11,5	–	12	–	–	2	.112	●				
12	4	8	70	120	11,5	–	12	–	–	2	.212	●				
12	4	10	50	200	11,5	150	16	1,5°	1°	2	.01216	●				
12	4	8	35	150	11,5	70	16	4°	2°	2	.11216	●				
16	5	12	80	200	15,5	–	16	–	–	2	.016	●				
±0,0004 ±0,0002																
1/64	0.0039	1/32	1/16	3 1/2	0.0142	2	1/4	3,5°	3,5°	2	.00156	●				
1/32	0.0078	1/16	1/8	3 1/2	0.0295	2	1/4	3,5°	3,5°	2	.003125	●				
1/16	0.0156	3/32	5/16	3 1/2	0.0551	2	1/4	3,5°	3°	2	.00625	●				
3/32	0.0234	1/8	3/8	3 1/2	0.0866	2	1/4	3°	2,5°	2	.009375	●				
1/8	0.0312	5/32	7/16	3 1/2	0.1181	2	1/4	2,5°	2°	2	.0125	●				
3/16	0.0469	3/16	1/2	3 1/2	0.1771	2	1/4	1,5°	1°	2	.01875	●				
1/4	0.0625	1/4	2	3 1/2	0.2362	–	1/4	–	–	2	.0250	●				
5/16	0.0781	9/32	2 1/2	4	0.2953	–	5/16	–	–	2	.03125	●				
3/8	0.0937	5/16	2 7/8	4 1/2	0.3583	–	3/8	–	–	2	.0375	●				
7/16	0.1094	11/32	3 1/8	5	0.4173	–	7/16	–	–	2	.04375	●				
1/2	0.1250	3/8	4 1/8	6	0.4803	–	1/2	–	–	2	.0500	●				

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

Werkzeug mit seiti. Mitnahmefläche: Bestell-Code 1981A
Tool with side-lock clamping: order code 1981A



- Product Finder
- N
- H
- W
- v_c / f_z

- Multifunktionales Hochleistungswerkzeug
- Mit 4 und 6 Schneiden
- Hochgenauer Eckenradius
- Multi-functional, high performance tool
- With 4 and 6 flutes
- High-precision corner radius

N

HM

DIN 6535
HA
HB

30°

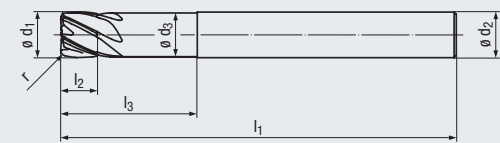
Torus

1-2°

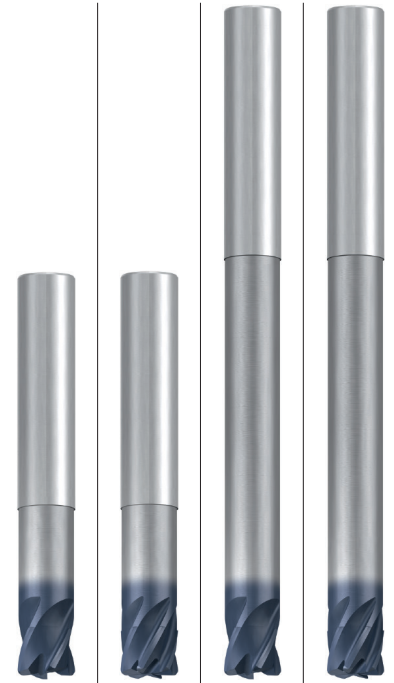
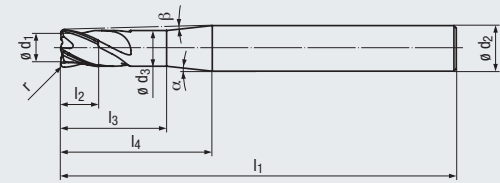
v_c / f_z
138

Optional

≤ 55 HRC



Design I₄:



Allround

Allround

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- In schwer zerspanbaren Materialien einsetzbar
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

- For difficult to cut materials
- Suitable for roughing, finishing and HSC finishing

P	1.1-5.1	P	1.1-5.1
M	1.1-2.1	M	1.1-2.1
K	1.1-4.2	K	1.1-4.2
N	2.2-2.8, 5.2 2.1	N	2.2-2.8, 5.2 2.1
S	1.1-2.6	S	1.1-2.6
H	1.1-1.2	H	1.1-1.2

Kurze Ausführung · Short design

Bestell-Code · Order code												1945A		
ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code			
3	0,5	3,5	10	57	2,8	20	6	11,5°	5°	4	.003	●		
4	0,5	4	12	57	3,8	20	6	11°	3,5°	4	.004	●		
5	0,5	5	14	57	4,7	20	6	10°	1,5°	4	.005	●		
6	0,8	6	20	57	5,6	–	6	–	–	4	.006004	●		
6	0,8	6	20	57	5,6	–	6	–	–	6	.006		●	
8	1	7	25	63	7,6	–	8	–	–	4	.008004	●		
8	1	7	25	63	7,6	–	8	–	–	6	.008		●	
10	1	8	30	72	9,6	–	10	–	–	4	.010004	●		
10	1	8	30	72	9,6	–	10	–	–	6	.010		●	
12	1,5	10	35	83	11,5	–	12	–	–	4	.012004	●		
12	1,5	10	35	83	11,5	–	12	–	–	6	.012		●	

Extra lange Ausführung · Extra long design

Bestell-Code · Order code												1947A		
ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code			
3	0,5	3,5	12	80	2,8	40	6	3,5°	2,5°	4	.003		●	
4	0,5	4	20	80	3,8	40	6	4°	1,5°	4	.004		●	
5	0,5	5	25	80	4,7	40	6	3°	1°	4	.005		●	
6	0,8	6	40	80	5,6	–	6	–	–	4	.006		●	
6	0,8	6	40	80	5,6	–	6	–	–	6	.006006			●
8	1	7	40	80	7,6	–	8	–	–	4	.008		●	
8	1	7	60	100	7,6	–	8	–	–	6	.108006			●
10	1	8	55	100	9,6	–	10	–	–	4	.010		●	
10	1	8	75	120	9,6	–	10	–	–	6	.110006			●
12	1,5	10	70	120	11,5	–	12	–	–	4	.012		●	
12	1,5	10	70	160	11,5	–	12	–	–	6	.112006			●

Werkzeug mit seitlicher Mitnahmeffläche: Bestell-Code 1946A (kurze Ausführung) und 1948A (extra lange Ausführung)
Tool with side-lock clamping: order code 1946A (short design) and 1948A (extra long design)



Turbine Hartmetall-Torusfräser mit 5-9 Schneiden siehe Seite 189

Turbine solid carbide torus end mills with 5-9 flutes, see page 189

- Hochleistungswerkzeug
- Patentierte Querschneide
- 3 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- 3 lengths available

H

HM

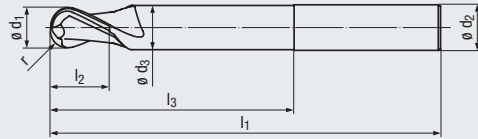
DIN 6535
HA
HB

≈ ASME
B94.19

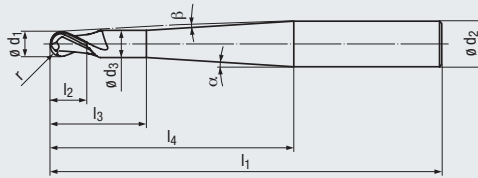
30° Kugel

v_c / f_z
132

Optional
≤ 63 HRC



Design I₄:



Hard materials



Hard materials

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In gehärteten Werkstoffen einsetzbar
- Zum Schrappen, Schlichten sowie zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For hardened materials
- Suitable for roughing, finishing and HSC finishing

P	3.1-5.1	1.1-2.1	P	3.1-5.1	1.1-2.1
K	1.1-4.2		K	1.1-4.2	
H	1.1-1.4		H	1.1-1.4	



Kurze Ausführung · Short design

Bestell-Code · Order code													1976A			
	ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code				
	0,5	0,25	1	2	57	0,45	20	6	10°	8,5°	2	.0005	●			
	1	0,5	2	4	57	0,95	20	6	10°	8°	2	.001	●			
	1,5	0,75	2,5	7,5	57	1,4	20	6	12,5°	7°	2	.0015	●			
	2	1	3	8	57	1,8	20	6	12°	6,5°	2	.002	●			
	3	1,5	3,5	10	57	2,8	20	6	11,5°	5°	2	.003	●			
	4	2	4	12	57	3,8	20	6	11°	3,5°	2	.004	●			
	5	2,5	5	14	57	4,7	20	6	10°	2°	2	.005	●			
	6	3	6	20	57	5,6	–	6	–	–	2	.006	●			
	8	4	7	25	63	7,6	–	8	–	–	2	.008	●			
	10	5	8	30	72	9,6	–	10	–	–	2	.010	●			
	12	6	10	35	83	11,5	–	12	–	–	2	.012	●			
	12	6	10	35	92	11,5	40	16	35°	3,5°	2	.01216	●			
	16	8	12	40	92	15,5	–	16	–	–	2	.016	●			
	±0,0004	±0,0002														
	1/4	0.1250	1/4	1/2	2	0.2362	–	1/4	–	–	2	.0250	●			
	5/16	0.1562	9/32	1	2 1/2	0.2953	–	5/16	–	–	2	.03125	●			
	3/8	0.1875	5/16	1 1/8	2 3/4	0.3583	–	3/8	–	–	2	.0375	●			
	7/16	0.2188	11/32	1 1/8	2	0.4173	–	7/16	–	–	2	.04375	●			
	1/2	0.2500	3/8	1 3/8	3 1/4	0.4803	–	1/2	–	–	2	.0500	●			

Lange Ausführung · Long design

Bestell-Code · Order code															1974A	
	ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code				
	8	4	7	40	90	7,6	–	8	–	–	2	.008			●	
	10	5	8	50	100	9,6	–	10	–	–	2	.010			●	
	12	6	10	65	120	11,5	–	12	–	–	2	.012			●	
	16	8	12	80	140	15,5	–	16	–	–	2	.016			●	

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Patentierte Querschneide
- 3 Baulängen verfügbar
- High performance tool
- Patented chisel edge
- 3 lengths available

H

HM

DIN 6535 HA HB ≈ ASME B94.19

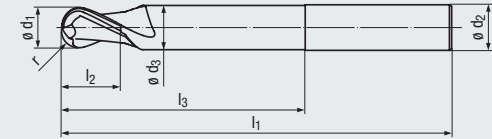
30° Kugel

v_c / f_z 132

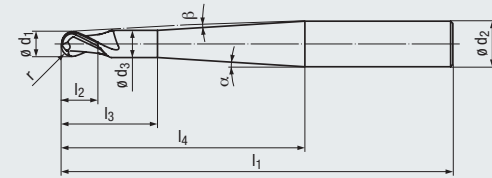
Optional ≤ 63 HRC



Hard materials



Design I₄:



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

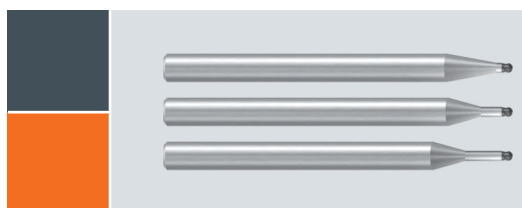
- In gehärteten Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

- For hardened materials
- Suitable for HSC finishing

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.4	

Extra lange Ausführung · Extra long design

Bestell-Code · Order code													1963A			
	$\varnothing d_1$ ±0,01	r ±0,005	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code				
	1	0,5	2	4	80	0,95	40	6	4,5°	4°	2	.001	●			
	1,5	0,75	2,5	7,5	80	1,4	40	6	4,5°	3,5°	2	.0015	●			
	2	1	3	8	80	1,8	40	6	4°	3°	2	.002	●			
	3	1,5	3,5	12	80	2,8	40	6	3,5°	2,5°	2	.003	●			
	4	2	4	20	80	3,8	40	6	4°	1,5°	2	.004	●			
	5	2,5	5	25	80	4,7	40	6	3°	1°	2	.005	●			
	6	3	6	40	80	5,6	—	6	—	—	2	.006	●			
	6	3	6	25	100	5,6	60	8	2°	1°	2	.00608	●			
	8	4	7	60	100	7,6	—	8	—	—	2	.008	●			
	8	4	7	30	120	7,6	75	10	2°	1°	2	.00810	●			
	10	5	8	75	120	9,6	—	10	—	—	2	.010	●			
	10	5	8	40	160	9,6	110	12	1°	1°	2	.01012	●			
	12	6	10	70	160	11,5	—	12	—	—	2	.012	●			
	12	6	10	50	200	11,5	150	16	1,5°	1°	2	.01216	●			
	16	8	12	80	200	15,5	—	16	—	—	2	.016	●			
	±0,0004	±0,0002														
[inch]	1/4	0.1250	1/4	2	3 1/2	0.2362	—	1/4	—	—	2	.0250	●			
	5/16	0.1562	9/32	2 1/2	4	0.2953	—	5/16	—	—	2	.03125	●			
	3/8	0.1875	5/16	2 7/8	4 1/2	0.3583	—	3/8	—	—	2	.0375	●			
	7/16	0.2188	11/32	3 1/8	5	0.4173	—	7/16	—	—	2	.04375	●			
	1/2	0.2500	3/8	4 1/8	6	0.4803	—	1/2	—	—	2	.0500	●			

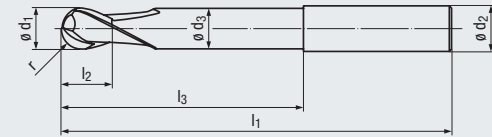


CBN-Micro- und Mini-Kugelfräser
siehe Seite 159

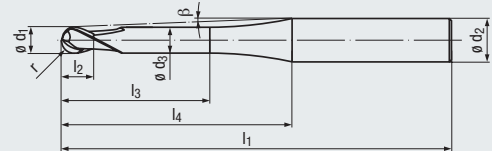
CBN micro and mini ball nose end mills,
see pages 159

- Hochleistungswerkzeug
- Spezielle Halsausführung
- Patentierte Querschneide

- High performance tool
- Special neck design
- Patented chisel edge



Design I₄:



H

HM

DIN 6535
HA
HB

30° **Kugel**

v_c/f_z
132

Optional
≤ 66
HRC



Hard materials

Product Finder

N

H

W

v_c/f_z

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In gehärteten Werkstoffen einsetzbar
- Fräsen von zylindrischen Kavitäten bis 16 x d₁
- Zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For hardened materials
- Milling of cylindrical cavities up to 16 x d₁
- Suitable for HSC finishing

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
N	2.2-2.8, 5.2	
H	1.1-1.5	

Lange Ausführung · Long design

Bestell-Code · Order code

2806A

∅ d ₁ ±0,01	r ±0,005	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h5	β	Z (Flutes)	Dimens.- Code			
0,4	0,2	0,3	2	57	0,35	8,5	6	18°	2	.1004	●		
0,4	0,2	0,3	3,2	57	0,35	9,5	6	16°	2	.2004	●		
0,4	0,2	0,3	4	57	0,35	10,5	6	15°	2	.3004	●		
0,4	0,2	0,3	4,8	57	0,35	11,5	6	14°	2	.4004	●		
0,5	0,25	0,5	2,5	57	0,45	9,5	6	17°	2	.0005	●		
0,5	0,25	0,5	4	57	0,45	11	6	15°	2	.1005	●		
0,5	0,25	0,5	5	57	0,45	12	6	13,5°	2	.2005	●		
0,5	0,25	0,5	6	57	0,45	13	6	12,5°	2	.3005	●		
0,6	0,3	0,5	1,5	57	0,55	8	6	19°	2	.0006	●		
0,6	0,3	0,5	3	57	0,55	9,5	6	16°	2	.1006	●		
0,6	0,3	0,5	4,8	57	0,55	11	6	13,5°	2	.2006	●		
0,6	0,3	0,5	6	57	0,55	12,5	6	12,5°	2	.3006	●		
0,6	0,3	0,5	7,2	57	0,55	13,5	6	11,5°	2	.4006	●		
0,8	0,4	0,5	2	57	0,75	8,5	6	18°	2	.0008	●		
0,8	0,4	0,5	4	57	0,75	10,5	6	14,5°	2	.1008	●		
0,8	0,4	0,5	6,4	57	0,75	13	6	12°	2	.2008	●		
0,8	0,4	0,5	8	57	0,75	14,5	6	10,5°	2	.3008	●		
0,8	0,4	0,5	9,6	57	0,75	16	6	9,5°	2	.4008	●		
1	0,5	1	2,5	57	0,95	9	6	17°	2	.401	●		
1	0,5	1	5	57	0,95	11,5	6	13°	2	.101	●		
1	0,5	1	8	57	0,95	14,5	6	10,5°	2	.201	●		
1	0,5	1	10	57	0,95	16,5	6	9°	2	.001	●		
1	0,5	1	12	57	0,95	18,5	6	8°	2	.301	●		
1	0,5	1	16	57	0,95	20,5	6	9,5°	2	.501	●		
1,2	0,6	1	6	57	1,15	12	6	12,5°	2	.0012	●		
1,2	0,6	1	12	57	1,15	18,5	6	8,5°	2	.2012	●		
1,5	0,75	1,25	7,5	57	1,4	13,5	6	10°	2	.1015	●		
1,5	0,75	1,25	12	57	1,4	18	6	7,5°	2	.0015	●		
1,5	0,75	1,25	18	57	1,4	21	6	5,5°	2	.2015	●		
2	1	1,5	5	57	1,9	10,5	6	14°	2	.302	●		
2	1	1,5	10	57	1,9	14	6	9°	2	.102	●		
2	1	1,5	16	57	1,9	20	6	6°	2	.002	●		
2	1	1,5	24	57	1,9	28	6	4,5°	2	.202	●		
2	1	1,5	32	80	1,9	37,5	6	4°	2	.402	●		
3	1,5	2	15	57	2,9	20,5	6	3,5°	2	.103	●		
3	1,5	2	20	80	2,9	34,5	6	3°	2	.003	●		
3	1,5	2	24	80	2,9	38,5	6	2,5°	2	.203	●		
3	1,5	2	36	80	2,9	42,5	6	2°	2	.303	●		
4	2	2,5	22	80	3,9	35	6	2°	2	.004	●		
4	2	2,5	32	80	3,9	42	6	1,5°	2	.104	●		
4	2	2,5	48	100	3,9	61	6	1°	2	.204	●		
5	2,5	3	25	80	4,9	35	6	1°	2	.005	●		
5	2,5	3	40	80	4,9	43	6	1°	2	.105	●		
5	2,5	3	60	100	4,9	63	6	0,5°	2	.205	●		
6	3	3,5	29	80	5,9	-	6	-	2	.006	●		
6	3	3,5	48	100	5,9	-	6	-	2	.106	●		
6	3	3,5	72	100	5,9	-	6	-	2	.206	●		

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

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Patentierte Querschneide
- Ausführung ohne Hals
- 2 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- Design without neck
- 2 lengths available

H

HM

DIN 6535
HA HB

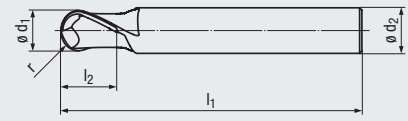
≈ ASME B94.19

30°

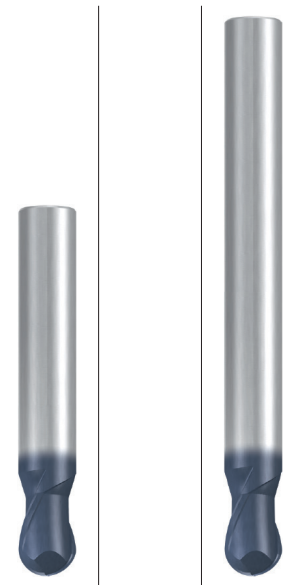
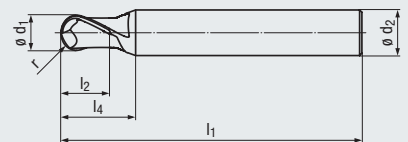
Kugel

v_c / f_z
132

Optional
44-66 HRC



Design I₄:



Hard materials

Hard materials

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- In gehärteten Werkstoffen einsetzbar
- Zum Schlichten sowie zum HSC-Schlichten geeignet

- For hardened materials
- Suitable for finishing and HSC finishing

P	3.1-5.1	P	3.1-5.1
K	1.1-4.2	K	1.1-4.2
H	1.1-1.5	H	1.1-1.5

Extra kurze Ausführung · Extra short design

Bestell-Code · Order code									1877A		
$\varnothing d_1$ ±0,01	r ±0,005	l_2	l_1	l_4	$\varnothing d_2$ h5	Z (Flutes)	Dimens.- Code				
1	0,5	4	40	12	4	2	.001	●			
1	0,5	4	50	13	6	2	.00106	●			
1,5	0,75	4	40	12	4	2	.0015	●			
1,5	0,75	4	50	13	6	2	.001506	●			
2	1	4	50	14	6	2	.002	●			
3	1,5	5	50	14	6	2	.003	●			
4	2	8	54	17	6	2	.004	●			
5	2,5	9	54	17	6	2	.005	●			
6	3	10	54	–	6	2	.006	●			
7	3,5	11	58	21	8	2	.007	●			
8	4	12	58	–	8	2	.008	●			
10	5	14	66	–	10	2	.010	●			
12	6	16	73	–	12	2	.012	●			
14	7	18	75	–	14	2	.014	●			
16	8	22	82	–	16	2	.016	●			
18	9	24	84	–	18	2	.018	●			
20	10	26	92	–	20	2	.020	●			
±0,0004	±0,0002										
1/8	0.0625	1/4	2 1/4	7/8	1/4	2	.0125	●			
3/16	0.0938	3/8	2 1/4	7/8	1/4	2	.01875	●			
1/4	0.1250	3/8	2 1/4	–	1/4	2	.250	●			
5/16	0.1563	1/2	2 1/2	–	5/16	2	.03125	●			
3/8	0.1875	9/16	2 3/4	–	3/8	2	.0375	●			
1/2	0.2500	5/8	3	–	1/2	2	.0500	●			
5/8	0.3125	7/8	3 1/4	–	5/8	2	.0625	●			
3/4	0.3750	1	3 3/4	–	3/4	2	.0750	●			

Extra lange Ausführung · Extra long design

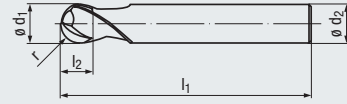
Bestell-Code · Order code											1879A
$\varnothing d_1$ ±0,01	r ±0,005	l_2	l_1	l_4	$\varnothing d_2$ h5	Z (Flutes)	Dimens.- Code				
2	1	4	60	22	6	2	.002			●	
3	1,5	5	60	22	6	2	.003			●	
4	2	8	75	38	6	2	.004			●	
5	2,5	9	75	38	6	2	.005			●	
6	3	10	100	–	6	2	.006			●	
7	3,5	11	100	63	8	2	.007			●	
8	4	12	100	–	8	2	.008			●	
10	5	14	100	–	10	2	.010			●	
12	6	16	100	–	12	2	.012			●	
14	7	18	120	–	14	2	.014			●	
16	8	22	150	–	16	2	.016			●	
18	9	24	150	–	18	2	.018			●	
20	10	26	150	–	20	2	.020			●	



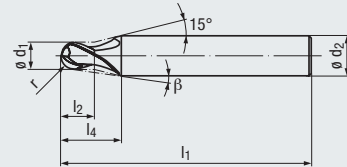
Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1977A (extra kurze Ausführung) und 1979A (extra lange Ausführung)
Tool with side-lock clamping: order code 1977A (extra short design) and 1979A (extra long design)

- Hochleistungswerkzeug
- Patentierte Querschneide
- Ausführung ohne Hals
- Extra kurze, stabile Schneidenlänge
- 2 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- Design without neck
- Extra short, stable flute length
- 2 lengths available



Design I₄:



H

HM

DIN 6535 HA HB ≈ ASME B94.19

30° Kugel

v_c / f_z 132

Optional 44-66 HRC



Hard materials



Hard materials

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In gehärteten Werkstoffen einsetzbar
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For hardened materials
- Suitable for roughing, finishing and HSC finishing

P	3.1-5.1	P	3.1-5.1
K	1.1-4.2	K	1.1-4.2
H	1.1-1.5	H	1.1-1.5



Kurze Ausführung · Short design

Bestell-Code · Order code										1973A			
[mm]	$\varnothing d_1$	r	l_2	l_1	l_4	$\varnothing d_2$	β	Z	Dimens.-Code				
	$\pm 0,01$	$\pm 0,005$				h5		(Flutes)					
	2	1	1,5	38	3,3	3	9°	2	.002	●			
	3	1,5	2	57	7,5	6	12°	2	.003	●			
	4	2	2,5	57	6	6	9°	2	.004	●			
	5	2,5	3	57	5	6	6°	2	.005	●			
	6	3	3,5	57	–	6	–	2	.006	●			
	8	4	4,5	63	–	8	–	2	.008	●			
	10	5	5,5	72	–	10	–	2	.010	●			
	12	6	6,5	83	–	12	–	2	.012	●			
[inch]	$\varnothing d_1$	r	l_2	l_1	l_4	$\varnothing d_2$	β	Z	Dimens.-Code				
	$\pm 0,0004$	$\pm 0,0002$											
	3/32	0.0468	1/16	2	3/8	1/4	3°	2	.009375	●			
	1/8	0.0625	5/64	2	3/8	1/4	2.5°	2	.0125	●			
	3/16	0.0938	7/64	2	1/4	1/4	1.5°	2	.01875	●			
	1/4	0.1250	9/64	2	–	1/4	–	2	.0250	●			
	5/16	0.1562	11/64	2 1/2	–	5/16	–	2	.03125	●			
	3/8	0.1875	13/64	2 3/4	–	3/8	–	2	.0375	●			
	7/16	0.2188	15/64	3	–	7/16	–	2	.04375	●			
	1/2	0.2500	17/64	3 1/4	–	1/2	–	2	.0500	●			

Lange Ausführung · Long design

Bestell-Code · Order code												2819A	
[mm]	$\varnothing d_1$	r	l_2	l_1	l_4	$\varnothing d_2$	β	Z	Dimens.-Code				
	$\pm 0,01$	$\pm 0,005$				h5		(Flutes)					
	6	3	3,5	80	–	6	–	2	.006			●	
	8	4	4,5	90	–	8	–	2	.008			●	
	10	5	5,5	100	–	10	–	2	.010			●	
	12	6	6,5	120	–	12	–	2	.012			●	

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Patentierte Querschneide
- Mit 4 Schneiden
- 2 Schneiden zur Mitte
- Kurze, stabile Schneidenlänge
- 2 Baulängen verfügbar
- High performance tool
- Patented chisel edge
- With 4 flutes
- 2 centre cutting edges
- Short, stable flute length
- 2 lengths available

H

HM

DIN 6535
HA
HB

≈ ASME
B94.19

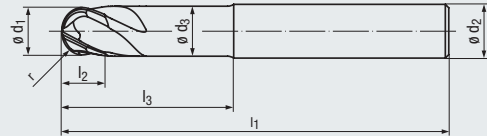
30°

Kugel

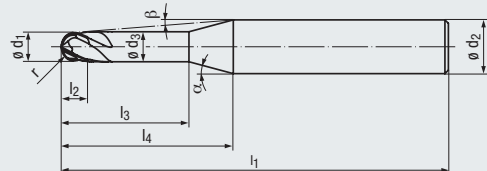
3-5°

v_c / f_z
133

Optional
≤ 66
HRC



Design I₄:



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- Zur Bearbeitung harter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

- For machining hard materials
- For finishing with very high surface quality
- Suitable for HSC finishing

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
N	2.3, 2.6-2.8	
N		2.2, 2.4-2.5
H	1.1-1.5	

Kurze Ausführung · Short design

Bestell-Code · Order code

2834A

[mm]	ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code
	±0,01	±0,005						h5			(Flutes)	
3	1,5	3,5	10	57	2,8	20	6	11,5°	5°	4	.003	●
4	2	4	12	57	3,8	20	6	11°	3,5°	4	.004	●
5	2,5	5	14	57	4,7	20	6	10°	2°	4	.005	●
6	3	6	20	57	5,6	—	6	—	—	4	.006	●
8	4	7	25	63	7,6	—	8	—	—	4	.008	●
10	5	8	30	72	9,6	—	10	—	—	4	.010	●
12	6	10	35	83	11,5	—	12	—	—	4	.012	●

Bestell-Code · Order code

2942A

[inch]	ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code
	±0,0004	±0,0002						h5			(Flutes)	
1/8	0.0625	5/32	7/16	2	0.1181	1/2	1/4	—	9°	—	4	.0125
3/16	0.0938	3/16	1/2	2	0.1772	1/2	1/4	—	5°	—	4	.01875
1/4	0.1250	1/4	1/2	2	0.2362	—	1/4	—	—	—	4	.0250
5/16	0.1563	9/32	1	2 1/2	0.2953	—	5/16	—	—	—	4	.03125
3/8	0.1875	5/16	1 1/8	2 3/4	0.3583	—	3/8	—	—	—	4	.0375
7/16	0.2188	11/32	1 1/8	3	0.4173	—	7/16	—	—	—	4	.04375
1/2	0.2500	3/8	1 3/8	3 1/4	0.4803	—	1/2	—	—	—	4	.0500

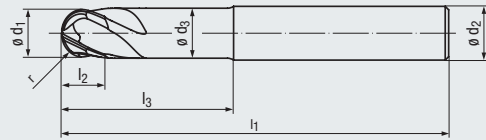
Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 2835A
Tool with side-lock clamping: order code 2835A



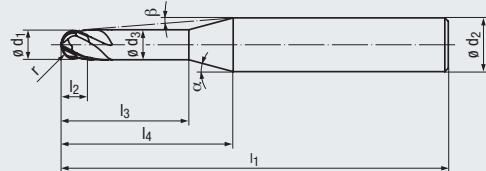
- 15-90° Alle Schneiden effektiv im Einsatz
All cutting edges in operation
- 0-15° 2 Schneiden effektiv im Einsatz
2 cutting edges in operation

- Hochleistungswerkzeug
- Patentierte Querschnitte
- Mit 4 Schneiden
- 2 Schneiden zur Mitte
- Kurze, stabile Schneidenlänge
- 2 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- With 4 flutes
- 2 centre cutting edges
- Short, stable flute length
- 2 lengths available



Design I₄:



H

HM

DIN 6535 HA HB ≈ ASME B94.19

30° Kugel

3-5°

v_c / f_z 133

Optional ≤ 66 HRC



Hard materials

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- Zur Bearbeitung harter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For machining hard materials
- For finishing with very high surface quality
- Suitable for HSC finishing

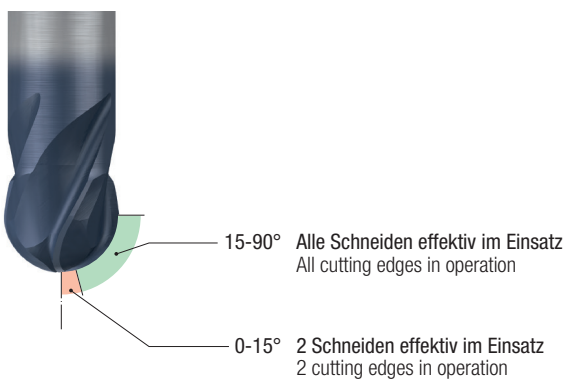
P	3.1-5.1	1.1-2.1
K	1.1-4.2	
N	2.3, 2.6-2.8	
N		2.2, 2.4-2.5
H	1.1-1.5	

Lange Ausführung · Long design

Bestell-Code · Order code												2842A			
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.-Code			
	$\pm 0,01$	$\pm 0,005$						h_5							
[mm]	6	3	6	30	80	5,6	–	6	–	–	4	.006	●		
	8	4	7	35	80	7,6	–	8	–	–	4	.008	●		
	10	5	8	45	100	9,6	–	10	–	–	4	.010	●		
	12	6	10	50	100	11,5	–	12	–	–	4	.012	●		

Bestell-Code · Order code												2943A			
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.-Code			
	$\pm 0,0004$	$\pm 0,0002$						h_5							
[inch]	1/8	0.0625	5/32	7/16	3 1/2	0.1181	2	1/4	2,5°	2°	4	.0125	●		
	3/16	0.0938	3/16	1/2	3 1/2	0.1772	2	1/4	1,5°	1°	4	.01875	●		
	1/4	0.1250	1/4	2	3 1/2	0.2362	–	1/4	–	–	4	.0250	●		
	5/16	0.1563	9/32	2 1/2	4	0.2953	–	5/16	–	–	4	.03125	●		
	3/8	0.1875	5/16	2 7/8	4 1/2	0.3583	–	3/8	–	–	4	.0375	●		
	7/16	0.2188	11/32	3 1/8	5	0.4173	–	7/16	–	–	4	.04375	●		
	1/2	0.2500	3/8	4 1/8	6	0.4803	–	1/2	–	–	4	.0500	●		

Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 2843A
Tool with side-lock clamping: order code 2843A



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

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Patentierte Querschneide
- Mit 6 und 8 Schneiden
- 2 Schneiden zur Mitte
- Kurze, stabile Schneidenlänge
- 2 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- With 6 and 8 flutes
- 2 centre cutting edges
- Short, stable flute length
- 2 lengths available

H

HM

DIN 6535
HA
HB

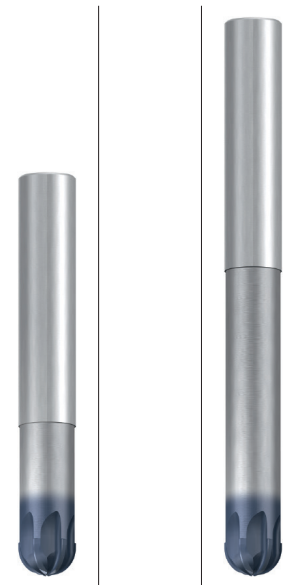
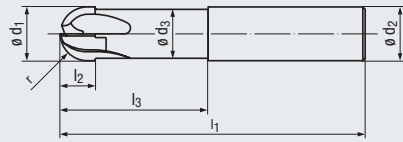
0°

Kugel

1-2°

v_c / f_z
133

Optional
44-66
HRC



Hard materials

Hard materials

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- Zur Bearbeitung harter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

- For machining hard materials
- For finishing with very high surface quality
- Suitable for HSC finishing

P	3.1-5.1	P	3.1-5.1
K	1.1-4.2	K	1.1-4.2
N	2.3, 2.6	N	2.3, 2.6
S	1.2-2.6	S	1.2-2.6
H	1.1-1.5	H	1.1-1.5

Kurze Ausführung · Short design

Bestell-Code · Order code

2836A

$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h5	Z (Flutes)	Dimens.- Code			
10	5	6	30	72	9,6	10	6	.010	●		
12	6	7	35	83	11,5	12	8	.012	●		

Lange Ausführung · Long design

Bestell-Code · Order code

2837A

$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h5	Z (Flutes)	Dimens.- Code			
10	5	6	45	100	9,6	10	6	.010		●	
12	6	7	50	100	11,5	12	8	.012		●	
16	8	8	60	120	15,5	16	8	.016		●	

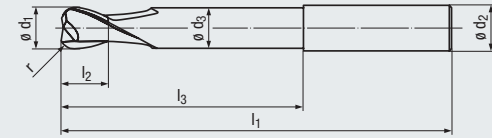


15-90° Alle Schneiden effektiv im Einsatz
All cutting edges in operation

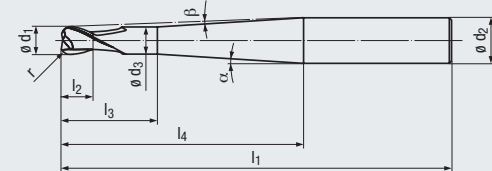
0-15° 2 Schneiden effektiv im Einsatz
2 cutting edges in operation

- Hochleistungswerkzeug
- Hochgenauer Eckenradius
- 3 Baulängen verfügbar

- High performance tool
- High-precision corner radius
- 3 lengths available



Design I₄:



H

HM

DIN 6535
HA
HB

≈ ASME
B94.19

30°
Torus

v_c / f_z
132

Optional
≤ 63
HRC



Hard materials



Hard materials

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In gehärteten Werkstoffen einsetzbar
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For hardened materials
- Suitable for roughing, finishing and HSC finishing

P	3.1-5.1	1.1-2.1	P	3.1-5.1	1.1-2.1
K	1.1-4.2		K	1.1-4.2	
H	1.1-1.4		H	1.1-1.4	

Kurze Ausführung · Short design

Bestell-Code · Order code												1996A			
ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code				
±0.01	±0.005						h5			(Flutes)					
0.5	0.1	1	2	57	0.45	20	6	10°	8.5°	2	.0005	●			
1	0.25	2	4	57	0.95	20	6	10°	8°	2	.001	●			
1.5	0.3	2.5	7.5	57	1.4	20	6	12.5°	7°	2	.0015	●			
2	0.5	3	8	57	1.8	20	6	12°	6.5°	2	.002	●			
3	0.5	3.5	10	57	2.8	20	6	11.5°	5°	2	.003	●			
4	1	4	12	57	3.8	20	6	11°	3.5°	2	.004	●			
5	1.5	5	14	57	4.7	20	6	10°	2°	2	.005	●			
6	2	6	20	57	5.6	-	6	-	-	2	.006	●			
8	2	7	25	63	7.6	-	8	-	-	2	.008	●			
10	3	8	30	72	9.6	-	10	-	-	2	.010	●			
12	4	10	35	83	11.5	-	12	-	-	2	.012	●			
12	4	10	35	92	11.5	40	16	35°	3.5°	2	.01216	●			
16	5	12	40	92	15.5	-	16	-	-	2	.016	●			
±0.0004	±0.0002														
1/4	0.0625	1/4	1/2	2	0.2362	-	1/4	-	-	2	.0250	●			
5/16	0.0781	9/32	1	2 1/2	0.2953	-	5/16	-	-	2	.03125	●			
3/8	0.0937	5/16	1 1/8	2 3/4	0.3583	-	3/8	-	-	2	.0375	●			
7/16	0.1094	11/32	1 1/8	3	0.4173	-	7/16	-	-	2	.04375	●			
1/2	0.1250	3/8	1 3/8	3 1/4	0.4803	-	1/2	-	-	2	.0500	●			

Lange Ausführung · Long design

Bestell-Code · Order code														1993A	
ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code				
±0.01	±0.005						h5			(Flutes)					
8	2	7	40	90	7.6	-	8	-	-	2	.008			●	
10	3	8	50	100	9.6	-	10	-	-	2	.010			●	
12	4	10	65	120	11.5	-	12	-	-	2	.012			●	
16	5	12	80	140	15.5	-	16	-	-	2	.016			●	



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Hochgenauer Eckenradius
- 3 Baulängen verfügbar
- High performance tool
- High-precision corner radius
- 3 lengths available

H

HM

DIN 6535
HA HB

≈ ASME B94.19

30°

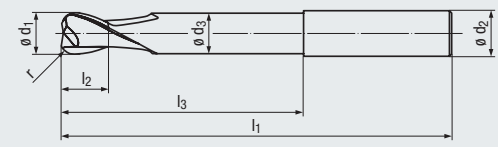
Torus

v_c / f_z
132

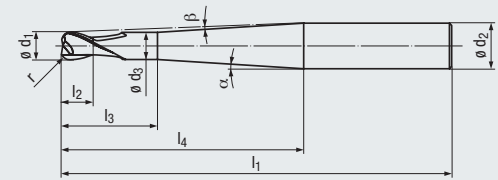
Optional
≤ 63 HRC



Hard materials



Design I₄:



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- In gehärteten Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

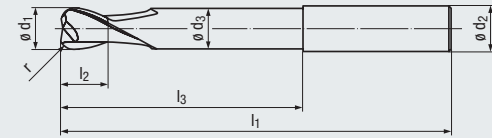
- For hardened materials
- Suitable for HSC finishing

P	3.1-5.1	1.1-2.1
K	1.1-4.2	
H	1.1-1.4	

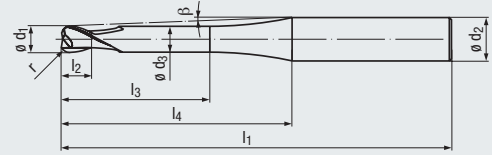
Extra lange Ausführung · Extra long design

Bestell-Code · Order code													1983A		
	ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code			
	1	0,25	2	4	80	0,95	40	6	4,5°	4°	2	.001	●		
	1,5	0,3	2,5	7,5	80	1,4	40	6	4,5°	3,5°	2	.0015	●		
	2	0,5	3	8	80	1,8	40	6	4°	3°	2	.002	●		
	3	0,5	3,5	12	80	2,8	40	6	3,5°	2,5°	2	.003	●		
	4	1	4	20	80	3,8	40	6	4°	1,5°	2	.004	●		
	5	1,5	5	25	80	4,7	40	6	3°	1°	2	.005	●		
	6	2	6	40	80	5,6	—	6	—	—	2	.006	●		
	6	2	6	25	100	5,6	60	8	2°	1°	2	.00608	●		
	8	2	7	60	100	7,6	—	8	—	—	2	.008	●		
	8	2	7	30	120	7,6	75	10	2°	1°	2	.00810	●		
	8	2,5	7	60	100	7,6	—	8	—	—	2	.108	●		
	10	2,5	8	75	120	9,6	—	10	—	—	2	.110	●		
	10	3	8	75	120	9,6	—	10	—	—	2	.010	●		
	10	3	8	40	160	9,6	110	12	1°	0,5°	2	.01012	●		
	12	4	10	70	160	11,5	—	12	—	—	2	.012	●		
	12	4	10	50	200	11,5	150	16	1,5°	1°	2	.01216	●		
	16	5	12	80	200	15,5	—	16	—	—	2	.016	●		
		±0,0004	±0,0002												
	1/4	0.0625	1/4	2	3 1/2	0.2362	—	1/4	—	—	2	.0250	●		
	5/16	0.0781	9/32	2 1/2	4	0.2953	—	5/16	—	—	2	.03125	●		
	3/8	0.0937	5/16	2 7/8	4 1/2	0.3583	—	3/8	—	—	2	.0375	●		
	7/16	0.1094	11/32	3 1/8	5	0.4173	—	7/16	—	—	2	.04375	●		
	1/2	0.1250	3/8	4 1/8	6	0.4803	—	1/2	—	—	2	.0500	●		

- Hochleistungswerkzeug
- Spezielle Halsausführung
- Hochgenauer Eckenradius
- High performance tool
- Special neck design
- High-precision corner radius



Design I₄:



H

HM

DIN 6535
HA
HB

30°

Torus

3-5°

v_c / f_z
132

Optional
≤ 66 HRC



Hard materials

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 94)

- In gehärteten Werkstoffen einsetzbar
- Fräsen von zylindrischen Kavitäten bis 12 x d_1
- Zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For hardened materials
- Milling of cylindrical cavities of up to 12 x d_1
- Suitable for HSC finishing

P 3.1-5.1 1.1-2.1

K 1.1-4.2

N 2.2-2.8, 5.2

H 1.1-1.5



Extra lange Ausführung · Extra long design

Bestell-Code · Order code

2807A

ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	β	Z (Flutes)	Dimens.- Code				
0,5	0,1	0,5	2,5	57	0,45	9,5	6	17°	2	.0005	●			
0,5	0,1	0,5	4	57	0,45	11	6	15°	2	.1005	●			
0,5	0,1	0,5	5	57	0,45	12	6	13,5°	2	.2005	●			
0,5	0,1	0,5	6	57	0,45	13	6	12,5°	2	.3005	●			
1	0,2	1	5	57	0,95	11,5	6	13°	2	.101	●			
1	0,2	1	8	57	0,95	14,5	6	10,5°	2	.201	●			
1	0,2	1	10	57	0,95	16,5	6	9°	2	.001	●			
1	0,2	1	12	57	0,95	18,5	6	8°	2	.301	●			
1,5	0,3	1,25	7,5	57	1,4	13,5	6	10°	2	.1015	●			
1,5	0,3	1,25	12	57	1,4	18	6	7,5°	2	.0015	●			
1,5	0,3	1,25	18	57	1,4	21	6	5,5°	2	.2015	●			
2	0,4	1,5	10	57	1,9	14	6	9°	2	.102	●			
2	0,4	1,5	16	57	1,9	20	6	6°	2	.002	●			
2	0,4	1,5	24	57	1,9	28	6	4,5°	2	.202	●			
3	0,5	2	15	57	2,9	20,5	6	3,5°	2	.103	●			
3	0,5	2	20	80	2,9	34,5	6	3°	2	.003	●			
3	0,5	2	24	80	2,9	38,5	6	2,5°	2	.203	●			
3	0,5	2	36	80	2,9	42,5	6	2°	2	.303	●			
4	0,6	2,5	22	80	3,9	35	6	2°	2	.004	●			
4	0,6	2,5	32	80	3,9	42	6	1,5°	2	.104	●			
4	0,6	2,5	48	100	3,9	61	6	1°	2	.204	●			
5	0,8	3	25	80	4,9	35	6	1°	2	.005	●			
5	0,8	3	40	80	4,9	43	6	1°	2	.105	●			
5	0,8	3	60	100	4,9	63	6	–	2	.205	●			
6	1	3,5	29	80	5,9	–	6	–	2	.006	●			
6	1	3,5	48	100	5,9	–	6	–	2	.106	●			
6	1	3,5	72	100	5,9	–	6	–	2	.206	●			



CBN-Micro- und Mini-Torusfräser
siehe Seite 160 - 161

CBN micro and mini torus end mills,
see pages 160 - 161

FRANKEN *Hard-Cut* Hartmetall-Torusfräser · Solid Carbide Torus End Mills

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Mit 4 Schneiden
- Hochgenauer Eckenradius
- Kurze, stabile Schneidenlänge
- 2 Baulängen verfügbar
- High performance tool
- With 4 flutes
- High-precision corner radius
- Short, stable flute length
- 2 lengths available

H

HM

DIN 6535
HA
HB

≈ ASME
B94.19

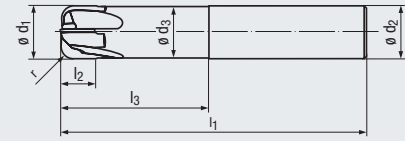
0°

Torus

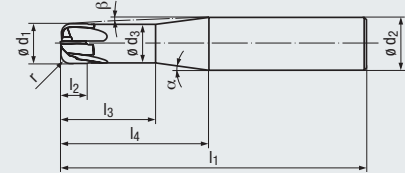
v_c / f_z
133

Optional

≤ 66
HRC



Design I₄:



Hard materials

Hard materials

Beschichtung - Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 94)

Applications – material (see page 94)

- Zur Bearbeitung harter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

- For machining hard materials
- For finishing with very high surface quality
- Suitable for HSC finishing

P	1.1-5.1	P	1.1-5.1
K	1.1-4.2	K	1.1-4.2
N	2.3, 2.6-2.8	N	2.3, 2.6-2.8
N	2.2, 2.4-2.5	N	2.2, 2.4-2.5
H	1.1-1.5	H	1.1-1.5

Kurze Ausführung · Short design

Bestell-Code · Order code

		ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code	1936A		
[mm]	3	0,75	2	10	57	2,8	20	6	11,5°	5°	4	.003	●			
	4	1	2,5	12	57	3,8	20	6	11°	3,5°	4	.004	●			
	5	1,25	3	14	57	4,7	20	6	10°	2°	4	.005	●			
	6	1,5	4	20	57	5,6	–	6	–	–	4	.006	●			
	8	2	5	25	63	7,6	–	8	–	–	4	.008	●			
	8	1	5	25	63	7,6	–	8	–	–	4	.008010	●			
	10	2,5	6	30	72	9,6	–	10	–	–	4	.010	●			
	10	1	6	30	72	9,6	–	10	–	–	4	.010010	●			
	12	3	7	35	83	11,5	–	12	–	–	4	.012	●			
	12	1	7	35	83	11,5	–	12	–	–	4	.012010	●			
16	4	8	40	92	15,5	–	16	–	–	4	.016	●				
[inch]	3/32	0.023	0.0850	3/8	2	0.0866	1/2	1/4	33.3°	3.3°	4	.009375	●			
	1/8	0.031	0.1000	7/16	2	0.1181	1/2	1/4	46.9°	7.6°	4	.0125	●			
	3/16	0.047	0.1299	1/2	2 1/2	0.1772	7/8	1/4	5.5°	2.2°	4	.01875	●			
	1/4	0.063	0.1693	1/2	2 1/2	0.2362	–	1/4	–	–	4	.0250	●			
	5/16	0.078	0.2008	1	2 1/2	0.2953	–	5/16	–	–	4	.03125	●			
	3/8	0.094	0.2283	1 1/8	2 3/4	0.3583	–	3/8	–	–	4	.0375	●			
	7/16	0.109	0.2500	1 1/8	2 3/4	0.4173	–	7/16	–	–	4	.04375	●			
	1/2	0.125	0.2500	1 3/8	3 1/4	0.4803	–	1/2	–	–	4	.0500	●			
	5/8	0.156	0.3102	1 1/2	3 1/2	0.6051	–	5/8	–	–	4	.0625	●			
	3/4	0.188	0.3799	1 7/8	4	0.7303	–	3/4	–	–	4	.0750	●			
1	0.250	0.5000	1 5/8	4	0.9803	–	1	–	–	4	.1000	●				

Lange Ausführung · Long design

Bestell-Code · Order code

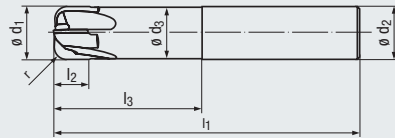
		ϕd_1 ±0,01	r ±0,005	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code		2832A	
[mm]	6	1,5	4	30	80	5,6	–	6	–	–	4	.006		●		
	8	2	5	35	80	7,6	–	8	–	–	4	.008		●		
	8	1	5	35	80	7,6	–	8	–	–	4	.008010		●		
	10	2,5	6	45	100	9,6	–	10	–	–	4	.010		●		
	10	1	6	45	100	9,6	–	10	–	–	4	.010010		●		
	12	3	7	50	100	11,5	–	12	–	–	4	.012		●		
	12	1	7	50	100	11,5	–	12	–	–	4	.012010		●		
	16	4	8	60	120	15,5	–	16	–	–	4	.016		●		



Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1937A (kurze Ausführung) und 2833A (lange Ausführung)
Tool with side-lock clamping: order code 1937A (short design) and 2833A (long design)

- Hochleistungswerkzeug
- Mit 6 und 8 Schneiden
- Hochgenauer Eckenradius
- Kurze, stabile Schneidenlänge
- 2 Baulängen verfügbar

- High performance tool
- With 6 and 8 flutes
- High-precision corner radius
- Short, stable flute length
- 2 lengths available



H

HM

DIN 6535
HA
HB

0° Torus

1-2°

v_c / f_z
133

Optional
44-66 HRC



Hard materials



Hard materials

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

- Zur Bearbeitung harter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

Applications – material (see page 94)

- For machining hard materials
- For finishing with very high surface quality
- Suitable for HSC finishing

TIALN

TIALN

P	3.1-5.1
K	1.1-4.2
N	2.3, 2.6
S	1.2-2.6
H	1.1-1.5

P	3.1-5.1
K	1.1-4.2
N	2.3, 2.6
S	1.2-2.6
H	1.1-1.5

Kurze Ausführung · Short design

Bestell-Code · Order code

$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h5	Z (Flutes)	Dimens.-Code	2876A			
10	1	6	30	72	9,6	10	6	.010010	●			
10	2,5	6	30	72	9,6	10	6	.010	●			
12	1	7	35	83	11,5	12	8	.012010	●			
12	3	7	35	83	11,5	12	8	.012	●			

Lange Ausführung · Long design

Bestell-Code · Order code

$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h5	Z (Flutes)	Dimens.-Code		2877A		
10	1	6	45	100	9,6	10	6	.010010		●		
10	2,5	6	45	100	9,6	10	6	.010		●		
12	1	7	50	100	11,5	12	8	.012010		●		
12	3	7	50	100	11,5	12	8	.012		●		
16	4	8	60	120	15,5	16	8	.016		●		



- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Patentierte Querschneide
- Scharfe Schneidkanten
- Sehr glatte CRN-Beschichtung
- 3 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- Sharp cutting edges
- Very smooth CRN coating
- 3 lengths available

W

HM

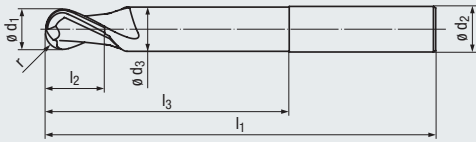
DIN 6535
HA
HB

≈ ASME
B94.19

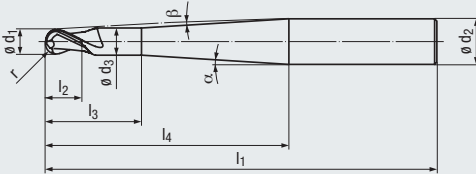
30°

Kugel

v_c / f_z
134



Design I₄:



Al



Al/Cu

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 94)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

	CRN
N 1.1-1.3	N 1.1-1.4
N 4.1-4.2 5.3	N 2.1-2.3 2.4-2.8
	N 3.1-4.4, 5.3
	S 1.1-2.1 2.2-2.3

Kurze Ausführung · Short design

Bestell-Code · Order code													1921		1921R	
	$\varnothing d_1$ ±0,01	r ±0,005	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code				
[mm]	0,5	0,25	1	2	38	0,45	9	3	10°	8°	2	.0005	●		●	
	0,5	0,25	1	2	57	0,45	20	6	10°	8,5°	2	.000506	●		●	
	1	0,5	2	4	38	0,95	9	3	12,5°	6,5°	2	.001	●		●	
	1	0,5	2	4	57	0,95	20	6	10°	8°	2	.00106	●		●	
	1,5	0,75	2,5	7,5	38	1,4	9	3	32°	5°	2	.0015	●		●	
	1,5	0,75	2,5	7,5	57	1,4	20	6	12,5°	7°	2	.001506	●		●	
	2	1	3	8	38	1,8	9	3	31°	3,5°	2	.002	●		●	
	2	1	3	8	57	1,8	20	6	12°	6,5°	2	.00206	●		●	
	3	1,5	3,5	10	57	2,8	20	6	11,5°	5°	2	.003	●		●	
	4	2	4	12	57	3,8	20	6	11°	3,5°	2	.004	●		●	
	5	2,5	5	14	57	4,7	20	6	10°	2°	2	.005	●		●	
	6	3	6	20	57	5,6	–	6	–	–	2	.006	●		●	
8	4	7	25	63	7,6	–	8	–	–	2	.008	●		●		
10	5	8	30	72	9,6	–	10	–	–	2	.010	●		●		
12	6	10	35	83	11,5	–	12	–	–	2	.012	●		●		
±0,0004 ±0,0002																
[inch]	3/32	0.0469	1/8	5/16	2 1/4	0.0866	3/4	1/4	13°	7°	2	.009375	●		●	
	1/8	0.0625	5/32	3/8	2 1/4	0.1181	3/4	1/4	12,5°	6°	2	.0125	●		●	
	3/16	0.0937	3/16	9/16	2 1/4	0.1771	3/4	1/4	18,5°	3°	2	.01875	●		●	
	1/4	0.1250	1/4	3/4	2 1/4	0.2362	–	1/4	–	–	2	.0250	●		●	
	5/16	0.1562	9/32	1	2 1/2	0.2953	–	5/16	–	–	2	.03125	●		●	
	3/8	0.1875	5/16	1	2 3/4	0.3583	–	3/8	–	–	2	.0375	●		●	
	7/16	0.2188	11/32	1 1/8	3	0.4173	–	7/16	–	–	2	.04375	●		●	
	1/2	0.2500	3/8	1 3/8	3 1/4	0.4803	–	1/2	–	–	2	.0500	●		●	
	5/8	0.3125	1/2	1 1/2	3 1/2	0.6053	–	5/8	–	–	2	.0625	●		●	
	3/4	0.3750	9/16	1 7/8	4	0.7303	–	3/4	–	–	2	.0750	●		●	

Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1922/1922R
Tool with side-lock clamping: order code 1922/1922R

- Hochleistungswerkzeug
- Patentierte Querschnitte
- Scharfe Schneidkanten
- Sehr glatte CRN-Beschichtung
- 3 Baulängen verfügbar

- High performance tool
- Patented chisel edge
- Sharp cutting edges
- Very smooth CRN coating
- 3 lengths available

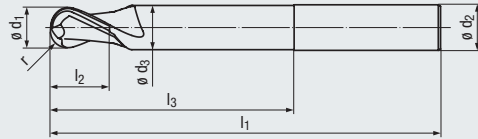
W

HM

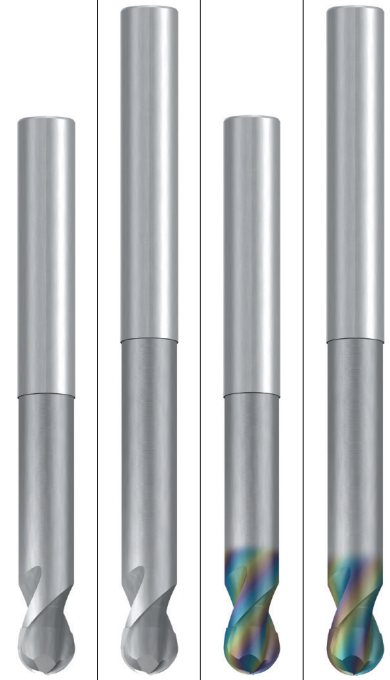
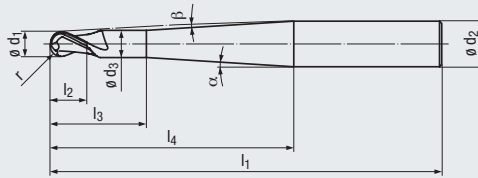
DIN 6535
HA
HB

30° **Kugel**

v_c / f_z
134



Design I₄:



Al

Al/Cu

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 94)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

		CRN	
N	1.1-1.3	N	1.1-1.4
N	4.1-4.2 5.3	N	2.1-2.3 2.4-2.8
N	3.1-4.4, 5.3	N	3.1-4.4, 5.3
S	1.1-2.1	S	2.2-2.3



Lange Ausführung · Long design

Bestell-Code · Order code

ϕd_1 $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code	2830	2830R
8	4	7	40	90	7,6	–	8	–	–	2	.008	●	●
10	5	8	50	100	9,6	–	10	–	–	2	.010	●	●
12	6	10	65	120	11,5	–	12	–	–	2	.012	●	●
16	8	12	80	140	15,5	–	16	–	–	2	.016	●	●

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

ϕd_1 $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h5	α	β	Z (Flutes)	Dimens.- Code	1943	1943R
3	1,5	3,5	12	80	2,8	40	6	3,5°	2,5°	2	.003	●	●
4	2	4	20	80	3,8	40	6	4°	1,5°	2	.004	●	●
5	2,5	5	10	100	4,7	40	6	1,5°	1°	2	.005	●	●
6	3	6	40	100	5,6	–	6	–	–	2	.006	●	●
8	4	7	60	120	7,6	–	8	–	–	2	.008	●	●
10	5	8	60	120	9,6	–	10	–	–	2	.010	●	●
12	6	10	70	160	11,5	–	12	–	–	2	.012	●	●



Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 2831/2831R (lange Ausführung) und 1843/1843R (extra lange Ausführung)
Tool with side-lock clamping: order code 2831/2831R (long design) and 1843/1843R (extra long design)



Induktionsschrumpfgerät SHrink-MASTER HL-2,
Schrumpf-Aufnahmen und -Zubehör
siehe Seite 362 - 374

Induction shrink-fit work station
SHrink-MASTER HL-2, shrink-fit chucks
and accessories, see pages 362 - 374

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Scharfe Schneidkanten
- Hochgenauer Eckenradius
- Sehr glatte CRN-Beschichtung
- 3 Baulängen verfügbar

- High performance tool
- Sharp cutting edges
- High-precision corner radius
- Very smooth CRN coating
- 3 lengths available

W

HM

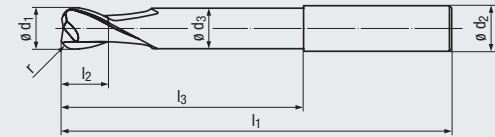
DIN 6535
HA HB

≈ ASME B94.19

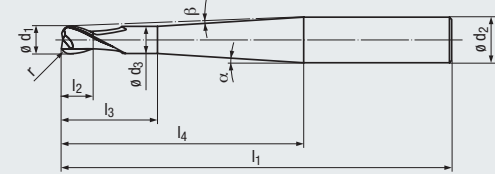
30°

Torus

v_c / f_z
134



Design I₄:



Al



Al/Cu

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 94)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

- N 1.1-1.3
- N 4.1-4.2 5.3

CRN

- N 1.1-1.4
- N 2.1-2.3 2.4-2.8
- N 3.1-4.4, 5.3
- S 1.1-2.1 2.2-2.3

Kurze Ausführung · Short design

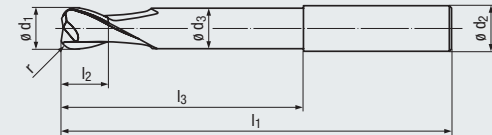
Bestell-Code · Order code

												1942		1942R		
[mm]	ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z	Dimens.-Code				
	$\pm 0,01$	$\pm 0,005$						h5			(Flutes)					
	0,5	0,1	1	2	38	0,45	9	3	10°	8°	2	.0005	●		●	
	0,5	0,1	1	2	57	0,45	20	6	10°	8,5°	2	.000506	●		●	
	1	0,25	2	4	38	0,95	9	3	12,5°	6,5°	2	.001	●		●	
	1	0,25	2	4	57	0,95	20	6	10°	8°	2	.00106	●		●	
	1,5	0,25	2,5	7,5	38	1,4	9	3	32°	5°	2	.0015	●		●	
	1,5	0,25	2,5	7,5	57	1,4	20	6	12,5°	7°	2	.001506	●		●	
	2	0,5	3	8	38	1,8	9	3	31°	3,5°	2	.002	●		●	
	2	0,5	3	8	57	1,8	20	6	12°	6,5°	2	.00206	●		●	
	3	0,5	3,5	10	57	2,8	20	6	11,5°	5°	2	.003	●		●	
	4	0,5	4	12	57	3,8	20	6	11°	3,5°	2	.004	●		●	
	5	0,5	5	14	57	4,7	20	6	10°	2°	2	.005	●		●	
	6	0,8	6	20	57	5,6	–	6	–	–	2	.006	●		●	
	8	1	7	25	63	7,6	–	8	–	–	2	.008	●		●	
	10	1	8	30	72	9,6	–	10	–	–	2	.010	●		●	
	12	1,5	10	35	83	11,5	–	12	–	–	2	.012	●		●	
	$\pm 0,0004$	$\pm 0,0002$														
[inch]	3/32	0.0078	1/8	5/16	2 1/4	0.0866	3/4	1/4	13°	6.5°	2	.009375	●		●	
	1/8	0.0156	5/32	3/8	2 1/4	0.1181	3/4	1/4	12.5°	5.5°	2	.0125	●		●	
	3/16	0.0156	3/16	9/16	2 1/4	0.1771	3/4	1/4	18.5°	3°	2	.01875	●		●	
	1/4	0.0234	1/4	3/4	2 1/4	0.2362	–	1/4	–	–	2	.0250	●		●	
	5/16	0.0312	9/32	1	2 1/2	0.2953	–	5/16	–	–	2	.03125	●		●	
	3/8	0.0391	5/16	1	2 3/4	0.3583	–	3/8	–	–	2	.0375	●		●	
	7/16	0.0469	11/32	1 1/8	3	0.4173	–	7/16	–	–	2	.04375	●		●	
	1/2	0.0547	3/8	1 3/8	3 1/4	0.4803	–	1/2	–	–	2	.0500	●		●	
	5/8	0.0625	1/2	1 1/2	3 1/2	0.6053	–	5/8	–	–	2	.0625	●		●	
	3/4	0.0781	9/16	1 7/8	4	0.7303	–	3/4	–	–	2	.0750	●		●	

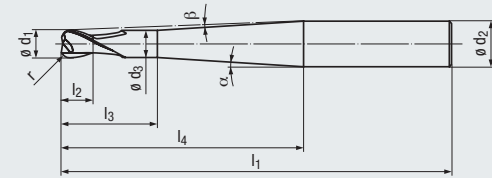
Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 1944/1944R
 Tool with side-lock clamping: order code 1944/1944R

- Hochleistungswerkzeug
- Scharfe Schneidkanten
- Hochgenauer Eckenradius
- Sehr glatte CRN-Beschichtung
- 3 Baulängen verfügbar

- High performance tool
- Sharp cutting edges
- High-precision corner radius
- Very smooth CRN coating
- 3 lengths available



Design I₄:



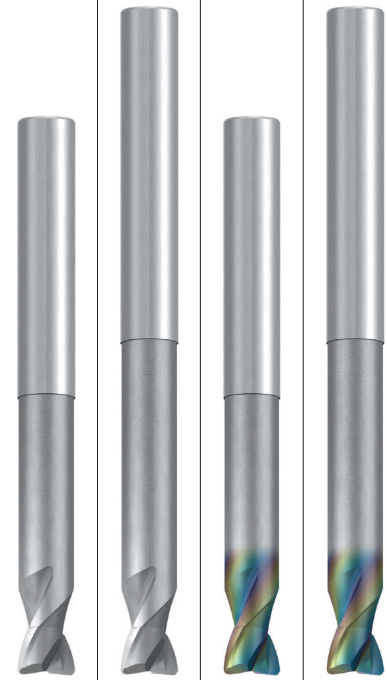
W

HM

DIN 6535
HA
HB

30°
Torus

v_c / f_z
134



AI

AI/Cu

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 94)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit CRN-Beschichtung auch in Kupfer-Legierungen einsetzbar

Applications – material (see page 94)

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With CRN coating also for copper alloys

		CRN	
N	1.1-1.3	N	1.1-1.4
N	4.1-4.2 5.3	N	2.1-2.3 2.4-2.8
N	3.1-4.4, 5.3	N	3.1-4.4, 5.3
S	1.1-2.1	S	2.2-2.3



Lange Ausführung · Long design

Bestell-Code · Order code

$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code	2838	2838R
8	1	7	40	90	7,6	–	8	–	–	2	.008	●	●
10	1	8	50	100	9,6	–	10	–	–	2	.010	●	●
12	1,5	10	65	120	11,5	–	12	–	–	2	.012	●	●
16	2	12	80	140	15,5	–	16	–	–	2	.016	●	●

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\varnothing d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code	1941	1941R
3	0,5	3,5	12	80	2,8	40	6	3,5°	2,5°	2	.003	●	●
4	0,5	4	20	80	3,8	40	6	4°	1,5°	2	.004	●	●
5	0,5	5	10	100	4,7	40	6	1,5°	1°	2	.005	●	●
6	0,8	6	40	100	5,6	–	6	–	–	2	.006	●	●
8	1	7	60	120	7,6	–	8	–	–	2	.008	●	●
10	1	8	60	120	9,6	–	10	–	–	2	.010	●	●
12	1,5	10	70	160	11,5	–	12	–	–	2	.012	●	●



Werkzeug mit seitlicher Mitnahmefläche: Bestell-Code 2839/2839R (lange Ausführung) und 1841/1841R (extra lange Ausführung)
Tool with side-lock clamping: order code 2839/2839R (long design) and 1841/1841R (extra long design)

Product Finder

N

H

W

v_c / f_z

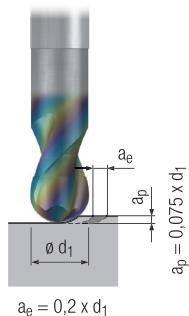


Hartmetall-Kugel- und Torusfräser – kurze, lange und extra lange Ausführung

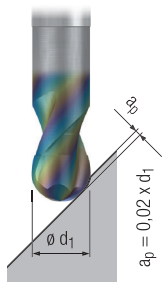
Solid carbide ball nose and torus end mills – short, long and extra long design

W

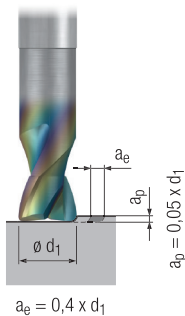
Schruppen
Roughing



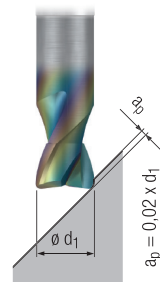
Schlichten
Finishing



Schruppen
Roughing



Schlichten
Finishing



Gültig für · Valid for

1921	1942	2830
1921R	1942R	2830R
1941	1943	2838
1941R	1943R	2838R

Achtung:
Bei unbeschichteter Ausführung ist die Schnittgeschwindigkeit v_c um 30% zu reduzieren!

Please note:
For uncoated design, please reduce cutting speed v_c by 30%!



	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P												
1.1												
2.1												
3.1												
4.1												
5.1												
M												
1.1												
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	900	$0,022 \times d_1$	1200	$0,016 \times d_1$	900	$0,022 \times d_1$	1200	$0,016 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	900	$0,020 \times d_1$	1200	$0,014 \times d_1$	900	$0,020 \times d_1$	1200	$0,014 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3	900	$0,017 \times d_1$	1200	$0,012 \times d_1$	900	$0,017 \times d_1$	1200	$0,012 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4	600	$0,020 \times d_1$	800	$0,014 \times d_1$	600	$0,020 \times d_1$	800	$0,014 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5												
1.6												
2.1	200	$0,014 \times d_1$	260	$0,010 \times d_1$	200	$0,014 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2	200	$0,014 \times d_1$	260	$0,010 \times d_1$	200	$0,014 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3	200	$0,014 \times d_1$	260	$0,010 \times d_1$	200	$0,014 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4	160	$0,011 \times d_1$	220	$0,008 \times d_1$	160	$0,011 \times d_1$	220	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5	160	$0,011 \times d_1$	220	$0,008 \times d_1$	160	$0,011 \times d_1$	220	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6	160	$0,011 \times d_1$	220	$0,008 \times d_1$	160	$0,011 \times d_1$	220	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7	100	$0,008 \times d_1$	140	$0,006 \times d_1$	100	$0,008 \times d_1$	140	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8	100	$0,008 \times d_1$	140	$0,006 \times d_1$	100	$0,008 \times d_1$	140	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1	450	$0,025 \times d_1$	600	$0,018 \times d_1$	450	$0,025 \times d_1$	600	$0,018 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2	450	$0,020 \times d_1$	600	$0,014 \times d_1$	450	$0,020 \times d_1$	600	$0,014 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.1	350	$0,021 \times d_1$	450	$0,015 \times d_1$	350	$0,021 \times d_1$	450	$0,015 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	500	$0,021 \times d_1$	650	$0,015 \times d_1$	500	$0,021 \times d_1$	650	$0,015 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3	200	$0,017 \times d_1$	250	$0,012 \times d_1$	200	$0,017 \times d_1$	250	$0,012 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4	140	$0,017 \times d_1$	180	$0,012 \times d_1$	140	$0,017 \times d_1$	180	$0,012 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1												
5.2												
5.3	220	$0,017 \times d_1$	300	$0,012 \times d_1$	220	$0,017 \times d_1$	300	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S												
1.1	110	$0,010 \times d_1$	150	$0,007 \times d_1$	110	$0,010 \times d_1$	150	$0,007 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	90	$0,010 \times d_1$	120	$0,006 \times d_1$	90	$0,010 \times d_1$	120	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3	50	$0,008 \times d_1$	70	$0,005 \times d_1$	50	$0,008 \times d_1$	70	$0,005 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.1	80	$0,008 \times d_1$	110	$0,006 \times d_1$	80	$0,008 \times d_1$	110	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2	30	$0,006 \times d_1$	50	$0,004 \times d_1$	30	$0,006 \times d_1$	50	$0,004 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3	20	$0,006 \times d_1$	40	$0,004 \times d_1$	20	$0,006 \times d_1$	40	$0,004 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4												
2.5												
2.6												
H												
1.1												
1.2												
1.3												
1.4												
1.5												





Hartmetall-Micro- und Mini-Kugelfräser und -Torusfräser – kurze, lange und extra lange Ausführung
Solid carbide micro and mini ball nose and torus end mills – short, long and extra long design

l3 : d1 = 2,2 : 1

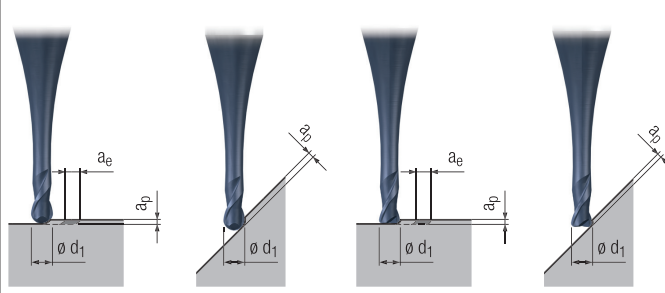
N

Richtwerte für die Schruppbearbeitung
Standard values for roughing

Richtwerte für die Schlichtbearbeitung
Standard values for finishing

Achtung: Beim Schruppen ist die Vorschubgeschwindigkeit vf zu halbieren

Please note: For roughing, please reduce feed speed vf by half



Gültig für · Valid for
2770A 2776A 2783A
2773A 2780A 2786A

Product Finder

- N
H
W

Vc / fz

Table with columns for tool types (P, M, K, N, S, H), roughing/finishing values (ap, ae), spindle speeds (n), and feed rates (vf) for various diameters (d1). Includes icons for coolant and MQL.



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

vf = Vorschubgeschwindigkeit · Feed speed
n = Drehzahl · Speed/rpm

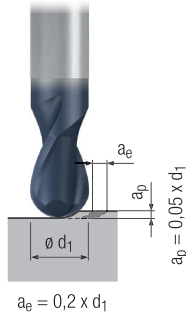
Hartmetall-Kugelfräser – extra kurze, lange und extra lange Ausführung
Solid carbide ball nose end mills – extra short, long and extra long design

N

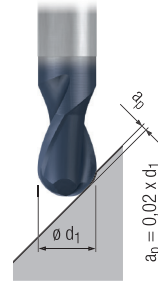
Gültig für · Valid for

1820A 1967A 2504A
1867A 2502A

Schruppen
Roughing



Schlichten
Finishing



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

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



Product
Finder

N

H

W

v_c / f_z





PKD-, CBN- und diamantbeschichtete Fräser
PCD, CBN and Diamond Coated End Mills

Seite · Page

Wegweiser	Product finder	142 - 145
Produktseiten	Product pages	146 - 161
Schnittwerte	Cutting conditions	162 - 170

Product Finder

N

H

W

v_c / f_z

Wegweiser

Bitte beachten:
Die Eignung der PKD-, CBN- und diamantbeschichteten Fräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 162 - 170 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:
The suitability of the PCD, CBN and diamond coated end mills is indicated as follows:

- = very suitable
- = suitable

Please find the cutting conditions on pages 162 - 170.

International comparison of materials, see page 416 - 429.



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 (S137-2) 1.0037 10SPb20 1.0722 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ² 20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ² X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²
	5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²
M	Nichtrostende Stahlwerkstoffe Stainless steel materials		
	1.1 Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ² 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
	4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ² X2CrNiMoN25-7-4 1.4410
K	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
	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	
N	Nichteisenwerkstoffe Non-ferrous materials		
	Aluminium-Legierungen Aluminium alloys		
	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 EN CW 004 A
	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 (AMP ^{CO} ® 8)
	2.8 Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ² (AMP ^{CO} ® 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
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 Graphit	Graphite	C 8000	
5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys	W-Cu 80/20	
5.3 Verbundwerkstoffe	Composite materials	Hyllite, Alucobond	
S	Spezialwerkstoffe Special materials		
	Titan-Legierungen Titanium alloys		
	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 Nickel-Basis-Legierungen	Nickel-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 Armax 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

Diamantbeschichtete Hartmetall-Fräser
Diamond coated solid carbide end mills

Product Finder

N

H

W

v_c / f_z

Graphite			Al		Graphite			
N			W		N			
Ø 2-5 mm	Ø 6-12 mm	Ø 2-12 mm	Ø 2-20 mm	Ø 2-20 mm	Ø 0,5-10 mm	Ø 2-12 mm	Ø 2-12 mm dia. 1/8 - 1/2"	Z (Flutes)
2	2	2	2-3	3-6	2	2	2	
2901D	2903D	2802D	1934G	1939G	2921D	2800D	2801D	
146	146	146	147	148	149	149	150	Seite · Page
162	162	162	162	162	163	163	163	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	
								2.1	
								2.2	
								3.1	
								3.2	
								4.1	
								4.2	
								1.1	N
								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	S
								1.2	
								1.3	
								2.1	
								2.2	
								2.3	
								2.4	
								2.5	
								2.6	
								1.1	H
								1.2	
								1.3	
								1.4	
								1.5	

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

PKD-Fräser
PCD end mills

Product Finder

N

H

W

v_c / f_z



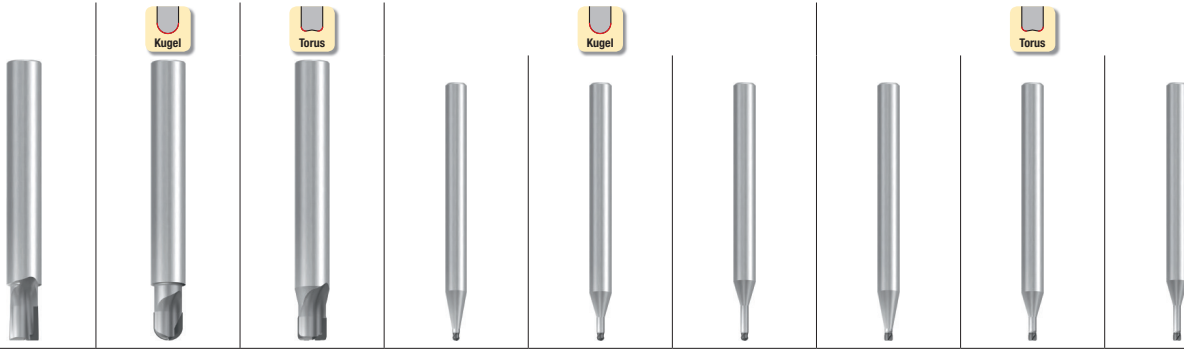
Al

N

	ø4 - 12 mm dia. 3/16 - 1/2"	ø10 - 20 mm	ø14 - 20 mm	ø4 - 12 mm dia. 3/16 - 1/2"	ø4 - 12 mm dia. 3/16 - 1/2"	ø32 - 160 mm
Z (Flutes)	2	3	5	2	2	8 - 28
	2805_Z	2856_Z	2857_Z	2803_Z	2804_Z	2885_Z
Seite · Page	151	152	152	153	154	155
v_c / f_z	164	164	164	164	164	165
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					
	2.6					
H	1.1					
	1.2					
	1.3					
	1.4					
	1.5					

PKD/CBN
Diamant

CBN-Fräser
CBN end mills



Hard materials

H

$\varnothing 4 - 12 \text{ mm}$ dia. $\frac{3}{16} - \frac{1}{2}''$
 $\varnothing 4 - 12 \text{ mm}$ dia. $\frac{3}{16} - \frac{1}{2}''$
 $\varnothing 4 - 12 \text{ mm}$ dia. $\frac{3}{16} - \frac{1}{2}''$
 $\varnothing 0,3 - 1 \text{ mm}$
 $\varnothing 0,3 - 2 \text{ mm}$
 $\varnothing 0,3 - 2 \text{ mm}$
 $\varnothing 0,4 - 1 \text{ mm}$
 $\varnothing 0,4 - 2 \text{ mm}$
 $\varnothing 0,4 - 2 \text{ mm}$

2 2 2 2 2 2 2 2 2

2810 **2808** **2809** **2618** **2619** **2620** **2638** **2639** **2640**

156 157 158 159 159 159 160 160 161

166 166 166 167 - 168 167 - 168 167 - 168 169 - 170 169 - 170 169 - 170

Z (Flutes)

 Seite · Page
 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
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										3.2
										4.1
										4.2
										1.1
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										1.6
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										2.6
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										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

Product Finder

N

H

W

v_c / f_z

PKD/CBN
Diamant

- Product Finder
- N
- H
- W
- v_c / f_z

- Diamantbeschichtet
- Schneiden zur Mitte
- 3 Baulängen verfügbar
- Diamond coated
- Centre cutting
- 3 lengths available

N

HM

DIN 6535

HA
HB

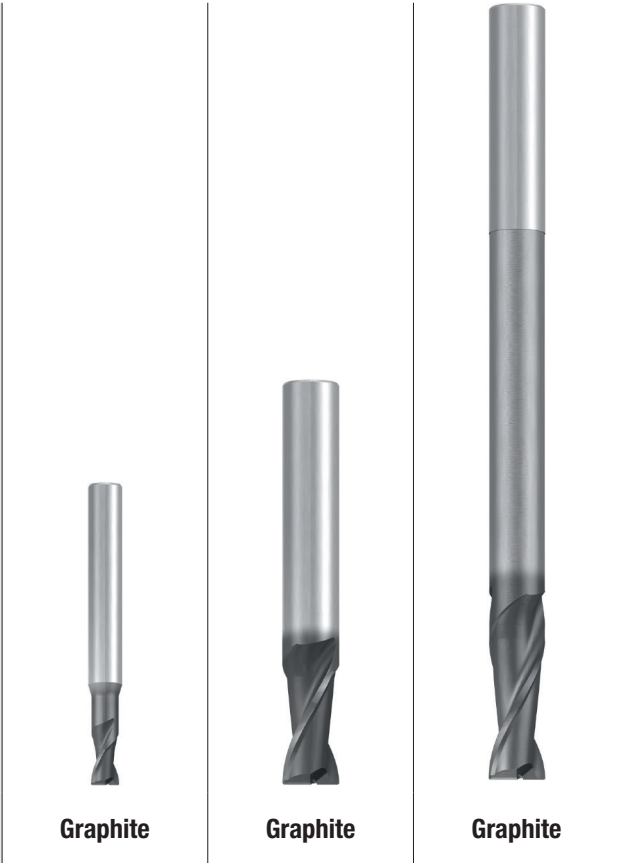
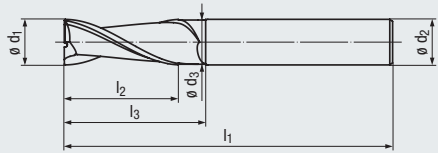
30°

KB x 45°

v_c / f_z

162

Optional



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 142) Applications – material (see page 142)

- Für die Grafitbearbeitung
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 12%
- Zum HSC-Schlichten geeignet
- For machining graphite
- For aluminium alloys with a silicon content of up to 12%
- Suitable for HSC finishing

DIAMANT	DIAMANT	DIAMANT
N 5.1 1.4-1.6, 4.1	N 5.1 1.4-1.6, 4.1	N 5.1 1.4-1.6, 4.1

DIN 6527 – Kurze Ausführung · Short design

Bestell-Code · Order code										2901D	
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	KB	Z (Flutes)	Dimens.- Code			
2	3	13	50	–	6	0,04	2	.002		●	
3	4	14	50	–	6	0,07	2	.003		●	
4	5	18	54	–	6	0,07	2	.004		●	
5	6	18	54	–	6	0,12	2	.005		●	

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code										2903D	
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	KB	Z (Flutes)	Dimens.- Code			
6	10	–	57	–	6	0,12	2	.006		●	
8	16	–	63	–	8	0,12	2	.008		●	
10	19	–	72	–	10	0,2	2	.010		●	
12	22	–	83	–	12	0,2	2	.012		●	

Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2802D	
$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	KB	Z (Flutes)	Dimens.- Code			
2	8	31	60	1,8	2	0,04	2	.002		●	
3	12	41	70	2,8	3	0,07	2	.003		●	
4	15	51	80	3,8	4	0,07	2	.004		●	
5	20	71	100	4,8	5	0,12	2	.005		●	
6	20	63	100	5,8	6	0,12	2	.006		●	
8	20	83	120	7,8	8	0,12	2	.008		●	
10	25	99	140	9,8	10	0,2	2	.010		●	
12	25	104	150	11,8	12	0,2	2	.012		●	

- Diamantbeschichtet
- Mit 2 und 3 Schneiden
- Schneiden zur Mitte

- Diamond coated
- With 2 and 3 flutes
- Centre cutting

W

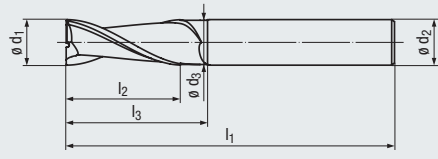
HM

DIN 6535
HA
HB

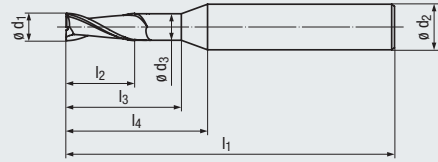
30°

KB x 45°

v_c/f_z
162



Design I₄:



AI

Product Finder

N

H

W

v_c / f_z

Beschichtung · Coating

DIAMANT

Einsatzgebiete – Material (siehe Seite 142)

Applications – material (see page 142)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Gut zum Bohrfräsen geeignet
- Zum Schruppen und Schlichten geeignet

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- Suitable for z-axis milling
- Suitable for roughing and finishing

N 1.4-1.6, 5.1 4.1, 5.3

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code										1934G			
ø d ₁ e8	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	KB	Z (Flutes)	Dimens.- Code				
2	6	10	57	1,9	20	6	0,04	2	.002	●			
2	4	18	55	–	–	6	0,04	2	.002001	●			
3	7	14	57	2,9	20	6	0,07	2	.003	●			
3	4	17	54	–	–	6	0,07	2	.003001	●			
4	8	18	57	3,8	20	6	0,07	2	.004	●			
5	10	18	57	4,8	20	6	0,12	2	.005	●			
6	10	20	57	5,8	–	6	0,12	2	.006	●			
8	16	25	63	7,7	–	8	0,12	2	.008	●			
10	19	30	72	9,5	–	10	0,2	2	.010	●			
10	19	30	72	9,5	–	10	0,2	3	.010003	●			
12	22	35	83	11,5	–	12	0,2	2	.012	●			
12	22	35	83	11,5	–	12	0,2	3	.012003	●			
16	26	40	92	15,5	–	16	0,2	3	.016	●			
20	32	50	104	19,5	–	20	0,3	3	.020	●			

PKD/CBN
Diamant

- Product Finder
- N
- H
- W
- v_c / f_z

- Diamantbeschichtet
- Mit 3, 4 und 6 Schneiden
- Schneiden zur Mitte
- Diamond coated
- With 3, 4 and 6 flutes
- Centre cutting

W

HM

DIN 6535

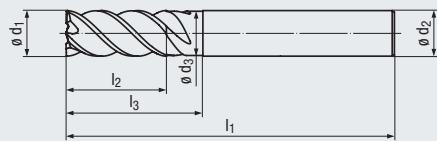
HA
HB

45°

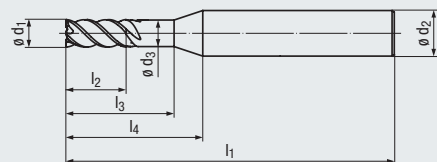
KB x 45°

3-5°

v_c / f_z
162



Design I₄:



AI

Beschichtung · Coating

DIAMANT

Einsatzgebiete – Material (siehe Seite 142)

Applications – material (see page 142)

- Für Aluminium-Knetlegierungen
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7%
- Mit 3 Schneiden zum HPC-Schruppen geeignet
- Mit 4 und 6 Schneiden zum HSC-Schlichten geeignet

- For wrought aluminium alloys
- For aluminium alloys with a silicon content of up to 7%
- With 3 flutes suitable for HPC roughing
- With 4 and 6 flutes suitable for HSC finishing

N 1.4-1.6, 5.1 4.1, 5.3

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code

1939G

$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	KB	Z (Flutes)	Dimens.- Code				
2	7	10	57	1,9	20	6	0,04	3	.002	●			
2	4	18	55	–	–	6	0,04	3	.002001	●			
3	8	14	57	2,9	20	6	0,07	3	.003	●			
3	4	17	54	–	–	6	0,07	3	.003001	●			
4	11	18	57	3,8	20	6	0,07	3	.004	●			
5	13	18	57	4,8	20	6	0,12	3	.005	●			
6	13	20	57	5,8	–	6	0,12	3	.006	●			
8	19	25	63	7,7	–	8	0,12	3	.008	●			
10	22	30	72	9,5	–	10	0,2	3	.010	●			
10	22	30	72	9,5	–	10	0,2	4	.010004	●			
12	26	35	83	11,5	–	12	0,2	4	.012	●			
12	26	35	83	11,5	–	12	0,2	6	.012006	●			
16	32	40	92	15,5	–	16	0,2	6	.016	●			
20	38	50	104	19,5	–	20	0,3	6	.020	●			



Induktionsschrumpfgerät SHRINK-MASTER HL-2,
Schrumpf-Aufnahmen und -Zubehör
siehe Seite 362 - 374

Induction shrink-fit work station
SHRINK-MASTER HL-2, shrink-fit chucks
and accessories, see pages 362 - 374

- Diamantbeschichtet
- Kurze, stabile Ausführung und extra lange Ausführung

- Diamond coated
- Short, stable design and extra long design

N

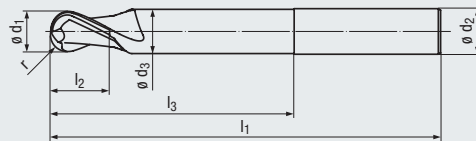
HM

DIN 6535
HA
HB

30° **Kugel**

v_c/f_z
163

Optional



Graphite



Graphite

Product Finder

N

H

W

v_c/f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 142)

- Für die Grafitbearbeitung
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 12%
- Zum HSC-Schlichten geeignet
- Mit extra langer Ausführung ist die Bearbeitung tiefer Konturen möglich

Applications – material (see page 142)

- For machining graphite
- For aluminium alloys with a silicon content of up to 12%
- Suitable for HSC finishing
- Machining of deep contours is possible with extra long design

DIAMANT

N 5.1 1.4-1.6, 4.1

DIAMANT

N 5.1 1.4-1.6, 4.1



Kurze Ausführung · Short design

Bestell-Code · Order code									2921D		
ø d ₁ h10	r	l ₂	l ₃	l ₁	ø d ₃	ø d ₂ h6	Z (Flutes)	Dimens.- Code			
0,5	0,25	1,5	8	38	–	3	2	.0005	●		
1	0,5	2	7	38	–	3	2	.001	●		
2	1	3	6	38	–	3	2	.002	●		
3	1,5	5	–	38	–	3	2	.00303	●		
3	1,5	5	14	50	–	6	2	.003	●		
4	2	8	18	54	–	6	2	.004	●		
5	2,5	9	18	54	–	6	2	.005	●		
6	3	10	–	54	–	6	2	.006	●		
8	4	12	–	58	–	8	2	.008	●		
10	5	14	–	66	–	10	2	.010	●		

Extra lange Ausführung · Extra long design

Bestell-Code · Order code									2800D		
ø d ₁ h10	r	l ₂	l ₃	l ₁	ø d ₃	ø d ₂ h6	Z (Flutes)	Dimens.- Code			
2	1	8	31	60	1,8	2	2	.002		●	
3	1,5	12	41	70	2,8	3	2	.003		●	
4	2	15	51	80	3,8	4	2	.004		●	
5	2,5	20	71	100	4,8	5	2	.005		●	
6	3	20	63	100	5,8	6	2	.006		●	
8	4	20	83	120	7,8	8	2	.008		●	
10	5	25	99	140	9,8	10	2	.010		●	
12	6	25	104	150	11,8	12	2	.012		●	

Extra lange Ausführung mit Halsfreischliff auf Anfrage lieferbar
 Extra long design available with neck relief on request

- Product Finder
- N
- H
- W
- v_c / f_z

- Diamantbeschichtet
- Extra lange Ausführung
- Diamond coated
- Extra long design

N

HM

DIN 6535
HA
HB

30°

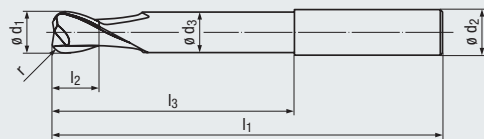
Torus

3-5°

v_c / f_z
163



Graphite



Beschichtung · Coating

DIAMANT

Einsatzgebiete – Material (siehe Seite 142) Applications – material (see page 142)

- Für die Grafitbearbeitung
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 12%
- Zum HSC-Schlichten geeignet
- Bearbeitung tiefer Konturen möglich
- For machining graphite
- For aluminium alloys with a silicon content of up to 12%
- Suitable for HSC finishing
- Machining of deep contours is possible

N 5.1 1.4-1.6, 4.1

Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2801D			
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$	Z	Dimens.-				
	h10	$\pm 0,01$				h6	(Flutes)	Code					
[mm]	2	0,3	8	31	60	1,8	2	2	.002	●			
	3	0,5	12	41	70	2,8	3	2	.003	●			
	4	0,5	15	51	80	3,8	4	2	.004	●			
	5	0,5	20	71	100	4,8	5	2	.005	●			
	6	0,8	20	63	100	5,8	6	2	.006	●			
	8	1	20	83	120	7,8	8	2	.008	●			
	10	1	25	99	140	9,8	10	2	.010	●			
12	1,5	25	104	150	11,8	12	2	.012	●				
[inch]	h10	$\pm 0,0004$											
	1/8	0.0234	1/2	0.594	2 3/4	0.1171	1/8	2	.0125	●			
	3/16	0.0312	3/4	0.328	3 1/2	0.1796	3/16	2	.01875	●			
	1/4	0.0391	7/8	0.594	4	0.2421	1/4	2	.0250	●			
	5/16	0.0469	7/8	0.328	4 3/4	0.3046	5/16	2	.03125	●			
	3/8	0.0547	1	0.875	5 1/2	0.3671	3/8	2	.0375	●			
	7/16	0.0625	1	0.875	5 1/2	0.4296	7/16	2	.04375	●			
	1/2	0.0703	1	0.188	6	0.4921	1/2	2	.0500	●			

- Eingelötete PKD-Schneiden
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- PCD-tipped cutting edges
- Internal coolant supply, axial exit (ICA)

N

ICA

PKD

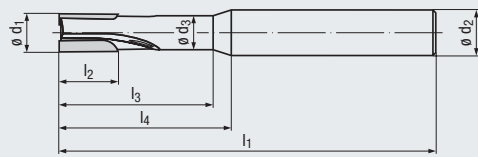
DIN 6535
HA
HB

2,5°

KB x 45°

3-5°

v_c/f_z
164



AI

Product Finder

N

H

W

v_c/f_z

- Einsatzgebiete – Material (siehe Seite 142)** **Applications – material (see page 142)**
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 17%
 - Auch für Verbundwerkstoffe und Grafitbearbeitung geeignet
 - Zum HSC-Schlichten geeignet
 - For aluminium alloys with a silicon content of up to 17%
 - Also suitable for composites and graphite
 - Suitable for HSC finishing

- N 1.1-1.6 4.1-4.2
- N 4.3-5.1, 5.3

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2805_Z			
	ø d ₁	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	KB	Z	Dimens.-Code				
	±0,02						h6		(Flutes)					
[mm]	4	8	35	75	3,8	40	6	0,15	2	.004	●			
	6	10	40	100	5,5	45	8	0,15	2	.006	●			
	8	15	40	100	7,5	45	10	0,15	2	.008	●			
	10	15	40	100	9,5	45	12	0,15	2	.010	●			
	12	20	40	100	11,5	50	16	0,15	2	.012	●			
[inch]	±0.0008													
	3/16	5/16	1 1/4	3	0.1677	1 3/8	1/4	0.006	2	.01875	●			
	1/4	3/8	1 1/2	4	0.2303	1 3/4	3/8	0.006	2	.0250	●			
	3/8	5/8	1 1/2	4	0.3553	1 3/4	1/2	0.006	2	.0375	●			
	1/2	3/4	1 1/2	4	0.4803	1 3/4	5/8	0.006	2	.0500	●			

PKD/CBN
Diamant

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Eingelötete PKD-Schneiden
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- High performance tool
- PCD-tipped cutting edges
- Internal coolant supply, radial exit (ICR)

N

ICR

PKD

DIN 6535
HA
HB

KB x 45°

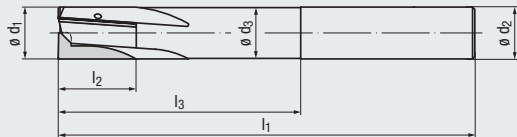
2856_Z:

4°

2857_Z:

0°

v_c / f_z
164



AI



AI

Einsatzgebiete – Material (siehe Seite 142) Applications – material (see page 142)

- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 17%
- Auch für Verbundwerkstoffe und Grafitbearbeitung geeignet
- Zum HSC-Schlichten geeignet
- For aluminium alloys with a silicon content of up to 17%
- Also suitable for composites and graphite
- Suitable for HSC finishing

N 1.1-1.6 4.1-4.2
N 4.3-5.1, 5.3

N 1.1-1.6 4.1-4.2
N 4.3-5.1, 5.3

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\varnothing d_1$ $\pm 0,02$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	KB	Z (Flutes)	Dimens.- Code			
10	15	50	100	9,6	10	0,2	3	.010	●		
12	20	50	100	11,6	12	0,2	3	.012	●		
14	20	50	100	13,6	14	0,2	3	.014	●		
16	20	60	120	15,6	16	0,2	3	.016	●		
18	25	60	120	17,6	18	0,2	3	.018	●		
20	30	60	120	19,6	20	0,2	3	.020	●		

2856_Z

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\varnothing d_1$ $\pm 0,02$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	KB	Z (Flutes)	Dimens.- Code			
14	10	50	100	13,6	14	0,2	5	.014		●	
16	10	60	120	15,6	16	0,2	5	.016		●	
18	10	60	120	17,6	18	0,2	5	.018		●	
20	10	60	120	19,6	20	0,2	5	.020		●	

2857_Z



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Just ask your EMUGE-FRANKEN sales contact.

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- Eingelötete PKD-Schneiden
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- PCD-tipped cutting edges
- Internal coolant supply, axial exit (ICA)

N

ICA

PKD

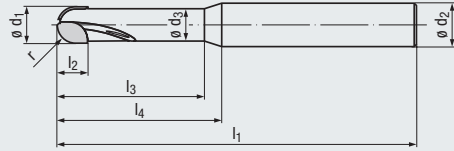
DIN 6535
HA
HB

0°

Kugel

3-5°

v_c/f_z
164



AI

Product Finder

N

H

W

v_c/f_z

- Einsatzgebiete – Material (siehe Seite 142)** **Applications – material (see page 142)**
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 17%
 - Auch für Verbundwerkstoffe und Grafitbearbeitung geeignet
 - Zum HSC-Schlichten geeignet
 - For aluminium alloys with a silicon content of up to 17%
 - Also suitable for composites and graphite
 - Suitable for HSC finishing

- N 1.1-1.6 4.1-4.2
- N 4.3-5.1, 5.3

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2803_Z			
	∅ d ₁ ±0,02	r ±0,01	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	Z (Flutes)	Dimens.- Code				
[mm]	4	2	4	35	75	3,8	40	6	2	.004	●			
	6	3	6	40	100	5,5	45	8	2	.006	●			
	8	4	7	40	100	7,5	45	10	2	.008	●			
	10	5	8	40	100	9,5	45	12	2	.010	●			
	12	6	9	40	100	11,5	50	16	2	.012	●			
	±0.0008	±0.0004												
[inch]	3/16	0.0937	5/16	1 1/4	3	0.1677	1 3/8	1/4	2	.01875	●			
	1/4	0.1250	3/8	1 1/2	4	0.2303	1 3/4	3/8	2	.0250	●			
	3/8	0.1875	5/8	1 1/2	4	0.3553	1 3/4	1/2	2	.0375	●			
	1/2	0.2500	3/4	1 1/2	4	0.4803	1 3/4	5/8	2	.0500	●			

PKD/CBN
Diamant

- Product Finder
- N
- H
- W
- v_c / f_z

- Eingelötete PKD-Schneiden
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)
- PCD-tipped cutting edges
- Internal coolant supply, axial exit (ICA)

N

ICA

PKD

DIN 6535
 HA
 HB

0°

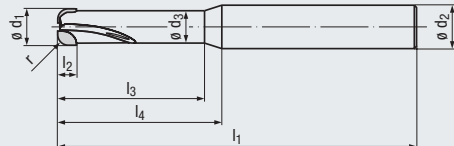
Torus

3-5°

v_c / f_z
164



AI



- Einsatzgebiete – Material (siehe Seite 142)** **Applications – material (see page 142)**
- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 17%
 - Auch für Verbundwerkstoffe und Grafitbearbeitung geeignet
 - Zum HSC-Schlichten geeignet
 - For aluminium alloys with a silicon content of up to 17%
 - Also suitable for composites and graphite
 - Suitable for HSC finishing

- N 1.1-1.6 4.1-4.2
- N 4.3-5.1, 5.3

Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2804_Z				
	$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	Z	Dimens.-Code				
	$\pm 0,02$	$\pm 0,01$						h6	(Flutes)					
[mm]	4	0,8	4	35	75	3,8	40	6	2	.004	●			
	6	1,2	6	40	100	5,5	45	8	2	.006	●			
	8	1,4	7	40	100	7,5	45	10	2	.008	●			
	10	1,6	8	40	100	9,5	45	12	2	.010	●			
	12	1,8	9	40	100	11,5	50	16	2	.012	●			
	$\pm 0,0008$	$\pm 0,0004$												
[inch]	3/16	0.0375	5/16	1 1/4	3	0.1677	1 3/8	1/4	2	.01875	●			
	1/4	0.0500	3/8	1 1/2	4	0.2303	1 3/4	3/8	2	.0250	●			
	3/8	0.0750	5/8	1 1/2	4	0.3553	1 3/4	1/2	2	.0375	●			
	1/2	0.1000	3/4	1 1/2	4	0.4803	1 3/4	5/8	2	.0500	●			



- Eingelötete PKD-Schneiden
- Schwingungsgedämpft durch massiven Stahlgrundkörper
- hohe Wuchtgüte
- hohe Schneidenanzahl ermöglicht hohe Vorschubwerte
- Kegel-Hohlschaft nach DIN 69893-1
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)

- PCD-tipped cutting edges
- Vibration absorbing due to solid steel base body
- High balance quality
- Large number of inserts enables high feed rates
- Hollow taper shank acc. DIN 69893-1
- Internal coolant supply, axial exit (ICA)

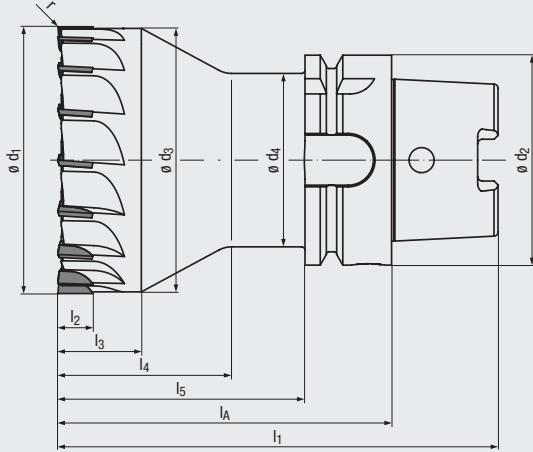
N

ICR **PKD**

HSK-A **ER**

n max. **1-3°**

v_c/f_z
165



Product Finder

N

H

W

v_c / f_z

AI

Einsatzgebiete – Material (siehe Seite 142)

- Für Aluminium-Legierungen mit einem Siliziumgehalt bis 17%
- Auch für Verbundwerkstoffe und Grafitbearbeitung geeignet
- Zum HSC-Schruppen und -Schlichten geeignet
- Ermöglicht sehr hohe Oberflächengüten

Applications – material (see page 142)

- For aluminium alloys with a silicon content of up to 17%
- Also suitable for composites and graphite
- Suitable for HSC roughing and finishing
- Enables to achieve very high surface qualities

N	1.1-1.6	2.1-2.8
N	3.1-3.2	4.1-4.2
N	4.3-5.1, 5.3	5.2

Monoblock-Ausführung · Monobloc design

Bestell-Code · Order code

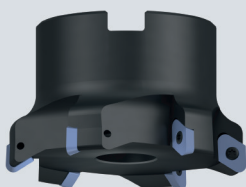
2885_Z

ø d ₁	r	l ₂	l ₁	ø d ₃	l ₃	ø d ₄	l ₄	l ₅	ø d ₂	l _A	n _{max.} ²⁾ min ⁻¹	Z (Flutes)	Dimens.- Code
±0,03	±0,02												
32	0,2	10	132	31	50	52	60	74	HSK-A63	100	25 000	8	.032
40	0,2	10	132	39	50	52	60	74	HSK-A63	100	25 000	10	.040
50	0,2	10	132	49	50	52	60	74	HSK-A63	100	25 000	12	.050
63	0,2	10	132	62	25	52	51	74	HSK-A63	100	25 000	14	.063
80	0,2	10	132	79	25	52	52	74	HSK-A63	100	25 000	16	.080
100	0,2	10	132	99	22	52	40	74	HSK-A63	100	25 000	18	.100
125	0,2	10	132	124	22	52	41	74	HSK-A63	100	20 000	22	.125
160	0,2	10	132	159	22	52	41	74	HSK-A63	100	15 000	28	.160

2) Maximal zulässige Drehzahl
Maximum permissible revolution

Auf Anfrage auch mit anderen Schaftausführungen lieferbar
Other shank designs available on request

Auf Anfrage auch mit reduzierter Zähnezahl lieferbar
Also available with a reduced number of inserts on request



Aufsteckfräskörper für rhombische
Wendeschneidplatten siehe Seite 223

Indexable milling cutters for rhombic inserts,
see page 223

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Eingelötete CBN-Schneiden
- Stabile Ausführung
- High performance tool
- CBN-tipped
- Stable design

H

CBN

DIN 6535

HA

HB

2,5°

KB x 45°

1-2°

v_c / f_z
166

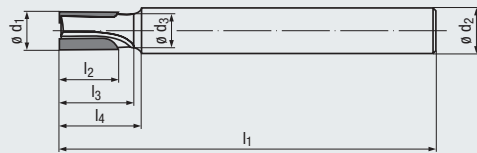
Optional

≤ 66
HRC



Hard materials

- K** 3.1-4.2 1.1-2.2
- H** 1.1-1.5



Einsatzgebiete – Material (siehe Seite 142)

- Zur Bearbeitung harter Werkstoffe und zur Gussbearbeitung hervorragend geeignet
- Zum HSC-Schlichten geeignet

Applications – material (see page 142)

- Suitable for machining hard and cast materials
- Suitable for HSC finishing

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2810			
	$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	KB	Z	Dimens.-Code				
	$\pm 0,02$						$h6$		(Flutes)					
[mm]	4	6	8	75	4	9	6	0,15	2	.004	●			
	6	9	12	100	6	13	8	0,15	2	.006	●			
	8	12	16	100	8	17	10	0,15	2	.008	●			
	10	15	20	100	10	21	12	0,15	2	.010	●			
	12	18	24	100	12	26	16	0,15	2	.012	●			
	$\pm 0,0008$													
[inch]	3/16	9/32	3/8	3	3/16	13/32	1/4	0,006	2	.01875	●			
	1/4	3/8	1/2	4	1/4	9/16	3/8	0,006	2	.0250	●			
	3/8	9/16	3/4	4	3/8	13/16	1/2	0,006	2	.0375	●			
	1/2	3/4	1	4	1/2	1 1/16	5/8	0,006	2	.0500	●			



- Hochleistungswerkzeug
- Eingelötete CBN-Schneiden
- Kurze, stabile Schneidenlänge
- High performance tool
- CBN-tipped
- Short, stable flute length

H

CBN

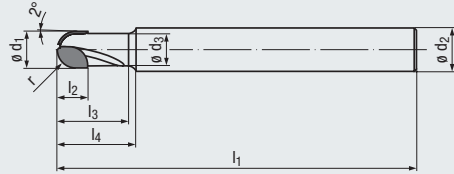
DIN 6535
HA
HB

0° **Kugel**

1-2°

V_c/f_z
166

Optional
≤ 66 HRC



Hard materials

Einsatzgebiete – Material (siehe Seite 142) Applications – material (see page 142)

- Zur Bearbeitung harter Werkstoffe und zur Gussbearbeitung hervorragend geeignet
- Zum HSC-Schlichten geeignet
- Suitable for machining hard and cast materials
- Suitable for HSC finishing

K 3.1-4.2 1.1-2.2

H 1.1-1.5

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2808		
	∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂	Z	Dimens.-Code			
	±0,02	±0,01						h6	(Flutes)				
[mm]	4	2	4	8	75	3,8	9	6	2	.004	●		
	6	3	6	12	100	5,5	13	8	2	.006	●		
	8	4	8	16	100	7,5	17	10	2	.008	●		
	10	5	10	20	100	9,5	21	12	2	.010	●		
[inch]	12	6	12	24	100	11,5	26	16	2	.012	●		
	±0.0008	±0.0004											
	3/16	0.0937	3/16	3/8	3	0.178	13/32	1/4	2	.01875	●		
	1/4	0.1250	1/4	1/2	4	0.237	9/16	3/8	2	.0250	●		
	3/8	0.1875	3/8	3/4	4	0.355	13/16	1/2	2	.0375	●		
1/2	0.2500	1/2	1	4	0.474	1 1/16	5/8	2	.0500	●			

Product Finder

N

H

W

v_c/f_z

PKD/CBN
Diamant

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Eingelötete CBN-Schneiden
- Kurze, stabile Schneidenlänge
- High performance tool
- CBN-tipped
- Short, stable flute length

H

CBN

DIN 6535
HA
HB

0°

Torus

1-2°

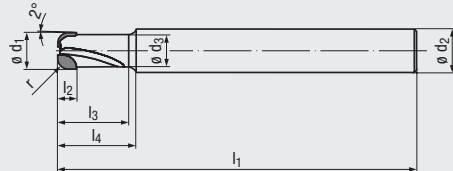
v_c / f_z
166

Optional
≤ 66
HRC



Hard materials

- K** 3.1-4.2 1.1-2.2
- H** 1.1-1.5

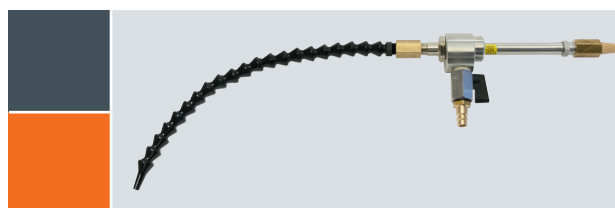


Einsatzgebiete – Material (siehe Seite 142) **Applications – material (see page 142)**

- Zur Bearbeitung harter Werkstoffe und zur Gussbearbeitung hervorragend geeignet
- Zum HSC-Schlichten geeignet
- Suitable for machining hard and cast materials
- Suitable for HSC finishing

Extra lange Ausführung · Extra long design

Bestell-Code · Order code										2809				
	$\varnothing d_1$ <small>±0,02</small>	r <small>-0,04</small>	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ <small>h6</small>	Z <small>(Flutes)</small>	Dimens.- Code				
[mm]	4	0,8	3	8	75	3,8	9	6	2	.004	●			
	6	1,2	4,5	12	100	5,7	13	8	2	.006	●			
	8	1,6	6	16	100	7,6	17	10	2	.008	●			
	10	2	7,5	20	100	9,5	21	12	2	.010	●			
	12	2,4	9	24	100	11,4	26	16	2	.012	●			
	<small>±0,0008</small>	<small>-0,0016</small>												
[inch]	3/16	0.0375	9/64	3/8	3	0.178	13/32	1/4	2	.01875	●			
	1/4	0.0500	3/16	1/2	4	0.237	9/16	3/8	2	.0250	●			
	3/8	0.0750	9/32	3/4	4	0.355	13/16	1/2	2	.0375	●			
	1/2	0.1000	3/8	1	4	0.474	1 1/16	5/8	2	.0500	●			



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Hochleistungswerkzeug
- Verschleißfester Schneidstoff
- Schaftdurchmesser-Toleranz h4
- Stabile Schneidenausführung
- 3 Halslängen verfügbar

- High-performance tool
- Wear-resistant cutting material
- Shank diameter tolerance h4
- Stable cutting edge design
- 3 neck lengths available

H

CBN

DIN 6535
HA
HB

Kugel

≤ 0.1 mm > 0.1 mm

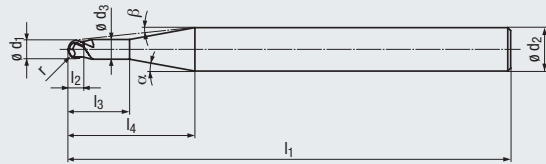
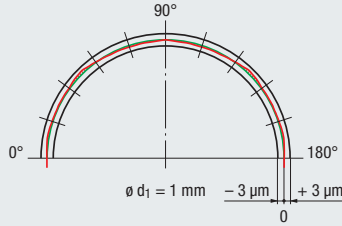
30° 0°

1-2°

v_c / f_z
167 - 168

Optional

≤ 66 HRC



Hard materials



Hard materials



Hard materials

Einsatzgebiete – Material (siehe Seite 142)

- Für hochgenaue Bearbeitungen
- Hartbearbeitung bis 66 HRC möglich
- Zum HSC-Schlichten von 2D-Konturen und 3D-Konturen mit hoher Oberflächengüte
- Auch zum Polierfräsen von Kupferelektroden

Applications – material (see page 142)

- For high precision machining
- Hard machining possible of up to 66 HRC
- For HSC finishing of 2D and 3D contours with high surface quality
- Also for mirror-surface milling copper electrodes

K	3.1-4.2	1.1-2.2	K	3.1-4.2	1.1-2.2	K	3.1-4.2	1.1-2.2
N	2.1	2.2-2.8	N	2.1	2.2-2.8	N	2.1	2.2-2.8
H	1.1-1.5		H	1.1-1.5		H	1.1-1.5	

l₃ : d₁ = 1,5 : 1 – Kurze Ausführung · Short design

Bestell-Code · Order code												2618	
ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	α	β	Z	Dimens.-Code		
±0,006	±0,003						h4			(Flutes)			
0,3	0,15	0,3	0,45	50	0,27	11	4	10°	10°	2	.030	●	
0,4	0,2	0,3	0,6	50	0,36	10,9	4	10°	10°	2	.040	●	
0,5	0,25	0,35	0,75	50	0,45	10,8	4	10°	9,5°	2	.050	●	
0,8	0,4	0,6	1,2	50	0,75	10,4	4	10°	9,5°	2	.080	●	
1	0,5	0,8	1,5	50	0,95	10,1	4	10°	9°	2	.100	●	

l₃ : d₁ = 3 : 1 – Kurze Ausführung · Short design

Bestell-Code · Order code												2619	
ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	α	β	Z	Dimens.-Code		
±0,006	±0,003						h4			(Flutes)			
0,3	0,15	0,3	0,9	50	0,27	7,9	4	15°	14°	2	.030	●	
0,4	0,2	0,3	1,2	50	0,36	8	4	15°	13,5°	2	.040	●	
0,5	0,25	0,35	1,5	50	0,45	8,1	4	15°	13°	2	.050	●	
0,8	0,4	0,6	2,4	50	0,75	8,5	4	15°	11,5°	2	.080	●	
1	0,5	0,8	3	50	0,95	8,7	4	15°	10,5°	2	.100	●	
1,5	0,75	1,1	4,5	50	1,45	9,3	4	15°	8,5°	2	.150	●	
2	1	1,3	6	50	1,95	9,8	4	15°	7°	2	.200	●	

l₃ : d₁ = 4,5 : 1 – Kurze Ausführung · Short design

Bestell-Code · Order code												2620	
ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	α	β	Z	Dimens.-Code		
±0,006	±0,003						h4			(Flutes)			
0,3	0,15	0,3	1,35	50	0,27	8,3	4	15°	13°	2	.030	●	
0,4	0,2	0,3	1,8	50	0,36	8,6	4	15°	12,5°	2	.040	●	
0,5	0,25	0,35	2,25	50	0,45	8,9	4	15°	12°	2	.050	●	
0,8	0,4	0,6	3,6	50	0,75	9,7	4	15°	10°	2	.080	●	
1	0,5	0,8	4,5	50	0,95	10,2	4	15°	9°	2	.100	●	
1,5	0,75	1,1	6,75	50	1,45	11,5	4	15°	7°	2	.150	●	
2	1	1,3	9	50	1,95	12,8	4	15°	5°	2	.200	●	

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



Product Finder

N

H

W

v_c / f_z

- Product Finder
- N
- H
- W
- v_c / f_z

- Hochleistungswerkzeug
- Verschleißfester Schneidstoff
- Schaftdurchmesser-Toleranz h4
- Stabile Schneidenausführung
- 3 Halslängen verfügbar
- Verschiedene Eckenradien pro Schneiddurchmesser

- High-performance tool
- Wear-resistant cutting material
- Shank diameter tolerance h4
- Stable cutting edge design
- 3 neck lengths available
- Various corner radii for each cutting diameter

H

CBN

DIN 6535

HA HB

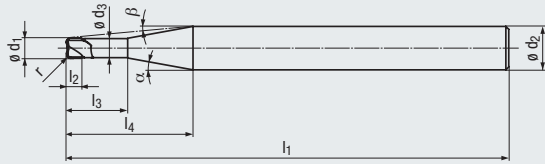
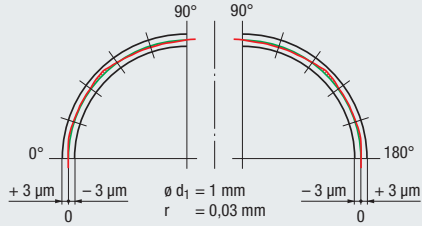
Torus

0°

1-2°

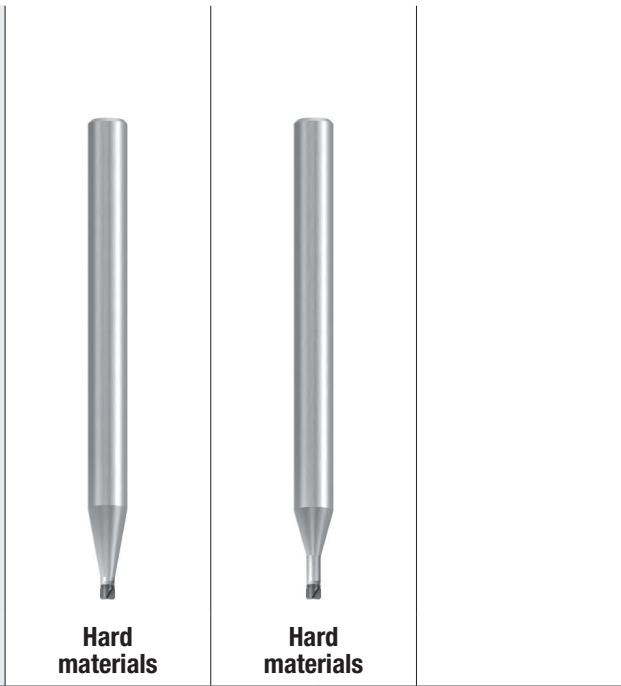
v_c / f_z

169 - 170



Optional

≤ 66
HRC



- Einsatzgebiete – Material (siehe Seite 142)**
- Für hochgenaue Bearbeitungen
 - Hartbearbeitung bis 66 HRC möglich
 - Zum HSC-Schlichten von 2D-Konturen und 3D-Konturen mit hoher Oberflächengüte
 - Auch zum Polierfräsen von Kupferelektroden

- Applications – material (see page 142)**
- For high precision machining
 - Hard machining possible of up to 66 HRC
 - For HSC finishing of 2D and 3D contours with high surface quality
 - Also for mirror-surface milling copper electrodes

K	3.1-4.2	1.1-2.2	
N	2.1	2.2-2.8	
H	1.1-1.5		

$l_3 : d_1 = 1,5 : 1$ – Kurze Ausführung · Short design

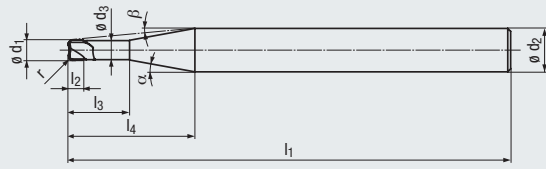
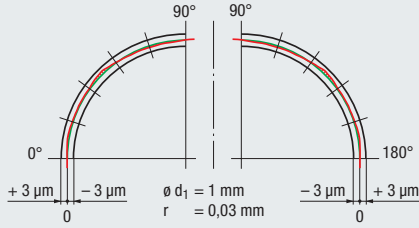
Bestell-Code · Order code											2638		
ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z (Flutes)	Dimens.-Code		
$\pm 0,006$	$\pm 0,003$						h4						
0,4	0,03	0,3	0,6	50	0,36	10,9	4	10°	9,5°	2	.040030	●	
0,4	0,05	0,3	0,6	50	0,36	10,9	4	10°	9,5°	2	.040050	●	
0,4	0,1	0,3	0,6	50	0,36	10,9	4	10°	9,5°	2	.040100	●	
0,5	0,03	0,35	0,75	50	0,45	10,8	4	10°	9,5°	2	.050030	●	
0,5	0,05	0,35	0,75	50	0,45	10,8	4	10°	9,5°	2	.050050	●	
0,5	0,1	0,35	0,75	50	0,45	10,8	4	10°	9,5°	2	.050100	●	
1	0,03	0,8	1,5	50	0,95	10,1	4	10°	8,5°	2	.100030	●	
1	0,05	0,8	1,5	50	0,95	10,1	4	10°	8,5°	2	.100050	●	
1	0,1	0,8	1,5	50	0,95	10,1	4	10°	9°	2	.100100	●	
1	0,2	0,8	1,5	50	0,95	10,1	4	10°	9°	2	.100200	●	

$l_3 : d_1 = 3 : 1$ – Kurze Ausführung · Short design

Bestell-Code · Order code											2639		
ϕd_1	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2	α	β	Z (Flutes)	Dimens.-Code		
$\pm 0,006$	$\pm 0,003$						h4						
0,4	0,03	0,3	1,2	50	0,36	8	4	15°	13°	2	.040030		●
0,4	0,05	0,3	1,2	50	0,36	8	4	15°	13°	2	.040050		●
0,4	0,1	0,3	1,2	50	0,36	8	4	15°	13°	2	.040100		●
0,5	0,03	0,35	1,5	50	0,45	8,1	4	15°	12,5°	2	.050030		●
0,5	0,05	0,35	1,5	50	0,45	8,1	4	15°	12,5°	2	.050050		●
0,5	0,1	0,35	1,5	50	0,45	8,1	4	15°	12,5°	2	.050100		●
1	0,03	0,8	3	50	0,95	8,7	4	15°	10°	2	.100030		●
1	0,05	0,8	3	50	0,95	8,7	4	15°	10°	2	.100050		●
1	0,1	0,8	3	50	0,95	8,7	4	15°	10°	2	.100100		●
1	0,2	0,8	3	50	0,95	8,7	4	15°	10,5°	2	.100200		●
1,5	0,1	1,1	4,5	50	1,45	9,3	4	15°	8°	2	.150100		●
1,5	0,2	1,1	4,5	50	1,45	9,3	4	15°	8°	2	.150200		●
1,5	0,3	1,1	4,5	50	1,45	9,3	4	15°	8°	2	.150300		●
2	0,1	1,3	6	50	1,95	9,8	4	15°	6°	2	.200100		●
2	0,2	1,3	6	50	1,95	9,8	4	15°	6°	2	.200200		●
2	0,3	1,3	6	50	1,95	9,8	4	15°	6°	2	.200300		●

- Hochleistungswerkzeug
- Verschleißfester Schneidstoff
- Schaftdurchmesser-Toleranz h4
- Stabile Schneidenausführung
- 3 Halslängen verfügbar
- Verschiedene Eckenradien pro Schneiddurchmesser

- High-performance tool
- Wear-resistant cutting material
- Shank diameter tolerance h4
- Stable cutting edge design
- 3 neck lengths available
- Various corner radii for each cutting diameter



H

CBN

DIN 6535
HA
HB

Torus

0° **1-2°**

V_c / f_z
169 - 170

Optional
≤ 66 HRC



Hard materials

Product Finder

N

H

W

v_c / f_z

- Einsatzgebiete – Material (siehe Seite 142)**
- Für hochgenaue Bearbeitungen
 - Hartbearbeitung bis 66 HRC möglich
 - Zum HSC-Schlichten von 2D-Konturen und 3D-Konturen mit hoher Oberflächengüte
 - Auch zum Polierfräsen von Kupferelektroden

- Applications – material (see page 142)**
- For high precision machining
 - Hard machining possible of up to 66 HRC
 - For HSC finishing of 2D and 3D contours with high surface quality
 - Also for mirror-surface milling copper electrodes

K	3.1-4.2	1.1-2.2
N	2.1	2.2-2.8
H	1.1-1.5	

l₃ : d₁ = 4,5 : 1 – Kurze Ausführung · Short design

Bestell-Code · Order code													2640	
∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂	α	β	Z	Dimens.-Code			
±0,006	±0,003						h4			(Flutes)				
0,4	0,03	0,3	1,8	50	0,36	8,6	4	15°	12°	2	.040030	●		
0,4	0,05	0,3	1,8	50	0,36	8,6	4	15°	12°	2	.040050	●		
0,4	0,1	0,3	1,8	50	0,36	8,6	4	15°	12°	2	.040100	●		
0,5	0,03	0,35	2,25	50	0,45	8,9	4	15°	11,5°	2	.050030	●		
0,5	0,05	0,35	2,25	50	0,45	8,9	4	15°	11,5°	2	.050050	●		
0,5	0,1	0,35	2,25	50	0,45	8,9	4	15°	11,5°	2	.050100	●		
1	0,03	0,8	4,5	50	0,95	10,2	4	15°	8,5°	2	.100030	●		
1	0,05	0,8	4,5	50	0,95	10,2	4	15°	8,5°	2	.100050	●		
1	0,1	0,8	4,5	50	0,95	10,2	4	15°	9°	2	.100100	●		
1	0,2	0,8	4,5	50	0,95	10,2	4	15°	9°	2	.100200	●		
1,5	0,1	1,1	6,75	50	1,45	11,5	4	15°	6,5°	2	.150100	●		
1,5	0,2	1,1	6,75	50	1,45	11,5	4	15°	6,5°	2	.150200	●		
1,5	0,3	1,1	6,75	50	1,45	11,5	4	15°	6,5°	2	.150300	●		
2	0,1	1,3	9	50	1,95	12,8	4	15°	5°	2	.200100	●		
2	0,2	1,3	9	50	1,95	12,8	4	15°	5°	2	.200200	●		
2	0,3	1,3	9	50	1,95	12,8	4	15°	5°	2	.200300	●		

PKD/CBN
Diamant

Product Finder

N

H

W

v_c / f_z

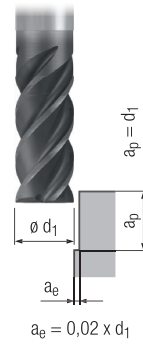
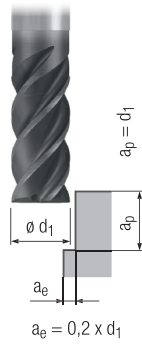
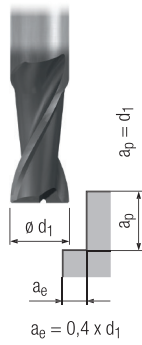


Diamantbeschichtete Hartmetall-Schafffräser – kurze, lange und extra lange Ausführung

Diamond coated solid carbide end mills – short, long and extra long design

N **W**

Gültig für · Valid for
 1934G 2802D 2903D
 1939G 2901D



	N		W		V		MMS MQL	Coolant
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]		
P								
1.1								
2.1								
3.1								
4.1								
5.1								
M								
1.1								
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	580	$0,010 \times d_1$	680	$0,012 \times d_1$	800	$0,014 \times d_1$	■	■
1.5	450	$0,008 \times d_1$	550	$0,010 \times d_1$	650	$0,012 \times d_1$	■	■
1.6	300	$0,006 \times d_1$	350	$0,008 \times d_1$	400	$0,010 \times d_1$	■	■
2.1								
2.2								
2.3								
2.4								
2.5								
2.6								
2.7								
2.8								
3.1								
3.2								
4.1	320	$0,010 \times d_1$	380	$0,012 \times d_1$	450	$0,014 \times d_1$	□	□
4.2								
4.3								
4.4								
5.1	420	$0,010 \times d_1$	500	$0,015 \times d_1$	600	$0,020 \times d_1$	□	□
5.2								
5.3	200	$0,008 \times d_1$	250	$0,010 \times d_1$	300	$0,012 \times d_1$	□	□
S								
1.1								
1.2								
1.3								
2.1								
2.2								
2.3								
2.4								
2.5								
2.6								
H								
1.1								
1.2								
1.3								
1.4								
1.5								



Diamantbeschichtete Hartmetall-Kugel- und Torusfräser – kurze und extra lange Ausführung
 Diamond coated solid carbide ball nose and torus end mills – short and extra long design

Gültig für · Valid for
 2800D 2801D 2921D

Product Finder

N

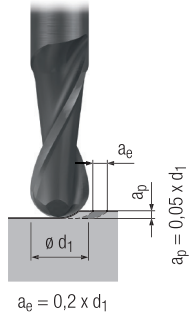
H

W

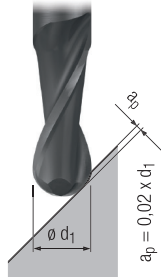
v_c / f_z

N

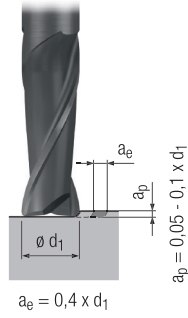
Schruppen
Roughing



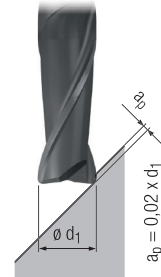
Schlichten
Finishing



Schruppen
Roughing



Schlichten
Finishing



v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]



MMS
MQL



	Schruppen		Schlichten		Schruppen		Schlichten		Coolant	MMS	Flood
	v_c	f_z	v_c	f_z	v_c	f_z	v_c	f_z			
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	600	$0,020 \times d_1$	800	$0,014 \times d_1$	600	$0,020 \times d_1$	800	$0,014 \times d_1$	■	■
	1.5	450	$0,017 \times d_1$	650	$0,012 \times d_1$	450	$0,017 \times d_1$	650	$0,012 \times d_1$	■	■
	1.6	300	$0,014 \times d_1$	400	$0,010 \times d_1$	300	$0,014 \times d_1$	400	$0,010 \times d_1$	■	■
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
2.8											
3.1											
3.2											
4.1	350	$0,021 \times d_1$	450	$0,015 \times d_1$	350	$0,021 \times d_1$	450	$0,015 \times d_1$	□	□	■
4.2											
4.3											
4.4											
5.1	450	$0,028 \times d_1$	600	$0,020 \times d_1$	450	$0,028 \times d_1$	600	$0,020 \times d_1$	□	□	■
5.2											
5.3											
S	1.1										
	1.2										
	1.3										
	2.1										
	2.2										
	2.6										
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

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



Product Finder

N

H

W

v_c / f_z

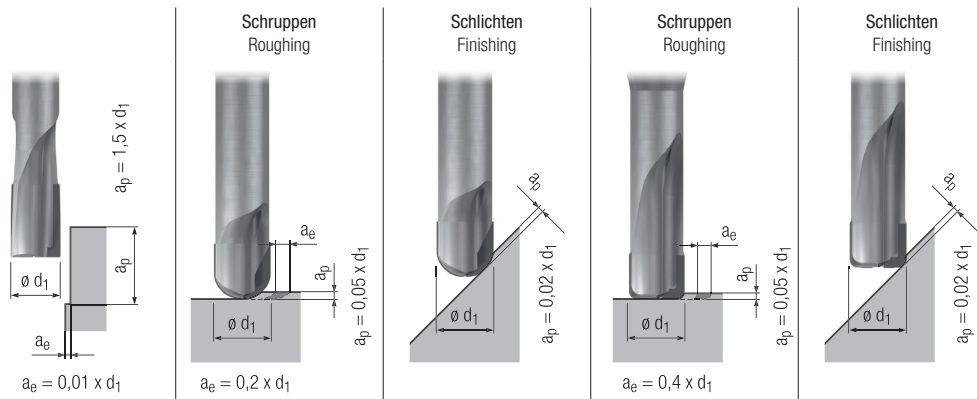


PKD-Schaft-, Kugel- und Torusfräser – extra lange Ausführung

PCD end mills, ball nose and torus end mills – extra long design

N

Gültig für · Valid for
 2803_Z 2805_Z 2857_Z
 2804_Z 2856_Z



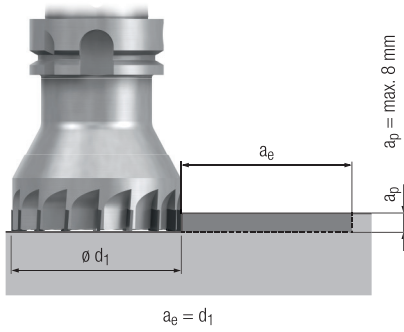
		Schruppen Roughing		Schlichten Finishing		Schruppen Roughing		Schlichten Finishing				MMS MQL	
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1												
	2.1												
	3.1												
	4.1												
	5.1												
M	1.1												
	2.1												
	3.1												
	4.1												
K	1.1												
	1.2												
	2.1												
	2.2												
	3.1												
	3.2												
	4.1												
4.2													
N	1.1	850	0,010 x d ₁	1000	0,022 x d ₁	1350	0,016 x d ₁	1000	0,022 x d ₁	1350	0,016 x d ₁	■	■
	1.2	850	0,010 x d ₁	1000	0,020 x d ₁	1350	0,014 x d ₁	1000	0,020 x d ₁	1350	0,014 x d ₁	■	■
	1.3	850	0,008 x d ₁	1000	0,017 x d ₁	1350	0,012 x d ₁	1000	0,017 x d ₁	1350	0,012 x d ₁	■	■
	1.4	500	0,010 x d ₁	600	0,020 x d ₁	800	0,014 x d ₁	600	0,020 x d ₁	800	0,014 x d ₁	■	■
	1.5	420	0,008 x d ₁	500	0,017 x d ₁	650	0,012 x d ₁	500	0,017 x d ₁	650	0,012 x d ₁	■	■
	1.6	260	0,007 x d ₁	300	0,014 x d ₁	400	0,010 x d ₁	300	0,014 x d ₁	400	0,010 x d ₁	■	■
	2.1												
	2.2												
	2.3												
	2.4												
	2.5												
	2.6												
	2.7												
	2.8												
	3.1												
	3.2												
4.1	500	0,010 x d ₁	600	0,020 x d ₁	800	0,014 x d ₁	600	0,020 x d ₁	800	0,014 x d ₁	□	■	
4.2	850	0,008 x d ₁	1000	0,017 x d ₁	1350	0,012 x d ₁	1000	0,017 x d ₁	1350	0,012 x d ₁	□	■	
4.3	420	0,008 x d ₁	500	0,017 x d ₁	650	0,012 x d ₁	500	0,017 x d ₁	650	0,012 x d ₁	□	■	
4.4	260	0,007 x d ₁	300	0,014 x d ₁	400	0,010 x d ₁	300	0,014 x d ₁	400	0,010 x d ₁	□	■	
5.1	500	0,010 x d ₁	600	0,020 x d ₁	800	0,014 x d ₁	600	0,020 x d ₁	800	0,014 x d ₁	□	□	
5.2													
5.3	260	0,007 x d ₁	300	0,014 x d ₁	400	0,010 x d ₁	300	0,014 x d ₁	400	0,010 x d ₁	□	■	
S	1.1												
	1.2												
	1.3												
	2.1												
	2.2												
	2.3												
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

PKD-Plan- und Eckfräser
PCD side and face milling cutters

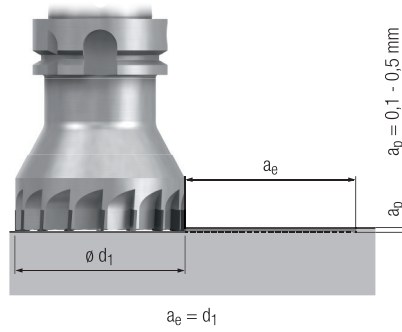
N

Gültig für · Valid for
2885_Z

Schruppen
Roughing



Schlichten
Finishing



Product
Finder

N

H

W

v_c / f_z

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]



MMS
MQL



		Schruppen		Schlichten					
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
P	1.1								
	2.1								
	3.1								
	4.1								
	5.1								
M	1.1								
	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	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,12	■	□	■	
	1.2	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,12	■	□	■	
	1.3	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,12	■	□	■	
	1.4	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,12	■	□	■	
	1.5	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,12	■	□	■	
	1.6	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,12	■	□	■	
	2.1	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.2	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.3	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.4	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.5	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.6	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.7	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	2.8	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■	
	3.1	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,08		□	■	
	3.2	2500 - 5000	0,08 - 0,12	2500 - 5000	0,03 - 0,08		□	■	
4.1	1500 - 3000	0,08 - 0,12	1500 - 3000	0,03 - 0,08		□	■		
4.2	1500 - 3000	0,08 - 0,12	1500 - 3000	0,03 - 0,08		□	■		
4.3	1500 - 3000	0,08 - 0,12	1500 - 3000	0,03 - 0,08		□	■		
4.4	1500 - 3000	0,08 - 0,12	1500 - 3000	0,03 - 0,08		□	■		
5.1	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■		
5.2	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■		
5.3	1000 - 2000	0,08 - 0,12	1000 - 2000	0,03 - 0,08		□	■		
S	1.1								
	1.2								
	1.3								
	2.1								
	2.2								
	2.3								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

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

Product Finder

N

H

W

v_c / f_z

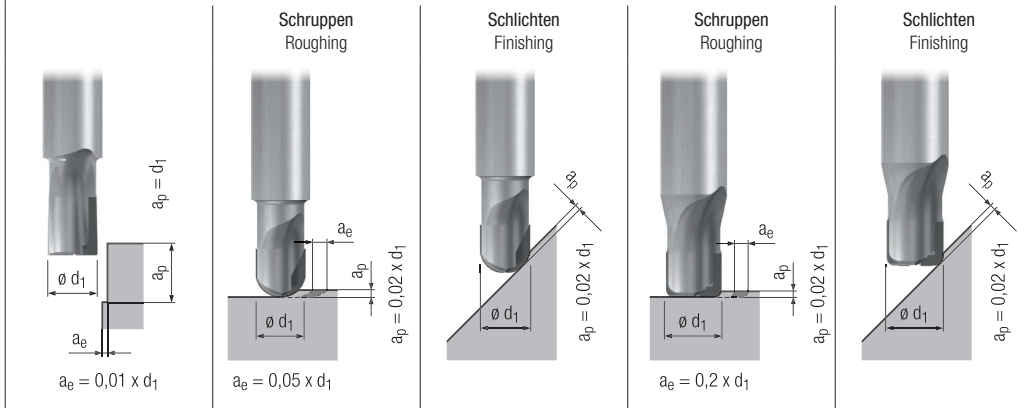


CBN-Schaft-, Kugel- und Torusfräser – extra lange Ausführung

CBN end mills, ball nose and torus end mills – extra long design

Gültig für · Valid for
2808 2809 2810

H

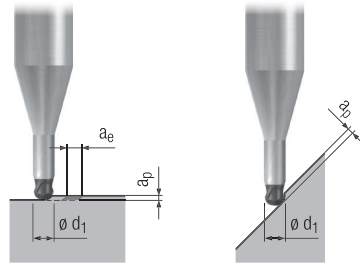


	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	MMS MQL			
P														
1.1														
2.1														
3.1														
4.1														
5.1														
M														
1.1														
2.1														
3.1														
4.1														
K														
1.1	450	0,008 x d ₁	450	0,010 x d ₁	600	0,008 x d ₁	450	0,010 x d ₁	600	0,008 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2	450	0,008 x d ₁	450	0,010 x d ₁	600	0,008 x d ₁	450	0,010 x d ₁	600	0,008 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.1	400	0,006 x d ₁	400	0,008 x d ₁	550	0,006 x d ₁	400	0,008 x d ₁	550	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2	400	0,006 x d ₁	400	0,008 x d ₁	550	0,006 x d ₁	400	0,008 x d ₁	550	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1	350	0,006 x d ₁	350	0,008 x d ₁	500	0,006 x d ₁	350	0,008 x d ₁	500	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2	350	0,006 x d ₁	350	0,008 x d ₁	500	0,006 x d ₁	350	0,008 x d ₁	500	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.1	300	0,005 x d ₁	300	0,006 x d ₁	350	0,005 x d ₁	300	0,006 x d ₁	350	0,005 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	250	0,005 x d ₁	250	0,006 x d ₁	300	0,005 x d ₁	250	0,006 x d ₁	300	0,005 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N														
1.1														
1.2														
1.3														
1.4														
1.5														
1.6														
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S														
1.1														
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1.3														
2.1														
2.2														
2.3														
2.4														
2.5														
2.6														
H														
1.1	400	0,006 x d ₁	400	0,007 x d ₁	500	0,006 x d ₁	400	0,007 x d ₁	500	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2	300	0,006 x d ₁	300	0,007 x d ₁	350	0,006 x d ₁	300	0,007 x d ₁	350	0,006 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.3	250	0,005 x d ₁	250	0,006 x d ₁	300	0,005 x d ₁	250	0,006 x d ₁	300	0,005 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.4	160	0,004 x d ₁	160	0,005 x d ₁	200	0,004 x d ₁	160	0,005 x d ₁	200	0,004 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.5	120	0,003 x d ₁	120	0,004 x d ₁	160	0,003 x d ₁	120	0,004 x d ₁	160	0,003 x d ₁	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

CBN-Micro- und Mini-Kugelfräser – kurze Ausführung
CBN micro and mini ball nose end mills – short design

Gültig für · Valid for
2618 2619 2620

H



Product Finder

N

H

W

v_c / f_z

	a_p [mm]	a_e [mm]	$d_1 = 0,3 \text{ mm}$		$d_1 = 0,4 \text{ mm}$		$d_1 = 0,5 \text{ mm}$		$d_1 = 0,8 \text{ mm}$						
			n [min ⁻¹]	V_f [mm/min]	n [min ⁻¹]	V_f [mm/min]	n [min ⁻¹]	V_f [mm/min]	n [min ⁻¹]	V_f [mm/min]					
P	1.1														
	2.1														
	3.1														
	4.1														
	5.1														
M	1.1														
	2.1														
	3.1														
	4.1														
K	1.1	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	$0,017 \times d_1$	$0,017 \times d_1$	50000	400	50000	520	50000	650	50000	1000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	$0,017 \times d_1$	$0,017 \times d_1$	50000	400	50000	520	50000	650	50000	1000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.2	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
N	1.1														
	1.2														
	1.3														
	1.4														
	1.5														
	1.6														
	2.1	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.3	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.4	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.5	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.6	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.7	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.8	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	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															
2.6															
H	1.1	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3	$0,025 \times d_1$	$0,025 \times d_1$	50000	600	50000	800	50000	1000	50000	1600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.4	$0,017 \times d_1$	$0,017 \times d_1$	50000	400	50000	520	50000	650	50000	1000	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.5	$0,013 \times d_1$	$0,013 \times d_1$	50000	320	50000	420	50000	530	50000	850	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

PKD/CBN
Diamant

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

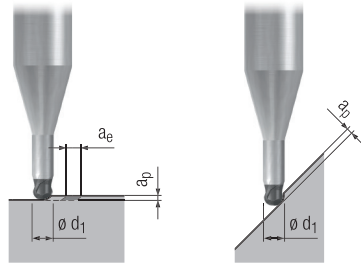


CBN-Micro- und Mini-Kugelfräser – kurze Ausführung

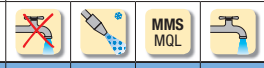
CBN micro and mini ball nose end mills – short design

H

Gültig für · Valid for
2618 2619 2620



		d ₁ = 1,0 mm		d ₁ = 1,5 mm		d ₁ = 2,0 mm	
a _p [mm]	a _e [mm]	n [min ⁻¹]	v _f [mm/min]	n [min ⁻¹]	v _f [mm/min]	n [min ⁻¹]	v _f [mm/min]

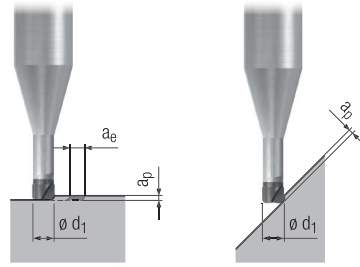


P	1.1												
	2.1												
	3.1												
	4.1												
	5.1												
M	1.1												
	2.1												
	3.1												
	4.1												
K	1.1	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000	□	■		
	1.2	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000	□	■		
	2.1	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000	□	■		
	2.2	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000	□	■		
	3.1	0,017 x d ₁	0,017 x d ₁	50000	1300	50000	2000	40000	2100	□	■		
	3.2	0,017 x d ₁	0,017 x d ₁	50000	1300	50000	2000	40000	2100	□	■		
	4.1	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000	□	■		
4.2	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000	□	■			
N	1.1												
	1.2												
	1.3												
	1.4												
	1.5												
	1.6												
	2.1	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.2	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.3	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.4	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.5	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.6	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.7	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	2.8	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	50000	4000		■	□	
	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													
2.6													
H	1.1	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	40000	3200	□	■	■	
	1.2	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	40000	3200	□	■	■	
	1.3	0,025 x d ₁	0,025 x d ₁	50000	2000	50000	3000	40000	3200	□	■	■	
	1.4	0,017 x d ₁	0,017 x d ₁	50000	1300	50000	2000	40000	2100	□	■	■	
	1.5	0,013 x d ₁	0,013 x d ₁	50000	1100	50000	1600	40000	1700	□	■	■	

CBN-Micro- und Mini-Torusfräser – kurze Ausführung
CBN micro and mini torus end mills – short design

H

Gültig für · Valid for
2638 2639 2640



			$d_1 = 0,4 \text{ mm}$		$d_1 = 0,5 \text{ mm}$				MMS MQL	
	a_p [mm]	a_e [mm]	n [min ⁻¹]	V_f [mm/min]	n [min ⁻¹]	V_f [mm/min]				
P	1.1									
	2.1									
	3.1									
	4.1									
	5.1									
M	1.1									
	2.1									
	3.1									
	4.1									
K	1.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1	$0,012 \times d_1$	$0,125 \times d_1$	50000	500	50000	600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.2	$0,012 \times d_1$	$0,125 \times d_1$	50000	500	50000	600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1									
	1.2									
	1.3									
	1.4									
	1.5									
	1.6									
	2.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.3	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.4	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.5	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.6	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.7	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.8	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	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										
2.6										
H	1.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	$0,015 \times d_1$	$0,175 \times d_1$	50000	600	50000	750	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	$0,012 \times d_1$	$0,125 \times d_1$	50000	500	50000	600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	$0,010 \times d_1$	$0,100 \times d_1$	50000	350	50000	450	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

CBN-Micro- und Mini-Torusfräser – kurze Ausführung
 CBN micro and mini torus end mills – short design

H

Gültig für · Valid for
 2638 2639 2640



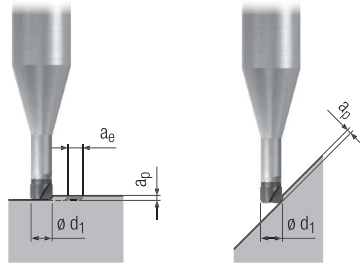
Product Finder

N

H

W

v_c / f_z



			$d_1 = 1,0 \text{ mm}$		$d_1 = 1,5 \text{ mm}$		$d_1 = 2,0 \text{ mm}$				MMS MQL	
	a_p [mm]	a_e [mm]	n [min ⁻¹]	v_f [mm/min]	n [min ⁻¹]	v_f [mm/min]	n [min ⁻¹]	v_f [mm/min]				
P												
1.1												
2.1												
3.1												
4.1												
5.1												
M												
1.1												
2.1												
3.1												
4.1												
K												
1.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
1.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3.1	$0,012 \times d_1$	$0,125 \times d_1$	45000	1100	30000	1100	23000	1200	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3.2	$0,012 \times d_1$	$0,125 \times d_1$	45000	1100	30000	1100	23000	1200	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
N												
1.1												
1.2												
1.3												
1.4												
1.5												
1.6												
2.1	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.2	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.3	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.4	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.5	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.6	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.7	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.8	$0,015 \times d_1$	$0,175 \times d_1$	50000	1500	50000	2200	50000	3000		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.1												
3.2												
4.1												
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5.1												
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S												
1.1												
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1.3												
2.1												
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2.3												
2.4												
2.5												
2.6												
H												
1.1	$0,015 \times d_1$	$0,175 \times d_1$	45000	1300	30000	1300	23000	1400	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
1.2	$0,015 \times d_1$	$0,175 \times d_1$	45000	1300	30000	1300	23000	1400	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
1.3	$0,015 \times d_1$	$0,175 \times d_1$	45000	1300	30000	1300	23000	1400	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
1.4	$0,012 \times d_1$	$0,125 \times d_1$	45000	1100	30000	1100	23000	1200	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
1.5	$0,010 \times d_1$	$0,100 \times d_1$	32000	800	21000	550	16000	600	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	



Kreissegment- und konische Hartmetall-Fräser Circle Segment and Solid Carbide Tapered End Mills

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Wegweiser	Product finder	172 - 175
Produktseiten	Product pages	176 - 191
Schnittwerte	Cutting conditions	192 - 206

- Product Finder
- NR
- NF
- N
- v_c / f_z

Wegweiser

Bitte beachten:
Die Eignung der Kreissegment- und konischen Hartmetall-Fräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 192 - 206 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:
The suitability of the circle segment and solid carbide tapered end mills is indicated as follows:

- = very suitable
- = suitable

Please find the cutting conditions on pages 192 - 206.

International comparison of materials, see page 416 - 429.

Einsatzgebiete – Material Applications – material		Material-Beispiele Material examples	Material-Nummern Material numbers
P	Stahlwerkstoffe 1.1 Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Steel materials Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	Cq15 1.1132 S235JR (S137-2) 1.0037 10SPb20 1.0722 E360 (S170-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	
	5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	
M	Nichtrostende Stahlwerkstoffe 1.1 Ferritisch, martensitisch	Stainless steel materials Ferritic, martensitic	X2CrTi12 1.4512
	2.1 Austenitisch	Austenitic	X6CrNiMoTi17-12-2 1.4571
	3.1 Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	X2CrNiMoN22-5-3 1.4462
	4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	X2CrNiMoN25-7-4 1.4410
K	Gusswerkstoffe 1.1 Gusseisen mit Lamellengrafit (GJL)	Cast materials Cast iron with lamellar graphite (GJL)	EN-GJL-200 (GG20) EN-JL-1030 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 500-900 N/mm ² EN-GJS-700-2 (GGG70) EN-JS-1070
	3.1 Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	300-400 N/mm ² GJV 300 400-500 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 500-800 N/mm ² EN-GJMB-450-6 (GTS-45) EN-JM-1140
	2.2		
	3.2		
	4.2		
N	Nichteisenwerkstoffe 1.1 Aluminium-Legierungen	Non-ferrous materials Aluminium alloys	
	1.2 Aluminium-Knetlegierungen	Wrought aluminium alloys	EN AW-AlMn1 EN AW-3103 EN AW-AlMgSi EN AW-6060 EN AW-AlZn5Mg3Cu EN AW-7022
	1.3		EN AC-AlMg5 EN AC-51300
	1.4		EN AC-AISi9Cu3 EN AC-46500
	1.5 Aluminium-Gusslegierungen	Aluminium cast alloys	GD-AISi17Cu4FeMg
	1.6		
	2.1 Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	E-Cu 57 EN CW 004 A
	2.2 Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	CuZn37 (Ms63) EN CW 508 L
	2.3 Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	CuZn36Pb3 (Ms58) EN CW 603 N
	2.4 Kupfer-Aluminium-Legierungen (Alubronze, langspanend)	Copper-aluminium alloys (alu bronze, long-chipping)	CuAl10Ni5Fe4 EN CW 307 G
	2.5 Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	CuSn8P EN CW 459 K
	2.6 Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	CuSn7 ZnPb (Rg7) 2.1090
	2.7 Kupfer-Sonderlegierungen	Special copper alloys	(AMPPO® 8) (AMPPO® 45)
	2.8		
	3.1 Magnesium-Knetlegierungen	Magnesium wrought alloys	MgAl6Zn 3.5612
	3.2 Magnesium-Gusslegierungen	Magnesium cast alloys	EN-MCMgAl9Zn1 EN-MC21120
S	Kunststoffe 4.1 Duroplaste (kurzspanend)	Synthetics 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
	5.1 Graphit	Graphite	C 8000
	5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys	W-Cu 80/20
	5.3 Verbundwerkstoffe	Composite materials	Hyllite, Alucobond
	Spezialwerkstoffe Titan-Legierungen	Special materials Titanium alloys	
1.1 Reintitan	Pure titanium	Ti1 3.7025	
1.2 Titan-Legierungen	Titanium alloys	TiAl6V4 3.7165 TiAl4Mo4Sn2 3.7185	
1.3			
2.1 Reinnickel	Pure nickel	Ni 99.6 2.4060	
2.2 Nickel-Basis-Legierungen	Nickel-base alloys	Monel 400 2.4360 Inconel 718 2.4668	
2.3			
2.4 Kobalt-Basis-Legierungen	Cobalt-base alloys	Udimet 605 Haynes 25 2.4964	
2.5			
2.6 Eisen-Basis-Legierungen	Iron-base alloys	Incloy 800 1.4958	
H	Harte Werkstoffe 1.1 Hochfeste Stähle, gehärtete Stähle, Hartguss	Hard materials High strength steels, hardened steels, hard castings	Weldox 1100 Hardox 550 Armox 600T Ferro-Titanit HSSE
	1.2		
	1.3		
	1.4		
	1.5		

Hartmetall-Kreissegment-Fräser
Solid carbide circle segment end mills

Fräser für die Impeller- und Schaufelblattbearbeitung
Milling cutters for machining of impellers and turbine blades



Allround

N

NR

fein · fine

N

r₂ = 50 mm

r₂ = 75 - 95 mm

r₂ = 250 - 500 mm

r₂ = 6 - 25 mm

α/2 = 4°
r = 2 - 4 mm

α/2 = 4°
r = 2 - 4 mm

α/2 = 4°
r = 2 - 4 mm

Z (Flutes)

Seite · Page

v_c / f_z

4

3 - 4

3

3

3

3

3/6

3542L

3538L

3540L

3544L

3546L

3550L

3548L

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198

■	■	■	■	■	■	■	■	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

Product Finder

NR

NF

N

v_c / f_z



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

Fräser für die Impeller- und Schaufelblattbearbeitung
Milling cutters for machining of impellers and turbine blades



Allround

Z (Flutes)	NF <small>fein · fine</small>		N					
	$\alpha/2 = 3 - 8^\circ$ r = 0,5 - 2 mm	$\alpha/2 = 3 - 8^\circ$ r = 0,5 - 2 mm	$\alpha/2 = 3 - 17,5^\circ$ r = 0,5 - 3 mm	$\alpha/2 = 3 - 17,5^\circ$ r = 0,5 - 3 mm	$\alpha/2 = 3 - 8^\circ$ r = 1,5 - 3 mm	$\alpha/2 = 3 - 8^\circ$ r = 1,5 - 3 mm	$\alpha/2 = 3 - 8^\circ$ $\phi d_1 = 3 - 5$ mm	$\alpha/2 = 3 - 8^\circ$ $\phi d_1 = 3 - 5$ mm
	3446 / 3447	3446L	3440 / 3441	3440L	3442 / 3443	3442L	3444 / 3445	3444L
Seite · Page	183	183	184	184	185	185	186	186
v_c / f_z	199	199	200	200	201	201	202	202

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	■	■	■	■	■	■	■
	2.6	□	□	□	□	□	□	□
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

HM



Fräser für die Impeller- und Schaufelblattbearbeitung
Milling cutters for machining of impellers and turbine blades

Konische Hartmetall-Fräser
Tapered solid carbide end mills



Product Finder

NR

NF

N

v_c / f_z

Allround

N

$\alpha/2 = 4^\circ$ $r = 3 - 8 \text{ mm}$	$\alpha/2 = 8^\circ$ $\phi d_1 = 8 - 11 \text{ mm}$	$\alpha/2 = 8^\circ$ $\phi d_1 = 9 - 19 \text{ mm}$	$\phi d_1 = 8 - 16 \text{ mm}$	$\alpha/2 = 0,5 - 5^\circ$ $\phi d_1 = 2 - 12 \text{ mm}$	$\alpha/2 = 0,5 - 5^\circ$ $\phi d_1 = 2 - 12 \text{ mm}$	Z (Flutes)
3/6	7 - 9	5 - 13	5 - 9	3 - 4	3 - 4	
2679A	2677AZ	2678AZ	2676AZ	1900 - 1905	1900A - 1905A	
187	188	188	189	190 - 191	190 - 191	Seite · Page
203	204	204	205	206	206	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

P

M

K

N

S

H



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

- Product Finder
- NR
- NF
- N
- v_c / f_z

- Hochleistungswerkzeug
- Tonnenform
- Mit 4 Schneiden
- Vibrationsarme Bearbeitung
- Hocheffiziente Schlichtbearbeitung
- Formtoleranz $\pm 0,01$ mm

- Multi-functional tool
- Barrel-shape
- With 4 flutes
- Low-vibration machining
- Highly efficient finishing
- Form tolerance ± 0.01 mm

N

HM

DIN 6535
HA
HB

Form
 $\pm 0,01$

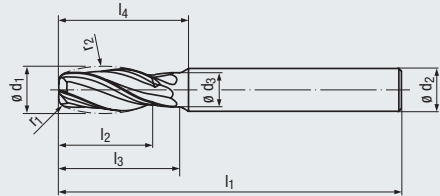
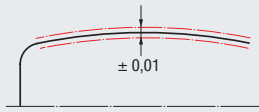
30°

v_c / f_z
192

Optional

✗

✗



Allround

Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 172)

Applications – material (see page 172)

- Speziell für hochfeste Werkstoffe geeignet
- In fast allen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

- Especially suitable for high-strength materials
- For almost all materials
- Suitable for HSC finishing

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

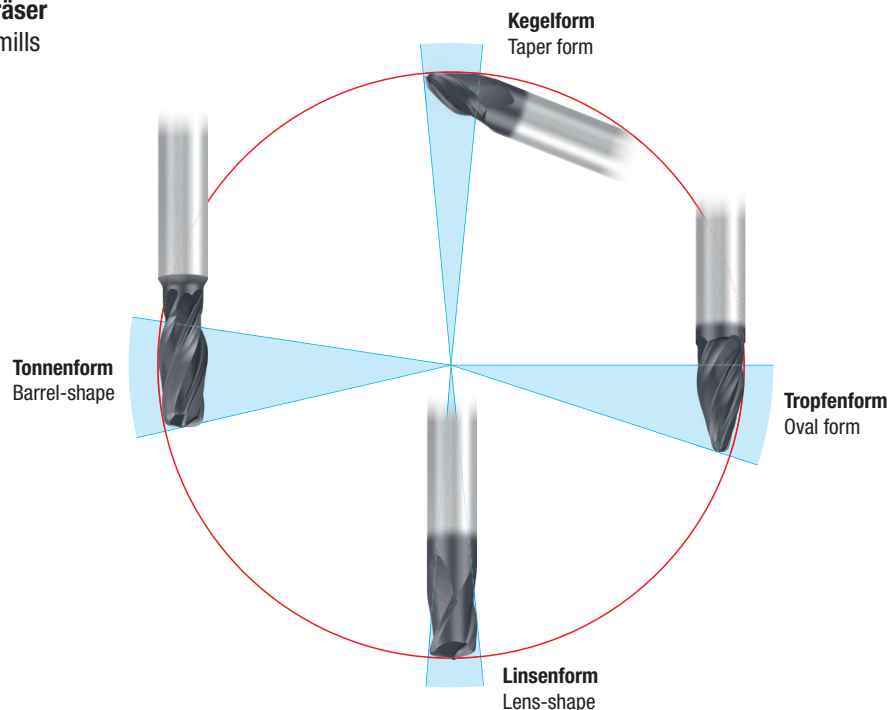
Bestell-Code · Order code

3542L

d_1	r_1	r_2	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code
10	2	50	21	28	80	8	30	10	4	.10050A

Die CAD-Daten (2D) der Werkzeuge können Sie per E-Mail an info@emuge-franken.com anfordern
You can request the CAD data (2D) of the tools via email from info@emuge-franken.com

Übersicht der Kreissegment-Fräser
Overview of circle segment end mills



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

N

HM

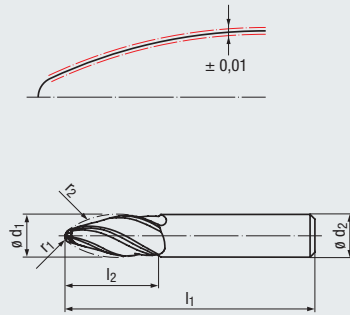
DIN 6535
HA
HB

Form
 $\pm 0,01$

30°

v_c / f_z
193

Optional



Allround

Product Finder

NR

NF

N

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

- Speziell für hochfeste Werkstoffe geeignet
- In fast allen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

Applications – material (see page 172)

- Especially suitable for high-strength materials
- For almost all materials
- Suitable for HSC finishing

ALCR

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

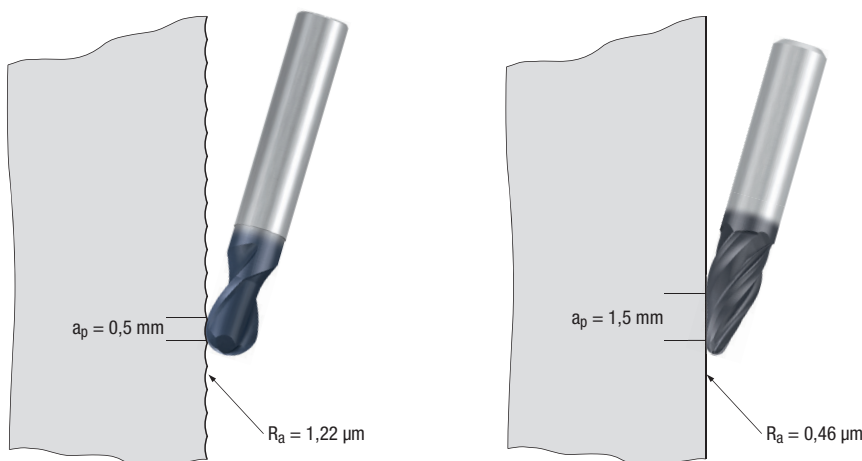
Bestell-Code · Order code

d_1	r_1	r_2	l_2	l_1	$\emptyset d_2$ h6	Z (Flutes)	Dimens.- Code	3538L
6	1	95	22	62	6	3	.06095A	●
8	1	90	25	68	8	3	.08090A	●
10	2	85	26	72	10	4	.10085A	●
12	2	80	28	83	12	4	.12080A	●
16	3	75	31	92	16	4	.16075A	●

Die CAD-Daten (2D) der Werkzeuge können Sie per E-Mail an info@emuge-franken.com anfordern
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Vergleichsbeispiel: Kugelfräser – Kreissegment-Fräser mit Tropfenform

Comparison example: Ball nose end mill – circle segment end mill with oval form



Ergebnis:

Kreissegment-Fräser ermöglichen eine höhere axiale Zustellung (a_p) bei wesentlich besseren Oberflächengüten.

Result:

Circle segment end mills enable a larger axial depth of cut (a_p) and a considerably better surface finish.

- Product Finder
- NR
- NF
- N
- v_c / f_z

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

N

HM

DIN 6535

HA
HB

Form

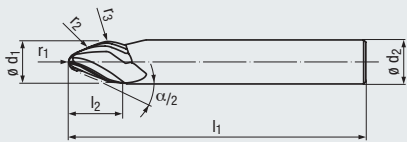
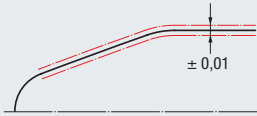
± 0,01

30°

v_c / f_z

194

Optional



Allround

Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 172)

Applications – material (see page 172)

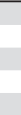
- Speziell für hochfeste Werkstoffe geeignet
- In fast allen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet
- Especially suitable for high-strength materials
- For almost all materials
- Suitable for HSC finishing

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

Bestell-Code · Order code

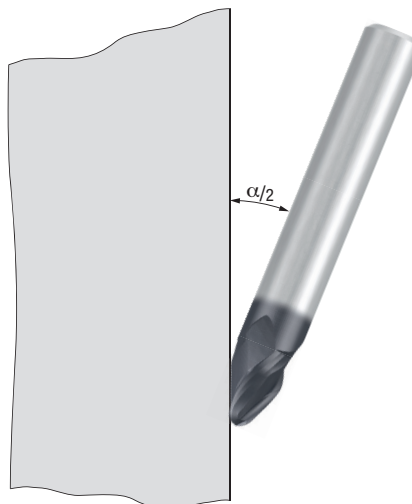
3540L

$\alpha/2$	$\varnothing d_1$	r_1	r_2	r_3	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code
17,5°	6	1	250	3	9,5	62	6	3	.06250A
20°	8	1,5	250	4	10,5	68	8	3	.08250A
20°	10	2	250	5	12,5	80	10	3	.10250A
20°	12	3	250	6	13,5	93	12	3	.12250A
20°	16	4	500	8	18,5	108	16	3	.16500A

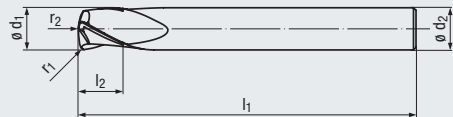
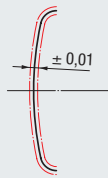


Die CAD-Daten (2D) der Werkzeuge können Sie per E-Mail an info@emuge-franken.com anfordern
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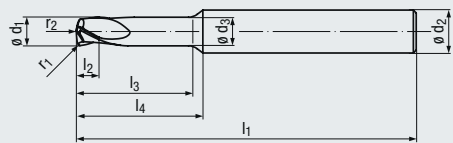
Nur mit Anstellwinkel $\alpha/2$ einsetzen!
 Only use with tilt angle $\alpha/2$!



- Hochleistungswerkzeug
- Linsenform
- Mit 3 Schneiden
- Vibrationsarme Bearbeitung
- Hocheffiziente Schlichtbearbeitung
- Formtoleranz ±0,01 mm
- Multi-functional tool
- Lens-shape
- With 3 flutes
- Low-vibration machining
- Highly efficient finishing
- Form tolerance ±0.01 mm



Design I₄:



N

HM

DIN 6535
HA
HB

Form
± 0,01

30°

v_c/f_z
195

Optional



Allround

Product Finder

NR

NF

N

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

- Speziell für hochfeste Werkstoffe geeignet
- In fast allen Werkstoffen einsetzbar
- Zum HSC-Schlichten geeignet

Applications – material (see page 172)

- Especially suitable for high-strength materials
- For almost all materials
- Suitable for HSC finishing

ALCR

P	1.1-5.1	
M	1.1-2.1	3.1-4.1
K	1.1-2.1	2.2
K	3.1-4.1	4.2
N	1.1-1.4	1.5-1.6
N	2.1-3.2	5.2
S	1.1-2.1	

Bestell-Code · Order code

ϕd_1	r ₁	r ₂	l ₂	l ₃	l ₁	ϕd_3	l ₄	ϕd_2 h6	Z (Flutes)	Dimens.- Code
4	0,25	6	4	18	62	4	20	6	3	.04006A
6	0,5	10	6	–	62	–	–	6	3	.06010A
8	0,75	15	8	–	68	–	–	8	3	.08015A
10	1	20	10	–	80	–	–	10	3	.10020A
12	1,25	25	12	–	93	–	–	12	3	.12025A

3544L

●
●
●
●
●



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Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Product Finder
- NR
- NF
- N
- v_c / f_z

- Hochleistungswerkzeug
- Mit 3 Schneiden
- Schrappverzahnung
- Multi-functional tool
- With 3 flutes
- Roughing profile

NR

fein
fine

HM

DIN 6535
HA
HB

45°

Kugel

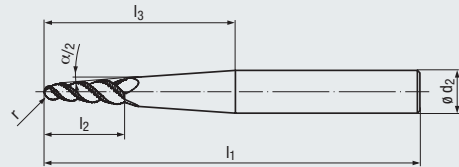
v_c / f_z

196

Optional



Allround



Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 172)

Applications – material (see page 172)

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

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

- P** 1.1-5.1
- M** 1.1-4.1
- N** 1.3-1.5
- S** 1.1-1.3
- S** 2.2-2.6

Bestell-Code · Order code

3546L

$\alpha/2$	r	l ₂	l ₃	l ₁	ϕd_2 h6	Z (Flutes)	Dimens.- Code			
4°	2	30	66	120	12	3	.04020A	●		
	3	35	81	140	16	3	.04030A	●		
	4	40	96	155	20	3	.04040A	●		



- Hochleistungswerkzeug
- Mit 3 Schneiden
- Schlichtgeometrie

- Multi-functional tool
- With 3 flutes
- Finishing geometry

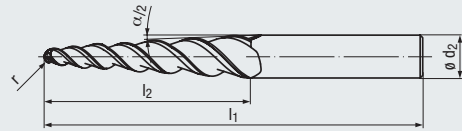
N

HM DIN 6535
HA
HB

34/35/36° Kugel

v_c / f_z
197

Optional



Allround

- Product Finder
- NR
 - NF
 - N**
 - v_c / f_z

Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 172)

Applications – material (see page 172)

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

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

- P** 1.1-5.1
- M** 1.1-4.1
- N** 1.3-1.5
- S** 1.1-1.3
- S** 2.2-2.6

Bestell-Code · Order code

3550L

$\alpha/2$	r $\pm 0,01$	l_2	l_1	$\emptyset d_2$ h6	Z (Flutes)	Dimens.- Code			
4°	2	59	120	12	3	.04020A	●		
	2	87	150	16	3	.04020B	●		
	3	74	140	16	3	.04030A	●		
	3	103	165	20	3	.04030B	●		
	4	89	155	20	3	.04040A	●		



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- Product Finder
- NR
- NF
- N
- v_c / f_z

- Hochleistungswerkzeug
- Mit 3 Schneiden im Radius
- 6 Umfangsschneiden
- Multi-functional tool
- 3 flutes in the ball nose section
- 6 radial flutes

N

HM **DIN 6535**
 HA
 HB

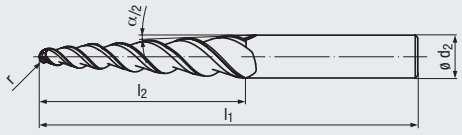
38° **Kugel**

v_c / f_z
 198

Optional



Allround



Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 172)

Applications – material (see page 172)

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

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

P 1.1-5.1

M 1.1-4.1

N 1.3-1.5

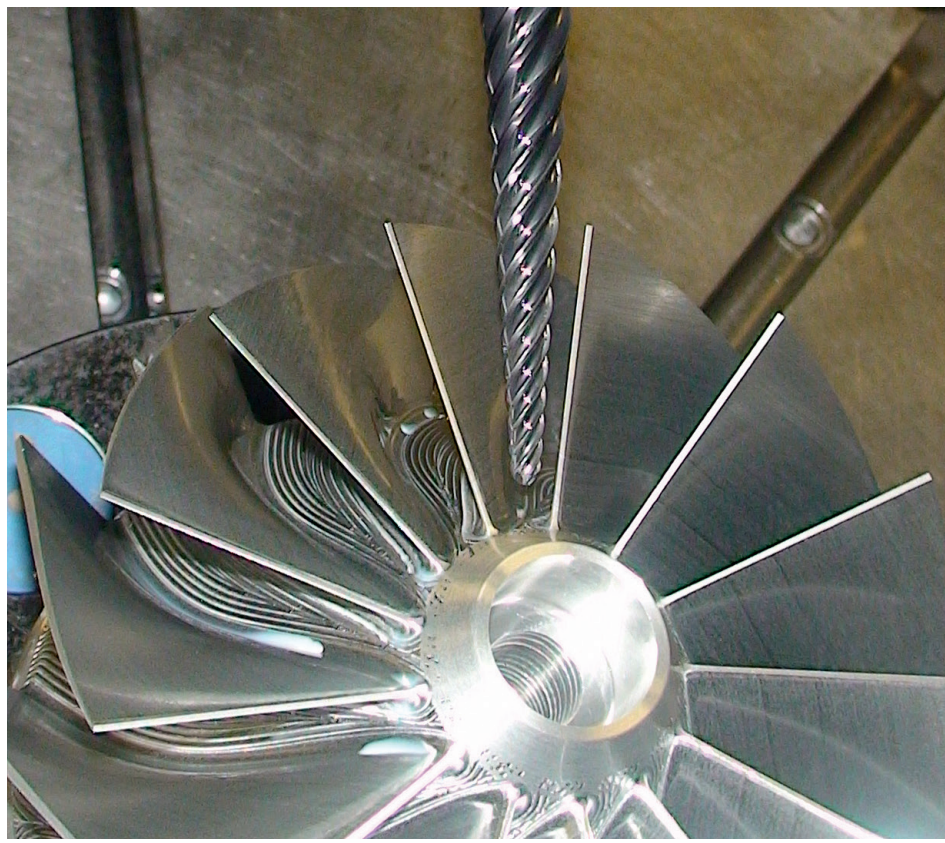
S 1.1-1.3

S 2.2-2.6

Bestell-Code · Order code

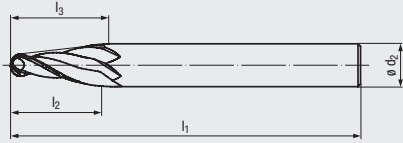
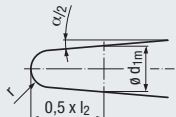
3548L

$\alpha/2$	r $\pm 0,01$	l_2	l_1	$\emptyset d_2$ h6	Z (Flutes)	Dimens.- Code			
4°	2	59	120	12	3/6	.04020A	●		
	2	87	150	16	3/6	.04020B	●		
	3	74	140	16	3/6	.04030A	●		
	3	103	165	20	3/6	.04030B	●		
	4	89	155	20	3/6	.04040A	●		

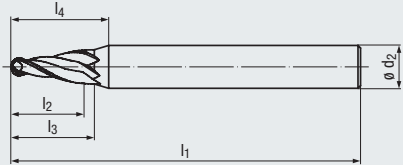


- Multifunktionales Werkzeug
- Feine Schruppschicht-Verzahnung
- Mit 2 Schneiden
- Verschiedene Kegelwinkel
- Auch mit poliertem Spanraum erhältlich

- Multi-functional tool
- Fine semi-finishing profile
- With 2 flutes
- Various taper angles
- Also available with polished chip space



Design I₄:



NF fein fine

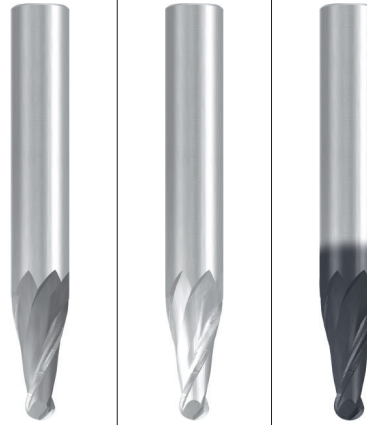
HM DIN 6535 HA HB

30° Kugel

V_c/f_z 199

Optional

Mit poliertem Spanraum
With polished chip space



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 172)

- For almost all materials
- Suitable for roughing and finishing

ALCR

- N 1.1-1.3
- N 4.1-4.2

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

Bestell-Code · Order code										3446	3447	3446L
$\alpha/2$	r ±0,01	l ₂	l ₃	l ₁	l ₄	d _{1m} h6	\emptyset d ₂ h6	Z (Flutes)	Dimens.- Code			
3°	1,5	20	20	62	24	3,90	6	2	.03015A	●	●	●
	2	31	31	80	35	5,42	8	2	.03020B	●	●	●
4°	0,5	20	20	62	24	2,33	6	2	.04005A	●	●	●
	1	20	20	62	24	3,26	6	2	.04010A	●	●	●
	1,5	20	20	63	25	4,20	8	2	.04015A	●	●	●
	2	30	30	72	-	5,83	8	2	.04020B	●	●	●
6°	0,5	20	24	62	-	3,00	6	2	.06005A	●	●	●
	1	19	19	62	-	3,80	6	2	.06010A	●	●	●
	1,5	15	15	62	-	4,28	6	2	.06015A	●	●	●
	1,5	25	25	68	-	5,33	8	2	.06015B	●	●	●
	2	20	20	68	-	5,70	8	2	.06020A	●	●	●
	2	30	30	80	-	6,76	10	2	.06020B	●	●	●
8°	0,5	18	18	62	-	3,40	6	2	.08005A	●	●	●
	1	15	15	62	-	3,85	6	2	.08010A	●	●	●
	1,5	19	19	63	-	5,28	8	2	.08015A	●	●	●
	2	23	23	72	-	6,71	10	2	.08020A	●	●	●

Product Finder

NR

NF

N

v_c / f_z



- Product Finder
- NR
- NF
- N
- v_c / f_z

- Multifunktionales Werkzeug
- Mit 3 Schneiden
- Verschiedene Kegelwinkel
- Auch mit poliertem Spanraum erhältlich
- Multi-functional tool
- With 3 flutes
- Various taper angles
- Also available with polished chip space

N

HM

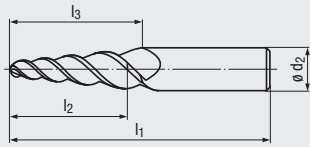
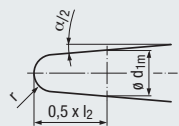
DIN 6535
HA
HB

45°

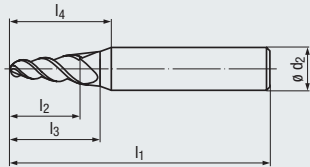
Kugel

v_c / f_z
200

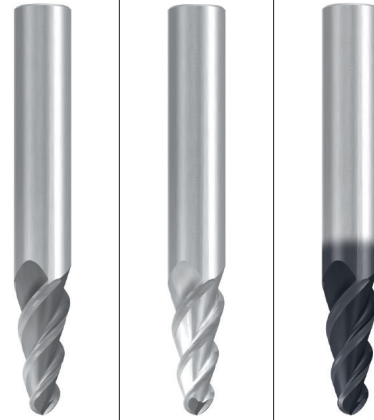
Optional



Design I₄:



Mit poliertem Spanraum
With polished chip space



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

- In fast allen Werkstoffen einsetzbar
- Zum Schlichten geeignet

Applications – material (see page 172)

- For almost all materials
- Suitable for finishing

ALCR

- N 1.1-1.3
- N 4.1-4.2

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

Bestell-Code · Order code

Bestell-Code · Order code										3440	3441	3440L
$\alpha/2$	r <small>±0,005</small>	l_2	l_3	l_1	l_4	d_{1m}	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code			
3°	1,5	20	20	62	24	3,90	6	3	.03015A	●	●	●
	2	21	21	66	—	4,90	6	3	.03020A	●	●	●
	2	31	31	80	35	5,42	8	3	.03020B	●	●	●
	3	22	22	72	—	6,85	8	3	.03030A	●	●	●
	3	31	31	80	35	7,32	10	3	.03030B	●	●	●
4°	0,5	20	20	62	24	2,33	6	3	.04005A	●	●	●
	1	20	20	62	24	3,26	6	3	.04010A	●	●	●
	1,5	20	20	63	25	4,20	8	3	.04015A	●	●	●
	2	20	30	68	—	5,13	8	3	.04020A	●	●	●
	2	30	30	72	—	5,83	8	3	.04020B	●	●	●
	3	25	31	72	—	7,34	10	3	.04030A	●	●	●
	3	31	31	80	—	7,76	10	3	.04030B	●	●	●
6°	0,5	20	24	62	—	3,00	6	3	.06005A	●	●	●
	1	19	19	62	—	3,80	6	3	.06010A	●	●	●
	1	29	29	72	—	4,85	8	3	.06010B	●	●	●
	1,5	15	15	62	—	4,28	6	3	.06015A	●	●	●
	1,5	25	25	68	—	5,33	8	3	.06015B	●	●	●
	2	20	20	68	—	5,70	8	3	.06020A	●	●	●
	2	30	30	80	—	6,76	10	3	.06020B	●	●	●
	3	21	21	72	—	7,61	10	3	.06030A	●	●	●
	3	31	31	83	—	8,66	12	3	.06030B	●	●	●
8°	0,5	18	18	62	—	3,40	6	3	.08005A	●	●	●
	1	15	15	62	—	3,85	6	3	.08010A	●	●	●
	1	22	22	63	—	4,83	8	3	.08010B	●	●	●
	1,5	19	19	63	—	5,28	8	3	.08015A	●	●	●
	1,5	26	26	72	—	6,26	10	3	.08015B	●	●	●
	2	23	23	72	—	6,71	10	3	.08020A	●	●	●
17,5°	0,5	8	8	57	—	3,26	6	3	.17505A	●	●	●



- Multifunktionales Werkzeug
- Mit 2 Schneiden
- Verschiedene Kegelwinkel
- Auch mit poliertem Spanraum erhältlich

- Multi-functional tool
- With 2 flutes
- Various taper angles
- Also available with polished chip space

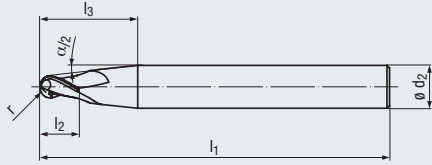
N

HM DIN 6535
HA
HB

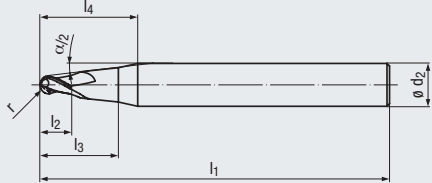
30° Kugel

v_c / f_z
201

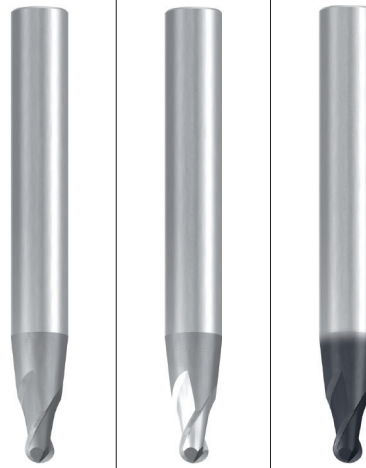
Optional



Design I₄:



Mit poliertem Spanraum
With polished chip space



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 172)

- For almost all materials
- Suitable for roughing and finishing

ALCR

- N 1.1-1.3
- N 4.1-4.2

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

Bestell-Code · Order code

$\alpha/2$	r	$\pm 0,01$	l_2	l_3	l_1	l_4	ϕd_2 h6	Z (Flutes)	Dimens.- Code	3442	3443	3442L
3°	1,5		4	24	63	26	8	2	.03015A	●	●	●
	3		7	38	80	39	10	2	.03030A	●	●	●
4°	1,5		4	24	63	26	8	2	.04015A	●	●	●
	3		7	33	80	-	10	2	.04030A	●	●	●
6°	1,5		4	26	63	-	8	2	.06015A	●	●	●
	3		7	23	80	-	10	2	.06030A	●	●	●
8°	1,5		4	27	80	-	10	2	.08015A	●	●	●
	3		7	25	83	-	12	2	.08030A	●	●	●

- Product Finder
- NR
 - NF
 - N
 - v_c / f_z



Induktionsschrumpfgerät SHRINK-MASTER HL-2,
Schrumpf-Aufnahmen und -Zubehör
siehe Seite 362 - 374

Induction shrink-fit work station
SHRINK-MASTER HL-2, shrink-fit chucks
and accessories, see pages 362 - 374

- Product Finder
- NR
- NF
- N
- v_c / f_z

- Multifunktionales Werkzeug
- Mit 2 Schneiden
- Verschiedene Kegelwinkel
- Auch mit poliertem Spanraum erhältlich
- Multi-functional tool
- With 2 flutes
- Various taper angles
- Also available with polished chip space

N

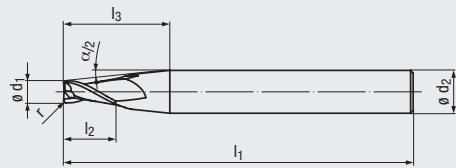
HM

DIN 6535
HA
HB

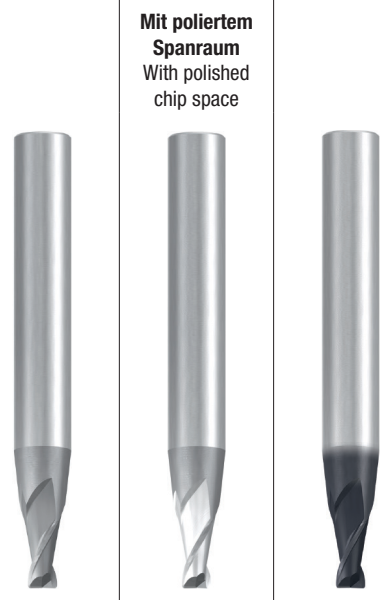
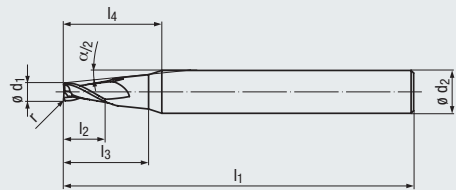
30°
Torus

v_c / f_z
202

Optional



Design I₄:



Mit poliertem Spanraum
With polished chip space

Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

- In fast allen Werkstoffen einsetzbar
- Zum Schrumpfen geeignet

Applications – material (see page 172)

- For almost all materials
- Suitable for roughing

ALCR

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

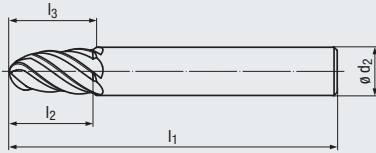
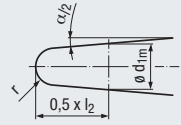
Bestell-Code · Order code

$\alpha/2$	$\varnothing d_1$	r $\pm 0,01$	l_2	l_3	l_1	l_4	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code	3444	3445	3444L
3°	3	0,3	6	24	63	26	8	2	.03003A	●	●	●
	4	0,4	8	24	63	26	8	2	.03004A	●	●	●
	5	0,5	10	25	63	26	8	2	.03005A	●	●	●
4°	3	0,3	6	24	63	26	8	2	.04003A	●	●	●
	4	0,4	8	25	63	26	8	2	.04004A	●	●	●
	5	0,5	10	23	63	-	8	2	.04005A	●	●	●
6°	3	0,3	6	25	63	-	8	2	.06003A	●	●	●
	4	0,4	8	20	63	-	8	2	.06004A	●	●	●
	5	0,5	10	25	80	-	10	2	.06005A	●	●	●
8°	3	0,3	6	25	80	-	10	2	.08003A	●	●	●
	4	0,4	8	22	80	-	10	2	.08004A	●	●	●
	5	0,5	10	25	83	-	12	2	.08005A	●	●	●



- Hochleistungswerkzeug
- Mit 3 Schneiden im Radius
- 6 Umfangsschneiden

- Multi-functional tool
- 3 flutes in the ball nose section
- 6 radial flutes



N

HM DIN 6535
HA
HB

38° Kugel

v_c / f_z
203

Optional



Allround

Product Finder

NR

NF

N

v_c / f_z

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 172)

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

Applications – material (see page 172)

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

P 1.1-5.1

M 1.1-4.1

K 1.1-4.2

N 2.1-2.8 5.2

S 1.1-2.6

Bestell-Code · Order code

2679A

$\alpha/2$	r $\pm 0,01$	l_2	l_3	l_1	d_{1m}	$\emptyset d_2$ h6	Z (Flutes)	Dimens.- Code			
4°	3	30	47	108	7,89	12	3/6	.04030A	●		
	3,5	39	39	108	9,26	12	3/6	.04035A	●		
	4	32	32	108	9,70	12	3/6	.04040A	●		
	5	35	49	108	11,77	16	3/6	.04050A	●		
	6	34	34	108	13,57	16	3/6	.04060A	●		
	8	36	36	108	17,44	20	3/6	.04080A	●		



- Product Finder
- NR
- NF
- N
- v_c / f_z

- Hochleistungswerkzeug
- Mit 5-13 Schneiden
- Ungleiche Teilung
- Vibrationsarme Bearbeitung
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)

- Multi-functional tool
- With 5-13 flutes
- Variable spacing
- Low-vibration machining
- Internal coolant supply, axial exit (ICA)

N

ICA

HM

DIN 6535

HA
HB

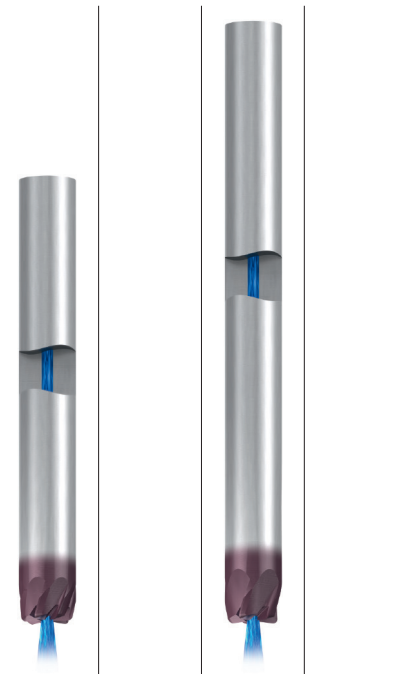
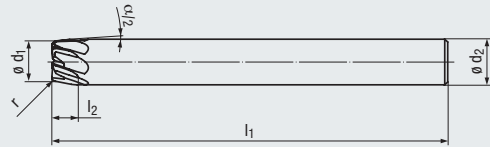
20°

Torus

v_c / f_z

204

Optional



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)

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

Applications – material (see page 172)

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

TIALN

TIALN

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

Lange Ausführung · Long design

Bestell-Code · Order code

$\alpha/2$	$\varnothing d_1$	r <small>$\pm 0,01$</small>	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code	2677AZ		
8°	8	0,8	7,5	80	10	7	.008008	●		
	9	1	3,5	80	10	7	.009010	●		
	10	1	7,5	80	12	9	.010010	●		
	11	1	3,5	80	12	9	.011010	●		

Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\alpha/2$	$\varnothing d_1$	r <small>$\pm 0,01$</small>	l_2	l_1	$\varnothing d_2$ h6	Z (Flutes)	Dimens.- Code		2678AZ	
8°	9	1	3,5	108	10	5	.009010		●	
	10	1	7,5	108	12	7	.010010		●	
	11	1	3,5	108	12	7	.011010		●	
	15	1	3,5	108	16	9	.015010		●	
	15	1	3,5	108	16	13	.115010		●	
	19	1	3,5	108	20	9	.019010		●	
	19	1	3,5	108	20	13	.119010		●	



- Hochleistungswerkzeug
- Mit 5-9 Schneiden
- Ungleiche Teilung
- Vibrationsarme Bearbeitung
- Innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)

- Multi-functional tool
- With 5-9 flutes
- Variable spacing
- Low-vibration machining
- Internal coolant supply, axial exit (ICA)

N

ICA

HM **DIN 6535**
HA
HB

20° **Torus**

v_c / f_z
205

Optional



Allround

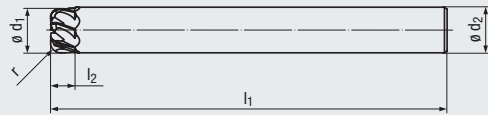
Product Finder

NR

NF

N

v_c / f_z



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 172)

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

Applications – material (see page 172)

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

P 1.1-5.1

M 1.1-4.1

K 1.1-4.2

N 2.1-2.8 5.2

S 1.1-2.6

Bestell-Code · Order code

2676AZ

∅ d ₁ f8	r ±0,01	l ₂	l ₁	∅ d ₂ h6	Z (Flutes)	Dimens.- Code			
8	1	3	80	8	5	.008010	●		
8	2	4	80	8	5	.008020	●		
10	1	3	80	10	7	.010010	●		
10	2	4	80	10	7	.010020	●		
12	1	3	108	12	7	.012010	●		
12	2	4	108	12	7	.012020	●		
16	1	3	108	16	9	.016010	●		
16	2	4	108	16	9	.016020	●		



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Product Finder
- NR
- NF
- N**
- v_c / f_z

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

N

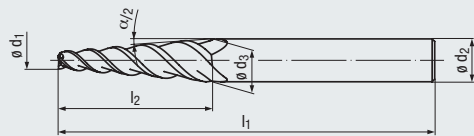
HM

DIN 6535
HA
HB

30°

v_c / f_z
206

Optional



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172) **Applications – material (see page 172)**
 - In fast allen Werkstoffen einsetzbar - For almost all materials

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

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

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



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

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

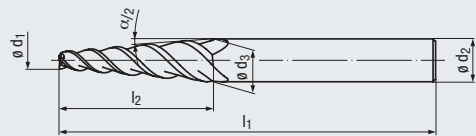
N

HM DIN 6535
HA
HB

30°

v_c / f_z
206

Optional



Allround



Allround

Product Finder

NR

NF

N

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 172)
- In fast allen Werkstoffen einsetzbar

Applications – material (see page 172)
- For almost all materials

TIALN

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

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

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



- Product Finder
- NR
- NF
- N
- v_c / f_z

Hartmetall-Kreissegment-Fräser mit Tonnenform

Solid carbide circle segment end mill with barrel-shape

N



Aufmaß - Allowance
0,05 - 0,1 mm



Aufmaß - Allowance
0,1 - 0,2 mm

Gültig für · Valid for
3542L

Für die Berechnung der Drehzahl n muss mit dem Durchmesser d_1 gerechnet werden.
In order to calculate the rotational speed n, the diameter d_1 has to be used.



	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
P	1.1	200	$0,008 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	$0,007 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	150	$0,006 \times d_1$	150	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	140	$0,005 \times d_1$	140	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	5.1	130	$0,005 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
M	1.1	100	$0,005 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,005 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60	$0,004 \times d_1$	60	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40	$0,004 \times d_1$	40	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	200	$0,008 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	200	$0,008 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	$0,007 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180	$0,007 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	150	$0,007 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	150	$0,007 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	130	$0,005 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	100	$0,004 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.1	600	$0,008 \times d_1$	600	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.2	600	$0,007 \times d_1$	600	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.3	600	$0,006 \times d_1$	600	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.4	410	$0,007 \times d_1$	410	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.5	380	$0,006 \times d_1$	380	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.6	270	$0,005 \times d_1$	270	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
N	2.1	180	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	180	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	170	$0,007 \times d_1$	170	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	170	$0,007 \times d_1$	170	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	170	$0,007 \times d_1$	170	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	100	$0,005 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	100	$0,005 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	410	$0,015 \times d_1$	410	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	410	$0,012 \times d_1$	410	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	410	$0,013 \times d_1$	410	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	600	$0,013 \times d_1$	600	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3									
4.4									
5.1									
5.2	100	$0,005 \times d_1$	100	$0,003 \times d_1$				<input checked="" type="checkbox"/>	
5.3									
S	1.1	100	$0,006 \times d_1$	100	$0,004 \times d_1$				<input checked="" type="checkbox"/>
	1.2	80	$0,005 \times d_1$	80	$0,003 \times d_1$				<input checked="" type="checkbox"/>
	1.3	60	$0,005 \times d_1$	60	$0,003 \times d_1$				<input checked="" type="checkbox"/>
	2.1	80	$0,004 \times d_1$	80	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.2	30	$0,004 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.3	30	$0,004 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.4	30	$0,004 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.5	30	$0,004 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
2.6	30	$0,004 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>	
H	1.1	130	$0,005 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2								
	1.3								
	1.4								
	1.5								



Hartmetall-Kreissegment-Fräser mit Tropfenform
Solid carbide circle segment end mills with oval form

N

Gültig für · Valid for
3538L



Aufmaß · Allowance
0,05 - 0,1 mm



Aufmaß · Allowance
0,1 - 0,2 mm



Aufmaß · Allowance
0,2 - 0,3 mm

Für die Berechnung der Drehzahl n muss mit dem Durchmesser d_1 gerechnet werden.
In order to calculate the rotational speed n , the diameter d_1 has to be used.



	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]				
									MMS MQL	
P	1.1	$0,008 \times d_1$	200	$0,007 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	$0,007 \times d_1$	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	$0,006 \times d_1$	150	$0,005 \times d_1$	150	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	$0,005 \times d_1$	140	$0,004 \times d_1$	140	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	5.1	$0,005 \times d_1$	130	$0,004 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
M	1.1	$0,005 \times d_1$	100	$0,004 \times d_1$	100	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	$0,005 \times d_1$	80	$0,004 \times d_1$	80	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	$0,004 \times d_1$	60	$0,003 \times d_1$	60	$0,002 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	$0,004 \times d_1$	40	$0,003 \times d_1$	40	$0,002 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	$0,008 \times d_1$	200	$0,007 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2	$0,008 \times d_1$	200	$0,007 \times d_1$	200	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1	$0,007 \times d_1$	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.2	$0,007 \times d_1$	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1	$0,007 \times d_1$	150	$0,006 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.2	$0,007 \times d_1$	150	$0,006 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.1	$0,005 \times d_1$	130	$0,004 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.2	$0,004 \times d_1$	100	$0,003 \times d_1$	100	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1	$0,008 \times d_1$	600	$0,007 \times d_1$	600	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	$0,007 \times d_1$	600	$0,006 \times d_1$	600	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	$0,006 \times d_1$	600	$0,005 \times d_1$	600	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	$0,007 \times d_1$	410	$0,006 \times d_1$	410	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	$0,006 \times d_1$	380	$0,005 \times d_1$	380	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6	$0,005 \times d_1$	270	$0,004 \times d_1$	270	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	$0,008 \times d_1$	180	$0,007 \times d_1$	180	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	$0,008 \times d_1$	180	$0,007 \times d_1$	180	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	$0,008 \times d_1$	180	$0,007 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	$0,007 \times d_1$	170	$0,006 \times d_1$	170	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	$0,007 \times d_1$	170	$0,006 \times d_1$	170	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	$0,007 \times d_1$	170	$0,006 \times d_1$	170	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	$0,005 \times d_1$	100	$0,004 \times d_1$	100	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	$0,005 \times d_1$	100	$0,004 \times d_1$	100	$0,003 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	$0,015 \times d_1$	410	$0,013 \times d_1$	410	$0,011 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	$0,012 \times d_1$	410	$0,010 \times d_1$	410	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	$0,013 \times d_1$	410	$0,011 \times d_1$	410	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	$0,013 \times d_1$	600	$0,011 \times d_1$	600	$0,009 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3								<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4								<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1									<input checked="" type="checkbox"/>	
5.2	100	$0,005 \times d_1$	100	$0,004 \times d_1$	100	$0,003 \times d_1$				<input checked="" type="checkbox"/>
5.3										<input checked="" type="checkbox"/>
S	1.1	$0,006 \times d_1$	100	$0,005 \times d_1$	100	$0,004 \times d_1$				<input checked="" type="checkbox"/>
	1.2	$0,005 \times d_1$	80	$0,004 \times d_1$	80	$0,003 \times d_1$				<input checked="" type="checkbox"/>
	1.3	$0,005 \times d_1$	60	$0,004 \times d_1$	60	$0,003 \times d_1$				<input checked="" type="checkbox"/>
	2.1	$0,004 \times d_1$	80	$0,003 \times d_1$	80	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.2	$0,004 \times d_1$	30	$0,003 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.3	$0,004 \times d_1$	30	$0,003 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
	2.4	$0,004 \times d_1$	30	$0,003 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>
2.5	$0,004 \times d_1$	30	$0,003 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>	
2.6	$0,004 \times d_1$	30	$0,003 \times d_1$	30	$0,002 \times d_1$				<input checked="" type="checkbox"/>	
H	1.1	$0,005 \times d_1$	130	$0,004 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2									
	1.3									
	1.4									
	1.5									

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



- Product Finder
- NR
- NF
- N
- v_c / f_z

Hartmetall-Kreissegment-Fräser mit Kegelform

Solid carbide circle segment end mills with taper form

N



Aufmaß - Allowance
0,05 - 0,1 mm



Aufmaß - Allowance
0,1 - 0,2 mm

Gültig für · Valid for
3540L

Für die Berechnung der Drehzahl n muss mit dem Durchmesser d_1 gerechnet werden.
In order to calculate the rotational speed n, the diameter d_1 has to be used.



	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL		
P	1.1	200	$0,007 \times d_1$	200	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	$0,006 \times d_1$	180	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	150	$0,005 \times d_1$	150	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	140	$0,004 \times d_1$	140	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	5.1	130	$0,004 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
M	1.1	100	$0,004 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,004 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	60	$0,003 \times d_1$	60	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	40	$0,003 \times d_1$	40	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	200	$0,007 \times d_1$	200	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	200	$0,007 \times d_1$	200	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	150	$0,006 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	150	$0,006 \times d_1$	150	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	130	$0,004 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	100	$0,003 \times d_1$	100	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.1	600	$0,007 \times d_1$	600	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1.2	600	$0,006 \times d_1$	600	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.3	600	$0,005 \times d_1$	600	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.4	410	$0,006 \times d_1$	410	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.5	380	$0,005 \times d_1$	380	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
1.6	270	$0,004 \times d_1$	270	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
N	2.1	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	180	$0,006 \times d_1$	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	170	$0,005 \times d_1$	170	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	170	$0,005 \times d_1$	170	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	170	$0,005 \times d_1$	170	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	100	$0,004 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	100	$0,004 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	410	$0,013 \times d_1$	410	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	410	$0,010 \times d_1$	410	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	410	$0,011 \times d_1$	410	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	600	$0,011 \times d_1$	600	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3									
4.4									
5.1									
5.2	100	$0,004 \times d_1$	100	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3									
S	1.1	100	$0,005 \times d_1$	100	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	80	$0,004 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	60	$0,004 \times d_1$	60	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	80	$0,003 \times d_1$	80	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	30	$0,003 \times d_1$	30	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	30	$0,003 \times d_1$	30	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	30	$0,003 \times d_1$	30	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5	30	$0,003 \times d_1$	30	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6	30	$0,003 \times d_1$	30	$0,002 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1	130	$0,004 \times d_1$	130	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2								
	1.3								
	1.4								
	1.5								

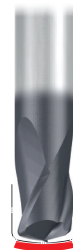
Hartmetall-Kreissegment-Fräser mit Linienform
Solid carbide circle segment end mill with lens-shape

N

Gültig für · Valid for
3544L



Aufmaß · Allowance
0,05 - 0,1 mm



Aufmaß · Allowance
0,1 - 0,2 mm

Für die Berechnung der Drehzahl n muss mit dem Durchmesser d_1 gerechnet werden.
In order to calculate the rotational speed n, the diameter d_1 has to be used.

	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL		
P	1.1	280	0,008 x d_1	280	0,006 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	240	0,007 x d_1	240	0,005 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	200	0,006 x d_1	200	0,004 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	180	0,005 x d_1	180	0,003 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	5.1	150	0,005 x d_1	150	0,003 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
M	1.1	150	0,005 x d_1	150	0,003 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	120	0,005 x d_1	120	0,003 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	90	0,004 x d_1	90	0,002 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	60	0,004 x d_1	60	0,002 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
K	1.1	300	0,008 x d_1	300	0,006 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2	300	0,008 x d_1	300	0,006 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1	270	0,007 x d_1	270	0,005 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.2	270	0,007 x d_1	270	0,005 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1	220	0,007 x d_1	220	0,005 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.2	220	0,007 x d_1	220	0,005 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.1	200	0,005 x d_1	200	0,003 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	4.2	150	0,004 x d_1	150	0,003 x d_1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
N	1.1	900	0,008 x d_1	900	0,006 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	900	0,007 x d_1	900	0,005 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	900	0,006 x d_1	900	0,004 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	600	0,007 x d_1	600	0,005 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	550	0,008 x d_1	550	0,004 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6	400	0,005 x d_1	400	0,003 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	270	0,008 x d_1	270	0,006 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	270	0,008 x d_1	270	0,006 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	270	0,008 x d_1	270	0,006 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	250	0,007 x d_1	250	0,005 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	250	0,007 x d_1	250	0,005 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	250	0,007 x d_1	250	0,005 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	150	0,005 x d_1	150	0,003 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	150	0,005 x d_1	150	0,003 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	600	0,015 x d_1	600	0,011 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	600	0,012 x d_1	600	0,008 x d_1			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1									
4.2									
4.3									
4.4									
5.1									
5.2	150	0,005 x d_1	150	0,003 x d_1				<input checked="" type="checkbox"/>	
5.3									
S	1.1	150	0,006 x d_1	150	0,004 x d_1				<input checked="" type="checkbox"/>
	1.2	120	0,005 x d_1	120	0,003 x d_1				<input checked="" type="checkbox"/>
	1.3	90	0,005 x d_1	90	0,003 x d_1				<input checked="" type="checkbox"/>
	2.1	120	0,004 x d_1	120	0,002 x d_1				<input checked="" type="checkbox"/>
	2.2								
	2.3								
2.4									
2.5									
2.6									
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

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

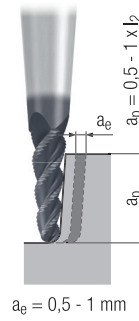
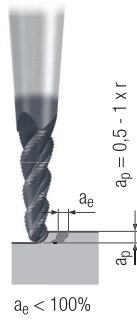


- Product Finder
- NR
- NF
- N
- v_c / f_z

Konische Hartmetall-Kugelfräser Tapered solid carbide ball nose end mills

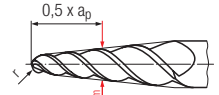
NR

Gültig für · Valid for
3546L



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

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



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



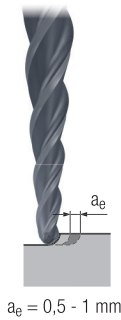
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
P	1.1	140	0,06	100	0,07		□	□	■
	2.1	130	0,05	90	0,06		□	□	■
	3.1	120	0,04	90	0,05		■	□	■
	4.1	110	0,04	80	0,05		■		
	5.1	100	0,03	70	0,04		■		
M	1.1	120	0,03	90	0,07				■
	2.1	120	0,03	90	0,07				■
	3.1	100	0,03	70	0,07				■
	4.1	100	0,03	70	0,07				■
K	1.1								
	1.2								
	2.1								
	2.2								
	3.1								
	3.2								
	4.1								
N	1.1								
	1.2								
	1.3	400	0,06	280	0,12				■
	1.4	280	0,06	200	0,12				■
	1.5	200	0,06	140	0,12				■
	1.6								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	3.1								
	3.2								
4.1									
4.2									
4.3									
4.4									
5.1									
5.2									
5.3									
S	1.1	120	0,03	90	0,07				■
	1.2	100	0,03	75	0,07				■
	1.3	60	0,03	45	0,07				■
	2.1								
	2.2	30	0,03	25	0,07				■
	2.3	30	0,03	25	0,07				■
	2.4	30	0,03	25	0,07				■
2.5	20	0,03	15	0,07				■	
2.6	30	0,03	25	0,07				■	
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								



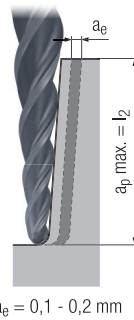
Konische Hartmetall-Kugelfräser
Tapered solid carbide ball nose end mills

N

Gültig für · Valid for
3550L



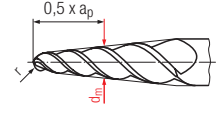
$a_e = 0,5 - 1 \text{ mm}$



$a_e = 0,1 - 0,2 \text{ mm}$

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

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



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

	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	120	0,07	80	0,05	■	□	■
	2.1	110	0,06	70	0,05	■	□	■
	3.1	100	0,05	60	0,04	■	□	■
	4.1	90	0,04	60	0,04	■		
	5.1	80	0,04	50	0,03	■		
M	1.1	90	0,07	60	0,03			■
	2.1	90	0,07	60	0,03			■
	3.1	70	0,07	50	0,03			■
	4.1	70	0,07	50	0,03			■
K	1.1							
	1.2							
	2.1							
	2.2							
	3.1							
	3.2							
	4.1							
4.2								
N	1.1							
	1.2							
	1.3	280	0,12	200	0,06			■
	1.4	200	0,12	140	0,06			■
	1.5	140	0,12	100	0,06			■
	1.6							
	2.1							
	2.2							
	2.3							
	2.4							
	2.5							
	2.6							
	2.7							
2.8								
3.1								
3.2								
4.1								
4.2								
4.3								
4.4								
5.1								
5.2								
5.3								
S	1.1	90	0,07	60	0,03			■
	1.2	75	0,07	50	0,03			■
	1.3	45	0,07	30	0,03			■
	2.1							
	2.2	25	0,07	15	0,03			■
	2.3	25	0,07	15	0,03			■
2.4	25	0,07	15	0,03			■	
2.5	15	0,07	10	0,03			■	
2.6	25	0,07	15	0,03			■	
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

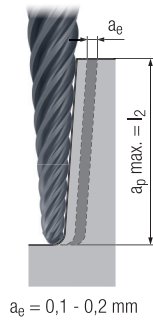
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



- Product Finder
- NR
- NF
- N
- v_c / f_z

Konische Hartmetall-Kugelfräser Tapered solid carbide ball nose end mills

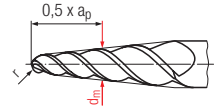
N



Gültig für · Valid for
3548L

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

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



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

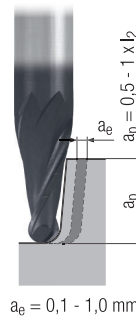
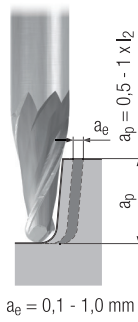
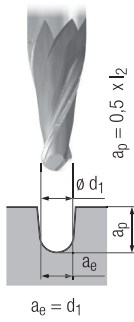


	v_c [m/min]	f_z [mm]			MMS MQL			
P	1.1	80	0,05		■	□	■	
	2.1	70	0,04		■	□	■	
	3.1	60	0,04		■	□	■	
	4.1	60	0,03		■			
	5.1	50	0,03		■			
M	1.1	60	0,03				■	
	2.1	60	0,03				■	
	3.1	50	0,03				■	
	4.1	50	0,03				■	
K	1.1							
	1.2							
	2.1							
	2.2							
	3.1							
	3.2							
	4.1							
4.2								
N	1.1							
	1.2							
	1.3	200	0,06				■	
	1.4	140	0,06				■	
	1.5	100	0,06				■	
	1.6							
	2.1							
	2.2							
	2.3							
	2.4							
	2.5							
	2.6							
	2.7							
	2.8							
	3.1							
	3.2							
4.1								
4.2								
4.3								
4.4								
5.1								
5.2								
5.3								
S	1.1	60	0,03				■	
	1.2	50	0,03				■	
	1.3	30	0,03				■	
	2.1							
	2.2	15	0,03					■
	2.3	15	0,03					■
	2.4	15	0,03					■
2.5	10	0,03					■	
2.6	15	0,03					■	
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							



Konische Hartmetall-Kugelfräser
Tapered solid carbide ball nose end mills

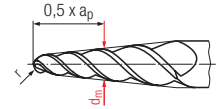
NF



Gültig für · Valid for
3446 3446L 3447

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

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



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

Unbeschichtet · Uncoated

ALCR

	Unbeschichtet · Uncoated		ALCR		MMS MQL	Coolant			
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
P	1.1				<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.1				<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.1				<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.1				<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	5.1				<input type="checkbox"/>	<input checked="" type="checkbox"/>			
M	1.1					<input type="checkbox"/>			
	2.1					<input type="checkbox"/>			
	3.1					<input type="checkbox"/>			
	4.1					<input type="checkbox"/>			
K	1.1				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.2				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.1				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.2				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.1				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.2				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.1				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.2				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
N	1.1	350	0,040 x r	300	0,020 x r	350	0,016 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	350	0,040 x r	300	0,020 x r	350	0,014 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	320	0,035 x r	270	0,017 x r	350	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4					280	0,014 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5					240	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6							<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1					140	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2					140	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3					140	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4					120	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5					120	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6					120	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7					70	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8					70	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1					320	0,018 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2					320	0,014 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1			180	0,016 x r	240	0,016 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2			160	0,016 x r	350	0,016 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3					180	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4					90	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1							<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.2					80	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3					160	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
S	1.1				80	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2				60	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3				40	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1				50	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.2				20	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.3				20	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4				20	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.5				15	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.6				20	0,004 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
H	1.1							<input type="checkbox"/>	
	1.2							<input type="checkbox"/>	
	1.3							<input type="checkbox"/>	
	1.4							<input type="checkbox"/>	
	1.5							<input type="checkbox"/>	

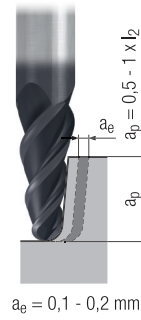
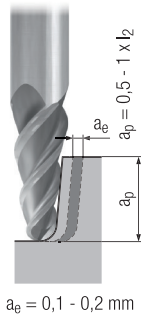
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



- Product Finder
- NR
- NF
- N
- v_c / f_z

Konische Hartmetall-Kugelfräser Tapered solid carbide ball nose end mills

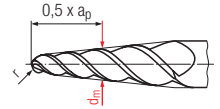
N



Gültig für · Valid for
3440 3440L 3441

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

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



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

Unbeschichtet · Uncoated

ALCR

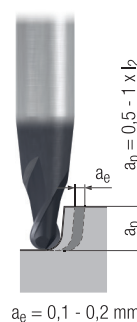
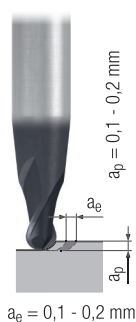
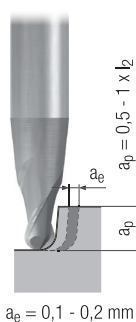
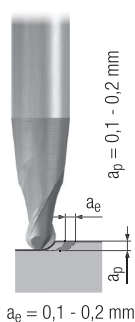


	Unbeschichtet · Uncoated		ALCR						
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
P	1.1		120	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1		100	0,010 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1		90	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.1		70	0,008 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	5.1		60	0,006 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
M	1.1		60	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1		50	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1								
	4.1								
K	1.1		120	0,010 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.2		120	0,010 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.1		100	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	2.2		100	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.1		90	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	3.2		90	0,008 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.1		70	0,006 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
	4.2		60	0,006 x r	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
N	1.1	180	0,016 x r	260	0,016 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	180	0,014 x r	260	0,014 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	180	0,012 x r	260	0,012 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4			200	0,014 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5			180	0,012 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6								
	2.1			100	0,010 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2			100	0,010 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3			100	0,010 x r	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4			80	0,008 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5			80	0,008 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6			80	0,008 x r	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7			50	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8			50	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1			240	0,018 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2			240	0,014 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	130	0,016 x r	180	0,016 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	110	0,016 x r	160	0,016 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3			100	0,012 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4			70	0,012 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1									
5.2			60	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3			120	0,012 x r	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
S	1.1		60	0,008 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2		50	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3		30	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1			40	0,006 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2			15	0,004 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3			15	0,004 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4			15	0,004 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.5			10	0,004 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6			15	0,004 x r			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								



Konische Hartmetall-Kugelfräser
Tapered solid carbide ball nose end mills

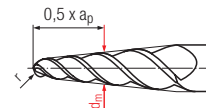
N



Gültig für · Valid for
3442 3442L 3443

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

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



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

Unbeschichtet · Uncoated

ALCR

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]



	Unbeschichtet · Uncoated				ALCR				Lubrication	MMS MQL	Coolant		
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
P	1.1				300	0,010 x r	160	0,010 x r	☐	■	☐	■	
	2.1				260	0,010 x r	140	0,010 x r	☐	■	☐	■	
	3.1				220	0,008 x r	120	0,008 x r	☐	■	☐	■	
	4.1				180	0,008 x r	100	0,008 x r	☐	■	☐	■	
	5.1				150	0,006 x r	80	0,006 x r	☐	■	☐	■	
M	1.1				150	0,006 x r	80	0,006 x r			☐	■	
	2.1				120	0,006 x r	70	0,006 x r			☐	■	
	3.1										☐	■	
	4.1										☐	■	
K	1.1				300	0,010 x r	160	0,010 x r	■	■			
	1.2				300	0,010 x r	160	0,010 x r	■	■			
	2.1				260	0,008 x r	140	0,008 x r	■	■			
	2.2				260	0,008 x r	140	0,008 x r	■	■			
	3.1				220	0,008 x r	120	0,008 x r	■	■			
	3.2				220	0,008 x r	120	0,008 x r	■	■			
	4.1				180	0,006 x r	100	0,006 x r	■	■			
	4.2				150	0,006 x r	80	0,006 x r	■	■			
N	1.1	490	0,016 x r	250	0,016 x r	700	0,016 x r	350	0,016 x r		☐	■	
	1.2	490	0,014 x r	250	0,014 x r	700	0,014 x r	350	0,014 x r		☐	■	
	1.3	490	0,012 x r	250	0,012 x r	700	0,012 x r	350	0,012 x r		☐	■	
	1.4					500	0,014 x r	280	0,014 x r		☐	■	
	1.5					450	0,012 x r	240	0,012 x r		☐	■	
	1.6										☐	■	
	2.1					260	0,010 x r	140	0,010 x r		☐	■	
	2.2					260	0,010 x r	140	0,010 x r		☐	■	
	2.3					260	0,010 x r	140	0,010 x r	☐	☐	☐	■
	2.4					220	0,008 x r	120	0,008 x r		☐	■	
	2.5					220	0,008 x r	120	0,008 x r		☐	■	
	2.6					220	0,008 x r	120	0,008 x r		☐	■	
	2.7					140	0,006 x r	70	0,006 x r	☐	☐	☐	■
	2.8					140	0,006 x r	70	0,006 x r		☐	■	
	3.1					600	0,018 x r	320	0,018 x r		☐	■	
	3.2					600	0,014 x r	320	0,014 x r		☐	■	
4.1	320	0,016 x r	170	0,016 x r	460	0,016 x r	240	0,016 x r		☐	☐	■	
4.2	460	0,016 x r	250	0,016 x r	650	0,016 x r	350	0,016 x r		☐	☐	■	
4.3					250	0,012 x r	180	0,012 x r		☐	☐	■	
4.4					180	0,012 x r	90	0,012 x r		☐	☐	■	
5.1										☐	■		
5.2					180	0,006 x r	80	0,006 x r		☐	■		
5.3					300	0,012 x r	160	0,012 x r	☐	■		■	
S	1.1				150	0,008 x r	80	0,008 x r			☐	■	
	1.2				120	0,006 x r	60	0,006 x r			☐	■	
	1.3				70	0,006 x r	40	0,006 x r			☐	■	
	2.1				110	0,006 x r	50	0,006 x r			☐	■	
	2.2				30	0,004 x r	20	0,004 x r			☐	■	
	2.3				30	0,004 x r	20	0,004 x r			☐	■	
2.4				30	0,004 x r	20	0,004 x r			☐	■		
2.5				20	0,004 x r	15	0,004 x r			☐	■		
2.6				30	0,004 x r	20	0,004 x r			☐	■		
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

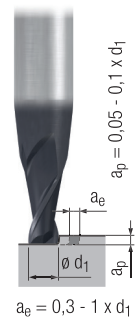
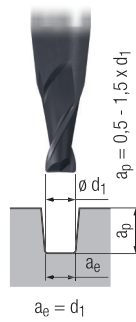
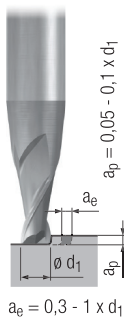
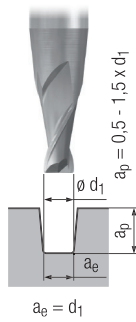
■ = sehr gut geeignet · very suitable
☐ = gut geeignet · suitable



- Product Finder
- NR
- NF
- N
- v_c / f_z**

Konische Hartmetall-Torusfräser Tapered solid carbide torus end mills

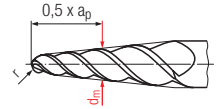
N



Gültig für · Valid for
3444 3444L 3445

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

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



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

Unbeschichtet · Uncoated

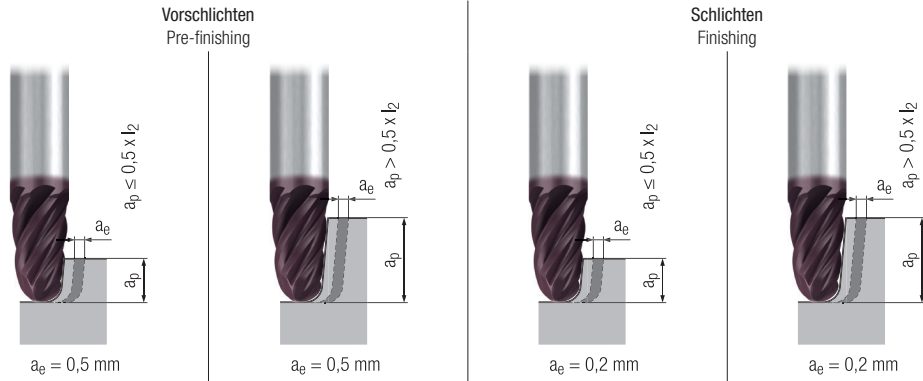
ALCR



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

Konische Hartmetall-Kugelfräser
Tapered solid carbide ball nose end mills

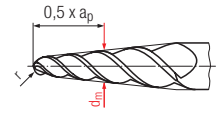
N



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2679A

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

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



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



	Vorschlichten Pre-finishing		Schlichten Finishing		Vorschlichten Pre-finishing		Schlichten Finishing						
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
P	1.1	130	0,008 x r	100	0,007 x r	160	0,011 x r	120	0,009 x r	□	■	□	■
	2.1	120	0,007 x r	90	0,006 x r	150	0,010 x r	110	0,008 x r	□	■	□	■
	3.1	110	0,006 x r	90	0,006 x r	140	0,009 x r	100	0,007 x r	□	■	□	■
	4.1	110	0,006 x r	80	0,005 x r	130	0,008 x r	100	0,006 x r	□	■	□	■
	5.1	100	0,005 x r	80	0,004 x r	120	0,007 x r	90	0,005 x r	□	■	□	■
M	1.1	70	0,006 x r	60	0,005 x r	90	0,008 x r	70	0,006 x r			□	■
	2.1	60	0,005 x r	50	0,004 x r	80	0,007 x r	60	0,005 x r			□	■
	3.1	50	0,004 x r	40	0,004 x r	60	0,006 x r	40	0,005 x r			□	■
	4.1	30	0,004 x r	30	0,003 x r	40	0,005 x r	30	0,004 x r			□	■
K	1.1	150	0,010 x r	120	0,008 x r	190	0,013 x r	140	0,011 x r	□	■	□	■
	1.2	150	0,010 x r	120	0,008 x r	190	0,013 x r	140	0,011 x r	□	■	□	■
	2.1	140	0,009 x r	110	0,008 x r	170	0,012 x r	130	0,010 x r	□	■	□	■
	2.2	140	0,009 x r	110	0,008 x r	170	0,012 x r	130	0,010 x r	□	■	□	■
	3.1	130	0,008 x r	100	0,007 x r	160	0,011 x r	120	0,009 x r	□	■	□	■
	3.2	130	0,008 x r	100	0,007 x r	160	0,011 x r	120	0,009 x r	□	■	□	■
	4.1	110	0,007 x r	90	0,006 x r	140	0,010 x r	100	0,008 x r	□	■	□	■
	4.2	100	0,006 x r	80	0,006 x r	120	0,009 x r	90	0,007 x r	□	■		
N	1.1				400	0,015 x r	300	0,013 x r				□	■
	1.2				400	0,016 x r	300	0,013 x r				□	■
	1.3				400	0,017 x r	300	0,014 x r				□	■
	1.4				350	0,013 x r	260	0,011 x r				□	■
	1.5				320	0,012 x r	240	0,010 x r				□	■
	1.6				240	0,011 x r	180	0,009 x r				□	■
	2.1	160	0,008 x r	130	0,007 x r	200	0,011 x r	150	0,009 x r			□	■
	2.2	160	0,008 x r	130	0,007 x r	200	0,011 x r	150	0,009 x r			□	■
	2.3	160	0,008 x r	130	0,007 x r	200	0,011 x r	150	0,009 x r			□	■
	2.4	140	0,006 x r	110	0,006 x r	170	0,009 x r	130	0,007 x r			□	■
	2.5	140	0,006 x r	110	0,006 x r	170	0,009 x r	130	0,007 x r			□	■
	2.6	140	0,006 x r	110	0,006 x r	170	0,009 x r	130	0,007 x r			□	■
	2.7	90	0,006 x r	70	0,005 x r	110	0,008 x r	80	0,006 x r			□	■
	2.8	90	0,006 x r	70	0,005 x r	110	0,008 x r	80	0,006 x r			□	■
	3.1	260	0,016 x r	200	0,014 x r	320	0,022 x r	240	0,018 x r			□	■
	3.2	260	0,016 x r	200	0,014 x r	320	0,022 x r	240	0,018 x r			□	■
	4.1												
4.2													
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1	100	0,008 x r	80	0,007 x r	120	0,011 x r	90	0,009 x r			□	■
	1.2	70	0,007 x r	60	0,006 x r	90	0,010 x r	70	0,008 x r			□	■
	1.3	50	0,006 x r	40	0,006 x r	60	0,009 x r	40	0,007 x r			□	■
	2.1	70	0,007 x r	50	0,006 x r	90	0,010 x r	60	0,008 x r			□	■
	2.2	30	0,006 x r	20	0,005 x r	40	0,008 x r	30	0,006 x r			□	■
	2.3	20	0,005 x r	20	0,004 x r	30	0,007 x r	20	0,005 x r			□	■
H	1.1												
	1.2												
	1.3												
	1.4												
1.5													

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

Product Finder

NR

NF

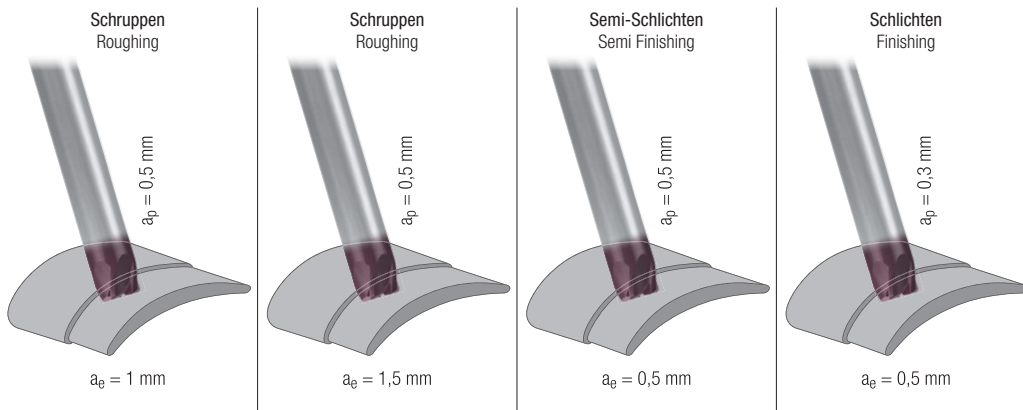
N

v_c / f_z

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

Gültig für · Valid for
2677AZ 2678AZ

N



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

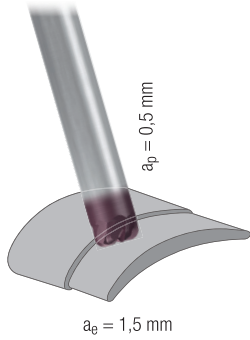


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2676AZ

Hartmetall-Torusfräser
Solid carbide torus end mills

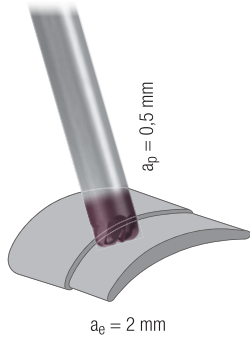
N

Schruppen
Roughing



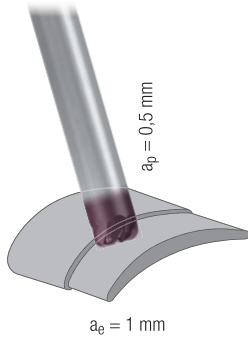
$a_e = 1,5 \text{ mm}$

Schruppen
Roughing



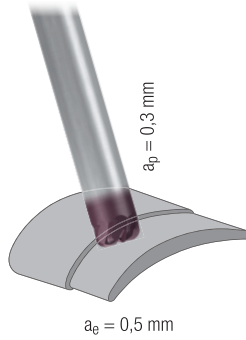
$a_e = 2 \text{ mm}$

Semi-Schlichten
Semi Finishing



$a_e = 1 \text{ mm}$

Schlichten
Finishing



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

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]

v_c
[m/min]

f_z
[mm]



MMS
MLQ



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

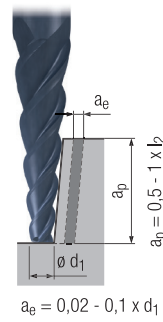
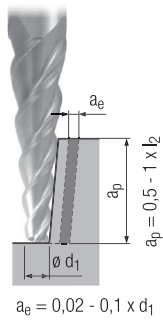
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



- Product Finder
- NR
- NF
- N
- v_c / f_z**

Konische Hartmetallfräser Tapered solid carbide end mills

N

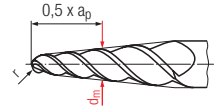


Gültig für · Valid for

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

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

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



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

Unbeschichtet · Uncoated

TIALN



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



Wende- und Wechselschneidplattenfräser Indexable Milling Cutters and End Mills

Seite · Page

Wegweiser	Product finder	208 - 213
Produktseiten	Product pages	214 - 235
Schnittwerte	Cutting conditions	236 - 244



Wegweiser

Bitte beachten:

Die Eignung der Wende- und Wechselschneidplatten ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 236 - 244 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:

The suitability of the inserts is indicated as follows:

- = very suitable
- = suitable

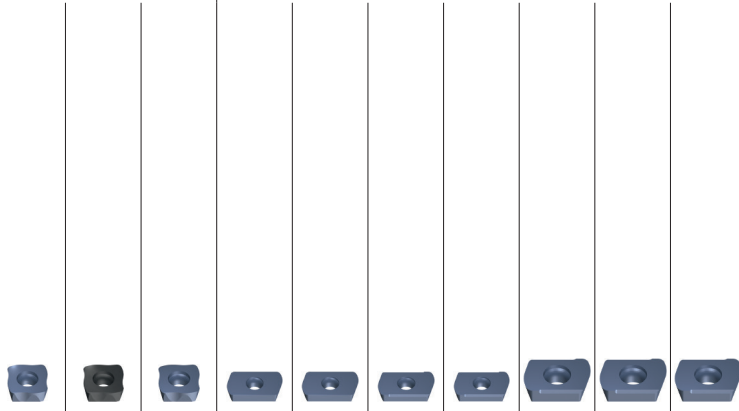
Please find the cutting conditions on pages 236 - 244.

International comparison of materials, see page 416 - 429.

Einsatzgebiete – Material Applications – material			Material-Beispiele Material examples	Material-Nummern Material numbers
P	Stahlwerkstoffe Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Steel materials Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	Cq15 1.1132 S235JR (S137-2) 1.0037 10SPb20 1.0722 E360 (S170-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	
	5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	
M	Nichtrostende Stahlwerkstoffe 1.1 Ferritisch, martensitisch	Stainless steel materials 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
	4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ²	X2CrNiMoN25-7-4 1.4410
K	Gusswerkstoffe 1.1 Gusseisen mit Lamellengrafit (GJL)	Cast materials 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
	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	
N	Nichteisenwerkstoffe 1.1 Aluminium-Legierungen	Non-ferrous materials 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 2.1 Reinkupfer, niedriglegiertes Kupfer	Copper alloys Pure copper, low-alloyed copper	≤ 400 N/mm ²	E-Cu 57 EN CW 004 A
	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	(AMPPO® 8)
	2.8 Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ²	(AMPPO® 45)
	Magnesium-Legierungen 3.1 Magnesium-Knetlegierungen	Magnesium alloys 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
Kunststoffe 4.1 Duroplaste (kurzspanend)	Synthetics 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 5.1 Graphit	Special materials Graphite		C 8000	
5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys		W-Cu 80/20	
5.3 Verbundwerkstoffe	Composite materials		Hyllite, Alucobond	
S	Spezialwerkstoffe Titan-Legierungen	Special materials Titanium alloys		
	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 2.1 Reinnickel	Nickel alloys, cobalt alloys and iron alloys 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 Nickel-Basis-Legierungen	Nickel-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 1.1 Hochfeste Stähle, gehärtete Stähle, Hartguss	Hard materials 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

Time-S4-Cut

Time-S-Cut



Steel			Steel	Cast iron	Steel		Steel			Cast iron
IC 8,5			IC 8				IC 12,5			
PE6			PE6	KB6	PE6		PE6		KB6	
9584A	9583X	9582A	9586A	9585A	9575A	9589A	9588A	9576A	9587A	
214	214	214	216	216	216	216	217	217	217	
236	236	236	237	237	237	237	238	238	238	

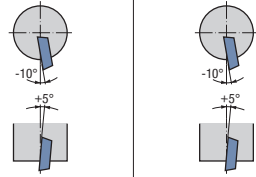
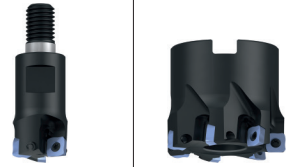
Seite · Page

v_c / f_z

■	■	■	■	□	■	■	■	■	□	1.1
■	■	■	■	□	■	■	■	■	□	2.1
■	■	□	■	□	□	■	■	□	□	3.1
□	■	□	■	□	□	■	■	□	□	4.1
□	■	□	■	□	□	■	■	□	□	5.1
										1.1
										2.1
										3.1
										4.1
□	■	□	□	■	□	□	□	□	■	1.1
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										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
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										2.3
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										1.5

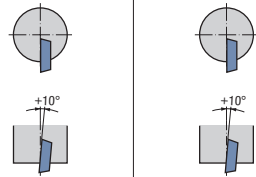
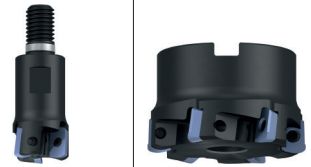
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

Fräskörper für Time-S4-Cut-Wendeschneidplatten
Indexable milling cutters for Time-S4-Cut inserts



IC 8,5	
ø20 - 42 mm	ø52 - 66 mm
Z (Inserts)	2 - 6
	7 - 9
	9190
	9290
Seite · Page	215

Fräskörper für Time-S-Cut-Wendeschneidplatten
Indexable milling cutters for Time-S-Cut inserts



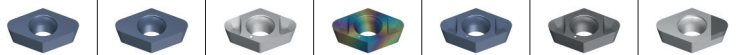
IC 8	IC 12,5	IC 8	IC 12,5
ø20 - 42 mm	ø42 mm	ø52 - 66 mm	ø52 - 80 mm
Z (Inserts)	2 - 5	3	6 - 7
			4 - 6
	9130	9135	9230
			9235
Seite · Page	218	218	219
		219	219

Product Finder

v_c / f_z

Rhombische Wendschneidplatten
Rhombic inserts

PKD

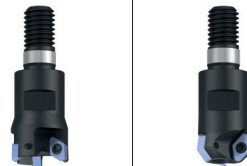


Steel	Al	Al/Cu		Graphite	Al	
IC 4,6 / IC 9,2	IC 4,6 / IC 9,2	IC 4,6 / IC 9,2	IC 4,6 / IC 9,2	IC 4,6 / IC 9,2	IC 4,6 / IC 9,2	
PE2	KC2	KC2	KC2	KC2	PKD	
0°	0°	20°	20°	20°	0°	
9624A	9625A	9635	9635R	9635A	9635G	9679

Seite · Page	220	220	220	220	221	221
v_c / f_z	239	239	239	240	240	241

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					
H	1.1		■			
	1.2		■			
	1.3		■			
	1.4					
	1.5					

Einschraubfräskörper
für rhombische Wendschneidplatten
Indexable screw-in end mills
for rhombic inserts



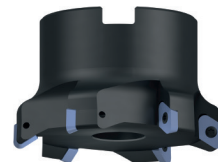
IC 4,6 / IC 9,2 IC 4,6 / IC 9,2



Ø 10 - 40 mm Ø 16 - 25 mm

Z (Inserts)	2 - 4	3
	9180 / 9185	9181 / 9186
Seite · Page	222	222

Aufsteckfräskörper
für rhombische Wendschneidplatten
Indexable milling cutters
for rhombic inserts



IC 9,2



Ø 50 - 125 mm

Z (Inserts)	5 - 8
	9285
Seite · Page	223

Runde Wendeschneidplatten
Round inserts



	Steel	Hard materials	Allround
	IC 8 - 12	IC 6 - 12	IC 6 - 12
	PE1	KC3	KP1
	0°	0°	0°
	9601A	9607A	9608A
			9619X

Seite · Page	224	224	224	225
v_c / f_z	242	242	242	242

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				□	
2.6				□	
H	1.1		■	■	
	1.2		■	■	
	1.3		□	■	
	1.4		□	■	
	1.5		□	□	

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

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



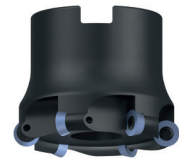
IC 6 - IC 12



ø 12 - 40 mm

Z (Inserts)	2 - 6
	9150, 9155, 9160, 9165
Seite · Page	226

Aufsteckfräskörper
für runde Wendeschneidplatten
Indexable milling cutters
for round inserts



IC 10 - IC 16



ø 50 - 125 mm

Z (Inserts)	4 - 8
	9260, 9265, 9275
Seite · Page	227

Product Finder

v_c / f_z

Kugel-Wechselschneidplatten
Ball nose inserts



Allround

Hard materials

ø6-32mm

ø8-25mm

KP1

KP1

0°

-

9581A

9579A

Seite · Page

228

228

v_c / f_z

243

243

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			
2.6			
H	1.1	■	■
	1.2	□	■
	1.3	□	■
	1.4	□	■
	1.5	□	■

Fräskörper für Kugel-Wechselschneidplatten
Milling cutters for ball nose inserts



ø6-32mm

ø6-32mm

ø6-25mm

Z (Inserts)

2

2

2

Seite · Page

229

230

230

Torus-Wechselschneidplatten
Torus inserts

HPC-Wechselschneidplatten
HPC inserts



Allround		Hard materials		Steel
ø 6 -32 mm	ø 6 -32 mm	ø 10 -32 mm		ø 10 -25 mm
KP1	KP1	KP1		PE6
20°	20°	0°		-
9596A	9598A	9595A		9594A

Seite · Page	231	231	231	234
v_c / f_z	244	244	244	244

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					
2.6					
H	1.1		■	■	
	1.2		■	■	
	1.3			■	
	1.4			■	
	1.5			■	

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

Fräskörper für Torus-Wechselschneidplatten
Milling cutters for torus inserts



	ø 10 - 32 mm	ø 6 - 32 mm	ø 6 - 25 mm
--	--------------	-------------	-------------

Z (Inserts)	2	2	2
	9117	9007	9004
Seite · Page	232	233	233

Fräskörper für HPC-Wechselschneidplatten
Milling cutters for HPC inserts



	ø 10 - 25 mm	ø 10 - 25 mm
--	--------------	--------------

Z (Inserts)	2	2
	9117	9007
Seite · Page	235	235

Product Finder



v_c / f_z

Product Finder

v_c / f_z

- Spezielle Schneidengeometrie für hohe Vorschubwerte
- Leistungsfähige Hartmetallsorten
- 4 Schneiden
- Special geometry for high feed rates
- High performance carbide grades
- 4 cutting edges



HM

R_{3D}

v_c/f_z
236



Steel



Steel



Steel

Präzisionsgesintert
Precision-sintered

Schneidstoff · Cutting material

PE6

PE6

PE6

Beschichtung · Coating

TIALN

ALO

TIALN

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Für niedrig- und hochlegierte Stähle sowie für Gusswerkstoffe geeignet
- Zum Hochvorschubfräsen von 2D-Konturen und 3D-Konturen

- Suitable for low-alloyed and high-alloyed steels and cast materials
- For high-feed cutting of 2D and 3D contours

P 1.1-3.1 4.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

P 1.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

P 1.1-2.1 3.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

Bestell-Code · Order code

9584A

9583X

9582A

IC	R _{3D}	r ₁ / r ₂	l ₁	l ₂	l _M	b	Dimens.-Code
8,5	1,5	5 / 1	8,5	8,5	3	3,4	.08515

Messpunktbestimmung

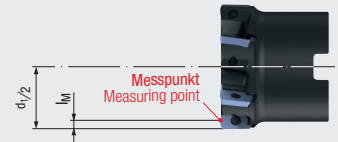
für die Längenmessung mit Laser

Measuring point definition

for measuring length using a laser

Für die Messpunktbestimmung durch die Längenmessung mit Laser muss das Maß l_M vom halben Schneidendurchmesser $d_{1/2}$ abgezogen werden.

In order to determine the measuring point by measuring the tool length with a laser, the dimension l_M must be deducted from the half cutting diameter $d_{1/2}$.



Zubehör · Accessories

Drehmoment-Schraubendreher · Torque Screwdriver



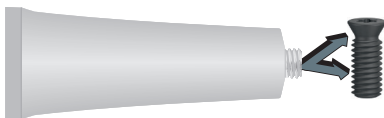
Bestell-Code · Order code		9800	9801
	Dimens.-Code		
IC 8,5	Griff · Handle 2 Nm Klinge · Blade Torx T9	.01 .09	● ●

Spannschraube · Clamping Screw



Bestell-Code · Order code				9808
	Größe Size	M _d max.	Dimens.-Code	
IC 8,5	M3 x 7,2 x Torx T9	2 Nm	.307209	●

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



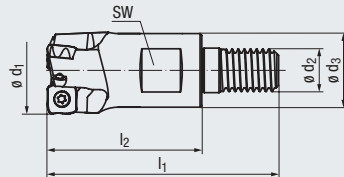
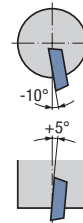
Bestell-Code · Order code		9000
Menge Quantity	Dimens.-Code	
100 g	.000	●

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

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

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

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



Product Finder



IC 8,5

Bestell-Code · Order code

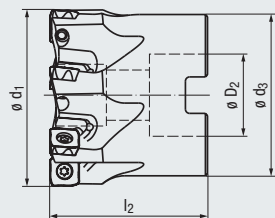
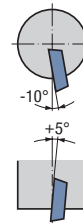
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	n_{max} . min ⁻¹	Z (Inserts)	Dimens.- Code	9190
20	36	56	15	18	M 10	30 Nm	45 000	2	.200362	●
25	44	66	17	21	M 12	50 Nm	40 000	3	.250443	●
35	52	78	22	29	M 16	100 Nm	35 000	5	.350525	●
42	41	66	22	29	M 16	100 Nm	30 000	6	.420416	●

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

Wendeschneidplatten und Zubehör siehe Seite 214
Inserts and accessories, see page 214

- Aufsteckfräskörper zum Hochvorschubfräsen
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)

- Indexable milling cutter for high-feed milling
- Internal coolant supply, radial exit (ICR)



IC 8,5

Bestell-Code · Order code

$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	n_{max} . min ⁻¹	Z (Inserts)	Dimens.- Code	9290
52	45	46	22	25 000	7	.05207	●
66	45	60	27	20 000	9	.06609	●

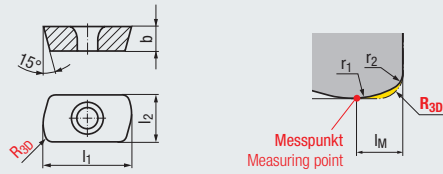
Lieferumfang: ohne Wendeschneidplatten, mit Torx-Schrauben
Delivery: without inserts, with Torx screws

Wendeschneidplatten und Zubehör siehe Seite 214
Inserts and accessories, see page 214

Product Finder

- Spezielle Schneidengeometrie für hohe Vorschubwerte
- Leistungsfähige Hartmetallsorten
- Mehrlagenbeschichtung für hohe Schnittgeschwindigkeiten

- Special geometry for high feed rates
- High performance carbide grades
- Multi-layer coating for high cutting speeds



HM

R_{3D}

V_c/f_z 237



Steel



Cast iron

Schneidstoff · Cutting material

PE6

KB6

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Für niedrig- und hochlegierte Stähle sowie für Gusswerkstoffe geeignet
- Zum Hochvorschubfräsen von 2D-Konturen und 3D-Konturen

- Suitable for low-alloyed and high-alloyed steels and cast materials
- For high-feed milling of 2D and 3D contours

P 1.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

P 1.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

Bestell-Code · Order code

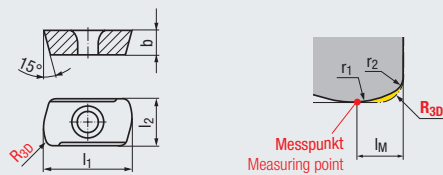
9586A

9585A

IC	R _{3D}	r ₁ /r ₂	l ₁	l ₂	l _M	b	Dimens.-Code
8	1,5	5 / 1	14	8	3	3	.08015

- Spezielle Schneidengeometrie für hohe Vorschubwerte
- Leistungsfähige Hartmetallsorten
- Mehrlagenbeschichtung für hohe Schnittgeschwindigkeiten

- Special geometry for high feed rates
- High performance carbide grades
- Multi-layer coating for high cutting speeds



HM

R_{3D}

V_c/f_z 237

Präzisionsgesintert
Precision-sintered



Steel



Steel

Schneidstoff · Cutting material

PE6

PE6

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Für niedrig- und hochlegierte Stähle sowie für Gusswerkstoffe geeignet
- Zum Hochvorschubfräsen von 2D-Konturen und 3D-Konturen
- Für lange Auskragung über 80 mm und zylindrische Konturen

- Suitable for low-alloyed and high-alloyed steels and cast materials
- For high-feed milling of 2D and 3D contours
- For long projection length over 80 mm and cylindrical contours

P 1.1-2.1 3.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

P 1.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.7

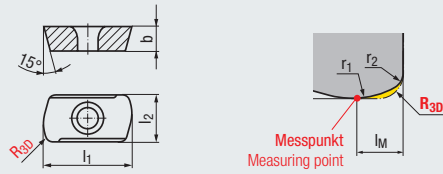
Bestell-Code · Order code

9575A

9589A

IC	R _{3D}	r ₁ /r ₂	l ₁	l ₂	l _M	b	Dimens.-Code
8	1,5	5 / 1	14	8	3	3	.08015

- Spezielle Schneidengeometrie für hohe Vorschubwerte
- Leistungsfähige Hartmetallsorten
- Mehrlagenbeschichtung für hohe Schnittgeschwindigkeiten
- Special geometry for high feed rates
- High performance carbide grades
- Multi-layer coating for high cutting speeds

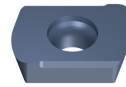


HM

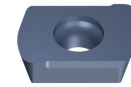
R_{3D}

V_c / f_z
238

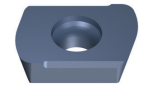
Präzisionsgesintert
Precision-sintered



Steel



Steel



Cast iron

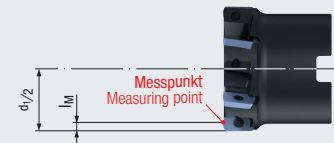
Schneidstoff · Cutting material								PE6	PE6	KB6
Beschichtung · Coating								TIALN	TIALN	TIALN
Einsatzgebiete – Material (siehe Seite 208)				Applications – material (see page 208)				P 1.1-5.1	P 1.1-2.1 3.1-5.1	P 1.1-5.1
- Für niedrig- und hochlegierte Stähle sowie für Gusswerkstoffe geeignet				- Suitable for low-alloyed and high-alloyed steels and cast materials				K 1.1-4.2	K 1.1-4.2	K 1.1-4.2
- Zum Hochvorschubfräsen von 2D-Konturen und 3D-Konturen				- For high-feed milling of 2D and 3D contours				N 2.3, 2.6-2.7	N 2.3, 2.6-2.7	N 2.3, 2.6-2.7
- Für lange Auskragung über 80 mm und zylindrische Konturen				- For long projection length over 80 mm and cylindrical contours						
Bestell-Code · Order code								9588A	9576A	9587A
IC	R _{3D}	r ₁ / r ₂	l ₁	l ₂	l _M	b	Dimens.-Code			
12,5	2	5 / 1	19,5	12,5	3,7	5,8	.12520	●		●
12,5	2,5	10 / 2	18,5	12,5	4,8	5,8	.12525	●	●	●

Messpunktbestimmung
für die Längenmessung mit Laser

Für die Messpunktbestimmung durch die Längenmessung mit Laser muss das Maß l_M vom halben Schneidendurchmesser d_{1/2} abgezogen werden.

Measuring point definition
for measuring length using a laser

In order to determine the measuring point by measuring the tool length with a laser, the dimension l_M must be deducted from the half cutting diameter d_{1/2}.



Zubehör · Accessories

Drehmoment-Schraubendreher · Torque Screwdriver



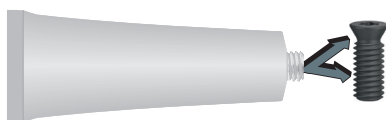
Bestell-Code · Order code				9800	9801
	Dimens.-Code				
IC 8	Griff · Handle 1,1 Nm	.00	●		
	Griff · Handle 2 Nm	.01	●		
	Klinge · Blade Torx T9	.09		●	
IC 12,5	Griff · Handle 5,5 Nm	.04	●		
	Klinge · Blade Torx T20	.20			●

Spannschraube · Clamping Screw



Bestell-Code · Order code				9808
	Größe Size	M_d max.	Dimens.-Code	
IC 8	M3 x 6 x Torx T9	2 Nm	.306009	●
IC 12,5	M4,5 x 10 x Torx T20	5,5 Nm	.451020	●

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



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

Klemmschraube · Locking Screw



Bestell-Code · Order code				9814
	Größe Size	M_d max.	Dimens.-Code	
IC 8 / IC 12,5	M4 x 12 x Torx T20	1,1 Nm	.401220	●

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

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

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

Product Finder

v_c / f_z



Product Finder

V_c / f_z

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

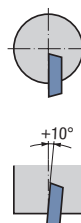
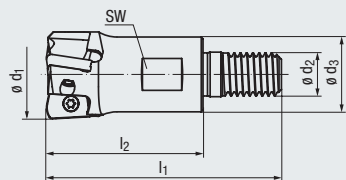
- Indexable screw-in end mill for high-feed milling
- Internal coolant supply, radial exit (ICR)
- Compatible with commercially available screw-in holders and adapters

kompatibel

ICR

n max.

R_{3D}



IC 8

Bestell-Code · Order code										9130	
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.-Code		
20	36	56	15	19	M 10	30 Nm	45 000	2	.200362	•	
25	44	66	19	23	M 12	50 Nm	40 000	3	.250443	•	
35	52	78	24	30	M 16	100 Nm	35 000	4	.350524	•	
42	40	66	28	32	M 16	100 Nm	30 000	5	.420415	•	

IC 12,5

Bestell-Code · Order code										9135	
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.-Code		
42	40	66	28	32	M 16	100 Nm	30 000	3	.420413	•	

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

Wendeschneidplatten und Zubehör siehe Seite 216 - 217
Inserts and accessories, see page 216 - 217

Lichtspaltprüfung

Beim Plattenwechsel muss stets eine Lichtspaltprüfung durchgeführt werden!

Plattenwechsel:

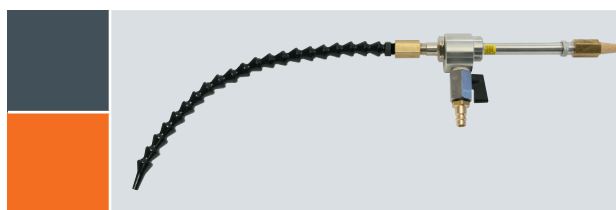
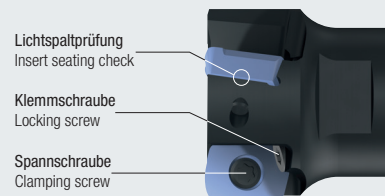
1. Klemmschraube im gelösten Zustand
2. Spannschraube leicht anziehen
3. Klemmschraube leicht anziehen (1,1 Nm)
4. Spannschraube auf das empfohlene Drehmoment anziehen (IC 8 = 2 Nm, IC 12,5 = 5,5 Nm)
5. Lichtspaltprüfung durchführen

Insert seating check

Whenever inserts are exchanged, ensure insert is correctly seated (no gap).

Insert change procedure:

1. Insert locking screw loosely
2. Tighten clamping screw lightly
3. Tighten locking screw lightly (1.1 Nm)
4. Tighten clamping screw to the recommended torque (IC 8 = 2 Nm, IC 12.5 = 5.5 Nm)
5. Carry out insert seating check

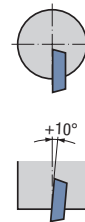
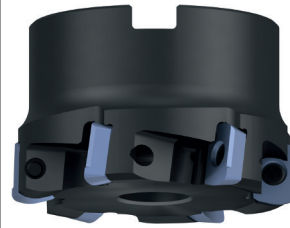
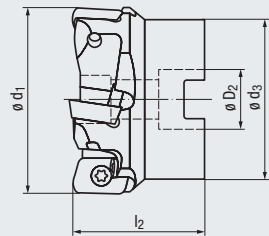


Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Aufsteckfräskörper zum Hochvorschubfräsen
 - Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)

- Indexable milling cutter for high-feed milling
 - Internal coolant supply, radial exit (ICR)



Product Finder



v_c / f_z

IC 8

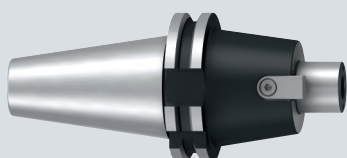
Bestell-Code · Order code							9230
$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{max. min^{-1}}$	Z (Inserts)	Dimens.-Code	
52	45	46	22	25 000	6	.05206	●
66	45	60	27	20 000	7	.06607	●

IC 12,5

Bestell-Code · Order code							9235
$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{max. min^{-1}}$	Z (Inserts)	Dimens.-Code	
52	45	41	22	25 000	4	.05204	●
66	45	55	27	20 000	5	.06605	●
80	50	70	27	18 000	6	.08006	●

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

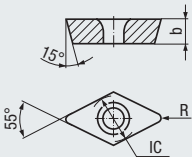

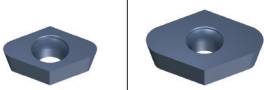
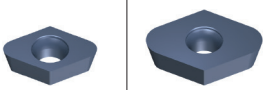
Wendeschneidplatten und Zubehör siehe Seite 216 - 217
 Inserts and accessories, see page 216 - 217

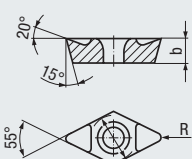




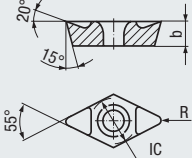

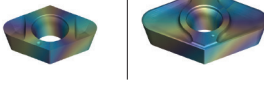

Aufnahmen für Aufsteckfräser
 siehe Seite 389 - 391

Holders for shell-type milling cutters,
 see pages 389 - 391



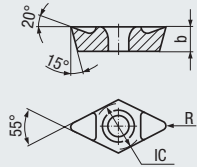
- Ohne Spanleitstufe - Without chip former 		HM 0° 	 <p>Steel</p>	 <p>Steel</p>
Schneidstoff · Cutting material			PE2	KC2
Beschichtung · Coating			TIALN	TIALN
Einsatzgebiete – Material (siehe Seite 208) Applications – material (see page 208) - Zum Schrumpfen und Schlichten von Stahlwerkstoffen geeignet - Suitable for roughing and finishing steel materials			P 1.1-5.1 K 1.1-4.2 N 5.2	P 1.1-5.1 K 1.1-4.2 N 5.2 H 1.1-1.3
Bestell-Code · Order code			9624A	9625A
IC	R	b	Dimens.-Code	
4,6	0,5	2,2	.04605	•
4,6	1	2,2	.04610	•
9,2	2	3,6	.09220	•
9,2	2,5	3,6	.09225	•

- Spanleitstufe 20° - Chip former 20° - Polierte Ausführung für optimalen Spanfluss - Polished design for optimum chip removal 		HM 20° 	 <p>Al</p>	
Schneidstoff · Cutting material			KC2	
Beschichtung · Coating				
Einsatzgebiete – Material (siehe Seite 208) Applications – material (see page 208) - Zum Schrumpfen und Schlichten von Aluminium-Knetlegierungen - Für die Volumenzerspannung - For roughing and finishing wrought aluminium alloys - For high-volume machining			N 1.1-1.3 2.1-4.2	
Bestell-Code · Order code			9635	
IC	R	b	Dimens.-Code	
4,6	0,5	2,2	.04605	•
4,6	1	2,2	.04610	•
9,2	2	3,6	.09220	•
9,2	2,5	3,6	.09225	•

- Spanleitstufe 20° - Chip former 20° - Sehr glatte CRN-Beschichtung - Very smooth CRN coating 		HM 20° 	 <p>Al/Cu</p>	 <p>Al/Cu</p>
Schneidstoff · Cutting material			KC2	KC2
Beschichtung · Coating			CRN	TIALN
Einsatzgebiete – Material (siehe Seite 208) Applications – material (see page 208) - Für Aluminium-Knetlegierungen - Für Aluminium-Legierungen mit einem Siliziumgehalt bis 7% - Für Kupfer-Legierungen - Zum Schrumpfen und Schlichten - For wrought aluminium alloys - For aluminium alloys with a silicon content of up to 7% - For copper alloys - For roughing and finishing			N 1.1-1.4 N 2.1-4.2 4.3-4.4 N 5.3	M 1.1-2.1 N 1.1-1.4, 2.1-3.2 N 4.1-4.2 4.3-5.1
Bestell-Code · Order code			9635R	9635A
IC	R	b	Dimens.-Code	
4,6	0,5	2,2	.04605	•
4,6	1	2,2	.04610	•
9,2	2	3,6	.09220	•
9,2	2,5	3,6	.09225	•

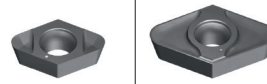
- Diamantbeschichtet
- Spanleitstufe 20°

- Diamond coated
- Chip former 20°



HM **20°**

V_c/f_z
240



Graphite

Schneidstoff · Cutting material

KC2

Beschichtung · Coating

DIAMANT

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Geeignet zum Schruppen und HSC-Schlichten von Grafit

- Suitable for roughing and HSC finishing graphite

N 4.3-5.1 1.4-1.5

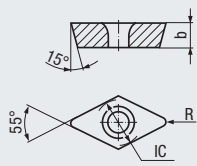
Bestell-Code · Order code

9635G

IC	R	b	Dimens.-Code				
4,6	1	2,2	.04610	●			
9,2	2,5	3,6	.09225		●		

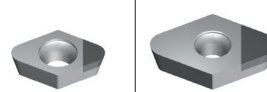
- PKD-bestückt
- Ohne Spanleitstufe
- Mit scharfen Schneidkanten

- PCD-tipped
- Without chip former
- Sharp cutting edges



PKD **0°**

V_c/f_z
241



Al

Schneidstoff · Cutting material

PKD

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Zum Schruppen und Schlichten von Aluminium-Legierungen mit einem Siliziumgehalt bis 17%

- For roughing and finishing aluminium alloys with a silicon content of up to 17%

N 1.5-1.6 1.1-1.4

N 5.1, 5.3

Bestell-Code · Order code

9679

IC	R	b	Dimens.-Code				
4,6	1	2,2	.04610	●			
9,2	2	3,6	.09220		●		

Zubehör · Accessories

Schraubendreher · Screwdriver



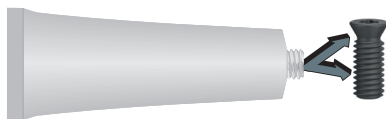
Spannschraube · Clamping Screw



Bestell-Code · Order code			9855
Größe Size	Dimens.-Code		
IC 4,6 Torx T7	.07	●	
IC 9,2 Torx T9	.09	●	

Bestell-Code · Order code				9805
Größe Size	M _d max.	Dimens.-Code		
IC 4,6 M2,2 x 3,7 x Torx T7	1 Nm	.223707	●	
IC 9,2 M3 x 6,5 x Torx T9	2,25 Nm	.306509	●	

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



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

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

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

Product Finder

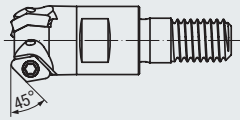
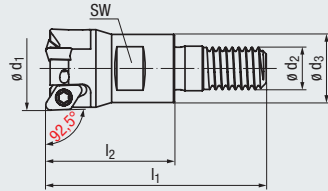
v_c / f_z

- Einschraubfräskörper
- Ab M8 innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Mit 45° zum Fasfräsen geeignet
- Kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern

- Indexable screw-in end mill
- From M8 internal coolant supply, radial exit (ICR)
- With 45° lead angle suitable for chamfering
- Compatible with commercially available screw-in holders and adapters

kompatibel $\geq M8$ ICR

n max. 45°



IC 4,6

Bestell-Code · Order code											9180	9181
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.-Code			
10	20	35	8	10	M 6	8 Nm	40 000	2	.100202		•	
12	20	35	8	10	M 6	8 Nm	35 000	2	.120202		•	
16	25	43	10	13	M 8	15 Nm	28 000	3	.160253		•	•
20	32	52	15	18	M 10	30 Nm	25 000	3	.200323		•	

IC 9,2

Bestell-Code · Order code											9185	9186
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.-Code			
20	32	52	15	18	M 10	30 Nm	35 000	2	.200322		•	
25	36	58	17	21	M 12	50 Nm	30 000	3	.250363		•	•
32	40	64	22	29	M 16	100 Nm	25 000	3	.320403		•	
40	40	64	22	29	M 16	100 Nm	22 000	4	.400424		•	

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

Wendeschneidplatten und Zubehör siehe Seite 220 - 221
Inserts and accessories, see page 220 - 221

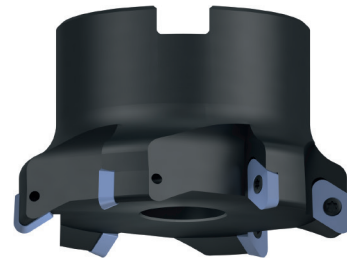
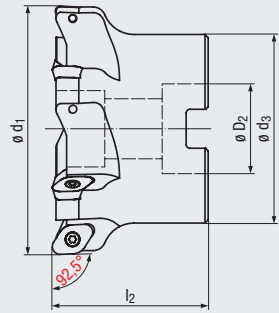
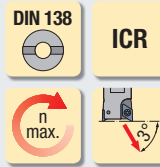


Einschraub-Aufnahmen und Adapter siehe Seite 383 - 388

Screw-in holders and adapters, see pages 383 - 388

- Aufsteckfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)

- Indexable milling cutter
- Internal coolant supply, radial exit (ICR)



Product Finder

v_c / f_z

IC 9,2

Bestell-Code · Order code							9285	
$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
50	50	40	22	22000	5	.05005	●	
63	50	50	27	20000	6	.06306	●	
80	50	60	27	18000	6	.08006	●	
100	56	78	32	15000	7	.10007	●	
125	65	90	40	12000	8	.12508	●	

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

Wendeschneidplatten und Zubehör siehe Seite 220 - 221
 Inserts and accessories, see page 220 - 221





PKD-Plan- und Eckfräser
siehe Seite 155

PCD side and face milling cutters,
see page 155

Product Finder

v_c / f_z

<ul style="list-style-type: none"> - Ohne Spanleitstufe - Leistungsfähige Hartmetallsorten 		<ul style="list-style-type: none"> - Without chip former - High performance carbide grades 							
<p>HM 0° v_c/f_z 242</p>				<p>Steel</p>		<p>Steel</p>			
<p>Schneidstoff · Cutting material</p>				<p>PE1</p>		<p>KC3</p>			
<p>Beschichtung · Coating</p>				<p>TIALN</p>		<p>TIALN</p>			
<p>Einsatzgebiete – Material (siehe Seite 208)</p> <ul style="list-style-type: none"> - Für Stahl- und Gusswerkstoffe - Geeignet zur Bearbeitung harter Werkstoffe - Zum Schruppen und Schlichten 		<p>Applications – material (see page 208)</p> <ul style="list-style-type: none"> - For steel and cast materials - Suitable for machining hard materials - For roughing and finishing 		<p>P 1.1-5.1</p> <p>K 1.1-4.2</p>		<p>P 1.1-3.1 4.1-5.1</p> <p>K 1.1-4.2</p> <p>H 1.1-1.2 1.3-1.5</p>			
<p>Bestell-Code · Order code</p>				<p>9601A</p>		<p>9607A</p>			
IC	b	Dimens.-Code							
IC 6	2	.06							
IC 8	2,6	.08		●		●			
IC 10	3,6	.10		●		●			
IC 12	4,5	.12		●		●			

<ul style="list-style-type: none"> - Ohne Spanleitstufe - Leistungsfähige Hartmetallsorten 		<ul style="list-style-type: none"> - Without chip former - High performance carbide grades 							
<p>HM 0° v_c/f_z 242</p>				<p>Hard materials</p>					
<p>Schneidstoff · Cutting material</p>				<p>KP1</p>					
<p>Beschichtung · Coating</p>				<p>TIALN</p>					
<p>Einsatzgebiete – Material (siehe Seite 208)</p> <ul style="list-style-type: none"> - Für Stahl- und Gusswerkstoffe - Geeignet zur Bearbeitung harter Werkstoffe - Zum Schruppen und Schlichten 		<p>Applications – material (see page 208)</p> <ul style="list-style-type: none"> - For steel and cast materials - Suitable for machining hard materials - For roughing and finishing 		<p>P 1.1-5.1</p> <p>K 1.1-4.2</p> <p>H 1.1-1.4 1.5</p>					
<p>Bestell-Code · Order code</p>				<p>9608A</p>					
IC	b	Dimens.-Code							
IC 6	2	.06		●					
IC 8	2,6	.08		●					
IC 10	3,6	.10		●					
IC 12	4,5	.12		●					



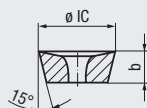
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- Mit Spanmulde für optimalen Spanfluss
- Universell verwendbar
- With chip former for optimal chip removal
- Highly versatile



HM **V_c/f_z**
242

Präzisionsgesintert
Precision-sintered



Allround

Schneidstoff · Cutting material

PE3

Beschichtung · Coating

ALO

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Zum Schruppen von Stahlwerkstoffen und nichtrostenden Stahlwerkstoffen

- For roughing steel materials and stainless steel materials

- P** 1.1-5.1
- M** 1.1-4.1
- K** 1.1-4.2
- N** 2.1-3.2, 5.1-5.2
- S** 1.1-2.6

Bestell-Code · Order code

9619X

IC	b	Dimens.-Code	
IC 8	2,6	.08	●
IC 10	3,6	.10	●
IC 12	4,5	.12	●
IC 16	5,5	.16	●

Zubehör · Accessories

Schraubendreher · Screwdriver



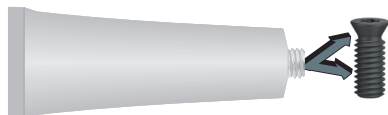
Bestell-Code · Order code	Größe Size	Dimens.-Code	9855
IC 6	Torx T7	.07	●
IC 8	Torx T9	.09	●
IC 10 / IC 12	Torx T15	.15	●
IC 16	Torx T20	.20	●

Spannschraube · Clamping Screw



Bestell-Code · Order code	Größe Size	M _d max.	Dimens.-Code	9805
IC 6	M2,2 x 3,7 x Torx T7	1 Nm	.223707	●
IC 8	M3 x 5,6 x Torx T9	2,25 Nm	.305609	●
IC 10 (d ₁ = 20)	M3,5 x 6,5 x Torx T15	3,45 Nm	.356515	●
IC 10 / IC 12	M3,5 x 9 x Torx T15	3,45 Nm	.359015	●
IC 16	M4,5 x 10 x Torx T20	7,6 Nm	.451020	●

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



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

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

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

Product Finder

v_c / f_z



Product Finder

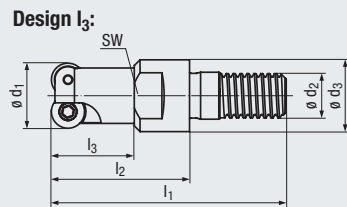
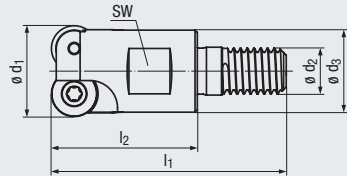
v_c / f_z

- Einschraubfräskörper
- Ab M8 innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern
- Indexable screw-in end mill
- From M8 internal coolant supply, radial exit (ICR)
- Compatible with commercially available screw-in holders and adapters

kompatibel

≥ M8
ICR

n max.



IC 6

Bestell-Code · Order code											9150
$\varnothing d_1$	l_3	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	n_{max} . min ⁻¹	Z (Inserts)	Dimens.- Code	
12	10	20	35	8	10	M 6	8 Nm	40 000	2	.120202	●
12	15	25	43	10	13	M 8	15 Nm	40 000	2	.120252	●
16	-	25	43	10	13	M 8	15 Nm	35 000	3	.160253	●
20	-	32	52	15	18	M 10	30 Nm	30 000	4	.200324	●
25	-	25	47	17	21	M 12	50 Nm	25 000	5	.250255	●
35	-	40	64	22	29	M 16	100 Nm	22 000	6	.350406	●

IC 8

Bestell-Code · Order code											9155
$\varnothing d_1$	l_3	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	n_{max} . min ⁻¹	Z (Inserts)	Dimens.- Code	
16	-	25	43	10	13	M 8	15 Nm	40 000	2	.160252	●
20	-	32	52	15	18	M 10	30 Nm	35 000	3	.200323	●
25	-	32	54	17	21	M 12	50 Nm	30 000	3	.250323	●

IC 10

Bestell-Code · Order code											9160
$\varnothing d_1$	l_3	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	n_{max} . min ⁻¹	Z (Inserts)	Dimens.- Code	
20	-	32	52	15	18	M 10	30 Nm	45 000	2	.200322	●
25	-	36	58	17	21	M 12	50 Nm	40 000	2	.250362	●
25	-	36	58	17	21	M 12	50 Nm	40 000	3	.250363	●
32	-	40	64	22	29	M 16	100 Nm	30 000	4	.320404	●
40	-	40	64	22	29	M 16	100 Nm	25 000	5	.400405	●

IC 12

Bestell-Code · Order code											9165
$\varnothing d_1$	l_3	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	n_{max} . min ⁻¹	Z (Inserts)	Dimens.- Code	
25	-	36	58	17	21	M 12	50 Nm	40 000	2	.250362	●
32	-	40	64	22	29	M 16	100 Nm	30 000	3	.320403	●
40	-	40	64	22	29	M 16	100 Nm	25 000	4	.400404	●

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

Wendeschneidplatten und Zubehör siehe Seite 224 - 225
Inserts and accessories, see page 224 - 225

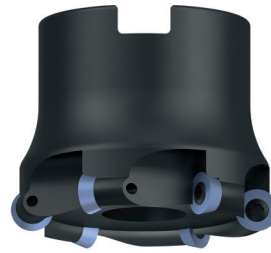
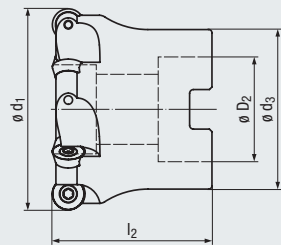
- Aufsteckfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)

- Indexable milling cutter
- Internal coolant supply, radial exit (ICR)

DIN 138



ICR

Product
Finder

IC 10

Bestell-Code · Order code

9260

$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{\max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
50	50	40	22	22000	5	.05005	●	
63	50	50	27	18000	6	.06306	●	
80	50	50	27	16000	7	.08007	●	

IC 12

Bestell-Code · Order code

9265

$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{\max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
50	50	40	22	22000	5	.05005	●	
63	50	50	27	20000	6	.06306	●	
80	50	60	27	18000	7	.08007	●	
100	56	78	32	15000	8	.10008	●	

IC 16

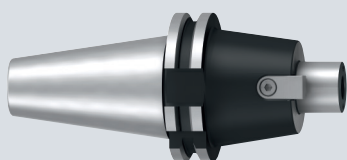
Bestell-Code · Order code

9275

$\varnothing d_1$	l_2	$\varnothing d_3$	$\varnothing D_2$	$n_{\max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
52	50	40	22	25000	4	.05204	●	
63	50	50	27	20000	5	.06305	●	
80	50	60	27	18000	6	.08006	●	
100	56	78	32	15000	7	.10007	●	
125	65	90	40	12000	8	.12508	●	

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

Wendeschneidplatten und Zubehör siehe Seite 224 - 225
Inserts and accessories, see page 224 - 225

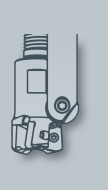


Aufnahmen für Aufsteckfräser
siehe Seite 389 - 391

Holders for shell-type milling cutters,
see pages 389 - 391

Product Finder

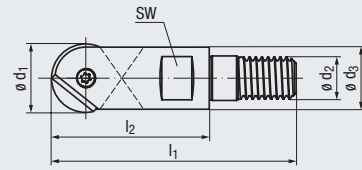
- Ohne Spanleitstufe - Without chip former 6-8 mm 10-32 mm 					<p>Allround</p>	
Schneidstoff · Cutting material					KP1	
Beschichtung · Coating					TIALN	
Einsatzgebiete – Material (siehe Seite 208) - In fast allen Werkstoffen einsetzbar - Zum Vorschlichten und HSC-Schichten - Zum 3D-Fräsen geeignet			Applications – material (see page 208) - Applicable in almost all materials - For pre-finishing and HSC finishing - Suitable for 3D-milling		P 1.1-5.1 K 1.1-4.2 N 1.1-1.3 N 2.3, 2.6-2.8 N 4.1, 5.1-5.3 S 1.1-1.3 H 1.1 1.2-1.4	
Bestell-Code · Order code					9581A	
$\varnothing d_1$ ±0,01	r	l_2	b	Dimens.-Code		
6	3	5,5	2,04	.06	●	
8	4	5,5	2,04	.08	●	
10	5	8,65	2,7	.10	●	
12	6	9,2	3	.12	●	
16	8	11,25	4	.16	●	
20	10	13,15	5	.20	●	
25	12,5	18,25	6	.25	●	
32	16	21,95	7	.32	●	



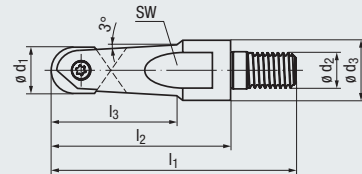
- Mit Spanleitstufe - With chip former - Gedrallte Schneide - Helical cutting edge 					<p>Hard materials</p>	
Schneidstoff · Cutting material					KP1	
Beschichtung · Coating					TIALSIN	
Einsatzgebiete – Material (siehe Seite 208) - Zum Vorschlichten und HSC-Schichten von gehärteten Stahlwerkstoffen bis 63 HRC - Zum 3D-Fräsen geeignet			Applications – material (see page 208) - For pre-finishing and HSC finishing of hardened steel materials up to 63 HRC - Suitable for 3D-milling		P 3.1-5.1 1.1-2.1 K 1.1-4.2 N 1.1-1.3 N 2.3, 2.6-2.8 N 4.1, 5.1-5.3 S 1.1-1.3 H 1.1-1.4	
Bestell-Code · Order code					9579A	
$\varnothing d_1$ ±0,01	r	l_2	b	Dimens.-Code		
8	4	5,2	2,04	.08	●	
10	5	6,5	2,7	.10	●	
12	6	9,2	3	.12	●	
16	8	11,25	4	.16	●	
20	10	13,15	5	.20	●	
25	12,5	18,25	6	.25	●	

- Einschraubfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)
- Kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern

- Indexable screw-in end mill
- Internal coolant supply, radial exit (ICR)
- High exchange precision due to V-clamping (± 0.01)
- Compatible with commercially available screw-in holders and adapters



Design I₃:



Product Finder

- Product icons
- Navigation icons
- Search icon
- Home icon
- Language icon
- vc / fz icon

Bestell-Code · Order code											9115	
$\varnothing d_1$	l_3	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	n_{max} min ⁻¹	Z (Inserts)	Dimens.-Code		
6	19	30	45	8	9,8	M 6	8 Nm	42 000	2	.060302	●	
8	19	30	45	8	9,8	M 6	8 Nm	40 000	2	.080302	●	
10	-	25	40	8	9,8	M 6	8 Nm	38 000	2	.100252	●	
12	-	27	42	8	10,8	M 6	8 Nm	35 000	2	.120272	●	
16	-	31	49	13	14,4	M 8	15 Nm	32 000	2	.160312	●	
20	-	36	56	15	18	M 10	30 Nm	28 000	2	.200362	●	
25	-	44	66	19	22,5	M 12	50 Nm	25 000	2	.250442	●	
32	-	52	78	24	28,6	M 16	100 Nm	20 000	2	.320522	●	

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

Wechselschneidplatten siehe Seite 228
Inserts, see page 228

Zubehör · Accessories

Schraubendreher · Screwdriver



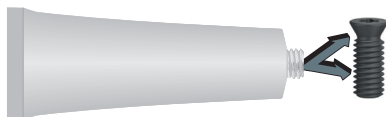
Bestell-Code · Order code			9855	
$\varnothing d_1$	Größe Size	Dimens.-Code		
6-8	Torx T7	.07	●	
10	Torx T15	.15	●	
12-25	Torx T20	.20	●	
32	Torx T30	.30	●	

Spannschraube · Clamping Screw



Bestell-Code · Order code					9817	
$\varnothing d_1$	Größe Size	M_d max.	Dimens.-Code			
6	M2,5 x 4,8 x Torx T7	1 Nm	.0607	●		
8	M2,5 x 6,3 x Torx T7	1 Nm	.0807	●		
10	M4 x 7,5 x Torx T15	4 Nm	.1015	●		
12	M5 x 8,9 x Torx T20	8 Nm	.1220	●		
16	M5 x 12,5 x Torx T20	8 Nm	.1620	●		
20	M5 x 15 x Torx T20	8 Nm	.2020	●		
25	M6 x 20 x Torx T20	8 Nm	.2520	●		
32	M8 x 24,5 x Torx T30	18 Nm	.3230	●		

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



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

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

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

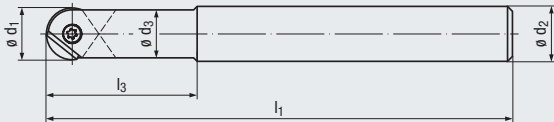
Product Finder

v_c / f_z

- Schafffräskörper
- Für universelle Bearbeitung
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)
- Indexable end mill
- For universal application
- High exchange precision due to V-clamping (± 0.01)

DIN 1835

Kugel



Bestell-Code · Order code									9017
$\varnothing d_1$	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
6	19	100	5,3	10	42 000	2	.060192	●	
8	19	100	6,8	10	40 000	2	.080192	●	
10	25	100	9	12	38 000	2	.100252	●	
12	46	150	10,8	12	35 000	2	.120462	●	
16	50	160	14,4	16	32 000	2	.160502	●	
20	61	190	18	20	28 000	2	.200612	●	
25	64	200	22,5	25	25 000	2	.250642	●	
32	76	250	28,6	32	20 000	2	.320762	●	

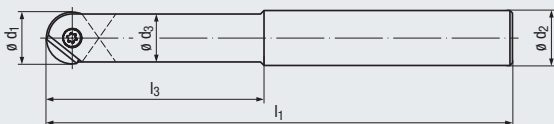
Lieferumfang: ohne Wechselschneidplatten, mit Torx-Schrauben
Delivery: without inserts, with Torx screws

Wechselschneidplatten und Zubehör siehe Seite 228 - 229
Inserts and accessories, see page 228 - 229

- Schafffräskörper mit Hartmetall-Schaft
- Für die HSC-Bearbeitung
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)
- Indexable end mill with carbide shank
- For HSC machining
- Internal coolant supply, radial exit (ICR)
- High exchange precision due to V-clamping (± 0.01)

DIN 6535

Kugel

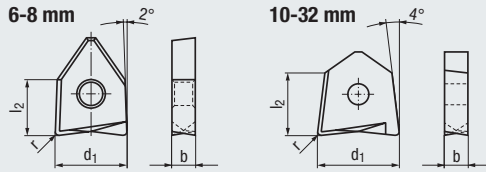


Bestell-Code · Order code									9003
$\varnothing d_1$	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
6	20	80	5,6	6	42 000	2	.060202	●	
6	45	100	5,6	6	42 000	2	.060452	●	
8	30	85	7,6	8	40 000	2	.080302	●	
8	60	105	7,6	8	40 000	2	.080602	●	
10	35	100	9,6	10	38 000	2	.100352	●	
10	75	140	9,6	10	38 000	2	.100752	●	
12	45	110	11,6	12	35 000	2	.120452	●	
12	85	150	11,6	12	35 000	2	.120852	●	
16	55	110	15,5	16	32 000	2	.160552	●	
16	85	150	15,5	16	32 000	2	.160852	●	
16	120	200	15,5	16	32 000	2	.161202	●	
20	65	110	19,5	20	28 000	2	.200652	●	
20	85	150	19,5	20	28 000	2	.200852	●	
20	120	200	19,5	20	28 000	2	.201202	●	
25	65	120	24,5	25	25 000	2	.250652	●	
25	85	160	24,5	25	25 000	2	.250852	●	
25	120	230	24,5	25	25 000	2	.251202	●	

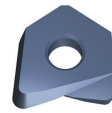
Lieferumfang: ohne Wechselschneidplatten, mit Torx-Schrauben
Delivery: without inserts, with Torx screws

Wechselschneidplatten und Zubehör siehe Seite 228 - 229
Inserts and accessories, see page 228 - 229

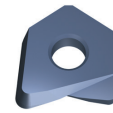
- Mit 20° Spanleitstufe
- Leistungsfähige Hartmetallsorte
- Mehrlagenbeschichtung für hohe Schnittgeschwindigkeiten
- Chip former 20°
- High performance carbide grade
- Multi-layer coating for high cutting speeds



HM 20°
Torus V_c/f_z 244



Allround



Allround

Schneidstoff · Cutting material

KP1

KP1

Beschichtung · Coating

TIALN

TIALSIN

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Für Stahlwerkstoffe geeignet
- In allen zähen Werkstoffen einsetzbar
- Zum HSC-Vorschlichten und HSC-Schlichten von 2D- und 3D-Konturen

- Suitable for steel materials
- Applicable in all tough materials
- For HSC pre-finishing and HSC finishing of 2D- and 3D-contours

P	1.1-3.1	4.1-5.1	P	1.1-5.1	
M	1.1-4.1		M	1.1-4.1	
N	1.1-1.4, 2.1, 2.3		N	1.1-1.4, 2.1, 2.3	
N	2.2, 2.4-2.5	2.6-2.8	N	2.2, 2.4-2.5	2.6-2.8
N	4.1-4.2, 5.1-5.3		N	4.1-4.2, 5.1-5.3	
S		1.1-1.3	S		1.1-1.3
H			H		1.1-1.2

Bestell-Code · Order code

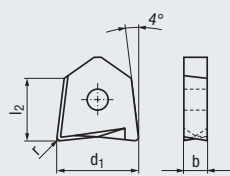
9596A

9598A

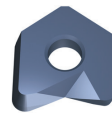
Ø d ₁ ±0,01	r	l ₂	b	Dimens.- Code	9596A	9598A
6	0,5	5,6	2,04	.0605	●*	●
8	0,5	5,6	2,04	.0805	●*	●
8	1	5,6	2,04	.0810		●
10	0,5	8,2	2,7	.1005	●*	●
10	1	8,2	2,7	.1010	●*	●
12	0,5	9,2	3	.1205	●*	●
12	1	9,2	3	.1210	●*	●
16	0,5	10,8	4	.1605	●*	●
16	1	10,8	4	.1610	●*	●
16	2	10,8	4	.1620	●*	●
20	0,5	12,5	5	.2005		●
20	1	12,5	5	.2010	●*	●
20	2	12,5	5	.2020	●*	●
20	3	12,5	5	.2030	●*	●
25	2	17	6	.2520	●*	●
25	3	17	6	.2530	●*	●
32	3	21	7	.3230	●*	●

* Lieferbar solange vorrätig
Available while stocks last

- Ohne Spanleitstufe
- Leistungsfähige Hartmetallsorte
- Mehrlagenbeschichtung für hohe Schnittgeschwindigkeiten
- Without chip former
- High performance carbide grade
- Multi-layer coating for high cutting speeds



HM 0°
Torus V_c/f_z 244



Hard materials

Schneidstoff · Cutting material

KP1

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 208)

Applications – material (see page 208)

- Für Stahl- und Gusswerkstoffe sowie gehärtete Werkstoffe bis 63 HRC
- Zum HSC-Vorschlichten und HSC-Schlichten von 2D-Konturen und 3D-Konturen

- For steel and cast materials and hardened materials up to 63 HRC
- For HSC pre-finishing and HSC finishing of 2D- and 3D-contours

P	1.1-5.1
K	1.1-4.2
N	2.3, 2.6-2.8
H	1.1-1.4

Bestell-Code · Order code

9595A

Ø d ₁ ±0,01	r	l ₂	b	Dimens.- Code	9595A
10	0,5	8,2	2,7	.1005	●
10	1	8,2	2,7	.1010	●
12	0,5	9,2	3	.1205	●
12	1	9,2	3	.1210	●
16	0,5	10,8	4	.1605	●
16	1	10,8	4	.1610	●
16	2	10,8	4	.1620	●
20	1	12,5	5	.2010	●
20	2	12,5	5	.2020	●
20	3	12,5	5	.2030	●
25	2	17	6	.2520	●
25	3	17	6	.2530	●
32	3	21	7	.3230	●

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

Product Finder

V_c / f_z



Product Finder

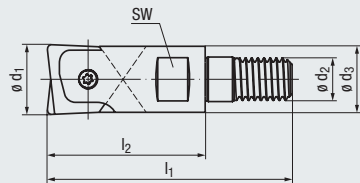
v_c / f_z

- Einschraubfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)
- Kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern
- Indexable screw-in end mill
- Internal coolant supply, radial exit (ICR)
- High exchange precision due to V-clamping (± 0.01)
- Compatible with commercially available screw-in holders and adapters

kompatibel

ICR

Torus



Bestell-Code · Order code										9117	
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	$M_d \text{ max.}$ ($\varnothing d_2$)	$n_{\text{max.}}$ min^{-1}	Z (Inserts)	Dimens.-Code		
10	25	40	8	9,8	M 6	8 Nm	38 000	2	.100252	●	
12	27	42	8	10,8	M 6	8 Nm	35 000	2	.120272	●	
16	31	49	13	14,4	M 8	15 Nm	32 000	2	.160312	●	
20	36	56	15	18	M 10	30 Nm	28 000	2	.200362	●	
25	44	66	19	22,5	M 12	50 Nm	25 000	2	.250442	●	
32	52	78	24	28,6	M 16	100 Nm	20 000	2	.320522	●	

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

Wechselschneidplatten siehe Seite 231
Inserts, see page 231

Zubehör · Accessories

Schraubendreher · Screwdriver



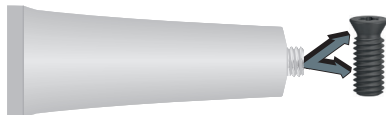
Spannschraube · Clamping Screw



Bestell-Code · Order code			9855
$\varnothing d_1$	Größe Size	Dimens.-Code	
6 - 8	Torx T7	.07	●
10	Torx T15	.15	●
12 - 25	Torx T20	.20	●
32	Torx T30	.30	●

Bestell-Code · Order code				9817
$\varnothing d_1$	Größe Size	$M_d \text{ max.}$	Dimens.-Code	
6	M2,5 x 4,8 x Torx T7	1 Nm	.0607	●
8	M2,5 x 6,3 x Torx T7	1 Nm	.0807	●
10	M4 x 7,5 x Torx T15	4 Nm	.1015	●
12	M5 x 8,9 x Torx T20	8 Nm	.1220	●
16	M5 x 12,5 x Torx T20	8 Nm	.1620	●
20	M5 x 15 x Torx T20	8 Nm	.2020	●
25	M6 x 20 x Torx T20	8 Nm	.2520	●
32	M8 x 24,5 x Torx T30	18 Nm	.3230	●

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



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

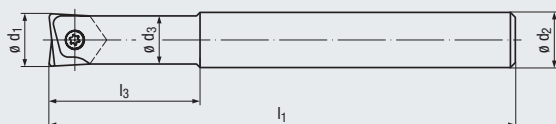
Sicherstellung der Lösbarkeit von Torx-Schrauben für Wechselschneidplatten durch leichtes Einfetten von Gewinde und Senkkopf!

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

- Schafffräskörper
- Für universelle Bearbeitung
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)

- Indexable end mill
- For universal application
- High exchange precision due to V-clamping ($\pm 0,01$)

DIN 1835



Product Finder



v_c / f_z

Bestell-Code · Order code

9007

$\varnothing d_1$	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
6	19	100	5,3	10	42 000	2	.060192	●	
8	19	100	6,8	10	40 000	2	.080192	●	
10	25	100	9	12	38 000	2	.100252	●	
12	46	150	10,8	12	35 000	2	.120462	●	
16	50	160	14,4	16	32 000	2	.160502	●	
20	61	200	18	20	28 000	2	.200612	●	
25	64	200	22,5	25	25 000	2	.250642	●	
32	76	250	28,6	32	20 000	2	.320762	●	

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

Wechselschneidplatten und Zubehör siehe Seite 231 - 232
Inserts and accessories, see page 231 - 232

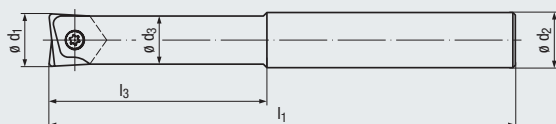
- Schafffräskörper mit Hartmetall-Schaft
- Für die HSC-Bearbeitung
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)

- Indexable end mill with carbide shank
- For HSC machining
- Internal coolant supply, radial exit (ICR)
- High exchange precision due to V-clamping ($\pm 0,01$)

DIN 6535



ICR



Bestell-Code · Order code

9004

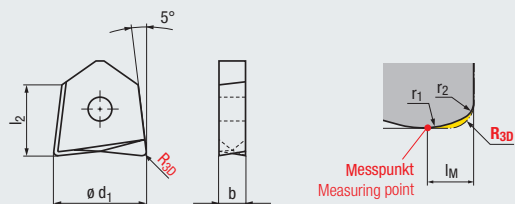
$\varnothing d_1$	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.- Code		
6	20	80	5,6	6	42 000	2	.060202	●	
6	45	100	5,6	6	42 000	2	.060452	●	
8	30	85	7,6	8	40 000	2	.080302	●	
8	60	105	7,6	8	40 000	2	.080602	●	
10	35	100	9,6	10	38 000	2	.100352	●	
10	75	140	9,6	10	38 000	2	.100752	●	
12	45	110	11,6	12	35 000	2	.120452	●	
12	85	150	11,6	12	35 000	2	.120852	●	
16	55	110	15,5	16	32 000	2	.160552	●	
16	85	150	15,5	16	32 000	2	.160852	●	
16	120	200	15,5	16	32 000	2	.161202	●	
20	65	110	19,5	20	28 000	2	.200652	●	
20	85	150	19,5	20	28 000	2	.200852	●	
20	120	200	19,5	20	28 000	2	.201202	●	
25	65	120	24,5	25	25 000	2	.250652	●	
25	85	160	24,5	25	25 000	2	.250852	●	
25	120	230	24,5	25	25 000	2	.251202	●	

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

Wechselschneidplatten und Zubehör siehe Seite 231 - 232
Inserts and accessories, see page 231 - 232

- Product Finder
-
-
-
-
-
-
-

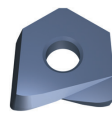
- Spezielle Schneidengeometrie für hohe Vorschubwerte
- Leistungsfähige Hartmetallsorte
- Mehrlagenbeschichtung für hohe Schnittgeschwindigkeiten
- Special geometry for high feed rates
- High performance carbide grade
- Multi-layer coating for high cutting speeds



HM

R_{3D}

V_c/f_z 244



Steel

Schneidstoff · Cutting material		PE6	
Beschichtung · Coating		TIALN	
Einsatzgebiete – Material (siehe Seite 208)		Applications – material (see page 208)	
<ul style="list-style-type: none"> - Für niedrig- und hochlegierte Stähle sowie für Gusswerkstoffe geeignet - Zum Hochvorschubfräsen von 2D-Konturen und 3D-Konturen 		<ul style="list-style-type: none"> - Suitable for low-alloyed and high-alloyed steels and cast materials - For high-feed milling of 2D and 3D contours 	
Bestell-Code · Order code		9594A	
ø d ₁ ±0,01	R _{3D}	r ₁ / r ₂	l _M l ₂ b Dimens.-Code
10	0,9	3 / 0,6	1,8 7,7 2,7 .1009
12	1,5	5 / 1	3 8,4 3 .1215
16	1,5	5 / 1	3 11,3 4 .1615
20	1,5	5 / 1	3 13,1 5 .2015
25	1,5	5 / 1	3 18 6 .2515

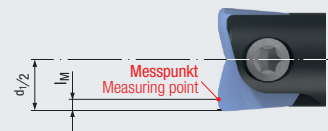
* Lieferbar solange vorrätig
Available while stocks last

Messpunktbestimmung für die Längenmessung mit Laser

Für die Messpunktbestimmung durch die Längenmessung mit Laser muss das Maß l_M vom halben Schneidendurchmesser d₁/2 abgezogen werden.

Measuring point definition for measuring length using a laser

In order to determine the measuring point by measuring the tool length with a laser, the dimension l_M must be deducted from the half cutting diameter d₁/2.



Zubehör · Accessories

Drehmoment-Schraubendreher · Torque Screwdriver



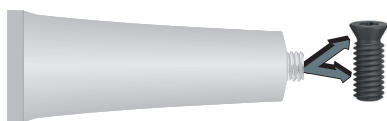
Bestell-Code · Order code		9800	9801
	Dimens.-Code		
Griff · Handle	3,8 Nm	●	
Klinge · Blade	Torx T15		●
Griff · Handle	7,2 Nm	●	
Klinge · Blade	Torx T20		●

Spannschraube · Clamping Screw



Bestell-Code · Order code				9817
ø d ₁	Größe Size	M _d max.	Dimens.-Code	
10	M4 x 7,5 x Torx T15	4 Nm	.1015	●
12	M5 x 8,9 x Torx T20	8 Nm	.1220	●
16	M5 x 12,5 x Torx T20	8 Nm	.1620	●
20	M5 x 15 x Torx T20	8 Nm	.2020	●
25	M6 x 20 x Torx T20	8 Nm	.2520	●

Hochtemperatur-Schraubenpaste · High-Temperature Screw Paste



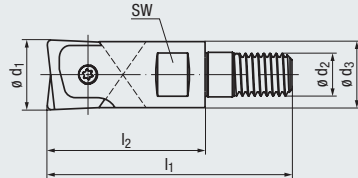
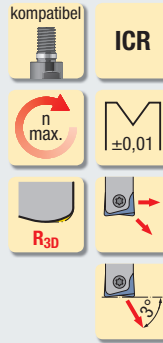
Bestell-Code · Order code		9000
Menge Quantity	Dimens.-Code	
100 g	.000	●

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

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

- Einschraubfräskörper
- Innere Kühlschmierstoff-Zufuhr, Austritt radial (ICR)
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)
- Kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern

- Indexable screw-in end mill
- Internal coolant supply, radial exit (ICR)
- High exchange precision due to V-clamping (± 0.01)
- Compatible with commercially available screw-in holders and adapters



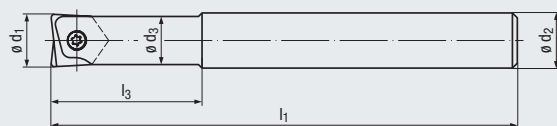
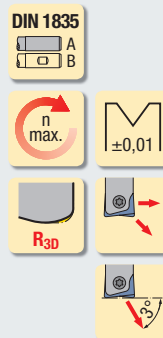
Bestell-Code · Order code										9117	
$\varnothing d_1$	l_2	l_1	SW	$\varnothing d_3$	$\varnothing d_2$	M_d max. ($\varnothing d_2$)	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.-Code		
10	25	40	8	9,8	M 6	8 Nm	38 000	2	.100252	●	
12	27	42	8	10,8	M 6	8 Nm	35 000	2	.120272	●	
16	31	49	13	14,4	M 8	15 Nm	32 000	2	.160312	●	
20	36	56	15	18	M 10	30 Nm	28 000	2	.200362	●	
25	44	66	19	22,5	M 12	50 Nm	25 000	2	.250442	●	

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

Wechselschneidplatten und Zubehör siehe Seite 234
Inserts and accessories, see page 234

- Schaftfräskörper
- Für universelle Bearbeitung
- Hohe Wechselgenauigkeit durch V-Klemmung ($\pm 0,01$)

- Indexable end mill
- For universal application
- High exchange precision due to V-clamping (± 0.01)



Bestell-Code · Order code								9007	
$\varnothing d_1$	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	$n_{max.}$ min ⁻¹	Z (Inserts)	Dimens.-Code		
10	25	100	9	12	38 000	2	.100252	●	
12	46	150	10,8	12	35 000	2	.120462	●	
16	50	160	14,4	16	32 000	2	.160502	●	
20	61	200	18	20	28 000	2	.200612	●	
25	64	200	22,5	25	25 000	2	.250642	●	

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

Wechselschneidplatten und Zubehör siehe Seite 234
Inserts and accessories, see page 234

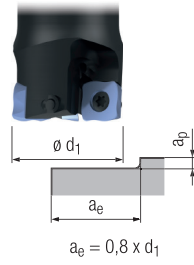
Product Finder

v_c / f_z



Wendeschneidplatten Time-S4-Cut Inserts Time-S4-Cut

Gültig für · Valid for
9582A 9583X 9584A



IC 8,5



Product Finder

-
-
-
-
-
-

v_c / f_z

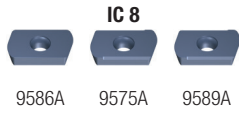
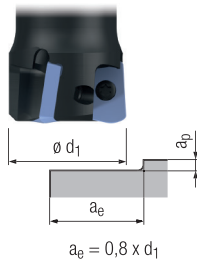


	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL	
P	1.1	220 - 260	0,8 - 1,6	0,5 - 0,8	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.1	220 - 260	0,8 - 1,6	0,5 - 0,8	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.1	200 - 240	0,8 - 1,6	0,5 - 0,7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.1	200 - 240	0,8 - 1,4	0,5 - 0,7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	5.1	160 - 200	0,8 - 1,2	0,5 - 0,7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
M	1.1						
	2.1						
	3.1						
	4.1						
K	1.1	240 - 280	0,8 - 1,6	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	1.2	240 - 280	0,8 - 1,6	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.1	180 - 220	0,5 - 1,4	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.2	180 - 220	0,5 - 1,4	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.1	120 - 160	0,5 - 1,2	0,5 - 0,7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.2	100 - 140	0,5 - 1,2	0,5 - 0,7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.1	140 - 180	0,5 - 1,4	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	4.2	140 - 180	0,5 - 1,4	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N	1.1						
	1.2						
	1.3						
	1.4						
	1.5						
	1.6						
	2.1						
	2.2						
	2.3	240 - 260	0,8 - 1,6	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.4						
	2.5						
	2.6	240 - 260	0,8 - 1,6	0,5 - 1,0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.7	200 - 240	0,6 - 1,4	0,5 - 1,0			
	2.8						
	3.1						
	3.2						
4.1							
4.2							
4.3							
4.4							
5.1							
5.2							
5.3							
S	1.1						
	1.2						
	1.3						
	2.1						
	2.2						
	2.6						
H	1.1						
	1.2						
	1.3						
	1.4						
	1.5						

Wendeschneidplatten Time-S-Cut
Inserts Time-S-Cut

Gültig für · Valid for

9575A 9586A
9585A 9589A



Product Finder



v_c / f_z

		v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL	
P	1.1	220-260	0,8-1,6	0,5-0,8	260-300	0,8-1,6	0,5-0,8	□	■		■
	2.1	220-260	0,8-1,6	0,5-0,8	260-300	0,8-1,6	0,5-0,8	□	■		■
	3.1	200-240	0,8-1,6	0,5-0,7	240-280	0,8-1,6	0,5-0,7	□	■		■
	4.1	200-240	0,8-1,4	0,5-0,7	240-280	0,8-1,4	0,5-0,7	□	■		□
	5.1	160-200	0,8-1,2	0,5-0,7	180-220	0,8-1,2	0,5-0,7	□	■		□
M	1.1										
	2.1										
	3.1										
	4.1										
K	1.1	240-280	0,8-1,6	0,5-1,0	280-320	0,8-1,6	0,5-1,0	□	■		■
	1.2	240-280	0,8-1,6	0,5-1,0	280-320	0,8-1,6	0,5-1,0	□	■		■
	2.1	180-220	0,5-1,4	0,5-1,0	220-260	0,5-1,4	0,5-1,0	□	■		■
	2.2	180-220	0,5-1,4	0,5-1,0	220-260	0,5-1,4	0,5-1,0	□	■		■
	3.1	120-160	0,5-1,2	0,5-0,7	140-180	0,5-1,2	0,5-0,7	□	■		■
	3.2	100-140	0,5-1,2	0,5-0,7	140-180	0,5-1,2	0,5-0,7	□	■		■
	4.1	140-180	0,5-1,4	0,5-1,0	160-200	0,5-1,4	0,5-1,0	□	■		■
	4.2	140-180	0,5-1,4	0,5-1,0	160-200	0,5-1,4	0,5-1,0	□	■		■
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1										
	2.2										
	2.3	240-260	0,8-1,6	0,5-1,0	260-300	0,8-1,6	0,5-1,0	□	■	□	■
	2.4										
	2.5										
	2.6	240-260	0,8-1,6	0,5-1,0	260-300	0,8-1,6	0,5-1,0	□	■	□	■
	2.7	200-240	0,6-1,4	0,5-1,0	240-280	0,6-1,4	0,5-1,0				■
	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											
2.6											
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

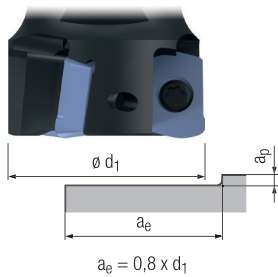
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



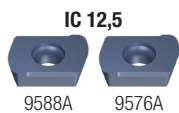
Product Finder

v_c / f_z

Wendeschneidplatten Time-S-Cut Inserts Time-S-Cut



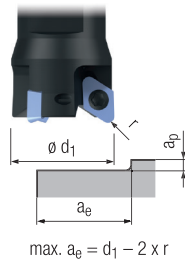
Gültig für · Valid for
9576A 9587A 9588A



	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL		
P	1.1	220-260	0,8-1,6	260-300	0,8-1,6	0,7-1,2	□	■		■	
	2.1	220-260	0,8-1,6	260-300	0,8-1,6	0,7-1,2	□	■		■	
	3.1	200-240	0,8-1,6	240-280	0,8-1,6	0,7-1,0	□	■		■	
	4.1	200-240	0,8-1,4	240-280	0,8-1,4	0,7-1,0	□	■		□	
	5.1	160-200	0,8-1,2	0,7-1,0	180-220	0,8-1,2	0,7-1,0	□	■		□
M	1.1										
	2.1										
	3.1										
	4.1										
K	1.1	240-280	0,8-1,6	280-320	0,8-1,6	0,7-1,5	□	■		■	
	1.2	240-280	0,8-1,6	280-320	0,8-1,6	0,7-1,5	□	■		■	
	2.1	180-220	0,5-1,4	220-260	0,5-1,4	0,7-1,5	□	■		■	
	2.2	180-220	0,5-1,4	220-260	0,5-1,4	0,7-1,5	□	■		■	
	3.1	120-160	0,5-1,2	140-180	0,5-1,2	0,7-1,2	□	■		■	
	3.2	100-140	0,5-1,2	140-180	0,5-1,2	0,7-1,2	□	■		■	
	4.1	140-180	0,5-1,4	160-200	0,5-1,4	0,7-1,2	□	■		■	
	4.2	140-180	0,5-1,4	160-200	0,5-1,4	0,7-1,2	□	■		■	
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1										
	2.2										
	2.3	240-260	0,8-1,6	0,5-1,2	260-300	0,8-1,6	0,5-1,2	□	■	□	■
	2.4										
	2.5										
	2.6	240-260	0,8-1,6	0,5-1,2	260-300	0,8-1,6	0,5-1,2	□	■	□	■
	2.7	200-240	0,6-1,4	0,5-1,2	240-280	0,6-1,4	0,5-1,2				■
	2.8										
	3.1										
	3.2										
4.1											
4.2											
4.3											
4.4											
5.1											
5.2											
5.3											
S	1.1										
	1.2										
	1.3										
	2.1										
	2.2										
	2.6										
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

Rhombische Wendschneidplatten
Rhombic inserts

Gültig für · Valid for
9624A 9625A 9635



	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]					
P	1.1	220 - 260	IC ÷ 60	0,05 - 0,10 x IC	260 - 300	IC ÷ 60	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	2.1	220 - 260	IC ÷ 60	0,05 - 0,10 x IC	260 - 300	IC ÷ 60	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	3.1	160 - 200	IC ÷ 80	0,05 - 0,10 x IC	220 - 260	IC ÷ 80	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	4.1	140 - 180	IC ÷ 80	0,05 - 0,10 x IC	180 - 220	IC ÷ 80	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	5.1	140 - 180	IC ÷ 80	0,05 - 0,10 x IC	180 - 220	IC ÷ 80	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
M	1.1													
	2.1													
	3.1													
	4.1													
K	1.1	180 - 220	IC ÷ 50	0,05 - 0,10 x IC	180 - 220	IC ÷ 50	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	1.2	180 - 220	IC ÷ 50	0,05 - 0,10 x IC	180 - 220	IC ÷ 50	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	2.1	160 - 200	IC ÷ 50	0,05 - 0,10 x IC	160 - 200	IC ÷ 50	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	2.2	140 - 180	IC ÷ 50	0,05 - 0,10 x IC	140 - 180	IC ÷ 50	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	3.1	80 - 120	IC ÷ 70	0,05 - 0,10 x IC	80 - 120	IC ÷ 70	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	3.2	60 - 100	IC ÷ 70	0,05 - 0,10 x IC	60 - 100	IC ÷ 70	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	4.1	100 - 140	IC ÷ 70	0,05 - 0,10 x IC	100 - 140	IC ÷ 70	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	4.2	100 - 140	IC ÷ 70	0,05 - 0,10 x IC	100 - 140	IC ÷ 70	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
N	1.1						800 - 1000	IC ÷ 30	0,10 - 0,20 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.2						800 - 1000	IC ÷ 30	0,10 - 0,20 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3						600 - 800	IC ÷ 30	0,10 - 0,20 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.4													
	1.5													
	1.6													
	2.1							300 - 350	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2							300 - 350	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3							280 - 320	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4							240 - 280	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5							240 - 280	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6							300 - 350	IC ÷ 60	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7							80 - 120	IC ÷ 60	0,05 - 0,10 x IC		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	2.8							80 - 120	IC ÷ 60	0,05 - 0,10 x IC		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	3.1							280 - 320	IC ÷ 30	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2							250 - 300	IC ÷ 30	0,05 - 0,10 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1							200 - 240	IC ÷ 30	0,05 - 0,10 x IC	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
4.2							80 - 120	IC ÷ 30	0,05 - 0,10 x IC		<input type="checkbox"/>		<input checked="" type="checkbox"/>	
4.3														
4.4														
5.1														
5.2	120 - 160	IC ÷ 60	0,05 - 0,10 x IC	120 - 160	IC ÷ 60	0,05 - 0,10 x IC					<input type="checkbox"/>		<input checked="" type="checkbox"/>	
5.3														
S	1.1													
	1.2													
	1.3													
	2.1													
	2.2													
	2.3													
H	1.1				140 - 160	IC ÷ 80	0,03 - 0,05 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	1.2				100 - 140	IC ÷ 80	0,03 - 0,05 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	1.3				80 - 100	IC ÷ 80	0,03 - 0,05 x IC			<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	1.4													
	1.5													

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

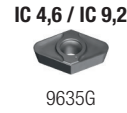
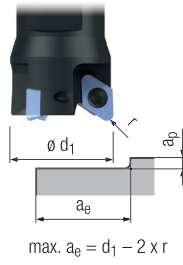
Product Finder

v_c / f_z



Rhombische Wendeschneidplatten Rhombic inserts

Gültig für · Valid for
9635A 9635G 9635R

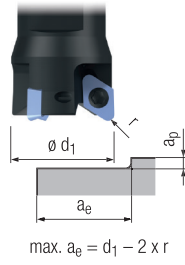


	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]			
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P	1.1											
	2.1											
	3.1											
	4.1											
	5.1											
M	1.1			100 - 140	IC ÷ 80	0,05 - 0,10 x IC					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1			80 - 120	IC ÷ 80	0,05 - 0,10 x IC					<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1											
	4.1											
K	1.1											
	1.2											
	2.1											
	2.2											
	3.1											
	3.2											
	4.1											
4.2												
N	1.1	800 - 1000	IC ÷ 30	0,10 - 0,20 x IC	500 - 700	IC ÷ 30	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	800 - 1000	IC ÷ 30	0,10 - 0,20 x IC	500 - 700	IC ÷ 30	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	600 - 800	IC ÷ 30	0,10 - 0,20 x IC	400 - 600	IC ÷ 30	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	400 - 600	IC ÷ 30	0,10 - 0,20 x IC	300 - 400	IC ÷ 30	0,05 - 0,10 x IC	400 - 600	IC ÷ 30	0,10 - 0,20 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5							300 - 500	IC ÷ 30	0,10 - 0,20 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6											
	2.1	300 - 350	IC ÷ 60	0,05 - 0,10 x IC	300 - 350	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	300 - 350	IC ÷ 60	0,05 - 0,10 x IC	300 - 350	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	280 - 320	IC ÷ 60	0,05 - 0,10 x IC	280 - 320	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	240 - 280	IC ÷ 60	0,05 - 0,10 x IC	240 - 280	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	240 - 280	IC ÷ 60	0,05 - 0,10 x IC	240 - 280	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	300 - 350	IC ÷ 60	0,05 - 0,10 x IC	300 - 350	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	80 - 120	IC ÷ 60	0,05 - 0,10 x IC	80 - 120	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	80 - 120	IC ÷ 60	0,05 - 0,10 x IC	80 - 120	IC ÷ 60	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	280 - 320	IC ÷ 30	0,05 - 0,10 x IC	280 - 320	IC ÷ 30	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	250 - 300	IC ÷ 30	0,05 - 0,10 x IC	250 - 300	IC ÷ 30	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	200 - 240	IC ÷ 30	0,05 - 0,10 x IC	200 - 240	IC ÷ 30	0,05 - 0,10 x IC				<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.2	80 - 120	IC ÷ 30	0,05 - 0,10 x IC	80 - 120	IC ÷ 30	0,05 - 0,10 x IC				<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3	100 - 140	IC ÷ 30	0,05 - 0,10 x IC	100 - 140	IC ÷ 30	0,05 - 0,10 x IC	200 - 300	IC ÷ 30	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4	80 - 120	IC ÷ 30	0,05 - 0,10 x IC	80 - 120	IC ÷ 30	0,05 - 0,10 x IC	100 - 200	IC ÷ 30	0,05 - 0,10 x IC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.1				180 - 220	IC ÷ 30	0,20 - 0,30 x IC	400 - 600	IC ÷ 30	0,20 - 0,30 x IC			<input checked="" type="checkbox"/>
5.2												
5.3	100 - 140	IC ÷ 30	0,05 - 0,10 x IC									<input checked="" type="checkbox"/>
S	1.1											
	1.2											
	1.3											
	2.1											
	2.2											
	2.3											
	2.4											
2.5												
2.6												
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

Rhombische PKD-Wechselschneidplatten
Rhombic PCD inserts

Gültig für · Valid for
9679



IC 4,6 / IC 9,2



9679

Product Finder



v_c / f_z

	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL	
P	1.1						
	2.1						
	3.1						
	4.1						
	5.1						
M	1.1						
	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	800 - 1000	IC ÷ 30	0,10 - 0,20 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	800 - 1000	IC ÷ 30	0,10 - 0,20 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	600 - 800	IC ÷ 30	0,10 - 0,20 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	400 - 600	IC ÷ 30	0,10 - 0,20 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	400 - 600	IC ÷ 30	0,10 - 0,20 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.6	300 - 500	IC ÷ 30	0,10 - 0,20 x IC		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	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	600 - 1000	IC ÷ 30	0,20 - 0,30 x IC				<input checked="" type="checkbox"/>
5.2							
5.3	200 - 300	IC ÷ 30	0,05 - 0,10 x IC				<input checked="" type="checkbox"/>
S	1.1						
	1.2						
	1.3						
	2.1						
	2.2						
	2.6						
H	1.1						
	1.2						
	1.3						
	1.4						
	1.5						

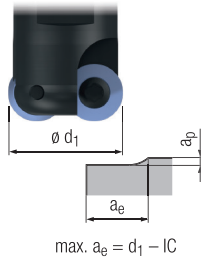
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



Product Finder

v_c / f_z

Runde Wendeschneidplatten Round inserts



Gültig für · Valid for

9601A 9608A
9607A 9619X

IC 8 - 12



9601A

IC 6 - 12



9607A 9608A

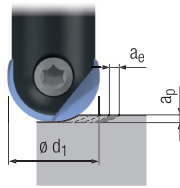
IC 8 - 16



9619X

	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]	v_c [m/min]	f_z [mm]	a_p [mm]			MMS MQL		
P	1.1	260 - 300	IC ± 50	0,05 - 0,10 x IC	260 - 300	IC ± 50	0,05 - 0,06 x IC	260 - 300	IC ± 50	0,05 - 0,10 x IC	□	■	■	
	2.1	260 - 300	IC ± 50	0,05 - 0,10 x IC	260 - 300	IC ± 50	0,05 - 0,06 x IC	260 - 300	IC ± 50	0,05 - 0,10 x IC	□	■	■	
	3.1	220 - 260	IC ± 60	0,05 - 0,10 x IC	220 - 260	IC ± 60	0,03 - 0,06 x IC	220 - 260	IC ± 60	0,05 - 0,10 x IC	□	■	■	
	4.1	200 - 240	IC ± 60	0,05 - 0,10 x IC	200 - 240	IC ± 60	0,03 - 0,06 x IC	200 - 240	IC ± 60	0,05 - 0,10 x IC	□	■	□	
	5.1	180 - 220	IC ± 60	0,05 - 0,10 x IC	180 - 220	IC ± 60	0,03 - 0,06 x IC	180 - 220	IC ± 60	0,05 - 0,10 x IC	□	■	□	
M	1.1							120 - 160	IC ± 60	0,05 - 0,10 x IC				
	2.1							60 - 100	IC ± 60	0,05 - 0,10 x IC				
	3.1							60 - 80	IC ± 80	0,05 - 0,10 x IC				
	4.1							40 - 60	IC ± 80	0,05 - 0,10 x IC				
K	1.1	180 - 220	IC ± 50	0,05 - 0,10 x IC	200 - 240	IC ± 50	0,03 - 0,06 x IC	180 - 220	IC ± 50	0,05 - 0,10 x IC	□	■	■	
	1.2	180 - 220	IC ± 50	0,05 - 0,10 x IC	200 - 240	IC ± 50	0,03 - 0,06 x IC	180 - 220	IC ± 50	0,05 - 0,10 x IC	□	■	■	
	2.1	160 - 200	IC ± 50	0,05 - 0,10 x IC	180 - 220	IC ± 50	0,03 - 0,06 x IC	160 - 200	IC ± 50	0,05 - 0,10 x IC	□	■	■	
	2.2	140 - 180	IC ± 50	0,05 - 0,10 x IC	160 - 200	IC ± 50	0,03 - 0,06 x IC	140 - 180	IC ± 50	0,05 - 0,10 x IC	□	■	■	
	3.1	80 - 120	IC ± 80	0,05 - 0,10 x IC	80 - 120	IC ± 80	0,03 - 0,06 x IC	80 - 120	IC ± 80	0,05 - 0,10 x IC	□	■	■	
	3.2	60 - 100	IC ± 80	0,05 - 0,10 x IC	60 - 100	IC ± 80	0,03 - 0,06 x IC	60 - 100	IC ± 80	0,05 - 0,10 x IC	□	■	■	
	4.1	100 - 140	IC ± 80	0,05 - 0,10 x IC	100 - 140	IC ± 80	0,03 - 0,06 x IC	100 - 140	IC ± 80	0,05 - 0,10 x IC	□	■	■	
4.2	120 - 160	IC ± 80	0,05 - 0,10 x IC	120 - 160	IC ± 80	0,03 - 0,06 x IC	120 - 160	IC ± 80	0,05 - 0,10 x IC	□	■	■		
N	1.1													
	1.2													
	1.3													
	1.4													
	1.5													
	1.6													
	2.1							300 - 350	IC ± 60	0,05 - 0,10 x IC	□	■	□	■
	2.2							300 - 350	IC ± 60	0,05 - 0,10 x IC	□	■	□	■
	2.3							280 - 320	IC ± 60	0,05 - 0,10 x IC	□	■	□	■
	2.4							240 - 280	IC ± 60	0,05 - 0,10 x IC	□	■	□	■
	2.5							240 - 280	IC ± 60	0,05 - 0,10 x IC	□	■	□	■
	2.6							300 - 350	IC ± 60	0,05 - 0,10 x IC	□	■	□	■
	2.7							80 - 120	IC ± 60	0,05 - 0,10 x IC	□	■	■	
	2.8							80 - 120	IC ± 60	0,05 - 0,10 x IC	□	■	■	
	3.1							280 - 320	IC ± 30	0,05 - 0,10 x IC			□	■
	3.2							250 - 300	IC ± 30	0,05 - 0,10 x IC			□	■
4.1														
4.2														
4.3														
4.4														
5.1							180 - 220	IC ± 30	0,20 - 0,30 x IC				■	
5.2							120 - 160	IC ± 60	0,05 - 0,10 x IC			□	■	
5.3														
S	1.1						120 - 160	IC ± 50	0,05 - 0,10 x IC				■	
	1.2						120 - 160	IC ± 50	0,05 - 0,10 x IC				■	
	1.3						100 - 140	IC ± 30	0,05 - 0,10 x IC				■	
	2.1						40 - 60	IC ± 30	0,05 - 0,10 x IC				■	
	2.2						30 - 60	IC ± 30	0,05 - 0,10 x IC				■	
	2.3						30 - 60	IC ± 30	0,05 - 0,10 x IC				■	
	2.4						30 - 50	IC ± 30	0,05 - 0,10 x IC				■	
2.5						30 - 50	IC ± 30	0,05 - 0,10 x IC				■		
2.6						30 - 50	IC ± 30	0,05 - 0,10 x IC				■		
H	1.1				160 - 200	IC ± 60	0,03 - 0,06 x IC				□	■		
	1.2				140 - 180	IC ± 60	0,03 - 0,06 x IC				□	■		
	1.3				100 - 120	IC ± 60	0,02 - 0,04 x IC				□	■		
	1.4				80 - 100	IC ± 80	0,01 - 0,02 x IC				□	■		
	1.5				50 - 70	IC ± 100	0,01 - 0,02 x IC				□	■		

Kugel-Wechselschneidplatten
Ball nose inserts



6 - 32 mm



9581A

8 - 25 mm



9579A

Gültig für · Valid for
9579A 9581A

Product Finder



v_c / f_z

	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]			MMS MQL	
P	1.1	260-300	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	260-300	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	260-300	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	260-300	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	5.1	180-220	$d_1 \div 160$	$0,010 \times d_1$	$0,010 \times d_1$	180-220	$d_1 \div 160$	$0,010 \times d_1$	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
M	1.1											
	2.1											
	3.1											
	4.1											
K	1.1	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	240-280	$d_1 \div 120$	$0,020 \times d_1$	$0,020 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	180-240	$d_1 \div 160$	$0,015 \times d_1$	$0,015 \times d_1$	180-240	$d_1 \div 160$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	180-240	$d_1 \div 160$	$0,015 \times d_1$	$0,015 \times d_1$	180-240	$d_1 \div 160$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	120-160	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	120-160	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	100-140	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	100-140	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	200-240	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	200-240	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4.2	200-240	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	200-240	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
N	1.1	300-600	$d_1 \div 70$	$0,020 \times d_1$	$0,020 \times d_1$	300-600	$d_1 \div 70$	$0,020 \times d_1$	$0,020 \times d_1$		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	300-600	$d_1 \div 70$	$0,020 \times d_1$	$0,020 \times d_1$	300-600	$d_1 \div 70$	$0,020 \times d_1$	$0,020 \times d_1$		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	300-600	$d_1 \div 70$	$0,020 \times d_1$	$0,020 \times d_1$	300-600	$d_1 \div 70$	$0,020 \times d_1$	$0,020 \times d_1$		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4											
	1.5											
	1.6											
	2.1											
	2.2											
	2.3	240-280	$d_1 \div 120$	$0,015 \times d_1$	$0,015 \times d_1$	240-280	$d_1 \div 120$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.4											
	2.5											
	2.6	240-280	$d_1 \div 120$	$0,015 \times d_1$	$0,015 \times d_1$	240-280	$d_1 \div 120$	$0,015 \times d_1$	$0,015 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.7	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1											
	3.2											
	4.1	300-400	$d_1 \div 70$	$0,015 \times d_1$	$0,015 \times d_1$	300-400	$d_1 \div 70$	$0,015 \times d_1$	$0,015 \times d_1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2												
4.3												
4.4												
5.1	300-400	$d_1 \div 70$	$0,015 \times d_1$	$0,015 \times d_1$	300-400	$d_1 \div 70$	$0,015 \times d_1$	$0,015 \times d_1$		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5.2	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.3	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	220-260	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
S	1.1	100-140	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	100-140	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	100-140	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$	100-140	$d_1 \div 140$	$0,015 \times d_1$	$0,015 \times d_1$		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	70-90	$d_1 \div 160$	$0,015 \times d_1$	$0,015 \times d_1$	70-90	$d_1 \div 160$	$0,015 \times d_1$	$0,015 \times d_1$		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1											
	2.2											
	2.3											
H	1.1	140-160	$d_1 \div 160$	$0,010 \times d_1$	$0,010 \times d_1$	210-240	$d_1 \div 160$	$0,010 \times d_1$	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	120-140	$d_1 \div 180$	$0,010 \times d_1$	$0,010 \times d_1$	180-210	$d_1 \div 180$	$0,010 \times d_1$	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	80-120	$d_1 \div 200$	$0,010 \times d_1$	$0,010 \times d_1$	120-180	$d_1 \div 200$	$0,010 \times d_1$	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	60-80	$d_1 \div 200$	$0,010 \times d_1$	$0,010 \times d_1$	90-120	$d_1 \div 200$	$0,010 \times d_1$	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5											

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

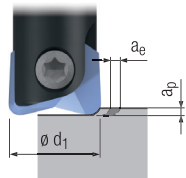


Product Finder

-

v_c / f_z

Torus-Wechselschneidplatten Torus inserts



6 - 32 mm



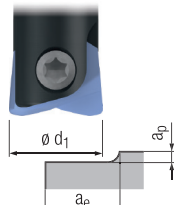
9596A, 9598A

10 - 32 mm



9595A

HPC-Wechselschneidplatten HPC inserts



$a_e = 0,8 \times d_1$

10 - 25 mm



9594A

Gültig für · Valid for

9594A 9596A
9595A 9598A

	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]	v _c [m/min]	f _z [mm]	a _p [mm]			MMS MQL		
P	1.1	260-300	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	260-300	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	220-260	0,8-1,2	0,030 x d ₁	□	■		■
	2.1	260-300	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	260-300	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	220-260	0,8-1,2	0,030 x d ₁	□	■		■
	3.1	260-280	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	240-280	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	200-240	0,8-1,2	0,030 x d ₁	□	■		■
	4.1	260-280	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	240-280	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	200-240	0,8-1,0	0,030 x d ₁	□	■		□
	5.1	180-200	d ₁ ÷ 160	0,010 x d ₁	0,010 x d ₁	180-220	d ₁ ÷ 160	0,010 x d ₁	0,010 x d ₁	160-200	0,8-1,0	0,030 x d ₁	□	■		□
M	1.1	120-160	d ₁ ÷ 160	0,010 x d ₁	0,010 x d ₁										□	■
	2.1	120-160	d ₁ ÷ 160	0,010 x d ₁	0,010 x d ₁										□	■
	3.1	100-120	d ₁ ÷ 180	0,010 x d ₁	0,010 x d ₁										□	■
	4.1	100-120	d ₁ ÷ 180	0,010 x d ₁	0,010 x d ₁										□	■
K	1.1				240-280	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	240-280	0,8-1,2	0,040 x d ₁	□	■		■	
	1.2				240-280	d ₁ ÷ 120	0,020 x d ₁	0,020 x d ₁	240-280	0,8-1,2	0,040 x d ₁	□	■		■	
	2.1				180-240	d ₁ ÷ 160	0,015 x d ₁	0,015 x d ₁	180-220	0,5-1,0	0,040 x d ₁	□	■		■	
	2.2				180-240	d ₁ ÷ 160	0,015 x d ₁	0,015 x d ₁	180-220	0,5-1,0	0,040 x d ₁	□	■		■	
	3.1				120-160	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	120-160	0,5-1,0	0,040 x d ₁	□	■		■	
	3.2				100-140	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	100-140	0,5-1,0	0,040 x d ₁	□	■		■	
	4.1				200-240	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	140-180	0,5-1,0	0,040 x d ₁	□	■		■	
	4.2				200-240	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	140-180	0,5-1,0	0,040 x d ₁	□	■		■	
N	1.1	300-600	d ₁ ÷ 70	0,020 x d ₁	0,020 x d ₁										□	■
	1.2	300-600	d ₁ ÷ 70	0,020 x d ₁	0,020 x d ₁										□	■
	1.3	300-600	d ₁ ÷ 70	0,020 x d ₁	0,020 x d ₁										□	■
	1.4	250-300	d ₁ ÷ 70	0,020 x d ₁	0,020 x d ₁										□	■
	1.5															
	1.6															
	2.1	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁								□	■	□	■
	2.2	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁								□	■	□	■
	2.3	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁	240-260	0,8-1,2	0,040 x d ₁	□	■	□	■
	2.4	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁								□	■	□	■
	2.5	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁								□	■	□	■
	2.6	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁	240-280	d ₁ ÷ 120	0,015 x d ₁	0,015 x d ₁	240-260	0,8-1,2	0,040 x d ₁	□	■	□	■
	2.7	220-260	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	220-260	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	200-240	0,6-1,2	0,040 x d ₁	□	■		■
	2.8	220-260	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁	220-260	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁							■
	3.1															
	3.2															
4.1	300-400	d ₁ ÷ 70	0,015 x d ₁	0,015 x d ₁								■	□		□	
4.2	180-200	d ₁ ÷ 90	0,015 x d ₁	0,015 x d ₁								■	□		■	
4.3																
4.4																
5.1	300-400	d ₁ ÷ 70	0,015 x d ₁	0,015 x d ₁											■	
5.2	220-260	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁										□	■	
5.3	220-260	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁											■	
S	1.1	100-140	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁											■
	1.2	100-140	d ₁ ÷ 140	0,015 x d ₁	0,015 x d ₁											■
	1.3	70-90	d ₁ ÷ 160	0,015 x d ₁	0,015 x d ₁											■
	2.1															
	2.2															
	2.3															
H	1.1	140-160	d ₁ ÷ 180	0,010 x d ₁	0,010 x d ₁	140-160	d ₁ ÷ 180	0,010 x d ₁	0,010 x d ₁				□	■		
	1.2	120-140	d ₁ ÷ 180	0,010 x d ₁	0,010 x d ₁	120-140	d ₁ ÷ 180	0,010 x d ₁	0,010 x d ₁				□	■		
	1.3					80-120	d ₁ ÷ 200	0,010 x d ₁	0,010 x d ₁				□	■		
	1.4					60-80	d ₁ ÷ 200	0,010 x d ₁	0,010 x d ₁				□	■		
	1.5															



HSS-Schaft- und Langlochfräser HSS End Mills and Slot Drills



Seite · Page

Wegweiser	Product finder	246 - 251
Produktseiten	Product pages	252 - 283
Schnittwerte	Cutting conditions	284 - 298

Wegweiser

Bitte beachten:

Die Eignung der HSS-Schaft- und Langlochfräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittwerte sind auf den Seiten 284 - 298 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:

The suitability of the HSS end mills and slot drills is indicated as follows:




- = very suitable
- = suitable

Please find the cutting conditions on pages 284 - 298.

International comparison of materials, see page 416 - 429.

Einsatzgebiete – Material Applications – material		Material-Beispiele Material examples	Material-Nummern Material numbers
P	Stahlwerkstoffe Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Steel materials Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	Cq15 1.1132 S235JR (S137-2) 1.0037 10SPb20 1.0722 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	
	5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	
M	Nichtrostende Stahlwerkstoffe 1.1 Ferritisch, martensitisch	Stainless steel materials Ferritic, martensitic	X2CrTi12 1.4512
	2.1 Austenitisch	Austenitic	X6CrNiMoTi17-12-2 1.4571
	3.1 Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	X2CrNiMoN22-5-3 1.4462
	4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	X2CrNiMoN25-7-4 1.4410
K	Gusswerkstoffe 1.1 Gusseisen mit Lamellengrafit (GJL)	Cast materials Cast iron with lamellar graphite (GJL)	EN-GJL-200 (GG20) EN-JL-1030
	1.2	Cast iron with lamellar graphite (GJL)	EN-GJL-300 (GG30) EN-JL-1050
	2.1 Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	EN-GJS-400-15 (GGG40) EN-JS-1030
	2.2	Cast iron with nodular graphite (GJS)	EN-GJS-700-2 (GGG70) EN-JS-1070
	3.1 Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	GJV 300
	3.2	Cast iron with vermicular graphite (GJV)	GJV 450
4.1 Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	EN-GJMW-350-4 (GTW-35) EN-JM-1010	
4.2	Malleable cast iron (GTMW, GTMB)	EN-GJMB-450-6 (GTS-45) EN-JM-1140	
N	Nichteisenwerkstoffe 1.1 Aluminium-Legierungen	Non-ferrous materials Aluminium alloys	
	1.2 Aluminium-Knetlegierungen	Wrought aluminium alloys	EN AW-AlMn1 EN AW-3103
	1.3	Wrought aluminium alloys	EN AW-AlMgSi EN AW-6060
	1.4	Wrought aluminium alloys	EN AW-AlZn5Mg3Cu EN AW-7022
	1.5 Aluminium-Gusslegierungen	Aluminium cast alloys	EN AC-AlMg5 EN AC-307 G
	1.6	Aluminium cast alloys	EN AC-AISi9Cu3 EN AC-46500
	2.1 Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	E-Cu 57 EN CW 004 A
	2.2 Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	CuZn37 (Ms63) EN CW 508 L
	2.3 Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	CuZn36Pb3 (Ms58) EN CW 603 N
	2.4 Kupfer-Aluminium-Legierungen (Alubronze, langspanend)	Copper-aluminium alloys (alu bronze, long-chipping)	CuAl10Ni5Fe4 EN CW 307 G
	2.5 Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	CuSn8P EN CW 459 K
	2.6 Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	CuSn7 ZnPb (Rg7) 2.1090
	2.7 Kupfer-Sonderlegierungen	Special copper alloys	(AMPCO® 8)
	2.8	Special copper alloys	(AMPCO® 45)
	3.1 Magnesium-Knetlegierungen	Magnesium wrought alloys	MgAl6Zn 3.5612
	3.2 Magnesium-Gusslegierungen	Magnesium cast alloys	EN-MCMgAl9Zn1 EN-MC21120
S	Kunststoffe 4.1 Duroplaste (kurzspanend)	Synthetics 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
H	Besondere Werkstoffe 5.1 Graphit	Special materials Graphite	C 8000
	5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys	W-Cu 80/20
	5.3 Verbundwerkstoffe	Composite materials	Hyllite, Alucobond
S	Spezialwerkstoffe Titan-Legierungen	Special materials Titanium alloys	
	1.1 Reintitan	Pure titanium	Ti1 3.7025
	1.2 Titan-Legierungen	Titanium alloys	TiAl6V4 3.7165
	1.3	Titanium alloys	TiAl4Mo4Sn2 3.7185
	2.1 Nickel-, Kobalt- und Eisen-Legierungen	Nickel alloys, cobalt alloys and iron alloys	
	2.2 Reinnickel	Pure nickel	Ni 99.6 2.4060
	2.3 Nickel-Basis-Legierungen	Nickel-base alloys	Monel 400 2.4360 Inconel 718 2.4668
	2.4 Kobalt-Basis-Legierungen	Cobalt-base alloys	Udimet 605
	2.5 Eisen-Basis-Legierungen	Iron-base alloys	Haynes 25 2.4964 Incoloy 800 1.4958
	2.6	Iron-base alloys	
H	Harte Werkstoffe 1.1 Hochfeste Stähle, gehärtete Stähle, Hartguss	Hard materials High strength steels, hardened steels, hard castings	Weldox 1100 Hardox 550 Armax 600T Ferro-Titanit HSSE
	1.2		
	1.3		
	1.4		
	1.5		



Allround				Steel		Allround									
NR <small>grob · coarse</small>						NF <small>mittel · medium</small>				N					
ø6 - 25 mm	ø6 - 25 mm	ø6 - 25 mm	ø6 - 25 mm	ø6 - 40 mm	ø6 - 40 mm	ø6 - 32 mm	ø6 - 32 mm	ø6 - 32 mm	ø6 - 32 mm	ø1 - 36 mm	ø1 - 36 mm	ø2 - 36 mm	ø2 - 36 mm	Z (Flutes)	
3	3	3	3	4 - 6	4 - 6	4 - 6	4 - 6	4 - 6	4 - 6	2	2	2	2	 	
1345	1345C	1349	1349C	1344	1344C	1364	1364C	1366	1366C	2300	2300C	2305	2305C	Seite · Page	
252	252	253	253	254	254	255	255	255	255	256 - 257	256 - 257	258	258		
290	290	291	291	290	290	292	292	292	292	296	296	298	298		
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P

M

K

N

S

H



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

NR

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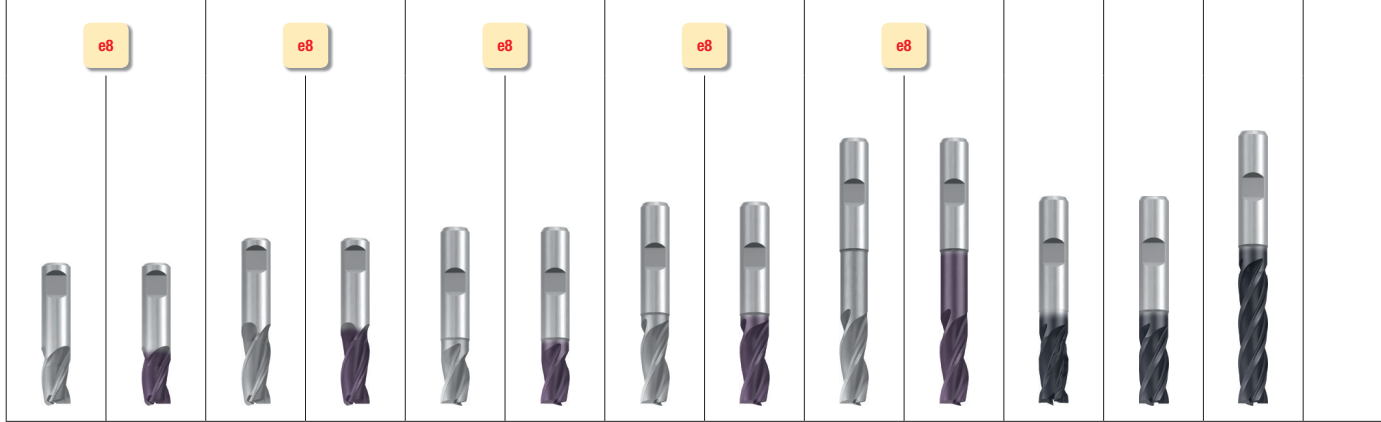
N

HR

WR

W

v_c / f_z



Allround

Inox

Allround

N

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Z (Flutes)	3	3	3	3	3	3	3	3	3	3	4	4	4
	2316	2316C	2317	2317C	2310	2310C	2345	2345C	2315	2315C	1391L	1576L	1578L
Seite · Page	259	259	259	259	260 - 261	260 - 261	262	262	263	263	264	265	265
v_c / f_z	296	296	296	296	296	296	297	297	298	298	285	293	293
P	1.1	■	■	■	■	■	■	■	■	■	□	■	■
	2.1	■	■	■	■	■	■	■	■	■	□	■	■
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	2.1	■	■	■	■	■	■	■	■	■	□	■	■
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	3.2	□	□	□	□	□	□	□	□	□	□		
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Allround				N				Inox				Allround		
N												HR <small>fein · fine</small>		
ø6 - 20 mm	ø6 - 20 mm	ø2 - 50 mm	ø2 - 50 mm	ø8 - 25 mm	ø8 - 25 mm	ø3 - 50 mm	ø3 - 50 mm	ø6 - 40 mm	ø6 - 40 mm	ø25 - 32 mm	ø25 - 32 mm	ø6 - 20 mm	ø6 - 20 mm	Z (Flutes)
4	4	4 - 8	4 - 8	4 - 5	4 - 5	4 - 8	4 - 8	4 - 8	4 - 8	8 - 10	8 - 10	4	4	
1329	1329C	1311	1311C	1318	1318C	1306	1306C	1316	1316C	1365A	1390A	1572L	1574L	
266	266	267	267	268	268	269	269	270	270	271	271	272	272	Seite · Page
296	296	294	294	294	294	295	295	295	295	286	286	289	289	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
														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

P

M

K

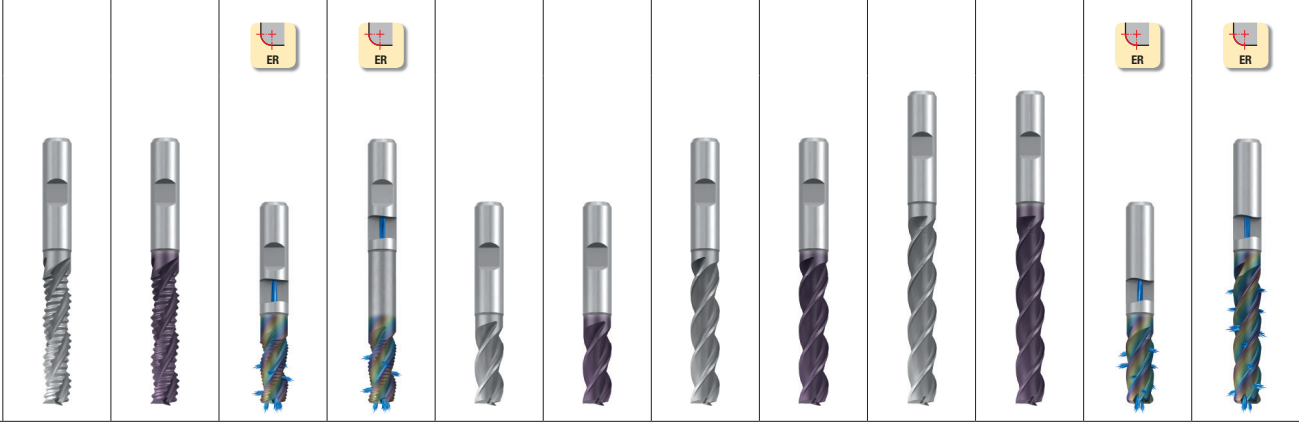
N

S

H



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



AI

WR grob - coarse

W

ø6 - 32 mm	ø6 - 32 mm	ø16 - 32 mm	ø16 - 32 mm	ø2 - 25 mm	ø2 - 25 mm	ø3 - 40 mm	ø3 - 40 mm	ø10 - 32 mm	ø10 - 32 mm	ø16 - 32 mm	ø16 - 32 mm	Z (Flutes)
3	3	3	3	3 - 4	3 - 4	3 - 4	3 - 4	3 - 4	3 - 4	4	4	
		1092RZ	1093RZ							1034RZ	1035RZ	
1594	1594C	1392RZ	1393RZ	1331	1331C	1336	1336C	1333	1333C			
279	279	280	280	281	281	281	281	282	282	283	283	Seite - Page
291	291	287	287	294	294	295	295	295	295	288	288	v_c / f_z

1.1
2.1
3.1
4.1
5.1

P

1.1
2.1
3.1
4.1

M

1.1
1.2
2.1
2.2
3.1
3.2
4.1
4.2

K

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

N

3.1
3.2
4.1
4.2
4.3
4.4

5.1
5.2
5.3

1.1
1.2
1.3

S

2.1
2.2
2.3
2.4
2.5
2.6

1.1
1.2
1.3
1.4
1.5

H



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

- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Schruppfräser mit groben, runden Spanteilern
- Erzeugt deutliche Oberflächenmarkierungen
- Zentrumschneidend
- Niedrige Schnittkräfte
- Universell verwendbar

- Roughing end mill with coarse, round chip breakers
- Generates significant milling marks
- Centre cutting
- Low cutting forces
- Highly versatile

NR

grob coarse

HSSE

DIN 1835

30°

45°

v_c / f_z

290

Design I₄:

Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Besonders leistungsfähig beim Bohrfräsen, Nuten- und Taschenfräsen
- Ideal für konventionelle Fräsmaschinen

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- Particularly effective for z-axis milling, slot milling and pocket milling
- Ideal for conventional milling machines

TICN

P	1.1-2.1	3.1
K	1.1	1.2
N	2.2-2.3, 2.5	

P	1.1-2.1	3.1
M	1.1-2.1	
K	1.1-1.2	2.1
N	2.1-2.6	
S	1.1	

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code

$\emptyset d_1$ k12	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A	Z (Flutes)	Dimens.- Code	1345	1345C
6	13	19	57	5,5	–	6	21	3	.006	●	●
7	16	22	66	6,5	24	10	26	3	.007	●	●
8	19	25	69	7,5	27	10	29	3	.008	●	●
9	19	26	69	8,5	27	10	29	3	.009	●	●
10	22	30	72	9,5	–	10	32	3	.010	●	●
11	22	30	79	10,5	32	12	34	3	.011	●	●
12	26	36	83	11,5	–	12	38	3	.012	●	●
14	26	36	83	11,5	–	12	38	3	.014	●	●
15	26	36	83	11,5	–	12	38	3	.015	●	●
16	32	42	92	15	–	16	44	3	.016	●	●
18	32	42	92	15	–	16	44	3	.018	●	●
20	38	52	104	19	–	20	54	3	.020	●	●
25	45	63	121	24	–	25	65	3	.025	●	●

Aufnahmen für Schäfte nach DIN 6535 HB und DIN 1835 B siehe Seite 380 - 382

Holders for shanks according to DIN 6535 HB and DIN 1835 B, see pages 380 - 382

252

EMUGE
FRANKEN

Bestell-Beispiel · Ordering example: **1345.006**

- Schruppfräser mit groben, runden Spanteilern
- Erzeugt deutliche Oberflächenmarkierungen
- Zentrumschneidend
- Niedrige Schnittkräfte
- Universell verwendbar

- Roughing end mill with coarse, round chip breakers
- Generates significant milling marks
- Centre cutting
- Low cutting forces
- Highly versatile

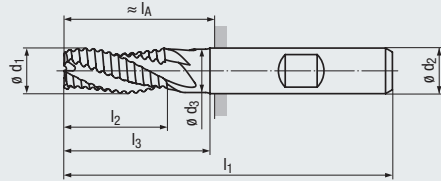
NR **grob coarse**

HSSE

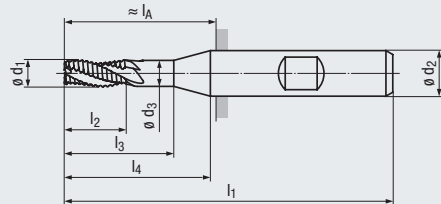
DIN 1835
A B

30° **45°**

V_c/f_z
291



Design I₄:



Allround



Allround

Product Finder

NR

NF

N

HR

WR

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Ideal für konventionelle Fräsmaschinen

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- Ideal for conventional milling machines

TICN

P 1.1-2.1 3.1

K 1.1 1.2

N 2.2-2.3, 2.5

P 1.1-2.1 3.1

M 1.1-2.1

K 1.1-1.2 2.1

N 2.1-2.6

S 1.1

DIN 844 – Lange Ausführung · Long design

Bestell-Code · Order code										1349	1349C
∅ d ₁ k12	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code		
6	24	30	68	5,5	–	6	32	3	.006	●	●
8	38	44	88	7,5	46	10	48	3	.008	●	●
9	38	45	88	8,5	46	10	48	3	.009	●	●
10	45	53	95	9,5	–	10	55	3	.010	●	●
11	45	53	102	10,5	55	12	57	3	.011	●	●
12	53	63	110	11,5	–	12	65	3	.012	●	●
14	53	63	110	11,5	–	12	65	3	.014	●	●
15	53	63	110	11,5	–	12	65	3	.015	●	●
16	63	73	123	15	–	16	75	3	.016	●	●
18	63	73	123	15	–	16	75	3	.018	●	●
20	75	89	141	19	–	20	91	3	.020	●	●
25	90	108	166	24	–	25	110	3	.025	●	●



- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Schrappfräser mit groben, runden Spanteilern
- Erzeugt deutliche Oberflächenmarkierungen
- Bis \varnothing 28 mm zentrumschneidend
- Großer Abmessungsbereich
- Roughing end mill with coarse, round chip breakers
- Generates significant milling marks
- Centre cutting of up to 28 mm dia.
- Wide range of diameters

NR

HSSE

DIN 1835

30°

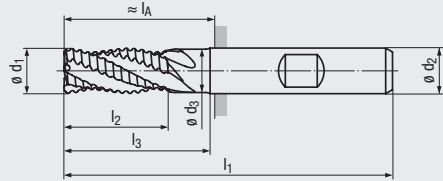
45°

$\varnothing 6 - 28$

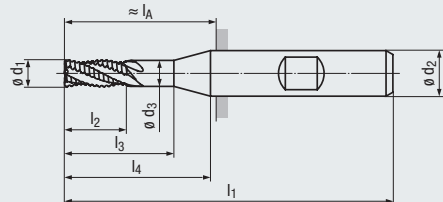
$\varnothing 30 - 40$

v_c / f_z

290



Design I₄:



Steel



Steel

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Für Stahlwerkstoffe und Kupferlegierungen gut geeignet
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Für typische Schrapp-Bearbeitungen

Applications – material (see page 246)

- Suitable for steel materials and copper alloys
- For materials with a tensile strength of up to 1000 N/mm²
- For typical roughing applications

P 1.1-2.1
N 2.2, 2.5

TICN

P 1.1-2.1 3.1
M 1.1
K 1.1
N 2.2-2.6, 5.2

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code										1344	1344C
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code		
6	13	19	57	5,5	–	6	21	4	.006	●	●
7	16	22	66	6,5	24	10	26	4	.007	●	●
8	19	25	69	7,5	27	10	29	4	.008	●	●
9	19	26	69	8,5	27	10	29	4	.009	●	●
10	22	30	72	9,5	–	10	32	4	.010	●	●
11	22	30	79	10,5	32	12	34	4	.011	●	●
12	26	36	83	11,5	–	12	38	4	.012	●	●
13	26	36	83	11,5	–	12	38	4	.013	●	●
14	26	36	83	11,5	–	12	38	4	.014	●	●
15	26	36	83	11,5	–	12	38	4	.015	●	●
16	32	42	92	15	–	16	44	4	.016	●	●
17	32	42	92	15	–	16	44	4	.017	●	●
18	32	42	92	15	–	16	44	4	.018	●	●
20	38	52	104	19	–	20	54	4	.020	●	●
22	38	52	104	19	–	20	54	4	.022	●	●
24	45	61	121	23	63	25	65	4	.024	●	●
25	45	63	121	24	–	25	65	4	.025	●	●
26	45	63	121	24	–	25	65	5	.026	●	●
28	45	63	121	24	–	25	65	5	.028	●	●
30	45	63	121	24	–	25	65	5	.030	●	●
32	53	70	133	31	–	32	73	6	.032	●	●
36	53	70	133	31	–	32	73	6	.036	●	●
40	63	80	155	38	–	40	85	6	.040	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1044/1044C
Tool with straight shank: order code 1044/1044C

- Schruppschichtfräser mit flachen, überdeckenden Spanteilern
- Erzeugt annähernd Schlichtoberflächen
- Bis ø 28 mm zentrumschneidend
- Universell verwendbar

- Semi-finishing end mill with flat, overlapping chip breakers
- Generates nearly finishing surfaces
- Centre cutting of up to 28 mm dia.
- Highly versatile

NF mittel medium

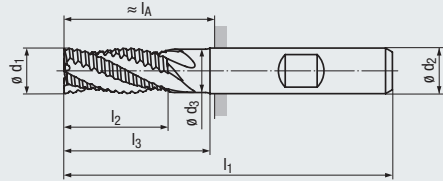
HSSE

DIN 1835
A B

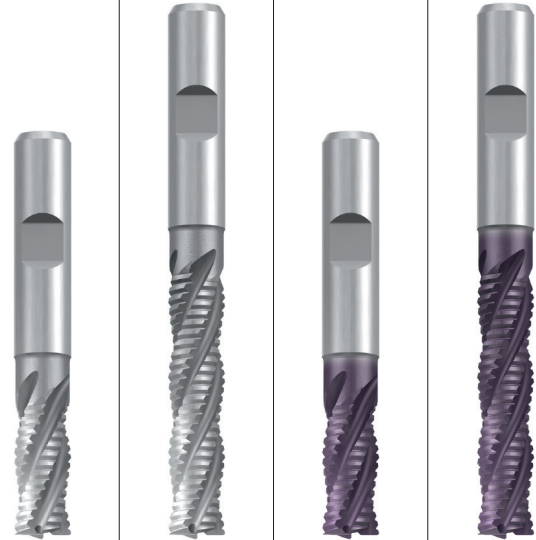
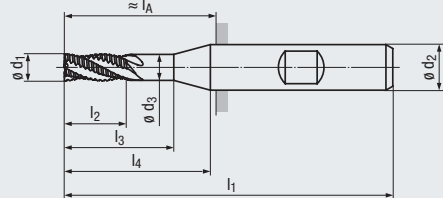
30° **45°**

ø6 - 28 **ø 30 - 32**

V_c/f_z
292



Design I₄:



Allround

Allround

Product Finder

- NR
- NF**
- N
- H
- WR
- W
- V_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen mit einer Zugfestigkeit bis 1400 N/mm² einsetzbar
- Kurze Späne lassen sich leicht abtransportieren

Applications – material (see page 246)

- Applicable in almost all ferrous materials and non-ferrous metals with a tensile strength of up to 1400 N/mm²
- Easy removal of short chips

		TICN	
P	1.1-2.1 3.1	P	1.1-3.1 4.1-5.1
M	1.1	M	1.1-4.1
K	1.1-1.2 2.1-2.2	K	1.1-2.1 2.2-3.2
K	4.1-4.2	K	4.1 4.2
N	2.2-2.3, 2.5	N	2.1 2.2-2.7, 5.2
		S	1.1-1.2, 2.1-2.2

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code										1364	1364C
ø d ₁ k12	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code		
6	13	19	57	5,5	–	6	21	4	.006	●	●
7	16	22	66	6,5	24	10	26	4	.007	●	●
8	19	25	69	7,5	27	10	29	4	.008	●	●
9	19	26	69	8,5	27	10	29	4	.009	●	●
10	22	30	72	9,5	–	10	32	4	.010	●	●
11	22	30	79	10,5	32	12	34	4	.011	●	●
12	26	36	83	11,5	–	12	38	4	.012	●	●
13	26	36	83	11,5	–	12	38	4	.013	●	●
14	26	36	83	11,5	–	12	38	4	.014	●	●
15	26	36	83	11,5	–	12	38	4	.015	●	●
16	32	42	92	15	–	16	44	4	.016	●	●
18	32	42	92	15	–	16	44	4	.018	●	●
20	38	52	104	19	–	20	54	4	.020	●	●
22	38	52	104	19	–	20	54	4	.022	●	●
25	45	63	121	24	–	25	65	4	.025	●	●
26	45	63	121	24	–	25	65	5	.026	●	●
28	45	63	121	24	–	25	65	5	.028	●	●
30	45	63	121	24	–	25	65	5	.030	●	●
32	53	70	133	31	–	32	73	6	.032	●	●

DIN 844 – Lange Ausführung · Long design

Bestell-Code · Order code										1366	1366C
ø d ₁ k12	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code		
6	24	30	68	5,5	–	6	32	4	.006	●	●
8	38	44	88	7,5	46	10	48	4	.008	●	●
10	45	53	95	9,5	–	10	55	4	.010	●	●
11	45	53	102	10,5	55	12	57	4	.011	●	●
12	53	63	110	11,5	–	12	65	4	.012	●	●
13	53	63	110	11,5	–	12	65	4	.013	●	●
14	53	63	110	11,5	–	12	65	4	.014	●	●
15	53	63	110	11,5	–	12	65	4	.015	●	●
16	63	73	123	15	–	16	75	4	.016	●	●
18	63	73	123	15	–	16	75	4	.018	●	●
20	75	89	141	19	–	20	91	4	.020	●	●
22	75	89	141	19	–	20	91	4	.022	●	●
25	90	108	166	24	–	25	110	4	.025	●	●
28	90	108	166	24	–	25	110	5	.028	●	●
30	90	108	166	24	–	25	110	5	.030	●	●
32	106	123	186	31	–	32	126	6	.032	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1064/1064C (kurze Ausführung) und 1066/1066C (lange Ausführung)
Tool with straight shank: order code 1064/1064C (short design) and 1066/1066C (long design)


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




- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Langlochfräser mit 2 Schneiden
- Zentrumschneidend
- Großer Abmessungsbereich
- Universell verwendbar
- Slot drill with 2 flutes
- Centre cutting
- Wide range of diameters
- Highly versatile


N




HSSE



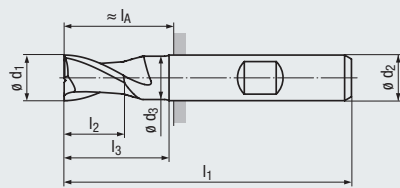
DIN 1835



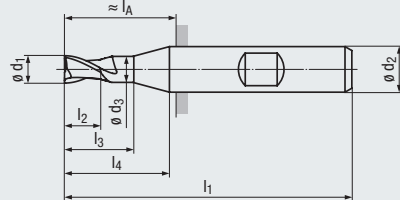
30°



v_c / f_z
296



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Werkstoffen mit einer Zugfestigkeit bis 1200 N/mm² einsetzbar
- Zur Herstellung von Passfedernuten nach DIN 6885-1
- Gut zum Bohrfräsen geeignet

Applications – material (see page 246)

- Applicable in almost all materials with a tensile strength of up to 1200 N/mm²
- For producing keyways acc. DIN 6885-1
- Suitable for z-axis milling

TICN

P	1.1-2.1
M	1.1-2.1
K	1.1-2.1, 2.2, 4.1-4.2
N	1.1-1.4, 2.2-2.7
N	3.1-4.2
S	1.2

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	1.1-1.5, 2.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2	2.1-2.2

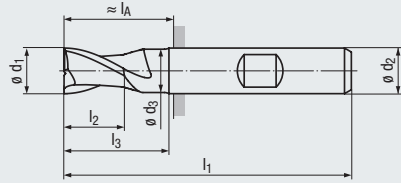
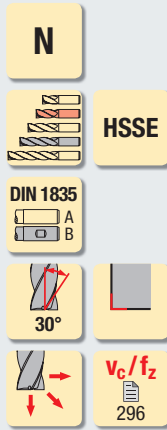
DIN 327 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

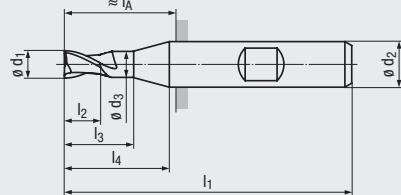
Bestell-Code · Order code											2300		2300C	
$\varnothing d_1$ e8	h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code				
1	1	2,5	9	47	–	–	6	11	2	.001	●		●	
	1,5	3	9	47	–	–	6	11	2	.0015	●		●	
	1,8	4	10	48	–	–	6	12	2	.0018	●		●	
2	4	4	10	48	–	–	6	12	2	.002	●		●	
2,5	5	5	11	49	–	–	6	13	2	.0025	●		●	
	2,8	5	11	49	–	–	6	13	2	.0028	●		●	
3	5	5	11	49	–	–	6	13	2	.003	●		●	
	3,5	6	12	50	–	–	6	14	2	.0035	●		●	
	3,8	7	13	51	–	–	6	15	2	.0038	●		●	
4	7	7	13	51	–	–	6	15	2	.004	●		●	
	4,5	7	13	51	–	–	6	15	2	.0045	●		●	
	4,8	8	14	52	–	–	6	16	2	.0048	●		●	
5	8	8	14	52	–	–	6	16	2	.005	●		●	
	5,5	8	14	52	–	–	6	16	2	.0055	●		●	
	5,75	8	14	52	–	–	6	16	2	.00575	●		●	
6	8	8	14	52	5,5	–	6	16	2	.006	●		●	
	6,5	10	16	60	6	18	10	20	2	.0065	●		●	
	6,75	10	16	60	6,5	18	10	20	2	.00675	●		●	
7	10	10	16	60	6,5	18	10	20	2	.007	●		●	
	7,5	10	16	60	7	18	10	20	2	.0075	●		●	
	7,75	11	17	61	7,5	19	10	21	2	.00775	●		●	
8	11	11	17	61	7,5	19	10	21	2	.008	●		●	
	8,5	11	18	61	8	19	10	21	2	.0085	●		●	
	8,7	11	18	61	8,5	19	10	21	2	.0087	●		●	
	9	11	18	61	8,5	19	10	21	2	.009	●		●	
	9,5	11	18	61	9	19	10	21	2	.0095	●		●	
	9,7	13	21	63	9,5	–	10	23	2	.0097	●		●	
10	13	13	21	63	9,5	–	10	23	2	.010	●		●	
	10,5	13	21	70	10	23	12	25	2	.0105	●		●	
	10,7	13	21	70	10,5	23	12	25	2	.0107	●		●	
	11	13	21	70	10,5	23	12	25	2	.011	●		●	
	11,5	13	21	70	11	23	12	25	2	.0115	●		●	
12	11,7	16	26	73	11,5	–	12	28	2	.0117	●		●	
	12,7	16	26	73	11,5	–	12	28	2	.012	●		●	
	13	16	26	73	11,5	–	12	28	2	.0127	●		●	
	13,7	16	26	73	11,5	–	12	28	2	.013	●		●	
	13,7	16	26	73	11,5	–	12	28	2	.0137	●		●	
14	16	16	26	73	11,5	–	12	28	2	.014	●		●	
	14,7	16	26	73	11,5	–	12	28	2	.0147	●		●	
	15	16	26	73	11,5	–	12	28	2	.015	●		●	
	15,7	19	29	79	15	–	16	31	2	.0157	●		●	
16	19	19	29	79	15	–	16	31	2	.016	●		●	



- Langlochfräser mit 2 Schneiden
- Zentrumschneidend
- Großer Abmessungsbereich
- Universell verwendbar
- Slot drill with 2 flutes
- Centre cutting
- Wide range of diameters
- Highly versatile



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Werkstoffen mit einer Zugfestigkeit bis 1200 N/mm² einsetzbar
- Zur Herstellung von Passfedernuten nach DIN 6885-1
- Gut zum Bohrfräsen geeignet

Applications – material (see page 246)

- Applicable in almost all materials with a tensile strength of up to 1200 N/mm²
- For producing keyways acc. DIN 6885-1
- Suitable for z-axis milling

TICN

P	1.1-2.1
M	1.1-2.1
K	1.1-2.1, 2.2, 4.1-4.2
N	1.1-1.4, 2.2-2.7
N	3.1-4.2
S	1.2

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	1.1-1.5, 2.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2	2.1-2.2

DIN 327 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2300		2300C	
$\varnothing d_1$	h_{10}	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z (Flutes)	Dimens.-Code				
e8	16,7	19	29	79	15	–	16	31	2	.0167	●		●	
	17	19	29	79	15	–	16	31	2	.017	●		●	
	17,7	19	29	79	15	–	16	31	2	.0177	●		●	
18	19	19	29	79	15	–	16	31	2	.018	●		●	
	19	19	29	79	15	–	16	31	2	.019	●		●	
	19,7	22	36	88	19	–	20	38	2	.0197	●		●	
20	22	22	36	88	19	–	20	38	2	.020	●		●	
	21,7	22	36	88	19	–	20	38	2	.0217	●		●	
22	22	22	36	88	19	–	20	38	2	.022	●		●	
	23,7	26	42	102	23	44	25	46	2	.0237	●		●	
24	26	26	42	102	23	44	25	46	2	.024	●		●	
	24,7	26	44	102	24	–	25	46	2	.0247	●		●	
25	26	26	44	102	24	–	25	46	2	.025	●		●	
	26	26	44	102	24	–	25	46	2	.026	●		●	
	27,7	26	44	102	24	–	25	46	2	.0277	●		●	
28	26	26	44	102	24	–	25	46	2	.028	●		●	
	30	26	44	102	24	–	25	46	2	.030	●		●	
	31,7	32	49	112	31	–	32	52	2	.0317	●		●	
32	32	32	49	112	31	–	32	52	2	.032	●		●	
	35	32	49	112	31	–	32	52	2	.035	●		●	
36	32	32	49	112	31	–	32	52	2	.036	●		●	

Werkzeug mit glattem Schaft: Bestell-Code 2000/2000C
Tool with straight shank: order code 2000/2000C



TOP-Cut Hartmetall-Langlochfräser
siehe Seite 35

TOP-Cut solid carbide slot drills,
see page 35



TOP-Cut HSS-Langlochfräser
mit 4 Schneiden siehe Seite 266

TOP-Cut HSS slot drills with 4 flutes,
see page 266

- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Langlochfräser mit 2 Schneiden
- Zentrumschneidend
- Mittellange Schneidenlänge
- Universell verwendbar
- Slot drill with 2 flutes
- Centre cutting
- Medium flute length
- Highly versatile

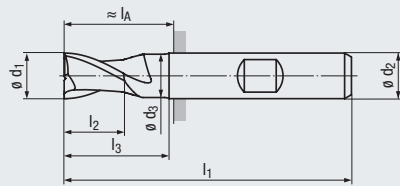
N

HSSE

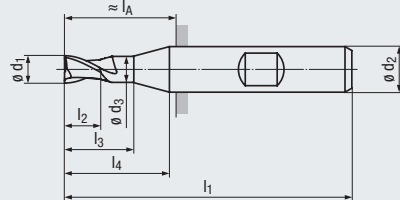
DIN 1835

30°

v_c / f_z



Design l_4 :



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Werkstoffen mit einer Zugfestigkeit bis 1200 N/mm² einsetzbar
- Zur Herstellung von Passfedernuten nach DIN 6885-1

Applications – material (see page 246)

- Applicable in almost all materials with a tensile strength of up to 1200 N/mm²
- For producing keyways acc. DIN 6885-1

P	1.1-2.1
M	1.1-2.1
K	1.1-2.1 2.2
K	4.1-4.2
N	1.1-1.4, 2.2-2.6
N	3.1-4.2

TICN

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.2	3.1-3.2
K	4.1	4.2
N	2.1	1.1-1.5, 2.2-2.7
N		3.1-4.2, 5.2
S		1.1-1.2, 2.1

Lange Ausführung · Long design

Bestell-Code · Order code										2305		2305C	
$\varnothing d_1$ e8 h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code				
2	6	10	54	1,9	16	6	18	2	.002	●		●	
3	8	13	56	2,9	18	6	20	2	.003	●		●	
4	3,5	10	17	5,9	3,4	21	6	23	2	.0035	●		●
4	11	21	63	3,9	25	6	27	2	.004	●		●	
5	4,5	11	22	6,3	4,4	25	6	27	2	.0045	●		●
5	13	27	68	4,9	30	6	32	2	.005	●		●	
6	5,5	13	28	6,8	5,35	30	6	32	2	.0055	●		●
6	13	30	68	5,35	-	6	32	2	.006	●		●	
7	6,5	16	36	8,0	6,35	38	10	40	2	.0065	●		●
7	16	36	80	6,35	38	10	40	2	.007	●		●	
8	7,5	16	36	8,0	7,35	38	10	40	2	.0075	●		●
8	19	44	88	7,35	46	10	48	2	.008	●		●	
9	8,5	19	45	8,8	8,35	46	10	48	2	.0085	●		●
9	19	45	88	8,35	46	10	48	2	.009	●		●	
10	9,5	19	45	8,8	9,35	46	10	48	2	.0095	●		●
10	22	53	95	9,35	-	10	55	2	.010	●		●	
12	11	22	53	10,5	55	12	57	2	.011	●		●	
12	26	63	110	11,5	-	12	65	2	.012	●		●	
13	26	63	110	11,5	-	12	65	2	.013	●		●	
14	26	63	110	11,5	-	12	65	2	.014	●		●	
15	26	63	110	11,5	-	12	65	2	.015	●		●	
16	32	73	123	15	-	16	75	2	.016	●		●	
17	32	73	123	15	-	16	75	2	.017	●		●	
18	32	73	123	15	-	16	75	2	.018	●		●	
19	32	73	123	15	-	16	75	2	.019	●		●	
20	38	89	141	19	-	20	91	2	.020	●		●	
22	38	89	141	19	-	20	91	2	.022	●		●	
24	45	106	166	23	108	25	110	2	.024	●		●	
25	45	108	166	24	-	25	110	2	.025	●		●	
26	45	108	166	24	-	25	110	2	.026	●		●	
28	45	108	166	24	-	25	110	2	.028	●		●	
30	45	108	166	24	-	25	110	2	.030	●		●	
32	53	123	186	31	-	32	126	2	.032	●		●	
34	53	123	186	31	-	32	126	2	.034	●		●	
36	53	123	186	31	-	32	126	2	.036	●		●	

Scharfkantig · Sharp-edged

Werkzeug mit glattem Schaft: Bestell-Code 2005/2005C
 Tool with straight shank: order code 2005/2005C

- Langlochfräser mit 3 Schneiden
- Zentrumschneidend
- Stabile Ausführung mit verkürzter Gesamtlänge
- Universell verwendbar
- Slot drill with 3 flutes
- Centre cutting
- Stable design with shortened overall length
- Highly versatile

N

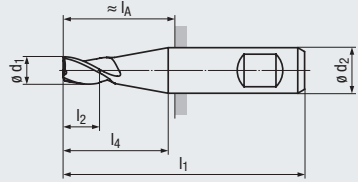
HSSE

≈ **DIN 1835**

B

30°

V_c/f_z
296



Allround

Allround

Product Finder

NR

NF

N

H

WR

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In vielen Werkstoffen mit einer Zugfestigkeit bis 1200 N/mm² einsetzbar

- Besonders für die Bearbeitung von Stahl- und Gusswerkstoffen geeignet

- Zur Herstellung von Passfedernuten nach DIN 6885-1 verwendbar

Applications – material (see page 246)

- Applicable in many materials with a tensile strength of up to 1200 N/mm²

- Very suitable for machining steel and cast materials

- Suitable for producing keyways acc. DIN 6885-1

TICN

P	1.1-2.1	4.1
M	1.1-2.1	1.1-4.1
K	1.1, 2.1	1.2, 2.2
K	4.1-4.2	4.2
N	2.2-2.6, 3.1-4.2	2.1-2.7, 3.1-4.2
N		5.1-5.2
S	1.1-2.2, 2.4	

Extra kurze Ausführung · Extra short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code								2316	2316C
∅ d ₁ e8	l ₂	l ₁	l ₄	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code		
1	2	34	7	6	7	3	.001	●	●
1,5	3	34	7	6	7	3	.0015	●	●
1,8	3	34	7	6	7	3	.0018	●	●
2	4	35	8	6	8	3	.002	●	●
2,3	4	35	8	6	8	3	.0023	●	●
2,5	5	36	9	6	9	3	.0025	●	●
2,8	5	36	9	6	9	3	.0028	●	●
3	5	36	9	6	9	3	.003	●	●
3,3	6	37	10	6	10	3	.0033	●	●
3,5	6	37	10	6	10	3	.0035	●	●
3,8	7	38	12	6	12	3	.0038	●	●
4	7	38	12	6	12	3	.004	●	●
4,3	7	38	12	6	12	3	.0043	●	●
4,5	7	38	12	6	12	3	.0045	●	●
4,8	8	39	13	6	13	3	.0048	●	●
5	8	39	13	6	13	3	.005	●	●
5,3	8	39	13	6	13	3	.0053	●	●
5,5	8	39	13	6	13	3	.0055	●	●
5,75	8	39	13	6	13	3	.00575	●	●
6	8	39	13	6	13	3	.006	●	●
6,5	10	42	16	8	16	3	.0065	●	●
7	10	42	16	8	16	3	.007	●	●
7,5	10	42	16	8	16	3	.0075	●	●
8	11	43	17	8	17	3	.008	●	●
8,5	11	48	18	10	18	3	.0085	●	●
9	11	48	18	10	18	3	.009	●	●
9,5	11	48	18	10	18	3	.0095	●	●
10	13	50	20	10	20	3	.010	●	●

Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code								2317	2317C
∅ d ₁ e8	l ₂	l ₁	l ₄	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code		
1,5	5	36	9	6	9	3	.0015	●	●
2	7	38	11	6	11	3	.002	●	●
2,5	8	39	12	6	12	3	.0025	●	●
3	8	39	12	6	12	3	.003	●	●
3,5	10	41	14	6	14	3	.0035	●	●
4	11	42	16	6	16	3	.004	●	●
4,5	11	42	16	6	16	3	.0045	●	●
5	13	44	18	6	18	3	.005	●	●
5,5	13	44	18	6	18	3	.0055	●	●
6	13	44	18	6	18	3	.006	●	●
6,5	16	48	22	8	22	3	.0065	●	●
7	16	48	22	8	22	3	.007	●	●
7,5	16	48	22	8	22	3	.0075	●	●
8	19	51	25	8	25	3	.008	●	●
8,5	19	56	26	10	26	3	.0085	●	●
9	19	56	26	10	26	3	.009	●	●
9,5	19	56	26	10	26	3	.0095	●	●
10	22	59	29	10	29	3	.010	●	●


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



- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z


- Langlochfräser mit 3 Schneiden
- Zentrumschneidend
- Großer Abmessungsbereich
- Universell verwendbar
- Slot drill with 3 flutes
- Centre cutting
- Wide range of diameters
- Highly versatile

N




HSSE

DIN 1835

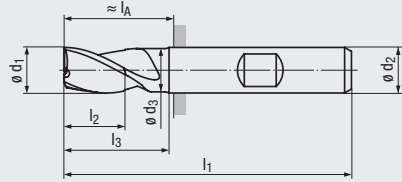


30°

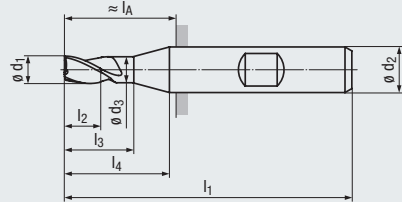


v_c / f_z

296



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zur Herstellung von Passfedernuten nach DIN 6885-1 verwendbar

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- Suitable for producing keyways acc. DIN 6885-1

P 1.1-2.1

M 1.1-2.1

K 1.1-2.1 2.2

K 4.1-4.2

N 1.3-1.4, 2.2-2.6

N 3.1-4.2

TICN

P 1.1-3.1 4.1

M 1.1 2.1-4.1

K 1.1-2.2 3.1-3.2

K 4.1 4.2


N 2.1 1.3-1.5, 2.2-2.7

N 3.1-4.2, 5.2

S 1.1-1.2, 2.1-2.2

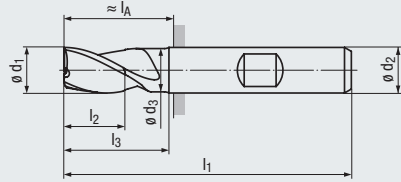
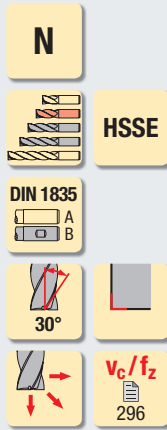
DIN 327 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

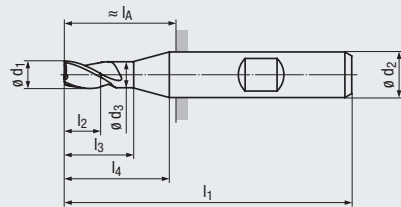
Bestell-Code · Order code											2310		2310C
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z	Dimens.-Code				
e8	h10					h6		(Flutes)					
1,5	3	9	47	–	–	6	11	3	.0015	●		●	
1,8	4	10	48	–	–	6	12	3	.0018	●		●	
2	4	10	48	–	–	6	12	3	.002	●		●	
2,5	5	11	49	–	–	6	13	3	.0025	●		●	
2,8	5	11	49	–	–	6	13	3	.0028	●		●	
3	5	11	49	–	–	6	13	3	.003	●		●	
3,5	6	12	50	–	–	6	14	3	.0035	●		●	
3,8	7	13	51	–	–	6	15	3	.0038	●		●	
4	7	13	51	–	–	6	15	3	.004	●		●	
4,5	7	13	51	–	–	6	15	3	.0045	●		●	
4,8	8	14	52	–	–	6	16	3	.0048	●		●	
5	8	14	52	–	–	6	16	3	.005	●		●	
5,5	8	14	52	–	–	6	16	3	.0055	●		●	
5,75	8	14	52	–	–	6	16	3	.00575	●		●	
6	8	14	52	5,5	–	6	16	3	.006	●		●	
6,5	10	16	60	6	18	10	20	3	.0065	●		●	
6,75	10	16	60	6,5	18	10	20	3	.00675	●		●	
7	10	16	60	6,5	18	10	20	3	.007	●		●	
7,5	10	16	60	7	18	10	20	3	.0075	●		●	
7,75	11	17	61	7,5	19	10	21	3	.00775	●		●	
8	11	17	61	7,5	19	10	21	3	.008	●		●	
8,5	11	18	61	8	19	10	21	3	.0085	●		●	
8,7	11	18	61	8,5	19	10	21	3	.0087	●		●	
9	11	18	61	8,5	19	10	21	3	.009	●		●	
9,5	11	18	61	9	19	10	21	3	.0095	●		●	
9,7	13	21	63	9,5	–	10	23	3	.0097	●		●	
10	13	21	63	9,5	–	10	23	3	.010	●		●	
10,5	13	21	70	10	23	12	25	3	.0105	●		●	
10,7	13	21	70	10,5	23	12	25	3	.0107	●		●	
11	13	21	70	10,5	23	12	25	3	.011	●		●	
11,5	13	21	70	11	23	12	25	3	.0115	●		●	
11,7	16	26	73	11,5	–	12	28	3	.0117	●		●	
12	16	26	73	11,5	–	12	28	3	.012	●		●	
12,7	16	26	73	11,5	–	12	28	3	.0127	●		●	
13	16	26	73	11,5	–	12	28	3	.013	●		●	
13,7	16	26	73	11,5	–	12	28	3	.0137	●		●	
14	16	26	73	11,5	–	12	28	3	.014	●		●	
14,7	16	26	73	11,5	–	12	28	3	.0147	●		●	
15	16	26	73	11,5	–	12	28	3	.015	●		●	
15,7	19	29	79	15	–	16	31	3	.0157	●		●	
16	19	29	79	15	–	16	31	3	.016	●		●	
16,7	19	29	79	15	–	16	31	3	.0167	●		●	
17	19	29	79	15	–	16	31	3	.017	●		●	



- Langlochfräser mit 3 Schneiden
- Zentrumschneidend
- Großer Abmessungsbereich
- Universell verwendbar
- Slot drill with 3 flutes
- Centre cutting
- Wide range of diameters
- Highly versatile



Design I₃:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zur Herstellung von Passfedernuten nach DIN 6885-1 verwendbar

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- Suitable for producing keyways acc. DIN 6885-1

TICN

P	1.1-2.1
M	1.1-2.1
K	1.1-2.1, 2.2
K	4.1-4.2
N	1.3-1.4, 2.2-2.6
N	3.1-4.2

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.2	3.1-3.2
K	4.1	4.2
N	2.1	1.3-1.5, 2.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2, 2.1-2.2	

DIN 327 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code										2310	2310C	
$\varnothing d_1$	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	l_A	Z (Flutes)	Dimens.-Code			
e8	h10					h6						
18	17,7	19	29	79	15	16	31	3	.0177	●	●	
	19	19	29	79	15	16	31	3	.018	●	●	
	19,7	22	36	88	19	20	38	3	.0197	●	●	
20	22	36	88	19	–	20	38	3	.020	●	●	
	21,7	22	36	88	19	20	38	3	.0217	●	●	
22	22	36	88	19	–	20	38	3	.022	●	●	
	23,7	26	42	102	23	44	25	46	3	.0237	●	●
24	26	42	102	23	44	25	46	3	.024	●	●	
	24,7	26	44	102	24	25	46	3	.0247	●	●	
25	26	44	102	24	–	25	46	3	.025	●	●	
	26	26	44	102	24	25	46	3	.026	●	●	
	27,7	26	44	102	24	25	46	3	.0277	●	●	
28	26	44	102	24	–	25	46	3	.028	●	●	
	29,7	26	44	102	24	25	46	3	.0297	●	●	
	30	26	44	102	24	25	46	3	.030	●	●	
	31,7	32	49	112	31	32	52	3	.0317	●	●	
32	32	49	112	31	–	32	52	3	.032	●	●	
	34	32	49	112	31	32	52	3	.034	●	●	
	35	32	49	112	31	32	52	3	.035	●	●	
36	32	49	112	31	–	32	52	3	.036	●	●	

Werkzeug mit glattem Schaft: Bestell-Code 2010/2010C
Tool with straight shank: order code 2010/2010C


- Product Finder
- NR
- NF
- N**
- H
- WR
- W
- V_c / f_z




- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Langlochfräser mit 3 Schneiden
- Zentrumschneidend
- Großer Abmessungsbereich
- Universell verwendbar
- Slot drill with 3 flutes
- Centre cutting
- Wide range of diameters
- Highly versatile


N




HSSE



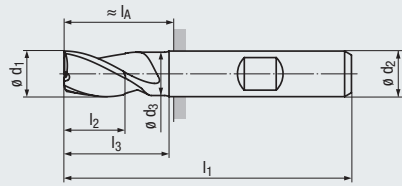
DIN 1835



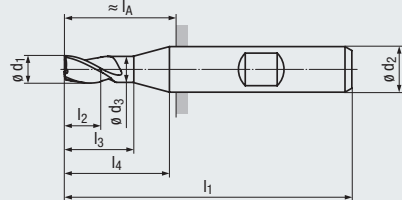
30°



v_c / f_z
297



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zur Herstellung von Passfedernuten nach DIN 6885-1 verwendbar

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- Suitable for producing keyways acc. DIN 6885-1

TICN

P	1.1-2.1
M	1.1-2.1
K	1.1-2.1 2.2
K	4.1-4.2
N	1.3-1.4, 2.2-2.6
N	3.1-4.2

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.2	3.1-3.2
K	4.1	4.2
N	2.1	1.3-1.5, 2.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2, 2.1-2.2	

Mittellange Ausführung · Medium length design

Scharfkantig · Sharp-edged

Bestell-Code · Order code										2345	2345C	
e8	$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code		
2		7	13	51	-	-	6	15	3	.002	●	●
2,5		8	14	52	-	-	6	16	3	.0025	●	●
3		8	14	52	-	-	6	16	3	.003	●	●
	3,5	10	16	54	-	-	6	18	3	.0035	●	●
4		11	17	55	-	-	6	19	3	.004	●	●
	4,5	11	17	55	-	-	6	19	3	.0045	●	●
5		13	19	57	-	-	6	21	3	.005	●	●
	5,5	13	19	57	-	-	6	21	3	.0055	●	●
6		13	19	57	5,5	-	6	21	3	.006	●	●
	6,5	16	22	66	6	24	10	26	3	.0065	●	●
7		16	22	66	6,5	24	10	26	3	.007	●	●
	7,5	16	22	66	7	24	10	26	3	.0075	●	●
8		19	25	69	7,5	27	10	29	3	.008	●	●
	8,5	19	26	69	8	27	10	29	3	.0085	●	●
	9	19	26	69	8,5	27	10	29	3	.009	●	●
	9,5	19	26	69	9	27	10	29	3	.0095	●	●
10		22	30	72	9,5	-	10	32	3	.010	●	●
	10,5	22	30	79	10	32	12	34	3	.0105	●	●
	11	22	30	79	10,5	32	12	34	3	.011	●	●
	11,5	22	30	79	11	32	12	34	3	.0115	●	●
12		26	36	83	11,5	-	12	38	3	.012	●	●
	13	26	36	83	11,5	-	12	38	3	.013	●	●
14		26	36	83	11,5	-	12	38	3	.014	●	●
	15	26	36	83	11,5	-	12	38	3	.015	●	●
	15,5	32	42	92	15	-	16	44	3	.0155	●	●
16		32	42	92	15	-	16	44	3	.016	●	●
	17	32	42	92	15	-	16	44	3	.017	●	●
18		32	42	92	15	-	16	44	3	.018	●	●
	19	32	42	92	15	-	16	44	3	.019	●	●
	19,5	38	52	104	19	-	20	54	3	.0195	●	●
20		38	52	104	19	-	20	54	3	.020	●	●
22		38	52	104	19	-	20	54	3	.022	●	●
24		45	61	121	23	63	25	65	3	.024	●	●
25		45	63	121	24	-	25	65	3	.025	●	●
28		45	63	121	24	-	25	65	3	.028	●	●
	30	45	63	121	24	-	25	65	3	.030	●	●
32		53	70	133	31	-	32	73	3	.032	●	●

Werkzeug mit glattem Schaft: Bestell-Code 2045/2045C
Tool with straight shank: order code 2045/2045C

- Langlochfräser mit 3 Schneiden
- Zentrumschneidend
- Großer Abmessungsbereich
- Mittellange Schneidenlänge
- Universell verwendbar
- Slot drill with 3 flutes
- Centre cutting
- Wide range of diameters
- Medium flute length
- Highly versatile

N

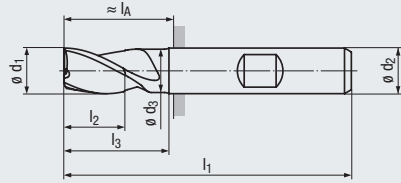
HSSE

DIN 1835

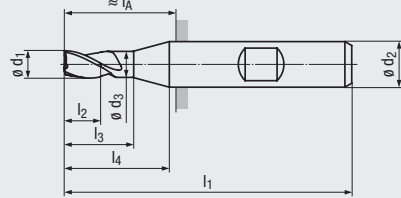
A B

30°

v_c / f_z
298



Design I₄:



Allround



Allround

Product Finder

NR

NF

N

H

WR

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zur Herstellung von Passfedernuten nach DIN 6885-1 verwendbar

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- Suitable for producing keyways acc. DIN 6885-1

		TICN	
P	1.1-2.1	1.1-3.1	4.1
M	1.1-2.1	1.1	2.1-4.1
K	1.1-2.1	1.1-2.2	3.1-3.2
K	4.1-4.2	4.1	4.2
N	1.3-1.4, 2.2-2.6	2.1	1.3-1.5, 2.2-2.7
N	3.1-4.2	N	3.1-4.2, 5.2
		S	1.1-1.2, 2.1

Lange Ausführung · Long design

Scharfkantig · Sharp-edged

Bestell-Code · Order code											2315	2315C
e8	$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code		
3	2,8	8	13	56	2,7	18	6	20	3	.0028	●	●
3		8	13	56	2,9	18	6	20	3	.003	●	●
4	3,8	11	21	63	3,7	25	6	27	3	.0038	●	●
4		11	21	63	3,9	25	6	27	3	.004	●	●
5	4,8	13	27	68	4,7	30	6	32	3	.0048	●	●
5		13	27	68	4,9	30	6	32	3	.005	●	●
6	5,75	13	28	68	5,35	30	6	32	3	.00575	●	●
6		13	30	68	5,35	—	6	32	3	.006	●	●
7		16	36	80	6,35	38	10	40	3	.007	●	●
8	7,75	19	44	88	7,35	46	10	48	3	.00775	●	●
8		19	44	88	7,35	46	10	48	3	.008	●	●
	9	19	45	88	8,35	46	10	48	3	.009	●	●
	9,7	22	53	95	9,35	—	10	55	3	.0097	●	●
10		22	53	95	9,35	—	10	55	3	.010	●	●
	11	22	53	102	10,5	55	12	57	3	.011	●	●
	11,7	26	63	110	11,5	—	12	65	3	.0117	●	●
12		26	63	110	11,5	—	12	65	3	.012	●	●
	13	26	63	110	11,5	—	12	65	3	.013	●	●
	13,7	26	63	110	11,5	—	12	65	3	.0137	●	●
14		26	63	110	11,5	—	12	65	3	.014	●	●
	15	26	63	110	11,5	—	12	65	3	.015	●	●
	15,7	32	73	123	15	—	16	75	3	.0157	●	●
16		32	73	123	15	—	16	75	3	.016	●	●
	17	32	73	123	15	—	16	75	3	.017	●	●
	17,7	32	73	123	15	—	16	75	3	.0177	●	●
18		32	73	123	15	—	16	75	3	.018	●	●
	19	32	73	123	15	—	16	75	3	.019	●	●
	19,7	38	89	141	19	—	20	91	3	.0197	●	●
20		38	89	141	19	—	20	91	3	.020	●	●

Werkzeug mit glattem Schaft: Bestell-Code 2015/2015C
Tool with straight shank: order code 2015/2015C

- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Schlichtfräser mit Wellenprofil in der Spanfläche
- Erzeugt glatte Oberflächen
- Vibrationsmindernde Geometrie
- Schneidstoff aus Pulverstahl
- Finishing end mill with wavy profile on rake face
- Generates smooth surfaces
- Low-vibration geometry
- Powder metal cutting material

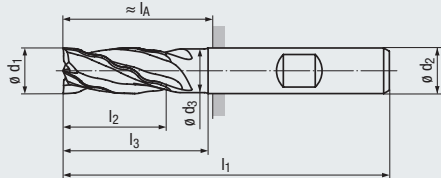
N

HSSE-PM

DIN 1835

30°

v_c / f_z



Inox

Beschichtung · Coating

ALCR

Einsatzgebiete – Material (siehe Seite 246)

Applications – material (see page 246)

- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Schlichtfräsen, insbesondere von Titan und rostfreien Legierungen
- Vorteile bei der Bearbeitung von labilen Werkstücken
- Hohes Zeitspanvolumen möglich

- For materials with a tensile strength of up to 1200 N/mm²
- For finish milling, particularly titanium and stainless alloys
- Advantages in machining delicate workpieces
- Enables high metal removal rates

P	1.1-4.1
M	1.1-2.1 3.1-4.1
K	1.1-4.2
S	1.1-1.2 1.3

DIN 844 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code

1391L

$\varnothing d_1$ k10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code			
12	26	36	83	11,5	12	38	4	.012	●		
16	32	42	92	15	16	44	4	.016	●		
20	38	52	104	19	20	54	4	.020	●		
25	45	63	121	24	25	65	4	.025	●		



- Schlichtfräser
- Erzeugt glatte Oberflächen
- Ungleich geteilte Schneiden reduzieren Vibrationen
- Verbesserte Werkzeugsteifigkeit durch konischen Spanntengrund
- Finishing end mill
- Generates smooth surfaces
- Variable spacing of cutting edges reduces vibrations
- Improved rigidity of tool due to tapered core diameter

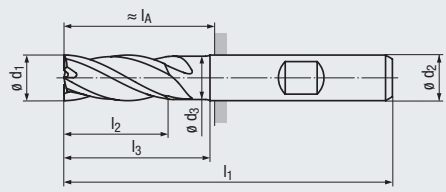
N

HSSE

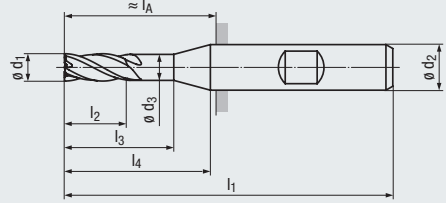
DIN 1835
A
B

30°

v_c/f_z
293



Design I₄:



Allround



Allround

Product Finder

NR

NF

N

H

WR

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Für typische Schlicht-Bearbeitungen

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- For typical finishing applications

ALCR

P	1.1-4.1	5.1
M	1.1	2.1-4.1
K	1.1-2.2	3.1-3.2
K	4.1	4.2
N	2.1	2.2-2.6, 5.2
S	1.1, 2.1-2.2	

ALCR

P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.6, 5.2
S	1.1, 2.1-2.2	

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code									
$\varnothing d_1$ k10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code
6	13	19	57	5,5	–	6	21	4	.006
8	19	25	69	7,5	27	10	29	4	.008
10	22	30	72	9,5	–	10	32	4	.010
12	26	36	83	11,5	–	12	38	4	.012
16	32	42	92	15	–	16	44	4	.016
20	38	52	104	19	–	20	54	4	.020

Scharfkantig · Sharp-edged

1576L	
●	
●	
●	
●	
●	
●	

DIN 844 – Lange Ausführung · Long design

Bestell-Code · Order code									
$\varnothing d_1$ k10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code
6	24	30	68	5,5	–	6	32	4	.006
8	38	44	88	7,5	46	10	48	4	.008
10	45	53	95	9,5	–	10	55	4	.010
12	53	63	110	11,5	–	12	65	4	.012
16	63	73	123	15	–	16	75	4	.016
20	75	89	141	19	–	20	91	4	.020

Scharfkantig · Sharp-edged

1578L	
●	
●	
●	
●	
●	
●	



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

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

- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Multifunktionaler Langlochfräser mit 4 Schneiden
- Zentrumschneidend
- Hohe Vorschübe möglich
- Universell verwendbar
- Multi-functional slot drill with 4 flutes
- Centre cutting
- High feed rates possible
- Highly versatile

N

HSSE

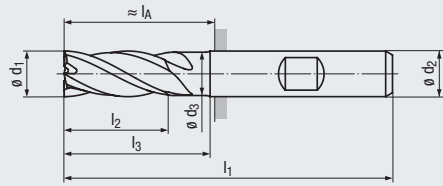
DIN 1835

A B

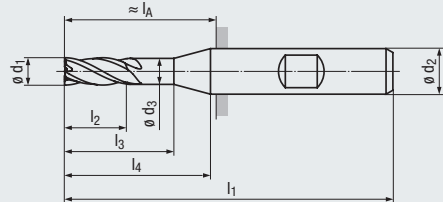
40°

v_c / f_z

296



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zur Herstellung von Passfedernuten nach DIN 6885-1 verwendbar

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- Suitable for producing keyways acc. DIN 6885-1

TICN

P	1.1-2.1
M	1.1-2.1
K	1.1, 2.1 1.2, 2.2
K	4.1-4.2
N	2.2-2.6

P	1.1-2.1	3.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-4.2
N	2.1-2.3	2.4-2.7, 5.2
S	1.1	1.2, 2.1-2.2

Extra kurze Ausführung · Extra short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code

1329

1329C

$\varnothing d_1$ e8	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code	1329	1329C
6	8	14	52	5,5	—	6	16	4	.006	●	●
8	11	17	61	7,5	19	10	21	4	.008	●	●
10	13	21	63	9,5	—	10	23	4	.010	●	●
12	16	26	73	11,5	—	12	28	4	.012	●	●
14	16	26	73	11,5	—	12	28	4	.014	●	●
16	19	29	79	15	—	16	31	4	.016	●	●
18	19	29	79	15	—	16	31	4	.018	●	●
20	22	36	88	19	—	20	38	4	.020	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1029/1029C
Tool with straight shank: order code 1029/1029C



- Schlichtfräser
- Erzeugt glatte Oberflächen
- Bis ø 28 mm zentrumschneidend
- Großer Abmessungsbereich
- 4 Baulängen verfügbar
- Universell verwendbar
- Finishing end mill
- Generates smooth surfaces
- Centre cutting of up to 28 mm dia.
- Wide range of diameters
- 4 lengths available
- Highly versatile

N

HSSE

DIN 1835

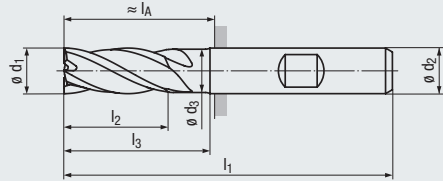
A B

30°

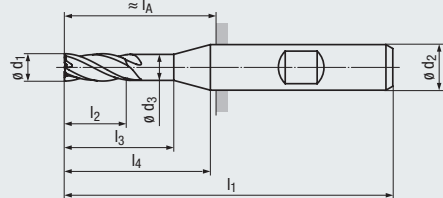
ø 2 - 28 ø 29 - 50

V_c / f_z

294



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Für typische Schlicht-Bearbeitungen

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- For typical finishing applications

TICN

P 1.1-2.1

M 1.1-2.1

K 1.1 1.2-2.2, 4.1-4.2

N 2.2-2.3, 2.6

P 1.1-3.1 4.1-5.1

M 1.1 2.1-4.1

K 1.1-2.1 2.2-3.2

K 4.1 4.2

N 2.1 2.2-2.6, 5.2

S 1.1, 2.1-2.2

DIN 844 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code										1311	1311C
ø d ₁ k10	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code		
2	7	13	51	-	-	6	15	4	.002	●	●
2,5	8	14	52	-	-	6	16	4	.0025	●	●
3	8	14	52	-	-	6	16	4	.003	●	●
3,5	10	16	54	-	-	6	18	4	.0035	●	●
4	11	17	55	-	-	6	19	4	.004	●	●
4,5	11	17	55	-	-	6	19	4	.0045	●	●
5	13	19	57	-	-	6	21	4	.005	●	●
5,5	13	19	57	-	-	6	21	4	.0055	●	●
6	13	19	57	5,5	-	6	21	4	.006	●	●
6,5	16	22	66	6	24	10	26	4	.0065	●	●
7	16	22	66	6,5	24	10	26	4	.007	●	●
7,5	16	22	66	7	24	10	26	4	.0075	●	●
8	19	25	69	7,5	27	10	29	4	.008	●	●
8,5	19	26	69	8	27	10	29	4	.0085	●	●
9	19	26	69	8,5	27	10	29	4	.009	●	●
9,5	19	26	69	9	27	10	29	4	.0095	●	●
10	22	30	72	9,5	-	10	32	4	.010	●	●
10,5	22	30	79	10	32	12	34	4	.0105	●	●
11	22	30	79	10,5	32	12	34	4	.011	●	●
11,5	22	30	79	11	32	12	34	4	.0115	●	●
12	26	36	83	11,5	-	12	38	4	.012	●	●
13	26	36	83	11,5	-	12	38	4	.013	●	●
14	26	36	83	11,5	-	12	38	4	.014	●	●
15	26	36	83	11,5	-	12	38	4	.015	●	●
16	32	42	92	15	-	16	44	4	.016	●	●
17	32	42	92	15	-	16	44	4	.017	●	●
18	32	42	92	15	-	16	44	4	.018	●	●
19	32	42	92	15	-	16	44	4	.019	●	●
20	38	52	104	19	-	20	54	4	.020	●	●
21	38	52	104	19	-	20	54	5	.021	●	●
22	38	52	104	19	-	20	54	5	.022	●	●
23	38	52	104	19	-	20	54	5	.023	●	●
24	45	61	121	23	63	25	65	5	.024	●	●
25	45	63	121	24	-	25	65	5	.025	●	●
26	45	63	121	24	-	25	65	5	.026	●	●
27	45	63	121	24	-	25	65	5	.027	●	●
28	45	63	121	24	-	25	65	5	.028	●	●
29	45	63	121	24	-	25	65	5	.029	●	●
30	45	63	121	24	-	25	65	5	.030	●	●
32	53	70	133	31	-	32	73	6	.032	●	●
36	53	70	133	31	-	32	73	6	.036	●	●
40	63	80	155	38	-	40	85	6	.040	●	●
45	63	80	155	38	-	40	85	8	.045	●	●
50	75	95	177	48	-	50	97	8	.050	●	●

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

Werkzeug mit glattem Schaft: Bestell-Code 1011/1011C
Tool with straight shank: order code 1011/1011C



Product Finder

NR

NF

N

H

WR

W

V_c / f_z



- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Schlichtfräser
- Erzeugt glatte Oberflächen
- Zentrumschneidend
- 4 Baulängen verfügbar
- Universell verwendbar
- Finishing end mill
- Generates smooth surfaces
- Centre cutting
- 4 lengths available
- Highly versatile

N

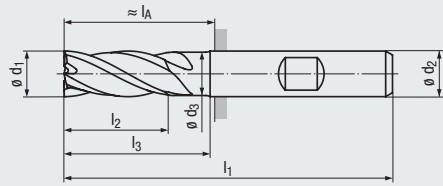
HSSE

DIN 1835

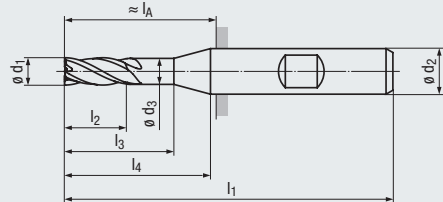
30°

KB x 45°

v_c / f_z
294



Design l_4 :



Allround



Allround

Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 246)** Applications – material (see page 246)
- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
 - Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
 - Für typische Schlicht-Bearbeitungen
 - For almost all ferrous materials and non-ferrous metals
 - For materials with a tensile strength of up to 1400 N/mm²
 - For typical finishing applications

TICN

P	1.1-2.1		P	1.1-3.1	4.1-5.1
M	1.1-2.1		M	1.1	2.1-4.1
K	1.1	1.2-2.2, 4.1-4.2	K	1.1-2.1	2.2-3.2
N	2.2-2.3, 2.6		K	4.1	4.2
			N	2.1	2.2-2.6, 5.2
			S	1.1-1.2, 2.1-2.2	

Mittellange Ausführung · Medium length design

Bestell-Code · Order code										1318	1318C	
$\varnothing d_1$ k10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	KB	Z (Flutes)	Dimens.- Code		
8	28	34	78	7,5	36	10	38	0,12	4	.008	●	●
10	34	42	84	9,5	—	10	44	0,2	4	.010	●	●
12	40	50	97	11,5	—	12	52	0,2	4	.012	●	●
14	40	50	97	11,5	—	12	52	0,2	4	.014	●	●
16	48	58	108	15	—	16	60	0,2	4	.016	●	●
18	48	58	108	15	—	16	60	0,2	4	.018	●	●
20	56	70	122	19	—	20	72	0,3	4	.020	●	●
25	68	86	144	24	—	25	88	0,3	5	.025	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1018/1018C
Tool with straight shank: order code 1018/1018C



- Schlichtfräser
- Erzeugt glatte Oberflächen
- Bis \varnothing 28 mm zentrumschneidend
- Großer Abmessungsbereich
- 4 Baulängen verfügbar
- Universell verwendbar
- Finishing end mill
- Generates smooth surfaces
- Centre cutting of up to 28 mm dia.
- Wide range of diameters
- 4 lengths available
- Highly versatile

N

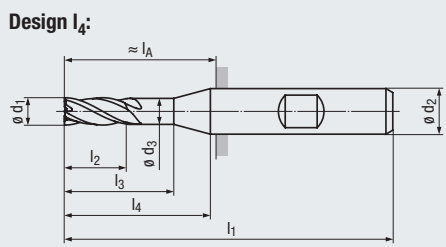
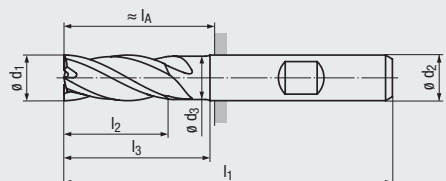
HSSE

DIN 1835
A
B

30°

\varnothing 3 - 28 \varnothing 30 - 50

v_c / f_z
295



Allround



Allround

Product Finder

NR

NF

N

H

WR

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Für typische Schlicht-Bearbeitungen

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- For typical finishing applications

TICN

P 1.1-2.1

M 1.1

K 1.1 1.2-2.2, 4.1-4.2

N 2.2-2.3, 2.6

P 1.1-3.1 4.1-5.1

M 1.1 2.1-4.1

K 1.1-2.1 2.2-3.2

K 4.1 4.2

N 2.1 2.2-2.6, 5.2

S 1.1, 2.1-2.2

DIN 844 – Lange Ausführung · Long design

Scharfkantig · Sharp-edged

Bestell-Code · Order code										1306	1306C
\varnothing d ₁ k10	l ₂	l ₃	l ₁	\varnothing d ₃	l ₄	\varnothing d ₂ h6	l _A 	Z (Flutes)	Dimens.-Code		
3	12	18	56	-	-	6	20	4	.003	●	●
3,5	15	21	59	-	-	6	23	4	.0035	●	●
4	19	25	63	-	-	6	27	4	.004	●	●
4,5	19	25	63	-	-	6	27	4	.0045	●	●
5	24	30	68	-	-	6	32	4	.005	●	●
6	24	30	68	5,5	-	6	32	4	.006	●	●
7	30	36	80	6,5	38	10	40	4	.007	●	●
8	38	44	88	7,5	46	10	48	4	.008	●	●
9	38	45	88	8,5	46	10	48	4	.009	●	●
10	45	53	95	9,5	-	10	55	4	.010	●	●
11	45	53	102	10,5	55	12	57	4	.011	●	●
12	53	63	110	11,5	-	12	65	4	.012	●	●
13	53	63	110	11,5	-	12	65	4	.013	●	●
14	53	63	110	11,5	-	12	65	4	.014	●	●
15	53	63	110	11,5	-	12	65	4	.015	●	●
16	63	73	123	15	-	16	75	4	.016	●	●
17	63	73	123	15	-	16	75	4	.017	●	●
18	63	73	123	15	-	16	75	4	.018	●	●
20	75	89	141	19	-	20	91	4	.020	●	●
22	75	89	141	19	-	20	91	5	.022	●	●
24	90	106	166	23	108	25	110	5	.024	●	●
25	90	108	166	24	-	25	110	5	.025	●	●
26	90	108	166	24	-	25	110	5	.026	●	●
28	90	108	166	24	-	25	110	5	.028	●	●
30	90	108	166	24	-	25	110	5	.030	●	●
32	106	123	186	31	-	32	126	6	.032	●	●
36	106	123	186	31	-	32	126	6	.036	●	●
40	125	142	217	38	-	40	147	6	.040	●	●
45	125	142	217	38	-	40	147	8	.045	●	●
50	150	172	252	48	-	50	172	8	.050	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1006/1006C
Tool with straight shank: order code 1006/1006C

Neuentwickelte HSS-Schlichtfräser
siehe Seite 265

Newly developed HSS finishing end mills,
see page 265

- Product Finder
- NR
- NF
- N**
- HR
- WR
- W
- v_c / f_z

- Schliffträser
- Erzeugt glatte Oberflächen
- Bis \varnothing 28 mm zentrumschneidend
- 4 Baulängen verfügbar
- Universell verwendbar
- Finishing end mill
- Generates smooth surfaces
- Centre cutting of up to 28 mm dia.
- 4 lengths available
- Highly versatile

N

HSSE

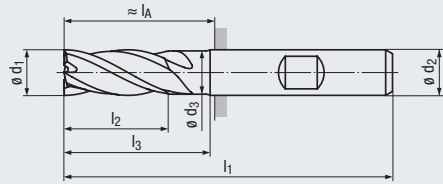
DIN 1835

A B

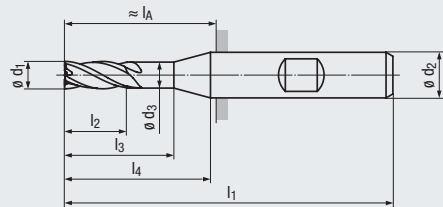
30°

$\varnothing 6 - 28$ $\varnothing 32 - 40$

v_c / f_z
295



Design I₄:



Allround



Allround

Beschichtung - Coating

Einsatzgebiete – Material (siehe Seite 246) Applications – material (see page 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Für Schliff-Bearbeitungen mit großer axialer Zustellung
- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- For finishing applications with a high axial depth of cut

TICN

P	1.1-2.1	
M	1.1	
K	1.1	1.2-2.2, 4.1-4.2
N	2.2-2.3, 2.6	
P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-1.2	2.1-3.2
K	4.1	4.2
N	2.1	2.2-2.6, 5.1-5.2
S		1.1, 2.1

Extra lange Ausführung · Extra long design

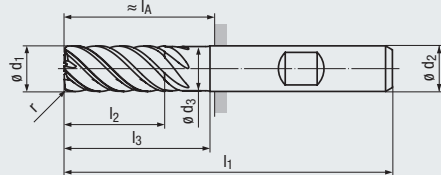
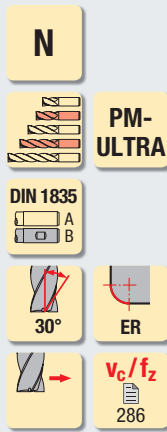
Scharfkantig · Sharp-edged

Bestell-Code · Order code										1316		1316C	
$\varnothing d_1$ k10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A A B	Z (Flutes)	Dimens.- Code				
6	56	62	100	5,5	–	6	64	4	.006	●		●	
8	70	73	115	7,5	73	10	75	4	.008	●		●	
10	75	79	121	9,5	–	10	81	4	.010	●		●	
12	85	85	130	–	–	12	85	4	.012	●		●	
14	85	85	130	–	–	12	85	4	.014	●		●	
16	90	95	145	15	–	16	97	4	.016	●		●	
18	100	110	160	15	–	16	112	5	.018	●		●	
20	110	128	180	19	–	20	130	5	.020	●		●	
22	110	128	180	19	–	20	130	5	.022	●		●	
25	125	142	200	24	–	25	144	6	.025	●		●	
28	140	147	205	24	–	25	149	6	.028	●		●	
32	160	167	230	31	–	32	170	6	.032	●		●	
40	180	197	260	31	–	32	200	8	.040	●		●	



- Hochleistungs-Schlichtfräser
- Vielzahnig
- Vibrationsarme Bearbeitung erzeugt glatte Oberflächen
- Neuentwickelte Geometrie mit ungleich geteilten Schneiden
- Schneidstoff aus Pulverstahl „PM-ULTRA“

- High-performance finishing end mill
- Multi-tooth design
- Low-vibration machining generates smooth surfaces
- Newly developed geometry with variable spacing of cutting edges
- Cutting material made of powder metal "PM-ULTRA"



Inox



Inox

- Product Finder
- NR
 - NF
 - N**
 - H
 - WR
 - W
 - Vc / fz

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Für Materialien mit einer Zugfestigkeit bis 1300 N/mm²
- Besonders zum Schlichtfräsen von Titan und rostfreien Legierungen geeignet

Applications – material (see page 246)

- For materials with a tensile strength of up to 1300 N/mm²
- Especially suitable for finishing titanium and corrosion resistant alloys

TIALN

TIALN

M	1.1-2.1	3.1-4.1
S	1.1-1.2	1.3

M	1.1-2.1	3.1-4.1
S	1.1-1.2	1.3

DIN 844 – Kurze Ausführung · Short design

Eckenradius · Corner radius

Bestell-Code · Order code										1365A	
∅ d ₁ h8	r ±0,05	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.-Code		
25	2	45	63	121	24	25	65	8	.025020	●	
25	4	45	63	121	24	25	65	8	.025040	●	
32	2	53	70	133	31	32	73	10	.032020	●	
32	4	53	70	133	31	32	73	10	.032040	●	

DIN 844 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code										1390A	
∅ d ₁ h8	r ±0,05	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.-Code		
25	2	90	108	166	24	25	110	8	.025020	●	
25	4	90	108	166	24	25	110	8	.025040	●	
32	2	106	123	186	31	32	126	10	.032020	●	
32	4	106	123	186	31	32	126	10	.032040	●	

Werkzeug mit glattem Schaft: Bestell-Code 1065A (kurze Ausführung) und 1090A (lange Ausführung)
Tool with straight shank: order code 1065A (short design) and 1090A (long design)

PM-ULTRA

Eigenschaften des neuen Schneidstoffes:

- Stahl ohne Kohlenstoffgehalt
- Mischung aus Kobalt, Molybdän und Eisen, ohne Verlust der Zähigkeit
- Hohe Warmfestigkeit des Schneidstoffes
- Verbindet die Eigenschaften von HSS und Hartmetall
- Erhöhung der Schnittgeschwindigkeit um bis zu 30-50% im Vergleich zu HSSE-PM
- Problemloses Be- und Entschichten der Werkzeuge möglich
- Kosteneinsparung durch Reduzierung der Bearbeitungszeiten auf Grund höherer Schnittgeschwindigkeiten
- Längere Standzeit des Schneidstoffes

PM-ULTRA

Characteristics of the new cutting material:

- Carbon-free material
- Cobalt, molybdenum, iron alloy, with outstanding toughness
- High heat resistant cutting material
- Combines the characteristics of HSS and carbide
- Up to 30-50 % higher cutting speed in comparison with HSSE-PM
- Easy tool coating and decoating
- Increased cutting speeds reduce machining time and save cost
- Cutting material with longer life



- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Schrufffräser mit feinen, runden Spanteilern
- Erzeugt Oberflächenmarkierungen
- Zentrumschneidend
- Schneidstoff aus Pulverstahl
- Verbesserte Werkzeugsteifigkeit durch konischen Spannutengrund
- Roughing end mill with fine, round chip breakers
- Generates milling marks
- Centre cutting
- Powder metal cutting material
- Improved rigidity of tool due to tapered core diameter

HR

fein
fine

HSSE-PM

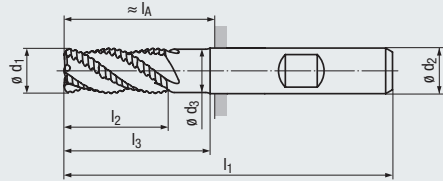
DIN 1835

30°

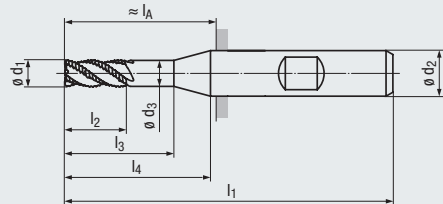
45°

v_c / f_z

289



Design I₄:



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Mit ALCR-Beschichtung gut geeignet für hochlegierte Materialien

Applications – material (see page 246)

- For materials with a tensile strength of up to 1400 N/mm²
- With ALCR coating suitable for high-alloyed materials

ALCR

P	2.1-4.1	1.1, 5.1
M	1.1	2.1-4.1
K	1.1-4.2	
N	2.1	2.2-2.7

ALCR

P	2.1-4.1	1.1, 5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.7

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code										1572L		
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code			
6	13	19	57	5,5	–	6	21	4	.006	●		
8	19	25	69	7,5	27	10	29	4	.008	●		
10	22	30	72	9,5	–	10	32	4	.010	●		
12	26	36	83	11,5	–	12	38	4	.012	●		
16	32	42	92	15	–	16	44	4	.016	●		
20	38	52	104	19	–	20	54	4	.020	●		

DIN 844 – Lange Ausführung · Long design

Bestell-Code · Order code											1574L	
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code			
6	24	30	68	5,5	–	6	32	4	.006		●	
8	38	44	88	7,5	46	10	48	4	.008		●	
10	45	53	95	9,5	–	10	55	4	.010		●	
12	53	63	110	11,5	–	12	65	4	.012		●	
16	63	73	123	15	–	16	75	4	.016		●	
20	75	89	141	19	–	20	91	4	.020		●	



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- Schruppfräser mit feinen, runden Spanteilern
 - Erzeugt Oberflächenmarkierungen
 - Bis \varnothing 28 mm zentrumschneidend
 - Großer Abmessungsbereich
 - 5 Baulängen verfügbar
 - Universell verwendbar
- Roughing end mill with fine, round chip breakers
 - Generates milling marks
 - Centre cutting of up to 28 mm dia.
 - Wide range of diameters
 - 5 lengths available
 - Highly versatile

HR fein fine

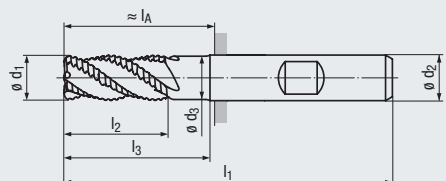
HSSE

DIN 1835
A B

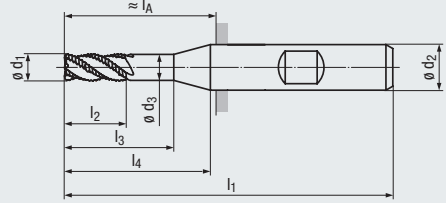
30° **45°**

$\varnothing 4 - 28$ $\varnothing 30 - 50$

v_c / f_z
290



Design I₄:



Allround



Allround

- Product Finder
- NR
 - NF
 - N
 - HR**
 - WR
 - W
 - v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²

TICN

P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.6, 5.2
S	1.1-1.2, 2.1-2.2	

TICN

P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.6, 5.2
S	1.1-1.2, 2.1-2.2	

Extra kurze Ausführung · Extra short design

Bestell-Code · Order code										1351C		
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code			
6	8	14	52	5,5	–	6	16	4	.006	●		
8	11	17	61	7,5	19	10	21	4	.008	●		
10	13	21	63	9,5	–	10	23	4	.010	●		
12	16	26	73	11,5	–	12	28	4	.012	●		
14	16	26	73	11,5	–	12	28	4	.014	●		
16	19	29	79	15	–	16	31	4	.016	●		
18	19	29	79	15	–	16	31	4	.018	●		
20	22	36	88	19	–	20	38	4	.020	●		

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code												1381C	
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
4	11	17	55	–	–	6	19	3	.004			●	
5	13	19	57	–	–	6	21	3	.005			●	
6	13	19	57	5,5	–	6	21	4	.006			●	
8	19	25	69	7,5	27	10	29	4	.008			●	
10	22	30	72	9,5	–	10	32	4	.010			●	
12	26	36	83	11,5	–	12	38	4	.012			●	
14	26	36	83	11,5	–	12	38	4	.014			●	
16	32	42	92	15	–	16	44	4	.016			●	
18	32	42	92	15	–	16	44	4	.018			●	
20	38	52	104	19	–	20	54	4	.020			●	
22	38	52	104	19	–	20	54	4	.022			●	
24	45	61	121	23	63	25	65	4	.024			●	
25	45	63	121	24	–	25	65	4	.025			●	
28	45	63	121	24	–	25	65	5	.028			●	
30	45	63	121	24	–	25	65	5	.030			●	
32	53	70	133	31	–	32	73	6	.032			●	
36	53	70	133	31	–	32	73	6	.036			●	
40	63	80	155	38	–	40	85	6	.040			●	
45	63	80	155	38	–	40	85	6	.045			●	
50	75	95	177	48	–	50	97	8	.050			●	

Werkzeug mit glattem Schaft: Bestell-Code 1051C (extra kurze Ausführung) und 1081C (kurze Ausführung)
Tool with straight shank: order code 1051C (extra short design) and 1081C (short design)



- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Schruppfräser mit feinen, runden Spanteilern
- Erzeugt Oberflächenmarkierungen
- Bis $\varnothing 28$ mm zentrumschneidend
- 5 Baulängen verfügbar
- Universell verwendbar
- Roughing end mill with fine, round chip breakers
- Generates milling marks
- Centre cutting of up to 28 mm dia.
- 5 lengths available
- Highly versatile

HR

fein
fine

HSSE

DIN 1835

A
B

30°

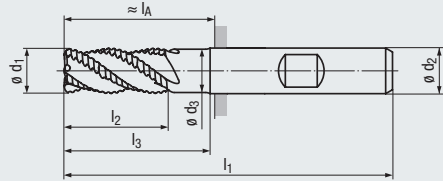
45°

$\varnothing 6 - 28$

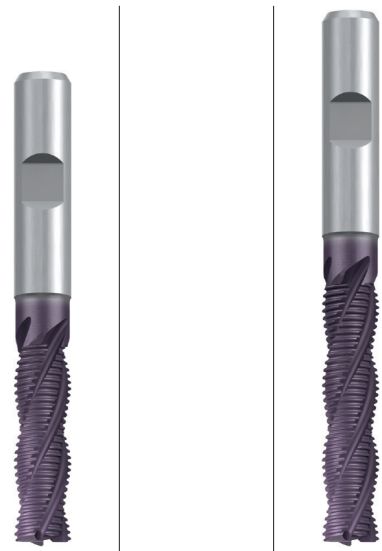
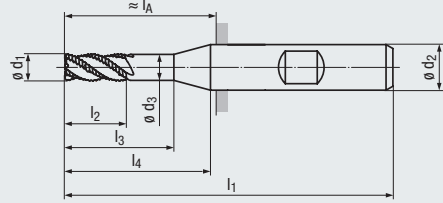
$\varnothing 30 - 40$

v_c / f_z

290 - 291



Design I₄:



Allround

Allround

Beschichtung · Coating

TICN

TICN

Einsatzgebiete – Material (siehe Seite 246)

Applications – material (see page 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²

P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.7, 5.2
S	1.1-1.2, 2.1-2.2	

P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.6, 5.2
S	1.1-1.2, 2.1-2.2	

Mittellange Ausführung · Medium length design

Bestell-Code · Order code										1355C		
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code			
8	28	34	78	7,5	36	10	38	4	.008	●		
10	34	42	84	9,5	—	10	44	4	.010	●		
12	40	50	97	11,5	—	12	52	4	.012	●		
14	40	50	97	11,5	—	12	52	4	.014	●		
16	48	58	108	15	—	16	60	4	.016	●		
18	48	58	108	15	—	16	60	4	.018	●		
20	56	70	122	19	—	20	72	4	.020	●		
22	56	70	122	19	—	20	72	4	.022	●		
25	68	86	144	24	—	25	88	4	.025	●		

DIN 844 – Lange Ausführung · Long design

Bestell-Code · Order code											1386C	
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A	Z (Flutes)	Dimens.- Code			
6	24	30	68	5,5	—	6	32	4	.006		●	
8	38	44	88	7,5	46	10	48	4	.008		●	
10	45	53	95	9,5	—	10	55	4	.010		●	
12	53	63	110	11,5	—	12	65	4	.012		●	
14	53	63	110	11,5	—	12	65	4	.014		●	
16	63	73	123	15	—	16	75	4	.016		●	
18	63	73	123	15	—	16	75	4	.018		●	
20	75	89	141	19	—	20	91	4	.020		●	
22	75	89	141	19	—	20	91	4	.022		●	
25	90	108	166	24	—	25	110	4	.025		●	
26	90	108	166	24	—	25	110	5	.026		●	
28	90	108	166	24	—	25	110	5	.028		●	
30	90	108	166	24	—	25	110	5	.030		●	
32	106	123	186	31	—	32	126	6	.032		●	
36	106	123	186	31	—	32	126	6	.036		●	
40	125	142	217	38	—	40	147	6	.040		●	

Werkzeug mit glattem Schaft: Bestell-Code 1055C (mittellange Ausführung) und 1086C (lange Ausführung)
 Tool with straight shank: order code 1055C (medium length design) and 1086C (long design)

- Schrufffräser mit feinen, runden Spanteilern
- Erzeugt Oberflächenmarkierungen
- Zentrumschneidend
- 5 Baulängen verfügbar
- Universell verwendbar

- Roughing end mill with fine, round chip breakers
- Generates milling marks
- Centre cutting
- 5 lengths available
- Highly versatile

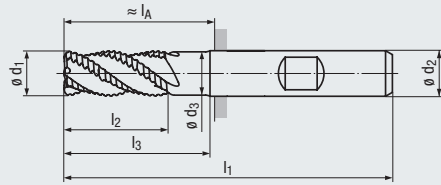
HR **fein**
fine

HSSE

DIN 1835
A B

30° **45°**

V_c/f_z
291



Allround

- Product Finder
- NR
 - NF
 - N
 - HR**
 - WR
 - W
 - V_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Für Schruff-Bearbeitungen mit großer axialer Zustellung

Applications – material (see page 246)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- For roughing applications with high axial depth of cut

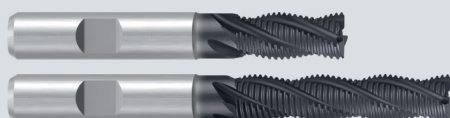
TICN

P	1.1-3.1	4.1-5.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1	2.2-2.7, 5.2
S		1.1-1.2, 2.1

Extra lange Ausführung · Extra long design

Bestell-Code · Order code									1359C			
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
10	62	70	112	9,5	10	72	4	.010	●			
12	78	88	135	11,5	12	90	4	.012	●			
16	95	105	155	15	16	107	4	.016	●			
20	120	134	186	19	20	136	4	.020	●			
25	150	168	226	24	25	170	4	.025	●			
32	180	197	260	31	32	200	6	.032	●			

Werkzeug mit glattem Schaft: Bestell-Code 1059C
Tool with straight shank: order code 1059C



Neuentwickelte HSS-Schrufffräser
siehe Seite 272

Newly developed HSS roughing end mills,
see page 272

- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Schruppfräser mit feinen, runden Spanteilern
- Erzeugt Oberflächenmarkierungen
- Zentrumschneidend
- Schneidstoff aus Pulverstahl
- Roughing end mill with fine, round chip breakers
- Generates milling marks
- Centre cutting
- Powder metal cutting material

HR

fein
fine

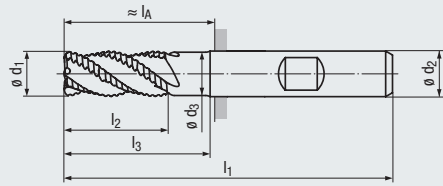
HSSE-PM

DIN 1835

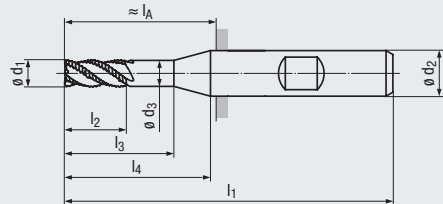
30°

45°

v_c / f_z
290



Design I₄:



Inox



Inox

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Gut geeignet für hochlegierte Materialien

Applications – material (see page 246)

- For materials with a tensile strength of up to 1400 N/mm²
- Suitable for high-alloyed materials

TICN

P	2.1-4.1	1.1, 5.1
M	1.1	2.1-4.1
K	1.1-2.2	3.1-3.2
K	4.1	4.2
N		2.1-2.7
S	1.1	1.2-2.2, 2.4

TICN

P	2.1-4.1	1.1, 5.1
M	1.1	2.1-4.1
K	1.1-2.2	3.1-3.2
K	4.1	4.2
N		2.1-2.7
S	1.1	1.2-2.2

Extra kurze Ausführung · Extra short design

Bestell-Code · Order code

$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code	1354C			
8	11	17	61	7,5	19	10	21	4	.008	●			
10	13	21	63	9,5	—	10	23	4	.010	●			
12	16	26	73	11,5	—	12	28	4	.012	●			
14	16	26	73	11,5	—	12	28	4	.014	●			
16	19	29	79	15	—	16	31	4	.016	●			
18	19	29	79	15	—	16	31	4	.018	●			
20	22	36	88	19	—	20	38	4	.020	●			
22	22	36	88	19	—	20	38	4	.022	●			
25	26	44	102	24	—	25	46	4	.025	●			
28	26	44	102	24	—	25	46	5	.028	●			
32	32	49	112	31	—	32	52	6	.032	●			

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code

$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code		1353C		
6	13	19	57	5,5	—	6	21	4	.006		●		
8	19	25	69	7,5	27	10	29	4	.008		●		
10	22	30	72	9,5	—	10	32	4	.010		●		
12	26	36	83	11,5	—	12	38	4	.012		●		
14	26	36	83	11,5	—	12	38	4	.014		●		
16	32	42	92	15	—	16	44	4	.016		●		
18	32	42	92	15	—	16	44	4	.018		●		
20	38	52	104	19	—	20	54	4	.020		●		
22	38	52	104	19	—	20	54	4	.022		●		
25	45	63	121	24	—	25	65	4	.025		●		
25	45	63	121	24	—	25	65	5	.025005		●		
28	45	63	121	24	—	25	65	5	.028		●		
32	53	70	133	31	—	32	73	6	.032		●		

Werkzeug mit glattem Schaft: Bestell-Code 1054C (extra kurze Ausführung) und 1053C (kurze Ausführung)
 Tool with straight shank: order code 1054C (extra short design) and 1053C (short design)

- Hochleistungs-Schrupfräser mit asymmetrischen Spanteilern
- Erzeugt Oberflächenmarkierungen
- Neuentwickelte Geometrie
- Zentrumschneidend
- Schneidstoff aus Pulverstahl
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Zahlreiche Kühlkanal-Austritte
- Baumaßergänzung zu TiNox-Cut Schrupschichtfräsern aus Hartmetall

- High-performance roughing end mill with asymmetrical chip breakers
- Generates milling marks
- Newly developed geometry
- Centre cutting
- Powder metal cutting material
- Internal coolant supply, radial and axial exit (ICRA)
- Numerous coolant outlet channels
- These HSS end mill are an extension of the solid carbide TiNox-Cut line

HR asymmetr.

ICRA

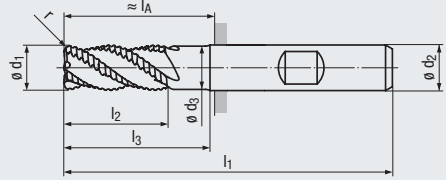
HSSE-PM

DIN 1835

40°

ER

V_c / f_z
284



Inox



Inox

Product Finder

NR

NF

N

HR

WR

W

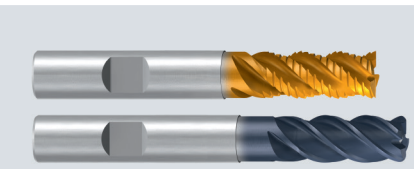
V_c / f_z

Beschichtung · Coating	TIALCN	TIALCN
Einsatzgebiete – Material (siehe Seite 246)	M 1.1-2.1 3.1-4.1	M 1.1-2.1 3.1-4.1
Applications – material (see page 246)	S 1.1-1.2 1.3	S 1.1-1.2 1.3

DIN 844 – Kurze Ausführung · Short design	Eckenradius · Corner radius																																																																																												
Bestell-Code · Order code	1395WZ																																																																																												
<table border="1"> <thead> <tr> <th>∅ d₁ k10</th> <th>r</th> <th>l₂</th> <th>l₃</th> <th>l₁</th> <th>∅ d₃</th> <th>∅ d₂ h6</th> <th>l_A</th> <th>Z (Flutes)</th> <th>Dimens.- Code</th> </tr> </thead> <tbody> <tr><td>16</td><td>2</td><td>32</td><td>42</td><td>92</td><td>15</td><td>16</td><td>44</td><td>4</td><td>.016020</td></tr> <tr><td>16</td><td>4</td><td>32</td><td>42</td><td>92</td><td>15</td><td>16</td><td>44</td><td>4</td><td>.016040</td></tr> <tr><td>20</td><td>2</td><td>38</td><td>52</td><td>104</td><td>19</td><td>20</td><td>54</td><td>4</td><td>.020020</td></tr> <tr><td>20</td><td>4</td><td>38</td><td>52</td><td>104</td><td>19</td><td>20</td><td>54</td><td>4</td><td>.020040</td></tr> <tr><td>25</td><td>2</td><td>45</td><td>63</td><td>121</td><td>24</td><td>25</td><td>65</td><td>5</td><td>.025020</td></tr> <tr><td>25</td><td>4</td><td>45</td><td>63</td><td>121</td><td>24</td><td>25</td><td>65</td><td>5</td><td>.025040</td></tr> <tr><td>32</td><td>2</td><td>53</td><td>70</td><td>133</td><td>31</td><td>32</td><td>73</td><td>6</td><td>.032020</td></tr> <tr><td>32</td><td>4</td><td>53</td><td>70</td><td>133</td><td>31</td><td>32</td><td>73</td><td>6</td><td>.032040</td></tr> </tbody> </table>	∅ d ₁ k10	r	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code	16	2	32	42	92	15	16	44	4	.016020	16	4	32	42	92	15	16	44	4	.016040	20	2	38	52	104	19	20	54	4	.020020	20	4	38	52	104	19	20	54	4	.020040	25	2	45	63	121	24	25	65	5	.025020	25	4	45	63	121	24	25	65	5	.025040	32	2	53	70	133	31	32	73	6	.032020	32	4	53	70	133	31	32	73	6	.032040			
∅ d ₁ k10	r	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code																																																																																				
16	2	32	42	92	15	16	44	4	.016020																																																																																				
16	4	32	42	92	15	16	44	4	.016040																																																																																				
20	2	38	52	104	19	20	54	4	.020020																																																																																				
20	4	38	52	104	19	20	54	4	.020040																																																																																				
25	2	45	63	121	24	25	65	5	.025020																																																																																				
25	4	45	63	121	24	25	65	5	.025040																																																																																				
32	2	53	70	133	31	32	73	6	.032020																																																																																				
32	4	53	70	133	31	32	73	6	.032040																																																																																				

DIN 844 – Lange Ausführung · Long design	Eckenradius · Corner radius																																																																																												
Bestell-Code · Order code	1399WZ																																																																																												
<table border="1"> <thead> <tr> <th>∅ d₁ k10</th> <th>r</th> <th>l₂</th> <th>l₃</th> <th>l₁</th> <th>∅ d₃</th> <th>∅ d₂ h6</th> <th>l_A</th> <th>Z (Flutes)</th> <th>Dimens.- Code</th> </tr> </thead> <tbody> <tr><td>16</td><td>2</td><td>63</td><td>73</td><td>123</td><td>15</td><td>16</td><td>75</td><td>4</td><td>.016020</td></tr> <tr><td>16</td><td>4</td><td>63</td><td>73</td><td>123</td><td>15</td><td>16</td><td>75</td><td>4</td><td>.016040</td></tr> <tr><td>20</td><td>2</td><td>75</td><td>89</td><td>141</td><td>19</td><td>20</td><td>91</td><td>4</td><td>.020020</td></tr> <tr><td>20</td><td>4</td><td>75</td><td>89</td><td>141</td><td>19</td><td>20</td><td>91</td><td>4</td><td>.020040</td></tr> <tr><td>25</td><td>2</td><td>90</td><td>108</td><td>166</td><td>24</td><td>25</td><td>110</td><td>5</td><td>.025020</td></tr> <tr><td>25</td><td>4</td><td>90</td><td>108</td><td>166</td><td>24</td><td>25</td><td>110</td><td>5</td><td>.025040</td></tr> <tr><td>32</td><td>2</td><td>106</td><td>123</td><td>186</td><td>31</td><td>32</td><td>126</td><td>6</td><td>.032020</td></tr> <tr><td>32</td><td>4</td><td>106</td><td>123</td><td>186</td><td>31</td><td>32</td><td>126</td><td>6</td><td>.032040</td></tr> </tbody> </table>	∅ d ₁ k10	r	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code	16	2	63	73	123	15	16	75	4	.016020	16	4	63	73	123	15	16	75	4	.016040	20	2	75	89	141	19	20	91	4	.020020	20	4	75	89	141	19	20	91	4	.020040	25	2	90	108	166	24	25	110	5	.025020	25	4	90	108	166	24	25	110	5	.025040	32	2	106	123	186	31	32	126	6	.032020	32	4	106	123	186	31	32	126	6	.032040			
∅ d ₁ k10	r	l ₂	l ₃	l ₁	∅ d ₃	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code																																																																																				
16	2	63	73	123	15	16	75	4	.016020																																																																																				
16	4	63	73	123	15	16	75	4	.016040																																																																																				
20	2	75	89	141	19	20	91	4	.020020																																																																																				
20	4	75	89	141	19	20	91	4	.020040																																																																																				
25	2	90	108	166	24	25	110	5	.025020																																																																																				
25	4	90	108	166	24	25	110	5	.025040																																																																																				
32	2	106	123	186	31	32	126	6	.032020																																																																																				
32	4	106	123	186	31	32	126	6	.032040																																																																																				

Werkzeug mit glattem Schaft: Bestell-Code 1095WZ (kurze Ausführung) und 1099WZ (lange Ausführung)
Tool with straight shank: order code 1095WZ (short design) and 1099WZ (long design)



TiNox-Cut Hartmetall-Schaftfräser
siehe Seite 27 - 29 und 44 - 46

TiNox-Cut solid carbide end mills,
see pages 27 - 29 and 44 - 46

- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Schruppfräser mit groben, runden Spanteilern
- Erzeugt deutliche Oberflächenmarkierungen
- Zentrumschneidend
- Große Spanräume
- Niedrige Schnittkräfte

- Roughing end mill with coarse, round chip breakers
- Generates significant milling marks
- Centre cutting
- Large chip space
- Low cutting forces

WR

grob
coarse

HSSE

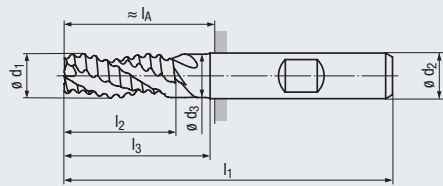
DIN 1835

36°

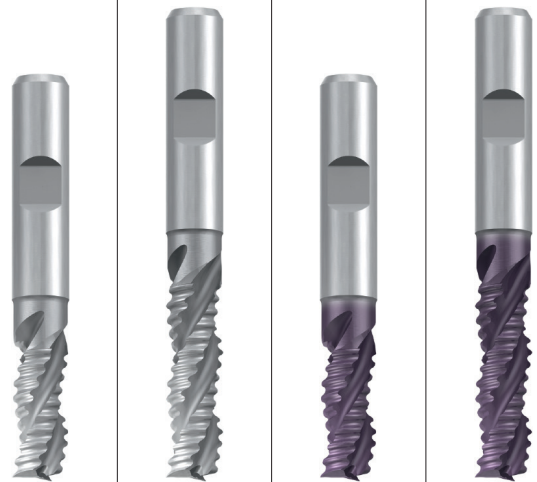
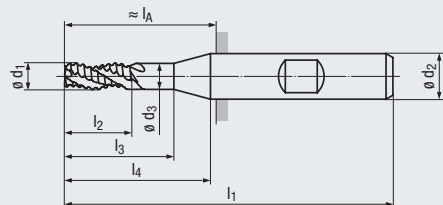
45°

v_c / f_z

290



Design I₄:



AI

AI

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Sehr gut zum Schruppfräsen von Leicht- und Buntmetallen mit einer Zugfestigkeit bis 500 N/mm²
- Besonders leistungsfähig beim Bohrfräsen, Nuten- und Taschenfräsen

Applications – material (see page 246)

- Very suitable for roughing light metals and non-ferrous metals with a tensile strength of up to 500 N/mm²
- Particularly effective for z-axis milling, slot milling and pocket milling

N	1.1-1.3	1.4, 2.2
N	3.1-3.2	4.1-4.2

TICN

N	1.1-1.4	1.5
N	2.1-2.3, 2.5-2.6	
N	3.1-3.2	5.2

DIN 844 – Kurze Ausführung · Short design

Bestell-Code · Order code										1590	1590C
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code		
6	13	19	57	5,5	–	6	21	3	.006	●	●
8	19	25	69	7,5	27	10	29	3	.008	●	●
10	22	30	72	9,5	–	10	32	3	.010	●	●
12	26	36	83	11,5	–	12	38	3	.012	●	●
14	26	36	83	11,5	–	12	38	3	.014	●	●
16	32	42	92	15	–	16	44	3	.016	●	●
18	32	42	92	15	–	16	44	3	.018	●	●
20	38	52	104	19	–	20	54	3	.020	●	●
25	45	63	121	24	–	25	65	3	.025	●	●

Mittellange Ausführung · Medium length design

Bestell-Code · Order code										1592	1592C
$\varnothing d_1$ k12	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code		
6	19	25	63	5,5	–	6	27	3	.006	●	●
8	28	34	78	7,5	36	10	38	3	.008	●	●
10	34	42	84	9,5	–	10	44	3	.010	●	●
12	40	50	97	11,5	–	12	52	3	.012	●	●
16	48	58	108	15	–	16	60	3	.016	●	●
20	56	70	122	19	–	20	72	3	.020	●	●
25	68	86	144	24	–	25	88	3	.025	●	●
32	80	97	160	31	–	32	100	3	.032	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1591/1591C (kurze Ausführung) und 1593/1593C (lange Ausführung)
 Tool with straight shank: order code 1591/1591C (short design) and 1593/1593C (long design)



- Schrappfräser mit groben, runden Spanteilern
- Erzeugt deutliche Oberflächenmarkierungen
- Zentrumschneidend
- Große Spanräume
- Niedrige Schnittkräfte

- Roughing end mill with coarse, round chip breakers
- Generates significant milling marks
- Centre cutting
- Large chip space
- Low cutting forces

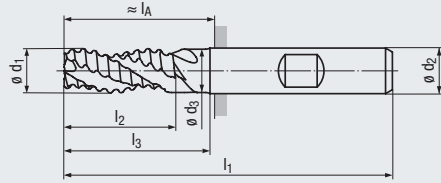
WR **grob coarse**

HSSE

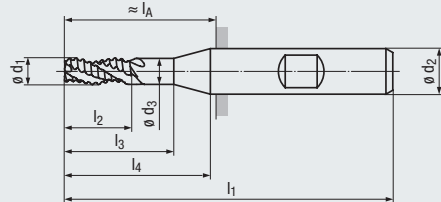
DIN 1835

36° **45°**

V_c/f_z 291



Design I₄:



AI



AI

Product Finder

NR

NF

N

H

WR

W

V_c/f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Sehr gut zum Schrappfräsen von Leicht- und Buntmetallen mit einer Zugfestigkeit bis 500 N/mm²

Applications – material (see page 246)

- Very suitable for roughing light metals and non-ferrous metals with a tensile strength of up to 500 N/mm²

TICN

N	1.1-1.3	1.4, 2.2
N	3.1-3.2	4.1-4.2

N	1.1-1.4	1.5
N	2.1-2.3, 2.5-2.6	
N	3.1-3.2	5.2

DIN 844 – Lange Ausführung · Long design

Bestell-Code · Order code

										1594		1594C	
∅ d ₁ k12	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code				
6	24	30	68	5,5	–	6	32	3	.006	●		●	
8	38	44	88	7,5	46	10	48	3	.008	●		●	
10	45	53	95	9,5	–	10	55	3	.010	●		●	
12	53	63	110	11,5	–	12	65	3	.012	●		●	
16	63	73	123	15	–	16	75	3	.016	●		●	
20	75	89	141	19	–	20	91	3	.020	●		●	
25	90	108	166	24	–	25	110	3	.025	●		●	
32	106	123	186	31	–	32	126	3	.032	●		●	

Werkzeug mit glattem Schaft: Bestell-Code 1595/1595C
Tool with straight shank: order code 1595/1595C



- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z

- Hochleistungs-Schruppfräser mit groben, runden Spanteilern
- Erzeugt deutliche Oberflächenmarkierungen
- Neuentwickelte Geometrie
- Zentrumschneidend
- Vibrationsarme Bearbeitung
- Große Spanräume
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Sehr gute Spanabfuhr
- Lange Ausführung mit kurzer Schneidenlänge

- High-performance roughing end mill with coarse, round chip breakers
- Generates significant milling marks
- Newly developed geometry
- Centre cutting
- Low-vibration machining
- Large chip space
- Internal coolant supply, radial and axial exit (ICRA)
- Excellent chip evacuation
- Long design with short flute length

WR

grob
coarse

ICRA

DIN 1835

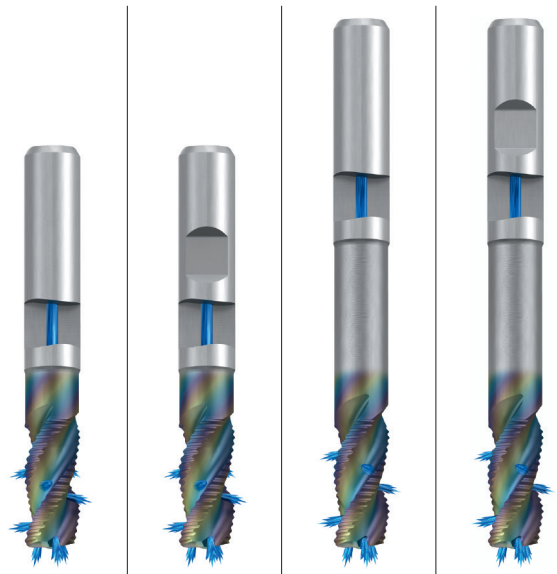
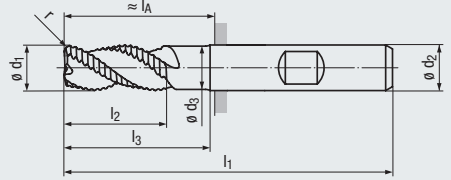
HSSE-
PM

40°

ER

v_c / f_z

287



AI

AI

Beschichtung · Coating

CRN

CRN

Einsatzgebiete – Material (siehe Seite 246)

Applications – material (see page 246)

- Sehr gut zum Schruppfräsen von Leicht- und Buntmetallen mit einer Zugfestigkeit bis 500 N/mm²
- Besonders leistungsfähig beim Bohrfräsen, Nuten- und Taschenfräsen
- Zur HPC-Bearbeitung geeignet

- Very suitable for roughing light metals and non-ferrous metals with a tensile strength of up to 500 N/mm²
- Particularly effective for z-axis milling, slot milling and pocket milling
- Suitable for HPC machining

N	1.1-1.4	1.5
N	2.1-2.6, 3.1-3.2	

N	1.1-1.4	1.5
N	2.1-2.6, 3.1-3.2	

DIN 844 – Kurze Ausführung · Short design

Eckenradius · Corner radius

Bestell-Code · Order code										1092RZ	1392RZ
$\varnothing d_1$ k10	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code		
16	2	32	42	92	14,5	16	44	3	.016020	●	●
16	4	32	42	92	14,5	16	44	3	.016040	●	●
20	2	38	52	104	18	20	54	3	.020020	●	●
20	4	38	52	104	18	20	54	3	.020040	●	●
25	2	45	63	121	23	25	65	3	.025020	●	●
25	4	45	63	121	23	25	65	3	.025040	●	●
32	2	53	70	133	30	32	73	3	.032020	●	●
32	4	53	70	133	30	32	73	3	.032040	●	●

Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code										1093RZ	1393RZ
$\varnothing d_1$ k10	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code		
16	2	32	73	123	14,5	16	75	3	.016020	●	●
16	4	32	73	123	14,5	16	75	3	.016040	●	●
20	2	38	89	141	18	20	91	3	.020020	●	●
20	4	38	89	141	18	20	91	3	.020040	●	●
25	2	45	108	166	23	25	110	3	.025020	●	●
25	4	45	108	166	23	25	110	3	.025040	●	●
32	2	53	123	186	30	32	126	3	.032020	●	●
32	4	53	123	186	30	32	126	3	.032040	●	●



Alu-Cut Hartmetall-Schafffräser
siehe Seite 56 - 58 und 61 - 64

Alu-Cut solid carbide end mills,
see pages 56 - 58 and 61 - 64

- Schlichtfräser
- Erzeugt glatte Oberflächen
- Zentrumschneidend
- Große Spanräume
- Schneidfremdige Geometrie
- Großer Abmessungsbereich

- Finishing end mill
- Generates smooth surfaces
- Centre cutting
- Large chip space
- High positive rake angle
- Wide range of diameters

W

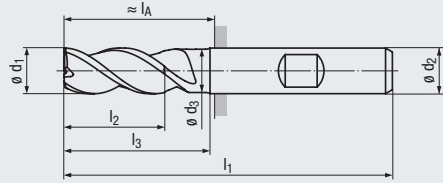
HSSE

DIN 1835
A
B

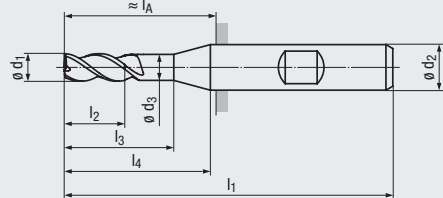
TICN
KB x 45°

40°

V_c/f_z
294 - 295



Design I₄:



Product Finder

NR

NF

N

H

WR

W

V_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Besonders zum Schlichtfräsen von Leicht- und Buntmetallen mit einer Zugfestigkeit bis 500 N/mm² geeignet
- Sehr gut in faserfreien Kunststoffen einsetzbar

Applications – material (see page 246)

- Especially suitable for finishing light metals and non-ferrous metals with a tensile strength of up to 500 N/mm²
- Very suitable for fibre-free synthetics

TICN

N 1.2-1.3 1.1, 1.4

N 3.1-4.2

N 1.2-1.4 1.1, 1.5-2.1

N 3.1-4.2

DIN 844 – Kurze Ausführung · Short design

Scharfkantig · Sharp-edged

Bestell-Code · Order code

ø d ₁ k10	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A	KB (TICN)	Z (Flutes)	Dimens.- Code
2	7	13	51	-	-	6	15	0,04	3	.002
3	8	14	52	-	-	6	16	0,07	3	.003
4	11	17	55	-	-	6	19	0,07	3	.004
5	13	19	57	-	-	6	21	0,12	3	.005
6	13	19	57	5,5	-	6	21	0,12	3	.006
7	16	22	66	6,5	24	10	26	0,12	3	.007
8	19	25	69	7,5	27	10	29	0,12	3	.008
9	19	26	69	8,5	27	10	29	0,2	3	.009
10	22	30	72	9,5	-	10	32	0,2	3	.010
12	26	36	83	11,5	-	12	38	0,2	3	.012
14	26	36	83	11,5	-	12	38	0,2	3	.014
16	32	42	92	15	-	16	44	0,2	3	.016
18	32	42	92	15	-	16	44	0,2	3	.018
20	38	52	104	19	-	20	54	0,3	3	.020
22	38	52	104	19	-	20	54	0,3	3	.022
25	45	63	121	24	-	25	65	0,3	4	.025

1331	1331C
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●

DIN 844 – Lange Ausführung · Long design

Scharfkantig · Sharp-edged

Bestell-Code · Order code

ø d ₁ k10	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A	KB (TICN)	Z (Flutes)	Dimens.- Code
3	12	18	56	-	-	6	20	0,07	3	.003
4	19	25	63	-	-	6	27	0,07	3	.004
5	24	30	68	-	-	6	32	0,12	3	.005
6	24	30	68	5,5	-	6	32	0,12	3	.006
7	30	36	80	6,5	38	10	40	0,12	3	.007
8	38	44	88	7,5	46	10	48	0,12	3	.008
9	38	45	88	8,5	46	10	48	0,2	3	.009
10	45	53	95	9,5	-	10	55	0,2	3	.010
12	53	63	110	11,5	-	12	65	0,2	3	.012
14	53	63	110	11,5	-	12	65	0,2	3	.014
16	63	73	123	15	-	16	75	0,2	3	.016
18	63	73	123	15	-	16	75	0,2	3	.018
20	75	89	141	19	-	20	91	0,3	3	.020
22	75	89	141	19	-	20	91	0,3	3	.022
24	90	106	166	23	108	25	110	0,3	3	.024
25	90	108	166	24	-	25	110	0,3	4	.025
28	90	108	166	24	-	25	110	0,3	4	.028
30	90	108	166	24	-	25	110	0,3	4	.030
32	106	123	186	31	-	32	126	0,3	4	.032
36	106	123	186	31	-	32	126	0,4	4	.036
40	125	142	217	38	-	40	147	0,4	4	.040

1336	1336C
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●

Werkzeug mit glattem Schaft: Bestell-Code 1031/1031C (kurze Ausführung) und 1036/1036C (lange Ausführung)
 Tool with straight shank: order code 1031/1031C (short design) and 1036/1036C (long design)

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

- Product Finder
- NR
- NF
- N
- HR
- WR
- W**
- v_c / f_z

- Schlichtfräser
- Erzeugt glatte Oberflächen
- Zentrumschneidend
- Große Spanräume
- Schneidfreundige Geometrie
- Finishing end mill
- Generates smooth surfaces
- Centre cutting
- Large chip space
- High positive rake angle

W

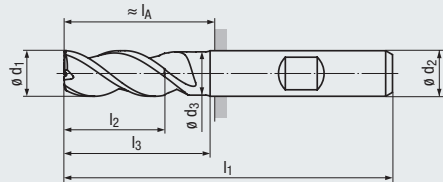
HSSE

DIN 1835

40°

TICN
KB x 45°

v_c / f_z
295



AI



AI

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Besonders zum Schlichtfräsen von Leicht- und Buntmetallen mit einer Zugfestigkeit bis 500 N/mm² geeignet
- Sehr gut in faserfreien Kunststoffen einsetzbar
- Für Schlicht-Bearbeitungen mit großer axialer Zustellung

Applications – material (see page 246)

- Especially suitable for finishing light metals and non-ferrous metals with a tensile strength of up to 500 N/mm²
- Very suitable for fibre-free synthetics
- For finishing applications with a high axial depth of cut

- N **1.2-1.3** 1.1, 1.4
- N **3.1-4.2**

TICN

- N **1.2-1.4** 1.1, 1.5-2.1
- N **3.1-4.2**

Extra lange Ausführung · Extra long design

Scharfkantig · Sharp-edged

Bestell-Code · Order code										1333	1333C
$\varnothing d_1$ k10	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A 	KB (TICN)	Z (Flutes)	Dimens.- Code		
10	62	70	112	9,5	10	72	0,2	3	.010	●	●
12	78	88	135	11,5	12	90	0,2	3	.012	●	●
16	95	105	155	15	16	107	0,2	3	.016	●	●
20	120	134	186	19	20	136	0,3	3	.020	●	●
25	150	168	226	24	25	170	0,3	4	.025	●	●
32	180	197	260	31	32	200	0,3	4	.032	●	●

Werkzeug mit glattem Schaft: Bestell-Code 1033/1033C
 Tool with straight shank: order code 1033/1033C



- Hochleistungs-Schlichtfräser
- Erzeugt glatte Oberflächen
- Neuentwickelte Geometrie mit ungleich geteilten Schneiden
- Zentrumschneidend
- Vibrationsarme Bearbeitung
- Große Spanräume
- Innere Kühlschmierstoff-Zufuhr, Austritt radial und axial (ICRA)
- Sehr gute Spanabfuhr
- Eingeschränkte Schneidendurchmesser-Toleranz

- High-performance finishing end mill
- Generates smooth surfaces
- Newly developed geometry with variable spacing of cutting edges
- Centre cutting
- Low-vibration machining
- Large chip space
- Internal coolant-lubricant supply, radial and axial exit (ICRA)
- Excellent chip evacuation
- Tighter cutting diameter tolerance

W

ICRA

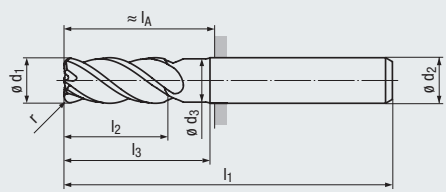
HSSE-PM

DIN 1835

40°

ER

v_c/f_z 288



AI



AI

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 246)

- Besonders zum Schlichtfräsen von Leicht- und Buntmetallen mit einer Zugfestigkeit bis 500 N/mm² geeignet

Applications – material (see page 246)

- Especially suitable for finishing light metals and non-ferrous metals with a tensile strength of up to 500 N/mm²

CRN

CRN

N	1.2-1.4	1.1, 1.5-1.6
N		3.1-4.2

N	1.2-1.4	1.1, 1.5-1.6
N		3.1-4.2

DIN 844 – Kurze Ausführung · Short design

Eckenradius · Corner radius

Bestell-Code · Order code									1034RZ	
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$	Z	Dimens.-Code		
h8	$\pm 0,1$					h6	(Flutes)			
16	2	32	42	92	14,5	16	4	.016020	●	
16	4	32	42	92	14,5	16	4	.016040	●	
20	2	38	52	104	18	20	4	.020020	●	
20	4	38	52	104	18	20	4	.020040	●	
25	2	45	63	121	23	25	4	.025020	●	
25	4	45	63	121	23	25	4	.025040	●	
32	2	53	70	133	30	32	4	.032020	●	
32	4	53	70	133	30	32	4	.032040	●	

DIN 844 – Lange Ausführung · Long design

Eckenradius · Corner radius

Bestell-Code · Order code									1035RZ	
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$	Z	Dimens.-Code		
h8	$\pm 0,1$					h6	(Flutes)			
16	2	63	73	123	14,5	16	4	.016020	●	
16	4	63	73	123	14,5	16	4	.016040	●	
20	2	75	89	141	18	20	4	.020020	●	
20	4	75	89	141	18	20	4	.020040	●	
25	2	90	108	166	23	25	4	.025020	●	
25	4	90	108	166	23	25	4	.025040	●	
32	2	106	123	186	30	32	4	.032020	●	
32	4	106	123	186	30	32	4	.032040	●	

Product Finder

NR

NF

N

H

WR

W

v_c / f_z



Induktionsschumpfgerät SHRINK-MASTER HL-2, Schumpf-Aufnahmen und -Zubehör siehe Seite 362 - 374

Induction shrink-fit work station SHRINK-MASTER HL-2, shrink-fit chucks and accessories, see pages 362 - 374

- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z**



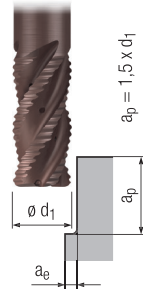
HSS-Schaftfräser – kurze und lange Ausführung

HSS end mills – short and long design

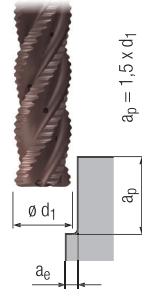
HR

Gültig für · Valid for
1395WZ 1399WZ

kurze Ausführung
short design



lange Ausführung
long design



$a_e = 0,5 \times d_1$

$a_e = 0,25 \times d_1$

$a_e = 0,25 \times d_1$

$a_e = 0,1 \times d_1$

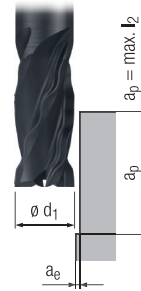
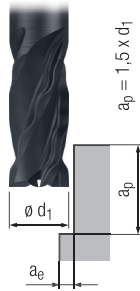
		$a_e = 0,5 \times d_1$		v_c [m/min]	$a_e = 0,25 \times d_1$					
		v_c [m/min]	f_z [mm]		f_z [mm]	v_c [m/min]				
P	1.1									
	2.1									
	3.1									
	4.1									
	5.1									
M	1.1	28	$0,0025 \times d_1$	$0,0038 \times d_1$	15	$0,0018 \times d_1$	$0,0027 \times d_1$			■
	2.1	24	$0,0023 \times d_1$	$0,0034 \times d_1$	14	$0,0016 \times d_1$	$0,0024 \times d_1$			■
	3.1	20	$0,0020 \times d_1$	$0,0030 \times d_1$	12	$0,0014 \times d_1$	$0,0022 \times d_1$			■
	4.1	18	$0,0018 \times d_1$	$0,0027 \times d_1$	11	$0,0013 \times d_1$	$0,0019 \times d_1$			■
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	40	$0,0025 \times d_1$	$0,0038 \times d_1$	15	$0,0018 \times d_1$	$0,0027 \times d_1$			■
	1.2	28	$0,0023 \times d_1$	$0,0034 \times d_1$	15	$0,0016 \times d_1$	$0,0024 \times d_1$			■
	1.3	20	$0,0020 \times d_1$	$0,0030 \times d_1$	12	$0,0014 \times d_1$	$0,0022 \times d_1$			■
	2.1									
	2.2									
	2.6									
H	1.1									
	1.2									
	1.3									
	1.4									
	1.5									



HSS-Schaftfräser „N-Wave“ – kurze Ausführung
HSS end mills “N-Wave” – short design

N

Gültig für · Valid for
1391L



$a_e = 0,25 \times d_1$

$a_e = 0,1 \times d_1$

$a_e = 0,2 \text{ mm}$

v_c
[m/min]

f_z
[mm]

f_z
[mm]

f_z
[mm]



MMS
MQL



		$a_e = 0,25 \times d_1$			$a_e = 0,1 \times d_1$			$a_e = 0,2 \text{ mm}$			
		v_c [m/min]	f_z [mm]	f_z [mm]	f_z [mm]	f_z [mm]	f_z [mm]	v_c [m/min]	f_z [mm]	f_z [mm]	
P	1.1	66	$0,0038 \times d_1$	$0,0053 \times d_1$	$0,0067 \times d_1$						
	2.1	61	$0,0035 \times d_1$	$0,0048 \times d_1$	$0,0062 \times d_1$						
	3.1	44	$0,0032 \times d_1$	$0,0044 \times d_1$	$0,0056 \times d_1$						
	4.1	42	$0,0029 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$						
	5.1										
M	1.1	31	$0,0032 \times d_1$	$0,0044 \times d_1$	$0,0056 \times d_1$						
	2.1	26	$0,0029 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$						
	3.1	22	$0,0026 \times d_1$	$0,0035 \times d_1$	$0,0045 \times d_1$						
	4.1	20	$0,0022 \times d_1$	$0,0031 \times d_1$	$0,0039 \times d_1$						
K	1.1	53	$0,0038 \times d_1$	$0,0053 \times d_1$	$0,0067 \times d_1$						
	1.2	46	$0,0035 \times d_1$	$0,0048 \times d_1$	$0,0062 \times d_1$						
	2.1	42	$0,0035 \times d_1$	$0,0048 \times d_1$	$0,0062 \times d_1$						
	2.2	37	$0,0032 \times d_1$	$0,0044 \times d_1$	$0,0056 \times d_1$						
	3.1	32	$0,0029 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$						
	3.2	28	$0,0029 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$						
	4.1	44	$0,0035 \times d_1$	$0,0048 \times d_1$	$0,0062 \times d_1$						
	4.2	30	$0,0032 \times d_1$	$0,0044 \times d_1$	$0,0056 \times d_1$						
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	44	$0,0032 \times d_1$	$0,0044 \times d_1$	$0,0056 \times d_1$						
	1.2	31	$0,0029 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$						
	1.3	22	$0,0026 \times d_1$	$0,0035 \times d_1$	$0,0045 \times d_1$						
	2.1										
	2.2										
	2.6										
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

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



- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z



HSS-Schaftfräser – kurze und lange Ausführung

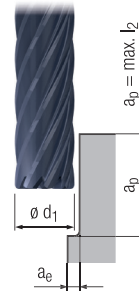
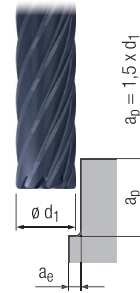
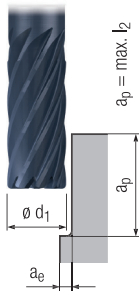
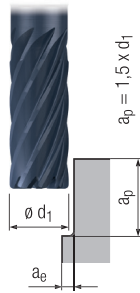
HSS end mills – short and long design

N

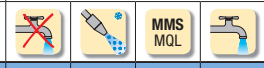
Gültig für · Valid for
1365A 1390A

kurze Ausführung
short design

lange Ausführung
long design



		kurze Ausführung short design		lange Ausführung long design					
		v_c [m/min]	f_z [mm]	f_z [mm]	v_c [m/min]				
P	1.1								
	2.1								
	3.1								
	4.1								
	5.1								
M	1.1	56	$0,0014 \times d_1$	$0,0022 \times d_1$	30	$0,0010 \times d_1$	$0,0012 \times d_1$		■
	2.1	48	$0,0013 \times d_1$	$0,0020 \times d_1$	29	$0,0009 \times d_1$	$0,0011 \times d_1$		■
	3.1	40	$0,0011 \times d_1$	$0,0018 \times d_1$	24	$0,0008 \times d_1$	$0,0010 \times d_1$		■
	4.1	36	$0,0010 \times d_1$	$0,0015 \times d_1$	22	$0,0007 \times d_1$	$0,0008 \times d_1$		■
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	80	$0,0014 \times d_1$	$0,0022 \times d_1$	30	$0,0010 \times d_1$	$0,0012 \times d_1$		■
	1.2	56	$0,0013 \times d_1$	$0,0020 \times d_1$	30	$0,0009 \times d_1$	$0,0011 \times d_1$		■
	1.3	40	$0,0011 \times d_1$	$0,0018 \times d_1$	24	$0,0008 \times d_1$	$0,0010 \times d_1$		■
	2.1								
	2.2								
	2.3								
	2.4								
2.5									
2.6									
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								





HSS-Schafffräser – kurze und lange Ausführung
HSS end mills – short and long design

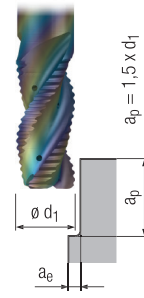
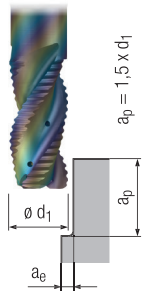
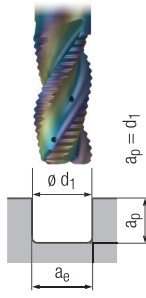
WR

Gültig für · Valid for

1092RZ 1392RZ
1093RZ 1393RZ

kurze Ausführung
short design

lange Ausführung
long design



$a_e = d_1$ $a_e = 0,5 \times d_1$ $a_e = 0,25 \times d_1$ $a_e = 0,5 \times d_1$ $a_e = 0,25 \times d_1$ $a_e = 0,1 \times d_1$

V_c [m/min] f_z [mm] f_z [mm] f_z [mm] V_c [m/min] f_z [mm] f_z [mm] f_z [mm]



P	1.1											
	2.1											
M	3.1											
	4.1											
	5.1											
K	1.1											
	1.2											
	2.1											
	2.2											
	3.1											
	3.2											
	4.1											
N	1.1	360	0,0048 x d ₁	0,0062 x d ₁	0,0077 x d ₁	60	0,0046 x d ₁	0,0053 x d ₁	0,0066 x d ₁			■
	1.2	320	0,0045 x d ₁	0,0059 x d ₁	0,0072 x d ₁	60	0,0044 x d ₁	0,0050 x d ₁	0,0062 x d ₁			■
	1.3	250	0,0042 x d ₁	0,0055 x d ₁	0,0067 x d ₁	55	0,0041 x d ₁	0,0046 x d ₁	0,0057 x d ₁			■
	1.4	200	0,0039 x d ₁	0,0051 x d ₁	0,0062 x d ₁	60	0,0038 x d ₁	0,0043 x d ₁	0,0053 x d ₁			■
	1.5	150	0,0036 x d ₁	0,0047 x d ₁	0,0058 x d ₁	50	0,0035 x d ₁	0,0040 x d ₁	0,0049 x d ₁			■
	1.6											
	2.1	52	0,0058 x d ₁	0,0047 x d ₁	0,0036 x d ₁	30	0,0049 x d ₁	0,0040 x d ₁	0,0035 x d ₁		□	■
	2.2	56	0,0053 x d ₁	0,0043 x d ₁	0,0033 x d ₁	34	0,0045 x d ₁	0,0036 x d ₁	0,0032 x d ₁		□	■
	2.3	100	0,0058 x d ₁	0,0047 x d ₁	0,0036 x d ₁	48	0,0049 x d ₁	0,0040 x d ₁	0,0035 x d ₁		□	■
	2.4	50	0,0043 x d ₁	0,0035 x d ₁	0,0027 x d ₁	32	0,0037 x d ₁	0,0030 x d ₁	0,0026 x d ₁		□	■
	2.5	80	0,0048 x d ₁	0,0039 x d ₁	0,0030 x d ₁	48	0,0041 x d ₁	0,0033 x d ₁	0,0029 x d ₁		□	■
	2.6	90	0,0058 x d ₁	0,0047 x d ₁	0,0036 x d ₁	48	0,0049 x d ₁	0,0040 x d ₁	0,0035 x d ₁		□	■
	2.7											
	2.8											
	3.1	200	0,0039 x d ₁	0,0051 x d ₁	0,0062 x d ₁	70	0,0038 x d ₁	0,0043 x d ₁	0,0053 x d ₁	□	■	□
	3.2	150	0,0045 x d ₁	0,0059 x d ₁	0,0072 x d ₁	70	0,0044 x d ₁	0,0050 x d ₁	0,0062 x d ₁	□	■	□
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											
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

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



HSS-Schaftfräser – kurze und lange Ausführung

HSS end mills – short and long design

W

Gültig für · Valid for
1034RZ 1035RZ



Product Finder

NR

NF

N

HR

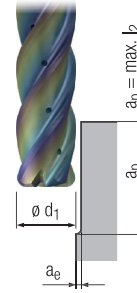
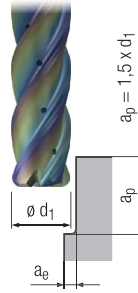
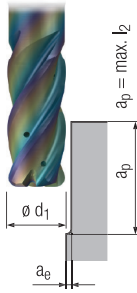
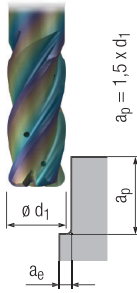
WR

W

v_c / f_z

kurze Ausführung
short design

lange Ausführung
long design



$a_e = 0,25 \times d_1$ $a_e = 0,1 \times d_1$ $a_e = 0,2 \text{ mm}$ $a_e = 0,25 \times d_1$ $a_e = 0,1 \times d_1$ $a_e = 0,2 \text{ mm}$

v_c [m/min] f_z [mm] f_z [mm] f_z [mm] v_c [m/min] f_z [mm] f_z [mm] f_z [mm]



Material	Grade	v_c [m/min]	kurze Ausführung short design			v_c [m/min]	lange Ausführung long design			Coolant	MMS MQL	Water	
			f_z [mm]	f_z [mm]	f_z [mm]		f_z [mm]	f_z [mm]	f_z [mm]				
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	360	$0,0051 \times d_1$	$0,0070 \times d_1$	$0,0090 \times d_1$	60	$0,0038 \times d_1$	$0,0046 \times d_1$	$0,0064 \times d_1$			■	
	1.2	320	$0,0048 \times d_1$	$0,0066 \times d_1$	$0,0084 \times d_1$	60	$0,0036 \times d_1$	$0,0044 \times d_1$	$0,0060 \times d_1$			■	
	1.3	250	$0,0045 \times d_1$	$0,0062 \times d_1$	$0,0078 \times d_1$	55	$0,0034 \times d_1$	$0,0041 \times d_1$	$0,0056 \times d_1$			■	
	1.4	200	$0,0042 \times d_1$	$0,0057 \times d_1$	$0,0073 \times d_1$	60	$0,0031 \times d_1$	$0,0038 \times d_1$	$0,0052 \times d_1$			■	
	1.5	150	$0,0038 \times d_1$	$0,0053 \times d_1$	$0,0067 \times d_1$	50	$0,0029 \times d_1$	$0,0035 \times d_1$	$0,0048 \times d_1$			■	
	1.6	90	$0,0035 \times d_1$	$0,0048 \times d_1$	$0,0062 \times d_1$	40	$0,0026 \times d_1$	$0,0032 \times d_1$	$0,0044 \times d_1$			■	
	2.1												
	2.2												
	2.3												
	2.4												
	2.5												
	2.6												
	2.7												
	2.8												
	3.1	200	$0,0042 \times d_1$	$0,0057 \times d_1$	$0,0073 \times d_1$	100	$0,0048 \times d_1$	$0,0058 \times d_1$	$0,0080 \times d_1$	□	■		□
	3.2	150	$0,0048 \times d_1$	$0,0066 \times d_1$	$0,0084 \times d_1$	180	$0,0048 \times d_1$	$0,0058 \times d_1$	$0,0080 \times d_1$	□	■		□
4.1	200	$0,0042 \times d_1$	$0,0057 \times d_1$	$0,0073 \times d_1$	100	$0,0048 \times d_1$	$0,0058 \times d_1$	$0,0080 \times d_1$	□	□	□	■	
4.2	150	$0,0048 \times d_1$	$0,0066 \times d_1$	$0,0084 \times d_1$	180	$0,0048 \times d_1$	$0,0058 \times d_1$	$0,0080 \times d_1$	□	□	□	■	
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1												
	1.2												
	1.3												
	2.1												
	2.2												
	2.6												
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												



HSS



HSS-Schafffräser – kurze und lange Ausführung
HSS end mills – short and long design

HR

Gültig für · Valid for
1572L 1574L

Product Finder

NR

NF

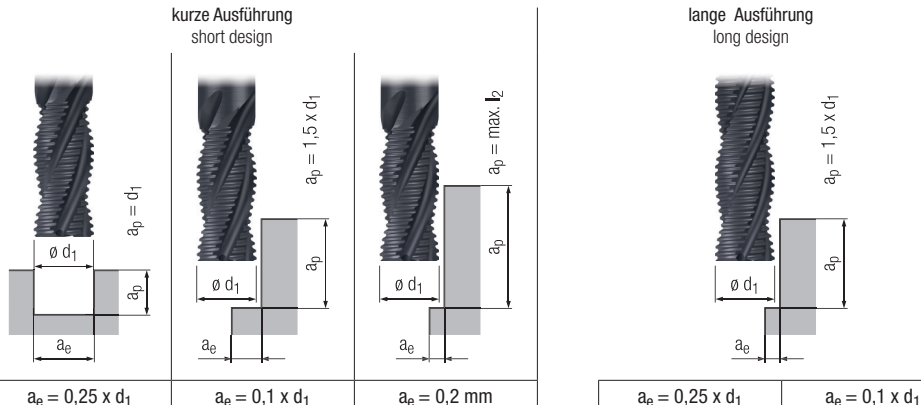
N

H

WR

W

v_c / f_z



		v_c [m/min]	f_z [mm]			v_c [m/min]	f_z [mm]				MMS MQL	
			$a_e = 0,25 \times d_1$	$a_e = 0,1 \times d_1$	$a_e = 0,2 \text{ mm}$		$a_e = 0,25 \times d_1$	$a_e = 0,1 \times d_1$				
P	1.1	66	$0,0036 \times d_1$	$0,0048 \times d_1$	$0,0060 \times d_1$	39	$0,0040 \times d_1$	$0,0050 \times d_1$			□	■
	2.1	63	$0,0033 \times d_1$	$0,0044 \times d_1$	$0,0055 \times d_1$	36	$0,0036 \times d_1$	$0,0046 \times d_1$				■
	3.1	46	$0,0030 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$	17	$0,0033 \times d_1$	$0,0042 \times d_1$				■
	4.1	44	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	17	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	5.1	35	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	17	$0,0030 \times d_1$	$0,0038 \times d_1$				■
M	1.1	32	$0,0030 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$	17	$0,0033 \times d_1$	$0,0042 \times d_1$				■
	2.1	28	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	16	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	3.1	23	$0,0024 \times d_1$	$0,0032 \times d_1$	$0,0040 \times d_1$	13	$0,0026 \times d_1$	$0,0034 \times d_1$				■
	4.1	21	$0,0021 \times d_1$	$0,0028 \times d_1$	$0,0035 \times d_1$	12	$0,0023 \times d_1$	$0,0029 \times d_1$				■
K	1.1	55	$0,0036 \times d_1$	$0,0048 \times d_1$	$0,0060 \times d_1$	31	$0,0040 \times d_1$	$0,0050 \times d_1$	□	□	□	■
	1.2	48	$0,0033 \times d_1$	$0,0044 \times d_1$	$0,0055 \times d_1$	28	$0,0036 \times d_1$	$0,0046 \times d_1$	□	□	□	■
	2.1	44	$0,0033 \times d_1$	$0,0044 \times d_1$	$0,0055 \times d_1$	25	$0,0036 \times d_1$	$0,0046 \times d_1$			□	■
	2.2	39	$0,0030 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$	17	$0,0033 \times d_1$	$0,0042 \times d_1$			□	■
	3.1	33	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	17	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	3.2	28	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	16	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	4.1	46	$0,0033 \times d_1$	$0,0044 \times d_1$	$0,0055 \times d_1$	26	$0,0036 \times d_1$	$0,0046 \times d_1$			□	■
4.2	31	$0,0030 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$	17	$0,0033 \times d_1$	$0,0042 \times d_1$			□	■	
N	1.1											
	1.2											
	1.3											
	1.4											
	1.5											
	1.6											
	2.1	43	$0,0036 \times d_1$	$0,0048 \times d_1$	$0,0060 \times d_1$	29	$0,0040 \times d_1$	$0,0050 \times d_1$				■
	2.2	47	$0,0033 \times d_1$	$0,0044 \times d_1$	$0,0055 \times d_1$	31	$0,0036 \times d_1$	$0,0046 \times d_1$				■
	2.3	85	$0,0036 \times d_1$	$0,0048 \times d_1$	$0,0060 \times d_1$	44	$0,0040 \times d_1$	$0,0050 \times d_1$			□	■
	2.4	44	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	30	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	2.5	67	$0,0030 \times d_1$	$0,0040 \times d_1$	$0,0050 \times d_1$	44	$0,0033 \times d_1$	$0,0042 \times d_1$			□	■
	2.6	77	$0,0036 \times d_1$	$0,0048 \times d_1$	$0,0060 \times d_1$	44	$0,0040 \times d_1$	$0,0050 \times d_1$				■
	2.7	45	$0,0027 \times d_1$	$0,0036 \times d_1$	$0,0045 \times d_1$	26	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	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											
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

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



Product Finder

NR

NF

N

HR

WR

W

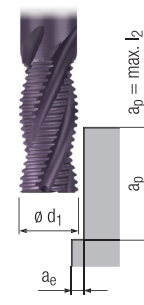
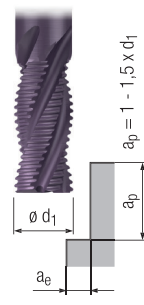
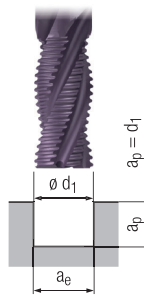
v_c / f_z



HSS-Schafffräser – extra kurze, kurze und mittellange Ausführung

HSS end mills – extra short, short and medium length design

NR HR WR



Gültig für · Valid for

1344	1353C	1592
1344C	1354C	1592C
1345	1590	
1345C	1590C	



1351C	1355C	1381C
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		v_c [m/min]		f_z [mm]		f_z [mm]		TICN		Unbesch. Uncoated		
		Unbeschichtet	TICN	$d_1 < 32$ mm	$d_1 \geq 32$ mm	$d_1 < 32$ mm	$d_1 \geq 32$ mm	$d_1 < 32$ mm	$d_1 \geq 32$ mm			
P	1.1	35	60	0,0035 x d_1	0,0034 x d_1	0,0046 x d_1	0,0036 x d_1	0,0056 x d_1	0,0044 x d_1			■
	2.1	30	55	0,0032 x d_1	0,0031 x d_1	0,0042 x d_1	0,0033 x d_1	0,0052 x d_1	0,0041 x d_1			■
	3.1	25	40	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1			■
	4.1		38	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	5.1		30	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
M	1.1		28	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1			■
	2.1		24	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	3.1		20	0,0023 x d_1	0,0022 x d_1	0,0030 x d_1	0,0024 x d_1	0,0038 x d_1	0,0030 x d_1			■
	4.1		18	0,0020 x d_1	0,0020 x d_1	0,0027 x d_1	0,0021 x d_1	0,0033 x d_1	0,0026 x d_1			■
K	1.1	25	48	0,0035 x d_1	0,0034 x d_1	0,0046 x d_1	0,0036 x d_1	0,0056 x d_1	0,0044 x d_1	□	□	■
	1.2	22	42	0,0032 x d_1	0,0031 x d_1	0,0042 x d_1	0,0033 x d_1	0,0052 x d_1	0,0041 x d_1	□	□	■
	2.1		38	0,0032 x d_1	0,0031 x d_1	0,0042 x d_1	0,0033 x d_1	0,0052 x d_1	0,0041 x d_1		□	■
	2.2		34	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1		□	■
	3.1		29	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	3.2		25	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	4.1		40	0,0032 x d_1	0,0031 x d_1	0,0042 x d_1	0,0033 x d_1	0,0052 x d_1	0,0041 x d_1		□	■
	4.2		27	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1		□	■
N	1.1	200	300	0,0046 x d_1	0,0045 x d_1	0,0061 x d_1	0,0048 x d_1	0,0075 x d_1	0,0059 x d_1			■
	1.2	170	270	0,0042 x d_1	0,0042 x d_1	0,0057 x d_1	0,0045 x d_1	0,0071 x d_1	0,0056 x d_1			■
	1.3	110	210	0,0041 x d_1	0,0039 x d_1	0,0053 x d_1	0,0042 x d_1	0,0066 x d_1	0,0052 x d_1			■
	1.4	90	170	0,0038 x d_1	0,0036 x d_1	0,0049 x d_1	0,0039 x d_1	0,0061 x d_1	0,0048 x d_1			■
	1.5		130	0,0035 x d_1	0,0034 x d_1	0,0046 x d_1	0,0036 x d_1	0,0056 x d_1	0,0044 x d_1			■
	1.6											■
	2.1		43	0,0035 x d_1	0,0034 x d_1	0,0046 x d_1	0,0036 x d_1	0,0056 x d_1	0,0044 x d_1			■
	2.2	26	47	0,0032 x d_1	0,0031 x d_1	0,0042 x d_1	0,0033 x d_1	0,0052 x d_1	0,0041 x d_1			■
	2.3	47	85	0,0035 x d_1	0,0034 x d_1	0,0046 x d_1	0,0036 x d_1	0,0056 x d_1	0,0044 x d_1		□	■
	2.4		44	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	2.5	37	67	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1		□	■
	2.6		77	0,0035 x d_1	0,0034 x d_1	0,0046 x d_1	0,0036 x d_1	0,0056 x d_1	0,0044 x d_1			■
	2.7		45	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	2.8											■
	3.1	80	170	0,0038 x d_1	0,0036 x d_1	0,0049 x d_1	0,0039 x d_1	0,0061 x d_1	0,0048 x d_1	□	■	□
	3.2	68	125	0,0044 x d_1	0,0042 x d_1	0,0057 x d_1	0,0045 x d_1	0,0071 x d_1	0,0056 x d_1	□	■	□
4.1	70		0,0058 x d_1	0,0056 x d_1	0,0076 x d_1	0,0060 x d_1	0,0094 x d_1	0,0074 x d_1			■	
4.2	100		0,0058 x d_1	0,0056 x d_1	0,0076 x d_1	0,0060 x d_1	0,0094 x d_1	0,0074 x d_1			■	
4.3											■	
4.4											■	
5.1											■	
5.2		28	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■	
5.3											■	
S	1.1		40	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1			■
	1.2		28	0,0026 x d_1	0,0025 x d_1	0,0034 x d_1	0,0027 x d_1	0,0042 x d_1	0,0033 x d_1			■
	1.3		20	0,0023 x d_1	0,0022 x d_1	0,0030 x d_1	0,0024 x d_1	0,0038 x d_1	0,0030 x d_1			■
	2.1		26	0,0029 x d_1	0,0028 x d_1	0,0038 x d_1	0,0030 x d_1	0,0047 x d_1	0,0037 x d_1			■
	2.2		12	0,0023 x d_1	0,0022 x d_1	0,0030 x d_1	0,0024 x d_1	0,0038 x d_1	0,0030 x d_1			■
	2.3											■
2.4		7	0,0023 x d_1	0,0022 x d_1	0,0030 x d_1	0,0024 x d_1	0,0038 x d_1	0,0030 x d_1			■	
2.5											■	
2.6											■	
H	1.1											■
	1.2											■
	1.3											■
	1.4											■
	1.5											■

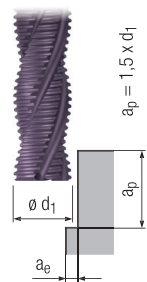
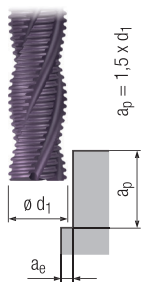


HSS-Schaftfräser – lange und extra lange Ausführung

HSS end mills – long and extra long design

NR HR WR

lange Ausführung
long design



Gültig für · Valid for

1349 1594
1349C 1594C



1359C 1386C

Product Finder

- NR
- NF
- N
- H
- WR
- W

v_c / f_z

	v_c [m/min]		f_z [mm]		TICN	$d_1 < 32$ mm	$d_1 \geq 32$ mm	TICN	f_z [mm]		TICN		Unbesch.				
	Unbeschichtet Uncoated	TICN	$d_1 < 32$ mm	$d_1 \geq 32$ mm					$d_1 < 32$ mm	$d_1 \geq 32$ mm	$d_1 < 32$ mm	$d_1 \geq 32$ mm	TICN	$d_1 < 32$ mm	$d_1 \geq 32$ mm	Unbesch. Uncoated	
P	1.1	21	35	$0,0038 \times d_1$	$0,0030 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	24	$0,0031 \times d_1$	$0,0025 \times d_1$		□	■				
	2.1	18	33	$0,0035 \times d_1$	$0,0028 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	22	$0,0029 \times d_1$	$0,0023 \times d_1$			■				
	3.1	15	15	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	16	$0,0026 \times d_1$	$0,0021 \times d_1$			■				
	4.1		15	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	15	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
	5.1		15	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	12	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
M	1.1		15	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	11	$0,0026 \times d_1$	$0,0021 \times d_1$			■				
	2.1		14	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	10	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
	3.1		12	$0,0026 \times d_1$	$0,0020 \times d_1$	$0,0032 \times d_1$	$0,0025 \times d_1$	10	$0,0021 \times d_1$	$0,0017 \times d_1$			■				
	4.1		11	$0,0022 \times d_1$	$0,0018 \times d_1$	$0,0028 \times d_1$	$0,0022 \times d_1$	10	$0,0018 \times d_1$	$0,0015 \times d_1$			■				
K	1.1	15	29	$0,0038 \times d_1$	$0,0030 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	19	$0,0031 \times d_1$	$0,0025 \times d_1$	□	□	□	■			
	1.2	13	25	$0,0035 \times d_1$	$0,0028 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	17	$0,0029 \times d_1$	$0,0023 \times d_1$	□	□	□	■			
	2.1		23	$0,0035 \times d_1$	$0,0028 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	15	$0,0029 \times d_1$	$0,0023 \times d_1$		□	■				
	2.2		15	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	14	$0,0026 \times d_1$	$0,0021 \times d_1$		□	■				
	3.1		15	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	11	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
	3.2		15	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	10	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
	4.1		24	$0,0035 \times d_1$	$0,0028 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	16	$0,0029 \times d_1$	$0,0023 \times d_1$		□	■				
	4.2		15	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	11	$0,0026 \times d_1$	$0,0021 \times d_1$		□	■				
	N	1.1	50	50	$0,0051 \times d_1$	$0,0040 \times d_1$	$0,0064 \times d_1$	$0,0050 \times d_1$		$0,0042 \times d_1$	$0,0034 \times d_1$			■			
		1.2	50	50	$0,0048 \times d_1$	$0,0038 \times d_1$	$0,0060 \times d_1$	$0,0047 \times d_1$		$0,0039 \times d_1$	$0,0032 \times d_1$			■			
1.3		40	45	$0,0045 \times d_1$	$0,0035 \times d_1$	$0,0056 \times d_1$	$0,0043 \times d_1$		$0,0036 \times d_1$	$0,0029 \times d_1$			■				
1.4		50	50	$0,0042 \times d_1$	$0,0033 \times d_1$	$0,0052 \times d_1$	$0,0040 \times d_1$		$0,0034 \times d_1$	$0,0027 \times d_1$			■				
1.5			40	$0,0038 \times d_1$	$0,0030 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$						■				
1.6													■				
2.1			26	$0,0038 \times d_1$	$0,0030 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	17	$0,0031 \times d_1$	$0,0025 \times d_1$			■				
2.2		15	28	$0,0035 \times d_1$	$0,0028 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	19	$0,0029 \times d_1$	$0,0023 \times d_1$			■				
2.3		28	40	$0,0038 \times d_1$	$0,0030 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	20	$0,0031 \times d_1$	$0,0025 \times d_1$	□		■				
2.4			27	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	18	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
2.5		22	40	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	20	$0,0026 \times d_1$	$0,0021 \times d_1$		□	■				
2.6			40	$0,0038 \times d_1$	$0,0030 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	20	$0,0031 \times d_1$	$0,0025 \times d_1$			■				
2.7								18	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
2.8													■				
3.1		50	60	$0,0042 \times d_1$	$0,0033 \times d_1$	$0,0052 \times d_1$	$0,0040 \times d_1$		$0,0034 \times d_1$	$0,0027 \times d_1$	□	■	□	■			
3.2		40	60	$0,0048 \times d_1$	$0,0038 \times d_1$	$0,0060 \times d_1$	$0,0047 \times d_1$		$0,0039 \times d_1$	$0,0032 \times d_1$	□	■	□	■			
4.1		60		$0,0064 \times d_1$	$0,0050 \times d_1$	$0,0080 \times d_1$	$0,0062 \times d_1$		$0,0052 \times d_1$	$0,0042 \times d_1$			■				
4.2	90		$0,0064 \times d_1$	$0,0050 \times d_1$	$0,0080 \times d_1$	$0,0062 \times d_1$		$0,0052 \times d_1$	$0,0042 \times d_1$			■					
4.3												■					
4.4												■					
5.1												■					
5.2		17	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	11	$0,0023 \times d_1$	$0,0019 \times d_1$			■					
5.3												■					
S	1.1		15	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	15	$0,0026 \times d_1$	$0,0021 \times d_1$			■				
	1.2		15	$0,0029 \times d_1$	$0,0023 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$	14	$0,0023 \times d_1$	$0,0019 \times d_1$			■				
	1.3												■				
	2.1		15	$0,0032 \times d_1$	$0,0025 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	15	$0,0026 \times d_1$	$0,0021 \times d_1$			■				
	2.2		10	$0,0026 \times d_1$	$0,0020 \times d_1$	$0,0032 \times d_1$	$0,0025 \times d_1$						■				
	2.3												■				
H	1.1												■				
	1.2												■				
	1.3												■				
	1.4												■				
	1.5												■				

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



HSS-Schafffräser – kurze und lange Ausführung HSS end mills – short and long design

NF

Gültig für · Valid for

1364 1366
1364C 1366C



NR

NF

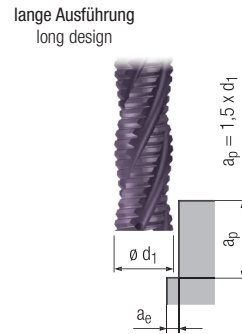
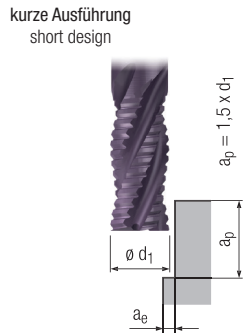
N

HR

WR

W

v_c / f_z



	v_c [m/min]		f_z [mm]		v_c [m/min]		f_z [mm]		TICN				Unbesch. Uncoated	
	Unbeschichtet Uncoated	TICN	$d_1 \leq 40$ mm	$d_1 \leq 40$ mm	Unbeschichtet Uncoated	TICN	$d_1 \leq 40$ mm	$d_1 \leq 40$ mm						
P	1.1	35	60	$0,0042 \times d_1$	$0,0055 \times d_1$	21	35	$0,0040 \times d_1$						■
	2.1	30	55	$0,0039 \times d_1$	$0,0051 \times d_1$	18	33	$0,0036 \times d_1$						■
	3.1	25	40	$0,0035 \times d_1$	$0,0046 \times d_1$	15	15	$0,0033 \times d_1$						■
	4.1		38	$0,0032 \times d_1$	$0,0041 \times d_1$		15	$0,0030 \times d_1$						■
	5.1													
M	1.1	15	28	$0,0035 \times d_1$	$0,0046 \times d_1$	14	15	$0,0033 \times d_1$						■
	2.1		24	$0,0032 \times d_1$	$0,0041 \times d_1$		14	$0,0030 \times d_1$						■
	3.1		20	$0,0028 \times d_1$	$0,0037 \times d_1$		12	$0,0026 \times d_1$						■
	4.1													
K	1.1	25	48	$0,0042 \times d_1$	$0,0055 \times d_1$	15	29	$0,0040 \times d_1$	□	□	□	□	□	■
	1.2	22	42	$0,0039 \times d_1$	$0,0051 \times d_1$	13	25	$0,0036 \times d_1$	□	□	□	□	□	■
	2.1	20	38	$0,0039 \times d_1$	$0,0051 \times d_1$	12	23	$0,0036 \times d_1$						■
	2.2	18	34	$0,0035 \times d_1$	$0,0046 \times d_1$	11	15	$0,0033 \times d_1$						■
	3.1		29	$0,0032 \times d_1$	$0,0041 \times d_1$		15	$0,0030 \times d_1$						■
	3.2		25	$0,0032 \times d_1$	$0,0041 \times d_1$		15	$0,0030 \times d_1$						■
	4.1	21	40	$0,0039 \times d_1$	$0,0051 \times d_1$	13	24	$0,0036 \times d_1$			□			■
	4.2	14	27	$0,0035 \times d_1$	$0,0046 \times d_1$	10	15	$0,0033 \times d_1$			□			■
N	1.1													
	1.2													
	1.3													
	1.4													
	1.5													
	1.6													
	2.1		43	$0,0042 \times d_1$	$0,0055 \times d_1$		26	$0,0040 \times d_1$						■
	2.2	26	47	$0,0039 \times d_1$	$0,0051 \times d_1$	15	28	$0,0036 \times d_1$						■
	2.3	47	85	$0,0042 \times d_1$	$0,0055 \times d_1$	28	40	$0,0040 \times d_1$			□			■
	2.4		44	$0,0032 \times d_1$	$0,0041 \times d_1$		27	$0,0030 \times d_1$						■
	2.5	37	67	$0,0035 \times d_1$	$0,0046 \times d_1$	22	40	$0,0033 \times d_1$			□			■
	2.6		77	$0,0042 \times d_1$	$0,0055 \times d_1$		40	$0,0040 \times d_1$						■
	2.7		45	$0,0032 \times d_1$	$0,0041 \times d_1$		23	$0,0030 \times d_1$						■
	2.8													
	3.1													
	3.2													
4.1														
4.2														
4.3														
4.4														
5.1														
5.2		28	$0,0032 \times d_1$	$0,0041 \times d_1$		17	$0,0030 \times d_1$						■	
5.3														
S	1.1		40	$0,0035 \times d_1$	$0,0046 \times d_1$		15	$0,0033 \times d_1$						■
	1.2		28	$0,0032 \times d_1$	$0,0041 \times d_1$		15	$0,0030 \times d_1$						■
	1.3													■
	2.1		26	$0,0035 \times d_1$	$0,0046 \times d_1$		15	$0,0033 \times d_1$						■
	2.2		12	$0,0028 \times d_1$	$0,0037 \times d_1$		10	$0,0026 \times d_1$						■
	2.3													
H	1.1													
	1.2													
	1.3													
	1.4													
	1.5													



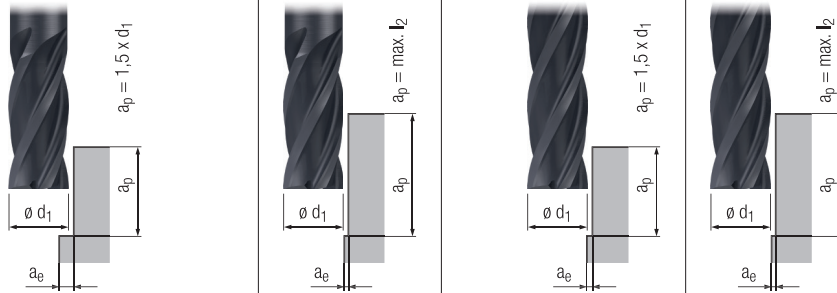
HSS-Schaftfräser – kurze und lange Ausführung
HSS end mills – short and long design

N

Gültig für · Valid for
1576L 1578L

kurze Ausführung
short design

lange Ausführung
long design



	kurze Ausführung short design			lange Ausführung long design			Symbole				
	V_c [m/min]	f_z [mm]	f_z [mm]	f_z [mm]	V_c [m/min]	f_z [mm]	f_z [mm]			MMS MQL	
P		$a_e = 0,25 \times d_1$	$a_e = 0,1 \times d_1$	$a_e = 0,2 \text{ mm}$		$a_e = 0,1 \times d_1$	$a_e = 0,2 \text{ mm}$				
	1.1	66	$0,0040 \times d_1$	$0,0054 \times d_1$	$0,0068 \times d_1$	35	$0,0037 \times d_1$	$0,0050 \times d_1$			
	2.1	61	$0,0036 \times d_1$	$0,0050 \times d_1$	$0,0063 \times d_1$	33	$0,0034 \times d_1$	$0,0046 \times d_1$			
	3.1	44	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	15	$0,0031 \times d_1$	$0,0042 \times d_1$			
	4.1	42	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	15	$0,0028 \times d_1$	$0,0038 \times d_1$			
5.1	33	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	15	$0,0028 \times d_1$	$0,0038 \times d_1$				
M											
	1.1	31	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	15	$0,0031 \times d_1$	$0,0042 \times d_1$			
	2.1	26	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	14	$0,0028 \times d_1$	$0,0038 \times d_1$			
	3.1	22	$0,0026 \times d_1$	$0,0036 \times d_1$	$0,0046 \times d_1$	12	$0,0025 \times d_1$	$0,0034 \times d_1$			
4.1	20	$0,0023 \times d_1$	$0,0032 \times d_1$	$0,0040 \times d_1$	11	$0,0022 \times d_1$	$0,0029 \times d_1$				
K	1.1	52	$0,0040 \times d_1$	$0,0054 \times d_1$	$0,0068 \times d_1$	29	$0,0037 \times d_1$	$0,0050 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	46	$0,0036 \times d_1$	$0,0050 \times d_1$	$0,0063 \times d_1$	25	$0,0034 \times d_1$	$0,0046 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	42	$0,0036 \times d_1$	$0,0050 \times d_1$	$0,0063 \times d_1$	23	$0,0034 \times d_1$	$0,0046 \times d_1$			<input type="checkbox"/>
	2.2	38	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	15	$0,0031 \times d_1$	$0,0042 \times d_1$			<input type="checkbox"/>
	3.1	31	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	15	$0,0028 \times d_1$	$0,0038 \times d_1$			<input type="checkbox"/>
	3.2	27	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	15	$0,0028 \times d_1$	$0,0038 \times d_1$			<input type="checkbox"/>
	4.1	44	$0,0036 \times d_1$	$0,0050 \times d_1$	$0,0063 \times d_1$	24	$0,0034 \times d_1$	$0,0046 \times d_1$			<input type="checkbox"/>
	4.2	29	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	15	$0,0031 \times d_1$	$0,0042 \times d_1$			<input type="checkbox"/>
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1	48	$0,0040 \times d_1$	$0,0054 \times d_1$	$0,0068 \times d_1$	26	$0,0037 \times d_1$	$0,0050 \times d_1$			
	2.2	47	$0,0036 \times d_1$	$0,0050 \times d_1$	$0,0063 \times d_1$	28	$0,0034 \times d_1$	$0,0046 \times d_1$			
	2.3	93	$0,0040 \times d_1$	$0,0054 \times d_1$	$0,0068 \times d_1$	40	$0,0037 \times d_1$	$0,0050 \times d_1$			<input type="checkbox"/>
	2.4	48	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	27	$0,0028 \times d_1$	$0,0038 \times d_1$			<input type="checkbox"/>
	2.5	73	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	40	$0,0031 \times d_1$	$0,0042 \times d_1$			<input type="checkbox"/>
	2.6	85	$0,0040 \times d_1$	$0,0054 \times d_1$	$0,0068 \times d_1$	40	$0,0037 \times d_1$	$0,0050 \times d_1$			<input type="checkbox"/>
	2.7										
	2.8										
3.1											
3.2											
4.1											
4.2											
4.3											
4.4											
5.1											
5.2	31	$0,0030 \times d_1$	$0,0041 \times d_1$	$0,0051 \times d_1$	17	$0,0028 \times d_1$	$0,0038 \times d_1$				
5.3											
S	1.1	44	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	15	$0,0031 \times d_1$	$0,0042 \times d_1$			
	1.2										
	1.3										
	2.1	29	$0,0033 \times d_1$	$0,0045 \times d_1$	$0,0057 \times d_1$	15	$0,0031 \times d_1$	$0,0042 \times d_1$			
	2.2	13	$0,0026 \times d_1$	$0,0036 \times d_1$	$0,0046 \times d_1$	10	$0,0025 \times d_1$	$0,0034 \times d_1$			
	2.3										
	2.4										
2.5											
2.6											
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

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



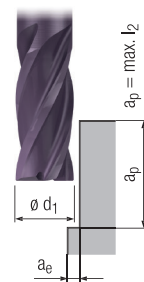
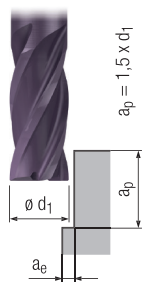
- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z



HSS-Schaftfräser – kurze und mittellange Ausführung

HSS end mills – short and medium length design

N **W**



Gültig für · Valid for
1331 1331C

FRANKEN
TOP-CUT
1311 1318
1311C 1318C

	v_c [m/min]		$a_e = 0,25 \times d_1$		$a_e = 0,1 \times d_1$		$a_e = 0,2 \text{ mm}$		TICN	Unbesch. Uncoated		
	Unbeschichtet Uncoated	TICN	f_z [mm]		f_z [mm]		f_z [mm]					
			$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$				
P	1.1	35	60	$0,0037 \times d_1$	$0,0026 \times d_1$	$0,0052 \times d_1$	$0,0036 \times d_1$	$0,0066 \times d_1$	$0,0040 \times d_1$	□	□	■
	2.1	30	55	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0061 \times d_1$	$0,0036 \times d_1$		□	■
	3.1		40	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$			■
	4.1		38	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
	5.1		30	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
M	1.1	15	28	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$			■
	2.1	12	24	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
	3.1		20	$0,0025 \times d_1$	$0,0018 \times d_1$	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0044 \times d_1$	$0,0026 \times d_1$			■
	4.1		18	$0,0022 \times d_1$	$0,0015 \times d_1$	$0,0030 \times d_1$	$0,0021 \times d_1$	$0,0039 \times d_1$	$0,0023 \times d_1$			■
K	1.1	25	48	$0,0037 \times d_1$	$0,0026 \times d_1$	$0,0052 \times d_1$	$0,0036 \times d_1$	$0,0066 \times d_1$	$0,0040 \times d_1$	□	□	■
	1.2	22	42	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0061 \times d_1$	$0,0036 \times d_1$	□	□	■
	2.1	20	38	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0061 \times d_1$	$0,0036 \times d_1$		□	■
	2.2	18	34	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$		□	■
	3.1		29	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
	3.2		25	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
	4.1	21	40	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0061 \times d_1$	$0,0036 \times d_1$		□	■
	4.2	14	27	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$		□	■
N	1.1	200	300	$0,0050 \times d_1$	$0,0035 \times d_1$	$0,0069 \times d_1$	$0,0048 \times d_1$	$0,0088 \times d_1$	$0,0053 \times d_1$			■
	1.2	170	270	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0065 \times d_1$	$0,0045 \times d_1$	$0,0083 \times d_1$	$0,0050 \times d_1$			■
	1.3	110	210	$0,0043 \times d_1$	$0,0031 \times d_1$	$0,0060 \times d_1$	$0,0042 \times d_1$	$0,0077 \times d_1$	$0,0046 \times d_1$			■
	1.4	90	170	$0,0040 \times d_1$	$0,0029 \times d_1$	$0,0056 \times d_1$	$0,0039 \times d_1$	$0,0072 \times d_1$	$0,0043 \times d_1$			■
	1.5		130	$0,0037 \times d_1$	$0,0026 \times d_1$	$0,0052 \times d_1$	$0,0036 \times d_1$	$0,0066 \times d_1$	$0,0040 \times d_1$			■
	1.6		80	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0061 \times d_1$	$0,0036 \times d_1$			■
	2.1		43	$0,0037 \times d_1$	$0,0026 \times d_1$	$0,0052 \times d_1$	$0,0036 \times d_1$	$0,0066 \times d_1$	$0,0040 \times d_1$			■
	2.2	26	47	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0061 \times d_1$	$0,0036 \times d_1$			■
	2.3	47	85	$0,0037 \times d_1$	$0,0026 \times d_1$	$0,0052 \times d_1$	$0,0036 \times d_1$	$0,0066 \times d_1$	$0,0040 \times d_1$		□	■
	2.4		44	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
	2.5		67	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$		□	■
	2.6	43	77	$0,0037 \times d_1$	$0,0026 \times d_1$	$0,0052 \times d_1$	$0,0036 \times d_1$	$0,0066 \times d_1$	$0,0040 \times d_1$			■
	2.7											
	2.8											
	3.1	80	170	$0,0040 \times d_1$	$0,0029 \times d_1$	$0,0056 \times d_1$	$0,0039 \times d_1$	$0,0072 \times d_1$	$0,0043 \times d_1$	□	■	□
	3.2	68	125	$0,0047 \times d_1$	$0,0033 \times d_1$	$0,0065 \times d_1$	$0,0045 \times d_1$	$0,0083 \times d_1$	$0,0050 \times d_1$	□	■	□
4.1	70	100	$0,0062 \times d_1$	$0,0044 \times d_1$	$0,0086 \times d_1$	$0,0060 \times d_1$	$0,0110 \times d_1$	$0,0066 \times d_1$	□	□	□	
4.2	100	190	$0,0062 \times d_1$	$0,0044 \times d_1$	$0,0086 \times d_1$	$0,0060 \times d_1$	$0,0110 \times d_1$	$0,0066 \times d_1$	□	□	□	
4.3												
4.4												
5.1												
5.2		28	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■	
5.3												
S	1.1		40	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$			■
	1.2		28	$0,0028 \times d_1$	$0,0020 \times d_1$	$0,0039 \times d_1$	$0,0027 \times d_1$	$0,0050 \times d_1$	$0,0030 \times d_1$			■
	1.3											
	2.1		26	$0,0031 \times d_1$	$0,0022 \times d_1$	$0,0043 \times d_1$	$0,0030 \times d_1$	$0,0055 \times d_1$	$0,0033 \times d_1$			■
	2.2		12	$0,0025 \times d_1$	$0,0018 \times d_1$	$0,0034 \times d_1$	$0,0024 \times d_1$	$0,0044 \times d_1$	$0,0026 \times d_1$			■
	2.3											
2.4												
2.5												
2.6												
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											



TICN Unbesch.
Uncoated

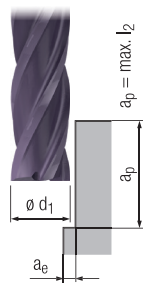
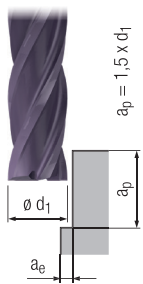
MMS MQL



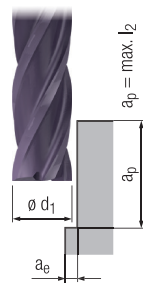
HSS-Schaftfräser – lange und extra lange Ausführung
 HSS end mills – long and extra long design

N W

lange Ausführung
long design



extra lange Ausführung
extra long design



Gültig für · Valid for

1333 1336
1333C 1336C

FRANKEN
TOP-Cut

1306 1316
1306C 1316C

	V_c [m/min]		f_z [mm]				V_c [m/min]		f_z [mm]				TICN		Unbesch. Uncoated	
	Unbeschichtet Uncoated	TICN	$a_e = 0,1 \times d_1$		$a_e = 0,2 \text{ mm}$		Unbeschichtet Uncoated	TICN	$a_e = 0,2 \text{ mm}$							
			$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$			$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$				

P	1.1	21	35	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	14	24	$0,0031 \times d_1$	$0,0025 \times d_1$					■
	2.1	18	33	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	12	22	$0,0029 \times d_1$	$0,0023 \times d_1$					■
	3.1		15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$		16	$0,0026 \times d_1$	$0,0021 \times d_1$					■
	4.1		15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		15	$0,0023 \times d_1$	$0,0019 \times d_1$					■
	5.1		15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		12	$0,0023 \times d_1$	$0,0019 \times d_1$					■
M	1.1	14	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	10	11	$0,0026 \times d_1$	$0,0021 \times d_1$					■
	2.1		14	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		10	$0,0023 \times d_1$	$0,0019 \times d_1$					■
	3.1		12	$0,0023 \times d_1$	$0,0019 \times d_1$	$0,0032 \times d_1$	$0,0025 \times d_1$		10	$0,0021 \times d_1$	$0,0017 \times d_1$					■
	4.1		11	$0,0020 \times d_1$	$0,0017 \times d_1$	$0,0028 \times d_1$	$0,0022 \times d_1$		10	$0,0018 \times d_1$	$0,0015 \times d_1$					■
K	1.1	15	29	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	10	19	$0,0031 \times d_1$	$0,0025 \times d_1$	□	□	□	□	■
	1.2	13	25	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	10	17	$0,0029 \times d_1$	$0,0023 \times d_1$	□	□	□	□	■
	2.1	12	23	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	10	15	$0,0029 \times d_1$	$0,0023 \times d_1$			□	□	■
	2.2	11	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	10	14	$0,0026 \times d_1$	$0,0021 \times d_1$			□	□	■
	3.1		15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		11	$0,0023 \times d_1$	$0,0019 \times d_1$					■
	3.2		15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		10	$0,0023 \times d_1$	$0,0019 \times d_1$					■
	4.1	13	24	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	10	16	$0,0029 \times d_1$	$0,0023 \times d_1$			□	□	■
	4.2	10	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	10	11	$0,0026 \times d_1$	$0,0021 \times d_1$			□	□	■
	N	1.1	50	50	$0,0046 \times d_1$	$0,0038 \times d_1$	$0,0064 \times d_1$	$0,0050 \times d_1$	38	40	$0,0042 \times d_1$	$0,0034 \times d_1$				
1.2		50	50	$0,0044 \times d_1$	$0,0036 \times d_1$	$0,0060 \times d_1$	$0,0047 \times d_1$	34	36	$0,0039 \times d_1$	$0,0032 \times d_1$					■
1.3		40	45	$0,0041 \times d_1$	$0,0034 \times d_1$	$0,0056 \times d_1$	$0,0043 \times d_1$	30	32	$0,0036 \times d_1$	$0,0029 \times d_1$					■
1.4		50	50	$0,0038 \times d_1$	$0,0031 \times d_1$	$0,0052 \times d_1$	$0,0040 \times d_1$	26	28	$0,0034 \times d_1$	$0,0027 \times d_1$					■
1.5		40	40	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$		24	$0,0031 \times d_1$	$0,0025 \times d_1$					■
1.6		35	35	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$		22	$0,0029 \times d_1$	$0,0023 \times d_1$					■
2.1			26	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$		17	$0,0031 \times d_1$	$0,0025 \times d_1$					■
2.2		15	28	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	10	19	$0,0029 \times d_1$	$0,0023 \times d_1$					■
2.3		28	40	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$		19	$0,0031 \times d_1$	$0,0025 \times d_1$			□	□	■
2.4			27	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		18	$0,0023 \times d_1$	$0,0019 \times d_1$					■
2.5			40	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$		20	$0,0026 \times d_1$	$0,0021 \times d_1$					■
2.6		26	40	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	17	20	$0,0031 \times d_1$	$0,0025 \times d_1$					■
2.7									18	$0,0023 \times d_1$	$0,0019 \times d_1$					■
2.8																■
3.1		50	60	$0,0038 \times d_1$	$0,0031 \times d_1$	$0,0052 \times d_1$	$0,0040 \times d_1$	32	40	$0,0034 \times d_1$	$0,0027 \times d_1$	□	■		□	■
3.2		40	60	$0,0044 \times d_1$	$0,0036 \times d_1$	$0,0060 \times d_1$	$0,0047 \times d_1$	27	40	$0,0039 \times d_1$	$0,0032 \times d_1$	□	■		□	■
4.1	60	90	$0,0058 \times d_1$	$0,0048 \times d_1$	$0,0080 \times d_1$	$0,0062 \times d_1$	50	75	$0,0052 \times d_1$	$0,0042 \times d_1$	□	□	□	□	■	
4.2	90	150	$0,0058 \times d_1$	$0,0048 \times d_1$	$0,0080 \times d_1$	$0,0062 \times d_1$	70	100	$0,0052 \times d_1$	$0,0042 \times d_1$	□	□	□	□	■	
4.3																
4.4																
5.1								20	$0,0018 \times d_1$	$0,0015 \times d_1$					■	
5.2		17	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$		11	$0,0023 \times d_1$	$0,0019 \times d_1$					■	
5.3																
S	1.1		15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$		15	$0,0026 \times d_1$	$0,0021 \times d_1$					■
	1.2															
	1.3															
	2.1		15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$	7	15	$0,0026 \times d_1$	$0,0021 \times d_1$					■
	2.2		10	$0,0023 \times d_1$	$0,0019 \times d_1$	$0,0032 \times d_1$	$0,0025 \times d_1$									■
	2.3															
2.4																
2.5																
2.6																
H	1.1															
	1.2															
	1.3															
	1.4															
	1.5															

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

Product
Finder

NR

NF

N

H

WR

W

V_c / f_z



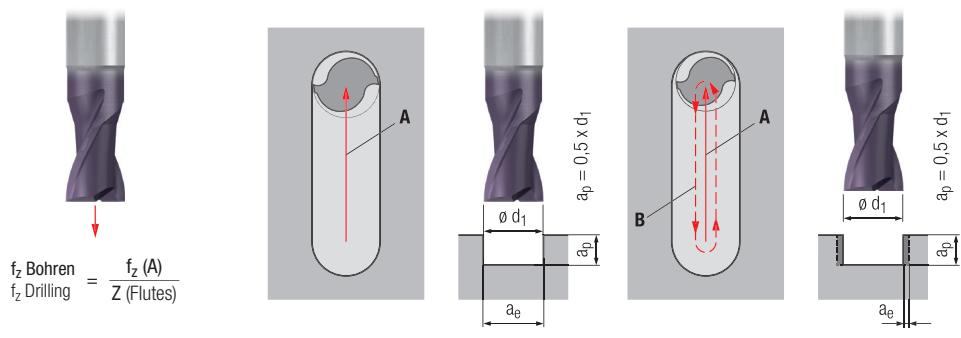
HSS

- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z



HSS-Langlochfräser – extra kurze und kurze Ausführung HSS slot drills – extra short and short design

N



Gültig für · Valid for

2316 2317
2316C 2317C

FRANKEN
TOP-CUT

1329 2300 2310
1329C 2300C 2310C

	v_c [m/min]		A $a_e = d_1$	B $a_e = 0,1 - 0,5 \text{ mm}$	Coatings				
	Unbeschichtet Uncoated	TICN			TICN HM	MMS MQL	Unbesch. Uncoated		
P	1.1	35	60	$0,0036 \times d_1$	$0,0062 \times d_1$			□	■
	2.1	30	55	$0,0033 \times d_1$	$0,0057 \times d_1$				■
	3.1		40	$0,0030 \times d_1$	$0,0052 \times d_1$				■
	4.1		38	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	5.1								
M	1.1	15	28	$0,0030 \times d_1$	$0,0052 \times d_1$				■
	2.1	12	24	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	3.1		20	$0,0024 \times d_1$	$0,0042 \times d_1$				■
	4.1		18	$0,0021 \times d_1$	$0,0036 \times d_1$				■
K	1.1	25	48	$0,0036 \times d_1$	$0,0062 \times d_1$			□	■
	1.2	22	42	$0,0033 \times d_1$	$0,0057 \times d_1$				■
	2.1	20	38	$0,0033 \times d_1$	$0,0057 \times d_1$			□	■
	2.2	18	34	$0,0030 \times d_1$	$0,0052 \times d_1$				■
	3.1		29	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	3.2		25	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	4.1	21	40	$0,0033 \times d_1$	$0,0057 \times d_1$				■
	4.2	14	27	$0,0030 \times d_1$	$0,0052 \times d_1$				■
N	1.1	200	300	$0,0048 \times d_1$	$0,0083 \times d_1$				■
	1.2	170	270	$0,0045 \times d_1$	$0,0078 \times d_1$				■
	1.3	110	210	$0,0042 \times d_1$	$0,0073 \times d_1$				■
	1.4	90	170	$0,0039 \times d_1$	$0,0068 \times d_1$				■
	1.5		130	$0,0036 \times d_1$	$0,0062 \times d_1$				■
	1.6								
	2.1		43	$0,0036 \times d_1$	$0,0062 \times d_1$				■
	2.2	26	47	$0,0033 \times d_1$	$0,0057 \times d_1$				■
	2.3	47	85	$0,0036 \times d_1$	$0,0062 \times d_1$				■
	2.4	25	44	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	2.5	37	67	$0,0030 \times d_1$	$0,0052 \times d_1$				■
	2.6	43	77	$0,0036 \times d_1$	$0,0062 \times d_1$				■
	2.7	23	45	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	2.8								
	3.1	80	170	$0,0039 \times d_1$	$0,0068 \times d_1$		□	■	□
	3.2	68	125	$0,0045 \times d_1$	$0,0078 \times d_1$		□	■	□
4.1	70	100	$0,0060 \times d_1$	$0,0104 \times d_1$			□	■	
4.2	100	190	$0,0060 \times d_1$	$0,0104 \times d_1$			□	■	
4.3									
4.4									
5.1		50	$0,0021 \times d_1$	$0,0036 \times d_1$				■	
5.2		28	$0,0027 \times d_1$	$0,0047 \times d_1$				■	
5.3									
S	1.1		40	$0,0030 \times d_1$	$0,0052 \times d_1$				■
	1.2	18	28	$0,0027 \times d_1$	$0,0047 \times d_1$				■
	1.3		20	$0,0024 \times d_1$	$0,0042 \times d_1$				■
	2.1		26	$0,0030 \times d_1$	$0,0052 \times d_1$				■
	2.2		12	$0,0024 \times d_1$	$0,0042 \times d_1$				■
	2.3								
2.4		7	$0,0024 \times d_1$	$0,0042 \times d_1$				■	
2.5									
2.6									
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								





HSS-Langlochfräser – mittellange Ausführung
HSS slot drills – medium length design

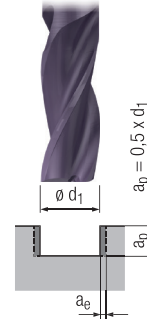
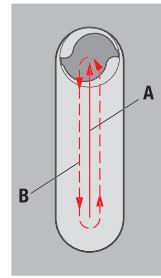
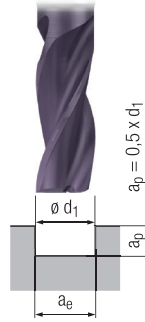
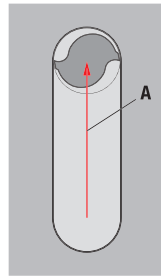
N

Gültig für · Valid for

2345 2345C

$$f_z \text{ Bohren} = \frac{f_z (A)}{Z \text{ (Flutes)}}$$

$$f_z \text{ Drilling} = \frac{f_z (A)}{Z \text{ (Flutes)}}$$



	V _c [m/min]		A a _e = d ₁	B a _e = 0,1 - 0,5 mm	TICN		Unbesch. Uncoated	
	Unbeschichtet Uncoated	TICN			MMS MQL	Unbesch. Uncoated		
P	1.1	28	48	0,0030 x d ₁	0,0054 x d ₁		□	■
	2.1	24	44	0,0028 x d ₁	0,0050 x d ₁			■
	3.1		32	0,0025 x d ₁	0,0045 x d ₁			■
	4.1		30	0,0023 x d ₁	0,0041 x d ₁			■
	5.1							
M	1.1	12	22	0,0025 x d ₁	0,0045 x d ₁			■
	2.1	10	19	0,0023 x d ₁	0,0041 x d ₁			■
	3.1		12	0,0020 x d ₁	0,0036 x d ₁			■
	4.1		11	0,0018 x d ₁	0,0032 x d ₁			■
K	1.1	20	38	0,0030 x d ₁	0,0054 x d ₁		□	■
	1.2	18	33	0,0028 x d ₁	0,0050 x d ₁			■
	2.1	16	30	0,0028 x d ₁	0,0050 x d ₁		□	■
	2.2	14	27	0,0025 x d ₁	0,0045 x d ₁			■
	3.1		23	0,0023 x d ₁	0,0041 x d ₁			■
	3.2		20	0,0023 x d ₁	0,0041 x d ₁			■
	4.1	17	32	0,0028 x d ₁	0,0050 x d ₁			■
	4.2	11	21	0,0025 x d ₁	0,0045 x d ₁			■
N	1.1							
	1.2							
	1.3	88	168	0,0035 x d ₁	0,0063 x d ₁			■
	1.4	72	136	0,0033 x d ₁	0,0059 x d ₁			■
	1.5		104	0,0030 x d ₁	0,0054 x d ₁			■
	1.6							
	2.1		35	0,0030 x d ₁	0,0054 x d ₁			■
	2.2	21	37	0,0028 x d ₁	0,0050 x d ₁			■
	2.3	38	68	0,0030 x d ₁	0,0054 x d ₁			■
	2.4	20	35	0,0023 x d ₁	0,0041 x d ₁			■
	2.5	30	53	0,0025 x d ₁	0,0045 x d ₁			■
	2.6	34	62	0,0030 x d ₁	0,0054 x d ₁			■
	2.7		36	0,0023 x d ₁	0,0041 x d ₁			■
	2.8							
	3.1	64	136	0,0033 x d ₁	0,0059 x d ₁		□	■
	3.2	54	100	0,0038 x d ₁	0,0068 x d ₁		□	■
4.1	56	80	0,0050 x d ₁	0,0090 x d ₁		□	■	
4.2	80	152	0,0050 x d ₁	0,0090 x d ₁		□	■	
4.3								
4.4								
5.1								
5.2		22		0,0023 x d ₁	0,0041 x d ₁			■
5.3								
S	1.1		32	0,0025 x d ₁	0,0045 x d ₁			■
	1.2		22	0,0023 x d ₁	0,0041 x d ₁			■
	1.3							
	2.1		21	0,0025 x d ₁	0,0045 x d ₁			■
	2.2		10	0,0020 x d ₁	0,0036 x d ₁			■
	2.3							
2.4								
2.5								
2.6								
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

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



v_c / f_z

Product Finder

NR

NF

N

H

WR

W

- Product Finder
- NR
- NF
- N
- HR
- WR
- W
- v_c / f_z



HSS-Langlochfräser – lange Ausführung

HSS slot drills – long design

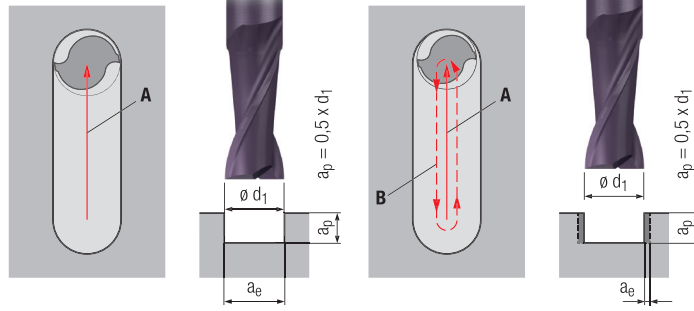
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Gültig für · Valid for

2305 2315
2305C 2315C

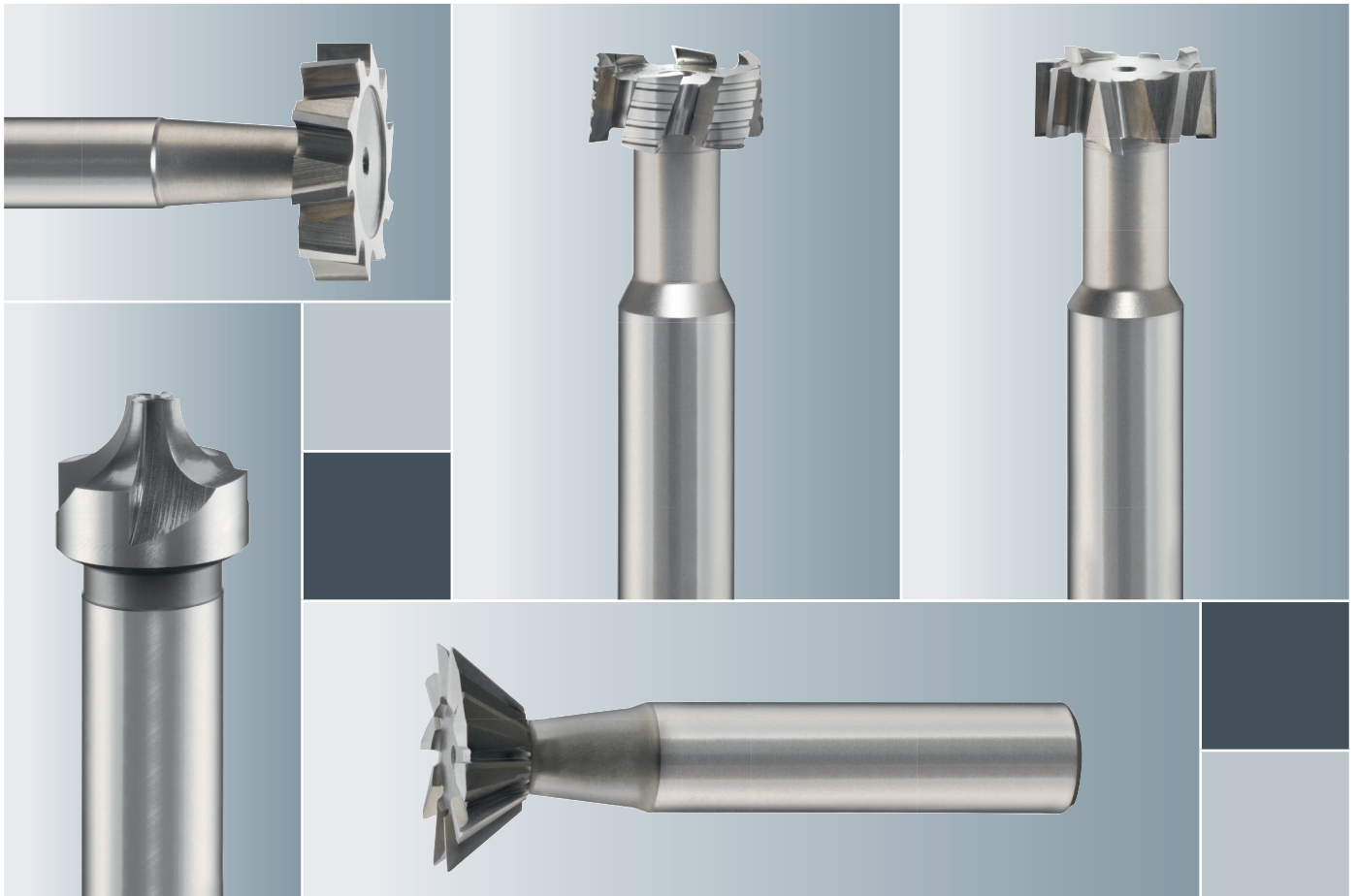
$$f_z \text{ Bohren} = \frac{f_z (A)}{Z \text{ (Flutes)}}$$

$$f_z \text{ Drilling} = \frac{f_z (A)}{Z \text{ (Flutes)}}$$



	v_c [m/min]		A $a_e = d_1$	B $a_e = 0,1 - 0,5 \text{ mm}$	TICN		Unbesch. Uncoated		
	Unbeschichtet Uncoated	TICN			f_z [mm]	f_z [mm]			
P	1.1	21	35	$0,0024 \times d_1$	$0,0030 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	18	33	$0,0022 \times d_1$	$0,0028 \times d_1$				<input checked="" type="checkbox"/>
	3.1		15	$0,0020 \times d_1$	$0,0025 \times d_1$				<input checked="" type="checkbox"/>
	4.1		15	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	5.1								
M	1.1	14	15	$0,0020 \times d_1$	$0,0025 \times d_1$				<input checked="" type="checkbox"/>
	2.1	10	14	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	3.1		12	$0,0016 \times d_1$	$0,0020 \times d_1$				<input checked="" type="checkbox"/>
	4.1		11	$0,0014 \times d_1$	$0,0018 \times d_1$				<input checked="" type="checkbox"/>
K	1.1	15	29	$0,0024 \times d_1$	$0,0030 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	13	25	$0,0022 \times d_1$	$0,0028 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	12	23	$0,0022 \times d_1$	$0,0028 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	11	15	$0,0020 \times d_1$	$0,0025 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1		15	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	3.2		15	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	4.1	13	24	$0,0022 \times d_1$	$0,0028 \times d_1$				<input checked="" type="checkbox"/>
	4.2	10	15	$0,0020 \times d_1$	$0,0025 \times d_1$				<input checked="" type="checkbox"/>
N	1.1	50	50	$0,0032 \times d_1$	$0,0040 \times d_1$				<input checked="" type="checkbox"/>
	1.2	50	50	$0,0030 \times d_1$	$0,0038 \times d_1$				<input checked="" type="checkbox"/>
	1.3	40	45	$0,0028 \times d_1$	$0,0035 \times d_1$				<input checked="" type="checkbox"/>
	1.4	50	50	$0,0026 \times d_1$	$0,0033 \times d_1$				<input checked="" type="checkbox"/>
	1.5		40	$0,0024 \times d_1$	$0,0030 \times d_1$				<input checked="" type="checkbox"/>
	1.6								
	2.1		26	$0,0024 \times d_1$	$0,0030 \times d_1$				<input checked="" type="checkbox"/>
	2.2	15	28	$0,0022 \times d_1$	$0,0028 \times d_1$				<input checked="" type="checkbox"/>
	2.3	28	40	$0,0024 \times d_1$	$0,0030 \times d_1$				<input checked="" type="checkbox"/>
	2.4	15	27	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	2.5	22	40	$0,0020 \times d_1$	$0,0025 \times d_1$				<input checked="" type="checkbox"/>
	2.6	26	40	$0,0024 \times d_1$	$0,0030 \times d_1$				<input checked="" type="checkbox"/>
	2.7		23	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	2.8								
	3.1	50	60	$0,0026 \times d_1$	$0,0033 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	40	60	$0,0030 \times d_1$	$0,0038 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
4.1	60	90	$0,0040 \times d_1$	$0,0050 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	90	150	$0,0040 \times d_1$	$0,0050 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3							<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.4									
5.1									
5.2		17	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>	
5.3									
S	1.1		15	$0,0020 \times d_1$	$0,0025 \times d_1$				<input checked="" type="checkbox"/>
	1.2		15	$0,0018 \times d_1$	$0,0023 \times d_1$				<input checked="" type="checkbox"/>
	1.3								
	2.1		15	$0,0020 \times d_1$	$0,0025 \times d_1$				<input checked="" type="checkbox"/>
	2.2								
	2.3								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								





HSS- und Hartmetall-Schaftformfräser HSS and Solid Carbide Form End Mills



Seite · Page

Wegweiser	Product finder	300 - 303
Produktseiten	Product pages	304 - 321
Schnittwerte	Cutting conditions	322 - 330

- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

Wegweiser

Bitte beachten:

Die Eignung der HSS- und Hartmetall-Schaftformfräser ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittdaten sind auf den Seiten 322 - 330 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:

The suitability of the HSS and solid carbide form end mills is indicated as follows:

- = very suitable
- = suitable

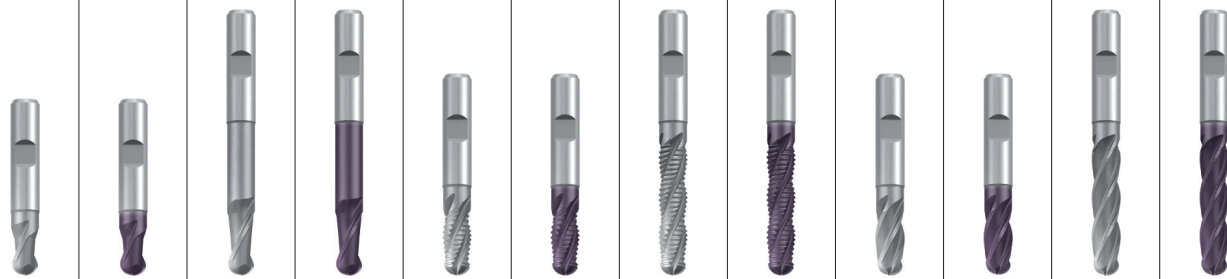
Please find the cutting conditions on pages 322 - 330.

International comparison of materials, see page 416 - 429.

		Einsatzgebiete – Material Applications – material		Material-Beispiele Material examples	Material-Nummern Material numbers	
P	Stahlwerkstoffe Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.		Steel materials Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	Cq15	1.1132	
	1.1	≤ 600 N/mm ²		S235JR (S137-2)	1.0037	
	2.1			10SPb20	1.0722	
	M	Nichtrostende Stahlwerkstoffe Ferritisch, martensitisch		Stainless steel materials Ferritic, martensitic	X2CrTi12	1.4512
		1.1	≤ 950 N/mm ²		X6CrNiMoTi17-12-2	1.4571
		2.1			X2CrNiMoN22-5-3	1.4462
3.1		X2CrNiMoN25-7-4			1.4410	
4.1						
K	Gusswerkstoffe Gusseisen mit Lamellengrafit (GJL)		Cast materials Cast iron with lamellar graphite (GJL)	EN-GJL-200 (GG20)	EN-JL-1030	
	1.1	100-250 N/mm ²		EN-GJL-300 (GG30)	EN-JL-1050	
	1.2			EN-GJS-400-15 (GGG40)	EN-JS-1030	
	2.1	350-500 N/mm ²		EN-GJS-700-2 (GGG70)	EN-JS-1070	
	2.2			GJV 300		
	3.1	500-900 N/mm ²		GJV 450		
	3.2			EN-GJMW-350-4 (GTW-35)	EN-JM-1010	
	4.1	250-500 N/mm ²		EN-GJMB-450-6 (GTS-45)	EN-JM-1140	
4.2	500-800 N/mm ²					
N	Nichteisenwerkstoffe Aluminium-Legierungen		Non-ferrous materials Aluminium alloys			
	1.1	≤ 200 N/mm ²		EN AW-AlMn1	EN AW-3103	
	1.2			EN AW-AlMgSi	EN AW-6060	
	1.3			EN AW-AlZn5Mg3Cu	EN AW-7022	
	1.4			EN AC-AlMg5	EN AC-51300	
	1.5	Aluminium cast alloys		EN AC-AISi9Cu3	EN AC-46500	
	1.6			GD-AISi17Cu4FeMg		
	2.1	≤ 400 N/mm ²		E-Cu 57	EN CW 004 A	
	2.2			CuZn37 (Ms63)	EN CW 508 L	
	2.3			CuZn36Pb3 (Ms58)	EN CW 603 N	
	2.4			CuAl10Ni5Fe4	EN CW 307 G	
	2.5			CuSn8P	EN CW 459 K	
	2.6			CuSn7 ZnPb (Rg7)	2.1090	
	2.7			(AMPCC® 8)		
	2.8			(AMPCC® 45)		
	3.1	≤ 500 N/mm ²		MgAl6Zn	3.5612	
	3.2			EN-MCMgAl9Zn1	EN-MC21120	
	S	Kunststoffe Duroplaste (kurzspanend)		Synthetics Duroplastics (short-chipping)	Bakelit, Pertinax	
		4.1			PMMA, POM, PVC	
		4.2			Fibre-reinforced synthetics (fibre content ≤ 30%)	GFK, CFK, AFK
4.3		Fibre-reinforced synthetics (fibre content > 30%)			GFK, CFK, AFK	
4.4						
5.1		≤ 450 N/mm ²		Ti1	3.7025	
1.1				TiAl6V4	3.7165	
1.2				TiAl4Mo4Sn2	3.7185	
1.3	≤ 900 N/mm ²		Ni 99.6	2.4060		
2.1			Monel 400	2.4360		
2.2			Inconel 718	2.4668		
2.3			Udimet 605			
2.4			Haynes 25	2.4964		
2.5			Incloy 800	1.4958		
2.6	≤ 1500 N/mm ²		W-Cu 80/20			
5.2			Hyllite, Alucobond			
5.3						
Spezialwerkstoffe Titan-Legierungen			Special materials Titanium alloys			
Harte Werkstoffe Hochfeste Stähle, gehärtete Stähle, Hartguss			Hard materials High strength steels, hardened steels, hard castings	Weldox 1100		
1.1	44 - 50 HRC		Hardox 550			
1.2			Armax 600T			
1.3			Ferro-Titanit			
1.4			HSSE			
1.5						



HSS-Kugelfräser
HSS ball nose end mills



Allround

N				HR <small>fein · fine</small>				H			
ø2-30 mm	ø2-30 mm	ø3-30 mm	ø3-30 mm	ø6-20 mm	ø6-20 mm	ø6-40 mm	ø6-40 mm	ø6-40 mm	ø6-40 mm	ø6-20 mm	ø6-20 mm
2	2	2	2	4	4	4-6	4-6	4-6	4-6	4	4
3262		3272									
3268	3268C	3278	3278C	3333	3333C	3338	3338C	3323	3323C	3328	3328C
304	304	305	305	306	306	306	306	307	307	307	307
323	323	324	324	322	322	322	322	323	323	324	324

Z (Flutes)

 Seite · Page

 v_c / f_z

■	■	■	■	■	■	■	■	■	■	■	■	1.1
■	■	■	■	■	■	■	■	■	■	■	■	2.1
□	■	□	■	□	■	□	■	□	■	□	■	3.1
	□		□		□		□		□		□	4.1
												5.1
□	■	□	■	□	■	□	■	□	■	□	■	1.1
	□		□		□		□		□		□	2.1
	□		□		□		□		□		□	3.1
	□		□		□		□		□		□	4.1
	□		□		□		□		□		□	4.1
	□		□		□		□		□		□	4.2
												1.1
												1.2
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												5.3
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	□		□		□		□		□		□	1.3
												2.1
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												2.7
												2.8
												1.1
												1.2
												1.3
												1.4
												1.5

Product Finder

NF

N

HR

90°

60°

Frässtifte
Burs

v_c / f_z



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

Product Finder

NF

N

HR

H

90°

60°

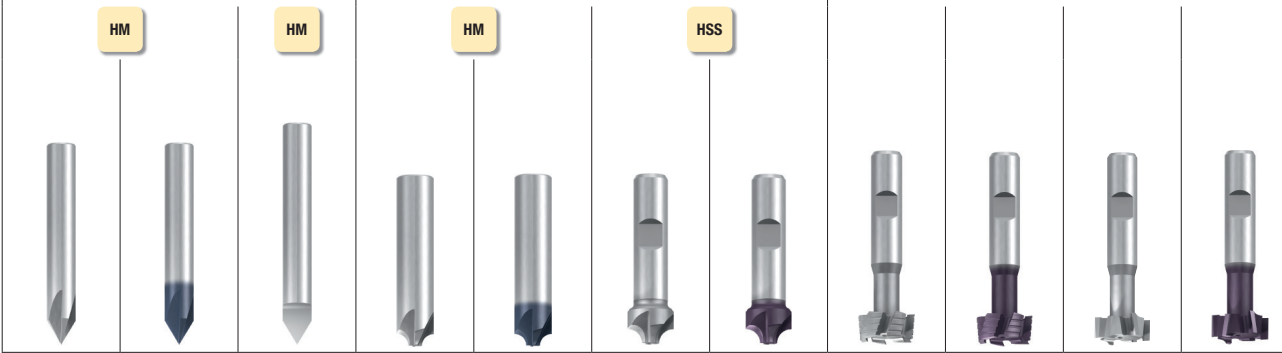
Fräsflifte
Burrs

v_c / f_z

NC-Entgratfräser und Gravierstichel
NC deburring end mills and engraving stylus

Viertelrund-Profilfräser
Corner-rounding end mills

HSS-T-Nutenfräser
HSS T-slot end mills



Allround

N **NF** mittel - medium **N**

$\varnothing 4 - 12 \text{ mm } 60^\circ / 90^\circ$ $\varnothing 4 - 12 \text{ mm } 60^\circ / 90^\circ$ $\varnothing 3 - 8 \text{ mm } 60^\circ / 90^\circ$ $r = 0,5 - 5 \text{ mm}$ $r = 0,5 - 5 \text{ mm}$ $r = 1 - 20 \text{ mm}$ $r = 1 - 16 \text{ mm}$ $\varnothing 21 - 45 \text{ mm}$ $\varnothing 21 - 45 \text{ mm}$ $\varnothing 11 - 60 \text{ mm}$ $\varnothing 11 - 60 \text{ mm}$

Z (Flutes)	4	4	1	4	4	4 - 6	4 - 6	6 - 8	6 - 8	6 - 10	6 - 10
	1715	1715A	1710	3281	3281A	3282	3288	3050	3058	3030	3038
						3288	3288C	3058	3058C	3038	3038C
Seite · Page	308	308	309	310	310	311	311	312	312	313	313
v_c / f_z	-	-	-	325	325	325	325	326	326	327	327

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											
2.6											
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

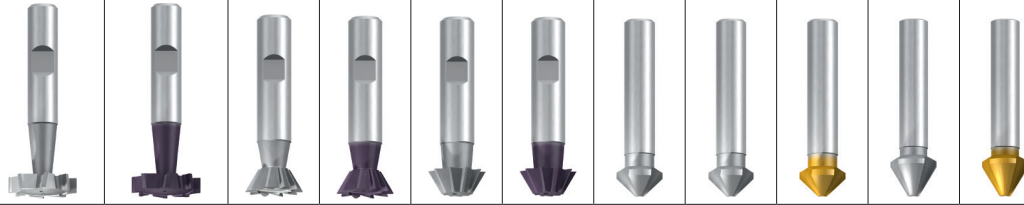


HSS-Schlitzfräser
HSS Woodruff keyseat end mills

HSS-Winkelfräser
HSS dovetail end mills

Kegelsenker
Countersinks

Hartmetall-Frässtifte
Carbide burrs



Allround

HM

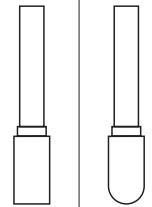
HSS

Product Finder

NF

N

HR



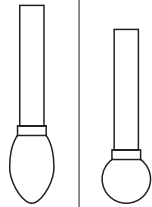
ZYA	WCR
ø3 - 12 mm	ø3 - 12 mm
1721 - 1726	1731 - 1736
320	320

90°

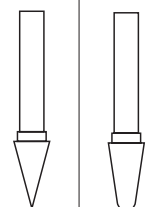
60°

Frässtifte
Burs

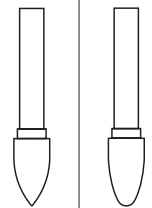
v_c / f_z



TRE	KUD
ø3 - 12 mm	ø3 - 16 mm
1741 - 1746	1751 - 1756
320	320



SKM	KEL
ø3 - 12 mm	ø3 - 12 mm
1761 - 1766	1771 - 1776
321	321



SPG	RBF
ø3 - 12 mm	ø3 - 16 mm
1781 - 1786	1791 - 1796
321	321

HSS/HM



Allround											Z (Flutes)
N		H				90°			60°		
ø4,5 - 45,5 mm	ø4,5 - 45,5 mm	ø16 - 25 mm 45 - 70°	ø16 - 25 mm 45 - 70°	ø16 - 25 mm 45 - 70°	ø16 - 25 mm 45 - 70°	ø10 - 31 mm	ø4,3 - 31 mm	ø4,3 - 31 mm	ø6,3 - 25 mm	ø6,3 - 25 mm	
6 - 12	6 - 12	10	10	10	10	3	3	3	3	3	3
3010		3200		3210		7581	7560	7560T	7550	7550T	
3018	3018C	3208	3208C	3218	3218C						
314	314	315	315	316	316	317	318	318	318	318	318
328	328	329	329	329	329	330	330	330	330	330	330
											Seite · Page
											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
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□	□	□	□	□	□	□	□	□	□	□	1.2
□	□	□	□	□	□	□	□	□	□	□	1.3
□	□	□	□	□	□	□	□	□	□	□	1.4
□	□	□	□	□	□	□	□	□	□	□	1.5
□	□	□	□	□	□	□	□	□	□	□	1.6
□	□	□	□	□	□	□	□	□	□	□	2.1
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□	□	□	□	□	□	□	□	□	□	□	2.3
□	□	□	□	□	□	□	□	□	□	□	2.4
□	□	□	□	□	□	□	□	□	□	□	2.5
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□	□	□	□	□	□	□	□	□	□	□	2.7
□	□	□	□	□	□	□	□	□	□	□	2.8
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□	□	□	□	□	□	□	□	□	□	□	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

- Product Finder
- NF
- N**
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

- Kugelfräser mit 2 Schneiden
- Zentrumschneidend
- Gute Spanabfuhr
- Vielseitig verwendbar
- Extra kurze, stabile Ausführung
- Großer Abmessungsbereich
- Ball nose end mill with 2 flutes
- Centre cutting
- Good chip evacuation
- Highly versatile
- Extra short, stable design
- Wide range of diameters

N

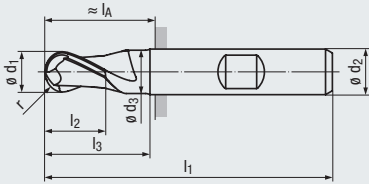
HSSE

DIN 1835

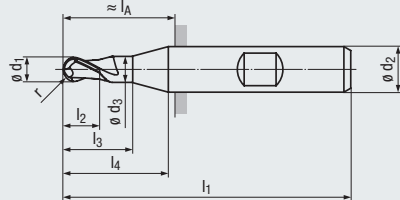
30°

Kugel

v_c / f_z



Design I₄:



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Fräsen von Halbkreisnuten und Radiusübergängen
- Auch zum Kopierfräsen geeignet

Applications – material (see page 300)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- For milling semi-circular grooves and transition radii
- Suitable for 2D and 3D copy milling

P	1.1-2.1	3.1
M		1.1
K	1.1-2.1	2.2, 4.1-4.2
N		1.1-1.3
N		2.2, 2.4-2.6
N		3.1-4.2

TICN

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-4.2
N		1.2-1.5, 2.1-2.7
N		4.1-4.2, 5.1-5.2
S	1.1	1.2-2.2, 2.4

Extra kurze Ausführung · Extra short design

Bestell-Code · Order code											3262	3268	3268C
$\varnothing d_1$ h10	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code			
2	1	4	10	48	–	–	6	12	2	.002	●	●	●
3	1,5	5	11	49	–	–	6	13	2	.003	●	●	●
4	2	7	13	51	–	–	6	15	2	.004	●	●	●
5	2,5	8	14	52	–	–	6	16	2	.005	●	●	●
6	3	8	14	52	5,5	–	6	16	2	.006	●	●	●
7	3,5	10	16	60	6,5	18	10	20	2	.007	●	●	●
8	4	11	17	61	7,5	19	10	21	2	.008	●	●	●
9	4,5	11	18	61	8,5	19	10	21	2	.009	●	●	●
10	5	13	21	63	9,5	–	10	23	2	.010	●	●	●
11	5,5	13	21	70	10,5	23	12	25	2	.011	●	●	●
12	6	16	26	73	11,5	–	12	28	2	.012	●	●	●
13	6,5	16	26	73	11,5	–	12	28	2	.013	●	●	●
14	7	16	26	73	11,5	–	12	28	2	.014	●	●	●
15	7,5	16	26	73	11,5	–	12	28	2	.015	●	●	●
16	8	19	29	79	15	–	16	31	2	.016	●	●	●
18	9	19	29	79	15	–	16	31	2	.018	●	●	●
20	10	22	36	88	19	–	20	38	2	.020	●	●	●
22	11	22	36	88	19	–	20	38	2	.022	●	●	●
24	12	26	42	102	23	44	25	46	2	.024	●	●	●
25	12,5	26	44	102	24	–	25	46	2	.025	●	●	●
26	13	26	44	102	24	–	25	46	2	.026	●	●	●
28	14	26	44	102	24	–	25	46	2	.028	●	●	●
30	15	26	44	102	24	–	25	46	2	.030	●	●	●



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- Kugelfräser mit 2 Schneiden
- Zentrumschneidend
- Gute Spanabfuhr
- Vielseitig verwendbar
- Großer Abmessungsbereich
- Kurze Schneidenlänge

- Ball nose end mill with 2 flutes
- Centre cutting
- Good chip evacuation
- Highly versatile
- Wide range of diameters
- Short flute length

N

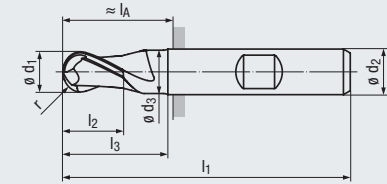
HSSE

DIN 1835

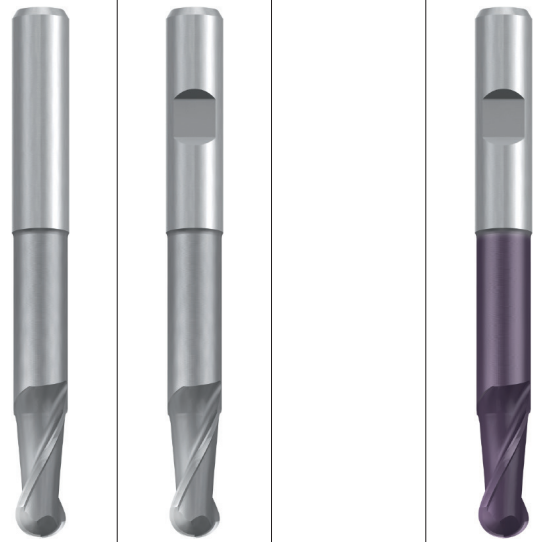
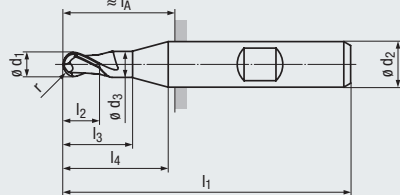
30°

Kugel

V_c/f_z 324



Design I₄:



Allround

Allround

Product Finder

NF

N

HR

90°

60°

Frässtifte
Burs

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Fräsen von Halbkreisnuten und Radiusübergängen
- Auch zum Kopierfräsen geeignet

Applications – material (see page 300)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- For milling semi-circular grooves and transition radii
- Suitable for 2D and 3D copy milling

TICN

P	1.1-2.1	3.1
M		1.1
K	1.1-2.1	2.2, 4.1-4.2
N		1.1-1.3
N		2.2, 2.4-2.6
N		3.1-4.2

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-4.2
N		1.2-1.5, 2.1-2.7
N		4.1-4.2, 5.1-5.2
S	1.1	1.2-2.2, 2.4

Lange Ausführung · Long design

Bestell-Code · Order code

											3272	3278	3278C
$\varnothing d_1$ h10	r	l ₂	l ₃	l ₁	$\varnothing d_3$	l ₄	$\varnothing d_2$ h6	l_A h6	Z (Flutes)	Dimens.- Code			
3	1,5	8	18	56	–	–	6	20	2	.003	●	●	●
4	2	11	25	63	–	–	6	27	2	.004	●	●	●
5	2,5	13	30	68	–	–	6	32	2	.005	●	●	●
6	3	13	30	68	5,5	–	6	32	2	.006	●	●	●
7	3,5	16	36	80	6,35	38	10	40	2	.007	●	●	●
8	4	19	44	88	7,35	46	10	48	2	.008	●	●	●
9	4,5	19	45	88	8,35	46	10	48	2	.009	●	●	●
10	5	22	53	95	9,35	–	10	55	2	.010	●	●	●
11	5,5	22	53	102	10,5	55	12	57	2	.011	●	●	●
12	6	26	63	110	11,5	–	12	65	2	.012	●	●	●
13	6,5	26	63	110	11,5	–	12	65	2	.013	●	●	●
14	7	26	63	110	11,5	–	12	65	2	.014	●	●	●
15	7,5	26	63	110	11,5	–	12	65	2	.015	●	●	●
16	8	32	73	123	15	–	16	75	2	.016	●	●	●
18	9	32	73	123	15	–	16	75	2	.018	●	●	●
20	10	38	89	141	19	–	20	91	2	.020	●	●	●
22	11	38	89	141	19	–	20	91	2	.022	●	●	●
24	12	45	106	166	23	108	25	110	2	.024	●	●	●
25	12,5	45	108	166	24	–	25	110	2	.025	●	●	●
30	15	45	108	166	24	–	25	110	2	.030	●	●	●



- Product Finder
- NF
- N
- HR**
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

- Gesenkräser mit runder Stirn
- Feine, runde Spanteiler am Umfang
- Erzeugt Oberflächenmarkierungen
- Zentrumschneidend

- Die-sinking end mill with ball nose geometry
- Fine, round chipbreakers on the peripheral edges
- Generates milling marks
- Centre cutting

HR

fein
fine

HSSE

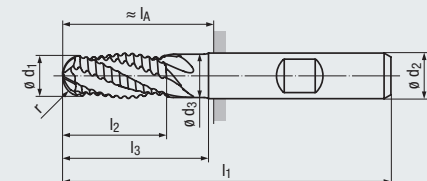
DIN 1835

30°

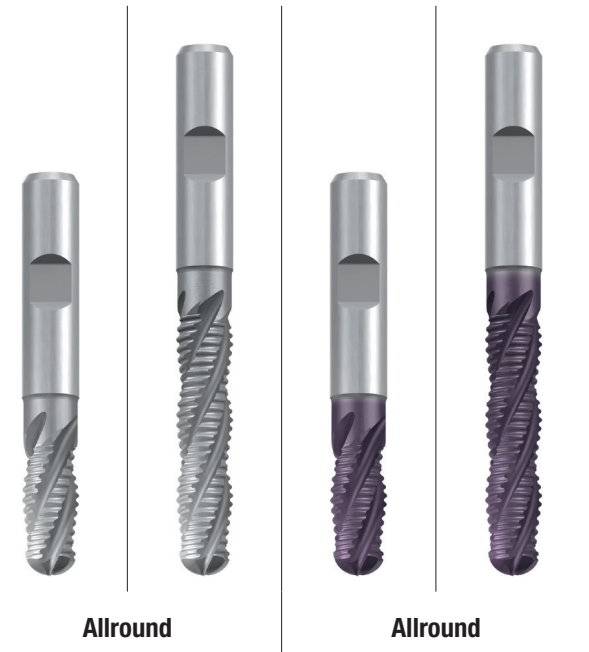
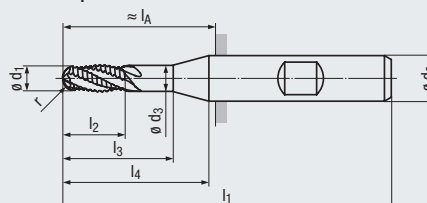
Kugel

v_c / f_z

322



Design I₄:



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Vorschruppen von Radien und Freiformflächen

Applications – material (see page 300)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- For pre-roughing radii and free-form surfaces

P	1.1-2.1	3.1
M		1.1
K	1.1-2.1	2.2, 4.1-4.2
N		2.2, 2.4-2.6

TICN

P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-4.2
N		2.1-2.7, 5.2
S	1.1	1.2-2.2, 2.4

DIN 1889 – Kurze Ausführung · Short design

Bestell-Code · Order code											3333		3333C	
$\varnothing d_1$ js14	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
6	3	13	19	57	5,5	–	6	21	4	.006	●		●	
8	4	19	25	69	7,5	27	10	29	4	.008	●		●	
10	5	22	30	72	9,5	–	10	32	4	.010	●		●	
12	6	26	36	83	11,5	–	12	38	4	.012	●		●	
16	8	32	42	92	15	–	16	44	4	.016	●		●	
20	10	38	52	104	19	–	20	54	4	.020	●		●	

DIN 1889 – Lange Ausführung · Long design

Bestell-Code · Order code												3338		3338C
$\varnothing d_1$ js14	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code				
6	3	24	30	68	5,5	–	6	32	4	.006		●		●
8	4	38	44	88	7,5	46	10	48	4	.008		●		●
10	5	45	53	95	9,5	–	10	55	4	.010		●		●
12	6	53	63	110	11,5	–	12	65	4	.012		●		●
16	8	63	73	123	15	–	16	75	4	.016		●		●
20	10	75	89	141	19	–	20	91	4	.020		●		●
25	12,5	90	108	166	24	–	25	110	4	.025		●		●
32	16	106	123	186	31	–	32	126	6	.032		●		●
40	20	125	142	217	38	–	40	147	6	.040		●		●



Multi-Cut Hartmetall-Kugelfräser
siehe Seite 24

Multi-Cut solid carbide ball nose end mills,
see pages 24

- Gesenkräser mit runder Stirn
- Erzeugt glatte Oberflächen
- Zentrumschneidend

- Die-sinking end mill with ball nose geometry
- Generates smooth surfaces
- Centre cutting

H

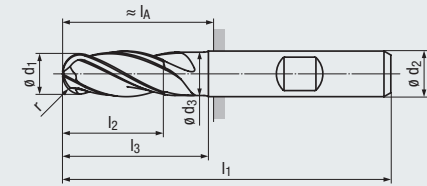
HSSE

DIN 1835

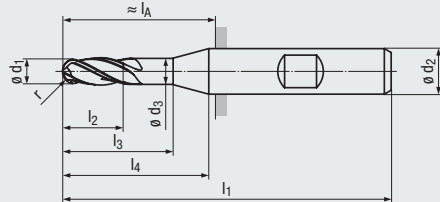
30°

Kugel

v_c/f_z
323 - 324



Design I₄:



Allround

Allround

Product Finder

NF

N

HR

H

90°

60°

Frässtifte
Burs

v_c/f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Schlichten von Radiusübergängen und Freiformflächen

Applications – material (see page 300)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1200 N/mm²
- For finishing transition radii and free-form surfaces

P	1.1-2.1	3.1
M		1.1
K	1.1-2.1	2.2, 4.1-4.2
N		2.2, 2.4-2.6

TICN

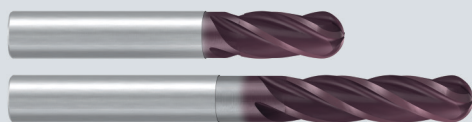
P	1.1-3.1	4.1
M	1.1	2.1-4.1
K	1.1-2.1	2.2-4.2
N		2.1-2.2, 2.4-2.7
S	1.1	1.2-2.2, 2.4

DIN 1889 – Kurze Ausführung · Short design

Bestell-Code · Order code											3323		3323C	
∅ d ₁ k12	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code				
6	3	13	19	57	5,5	–	6	21	4	.006	●		●	
8	4	19	25	69	7,5	27	10	29	4	.008	●		●	
10	5	22	30	72	9,5	–	10	32	4	.010	●		●	
12	6	26	36	83	11,5	–	12	38	4	.012	●		●	
16	8	32	42	92	15	–	16	44	4	.016	●		●	
20	10	38	52	104	19	–	20	54	4	.020	●		●	
25	12,5	45	63	121	24	–	25	65	5	.025	●		●	
32	16	53	70	133	31	–	32	73	6	.032	●		●	
40	20	63	80	155	38	–	40	85	6	.040	●		●	

DIN 1889 – Lange Ausführung · Long design

Bestell-Code · Order code												3328		3328C
∅ d ₁ k12	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h6	l _A	Z (Flutes)	Dimens.- Code				
6	3	24	30	68	5,5	–	6	32	4	.006		●		●
8	4	38	44	88	7,5	46	10	48	4	.008		●		●
10	5	45	53	95	9,5	–	10	55	4	.010		●		●
12	6	53	63	110	11,5	–	12	65	4	.012		●		●
16	8	63	73	123	15	–	16	75	4	.016		●		●
20	10	75	89	141	19	–	20	91	4	.020		●		●



TOP-Cut Hartmetall-Kugelfräser
siehe Seite 108

TOP-Cut solid carbide ball nose end mills,
see page 108



- Product Finder
- NF
- N**
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

- Multifunktionales Werkzeug
- Mit 4 Schneiden
- Konuswinkel 60° und 90°

- Multi-functional tool
- With 4 flutes
- Taper angle 60° or 90°

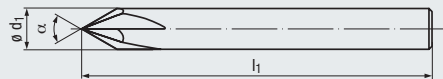
N

HM

DIN 6535
HA
HB

0°

Optional



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zum Anfasen von Kanten und Nuten

Applications – material (see page 300)

- For almost all materials
- For materials with a tensile strength of up to 1400 N/mm²
- For chamfering edges and slots

TIALN

P	1.1-3.1	4.1-5.1
M		1.1-3.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N		1.2-2.7
N		3.1-4.2, 5.2
S		1.1-1.2, 2.1-2.2

P	1.1-4.1	5.1
M		1.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N		1.2-4.3
N		5.1-5.3
S		1.1-2.2

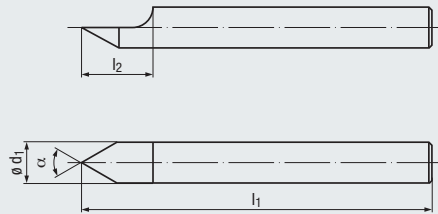
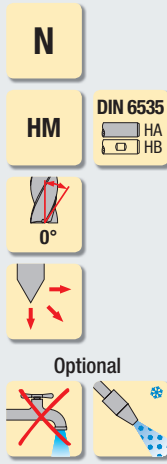
Bestell-Code · Order code

α	$\varnothing d_1$ h6	l_1	Z (Flutes)	Dimens.- Code	1715	1715A
60°	4	54	4	.06004	●	●
	6	54	4	.06006	●	●
	8	58	4	.06008	●	●
	10	66	4	.06010	●	●
	12	73	4	.06012	●	●
90°	4	54	4	.09004	●	●
	6	54	4	.09006	●	●
	8	58	4	.09008	●	●
	10	66	4	.09010	●	●
	12	73	4	.09012	●	●



- Multifunktionales Werkzeug
- Mit 1 Schneide
- Konuswinkel 60° und 90°

- Multi-functional tool
- With 1 effective cutting edge
- Taper angle 60° or 90°



Allround

Product Finder

- NF
- N**
- HR
- H
- 90°
- 60°
- Fräslifte Burrs
- v_c / f_z

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zum Gravieren von Schriftzügen

Applications – material (see page 300)

- For almost all materials
- For materials with a tensile strength of up to 1400 N/mm²
- For engraving letter markings

P	1.1-3.1	4.1-5.1
M		1.1-3.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N		1.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2, 2.1-2.2	

Bestell-Code · Order code

1710

α	$\varnothing d_1$ h6	l_2	l_1	Z (Flutes)	Dimens.- Code			
60°	3	4	50	1	.06003	●		
	4	5	55	1	.06004	●		
	5	6	62	1	.06005	●		
	6	7	66	1	.06006	●		
	8	9	79	1	.06008	●		
90°	3	4	50	1	.09003	●		
	4	5	55	1	.09004	●		
	5	6	62	1	.09005	●		
	6	7	66	1	.09006	●		
	8	9	79	1	.09008	●		



- Product Finder
- NF
- N**
- HR
- H
- 90°
- 60°
- Frässlifte
Burrs
- v_c / f_z

- Konkav
- Fasenhinterschliffen
- Universelle Geometrie
- Nur an der Spanfläche nachschärfbar

- Concave
- Land-ground
- Universal tool geometry
- Resharpenable only on the rake face

N

HM

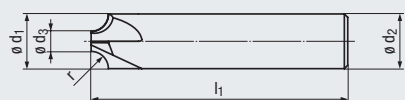
DIN 6535
HA
HB

0°

90°

v_c / f_z
325

Optional



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zum Fräsen von Übergängen und Radien an Kanten und Nuten

Applications – material (see page 300)

- For almost all materials
- For materials with a tensile strength of up to 1400 N/mm²
- For milling of radii on edges and slots

TIALN

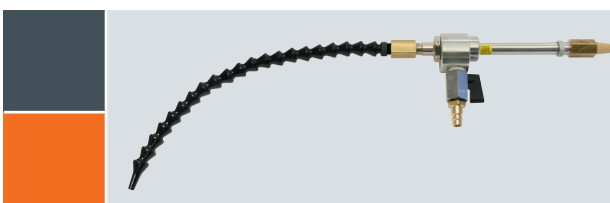
P	1.1-3.1	4.1-5.1
M		1.1-3.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N		1.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2, 2.1-2.2	

P	1.1-4.1	5.1
M		1.1-4.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N		1.2-4.3
N		5.1-5.3
S		1.1-2.2

≈ DIN 6518

Bestell-Code · Order code							3281	3281A
r H11	∅ d ₁	∅ d ₃	l ₁	∅ d ₂ h6	Z (Flutes)	Dimens.- Code		
0,5	10	9	75	10	4	.0005	●	●
1	10	8	75	10	4	.001	●	●
1,25	10	7,5	75	10	4	.00125	●	●
1,5	10	7	75	10	4	.0015	●	●
2	10	6	75	10	4	.002	●	●
2,5	10	5	75	10	4	.0025	●	●
3	10	4	75	10	4	.003	●	●
4	12	4	75	12	4	.004	●	●
5	16	6	75	16	4	.005	●	●

Mit seitlicher Mitnahmefläche auf Anfrage lieferbar
With side-lock clamping on request



Kaltluftdüse und Zubehör
siehe Seite 392 - 394

Cold-air nozzle and accessories,
see pages 392 - 394

- Konkav
- Formkonstant hinterdreht
- Universelle Geometrie
- Nur an der Spanfläche nachschärfbar

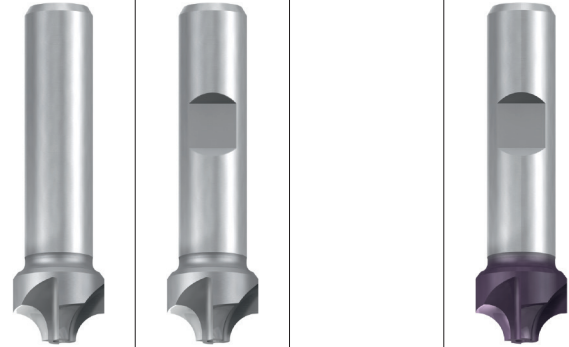
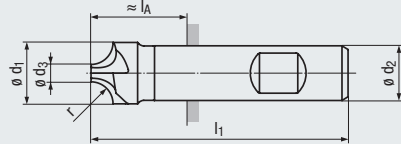
- Concave
- Constant-form relieved, turned
- Universal tool geometry
- Resharpenable only on the rake face

N

HSSE **DIN 1835**

0° 90°

V_c/f_z
325



Allround

Allround

Product Finder

NF

N

HR

H

90°

60°

Frässtifte
Burs

V_c/f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Fräsen von Übergängen und Radien an Kanten und Nuten

Applications – material (see page 300)

- For almost all materials
- For materials with a tensile strength of up to 1200 N/mm²
- For milling of radii on edges and slots

P	1.1-2.1	3.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

TICN

P	1.1-3.1	4.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

DIN 6518

Bestell-Code · Order code								3282	3288	3288C
r H11	∅ d ₁	∅ d ₃	l ₁	∅ d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code			
1	8	6	60	10	20	4	.001	●	●	●
1,5	9	6	60	10	20	4	.0015	●	●	●
2	10	6	60	10	20	4	.002	●	●	●
2,5	11	6	60	10	20	4	.0025	●	●	●
3	12	6	60	12	15	4	.003	●	●	●
3,5	13	6	60	12	15	4	.0035	●	●	○
4	14	6	60	12	15	4	.004	●	●	●
4,5	15	6	60	12	15	4	.0045	●	●	○
5	16	6	60	12	15	4	.005	●	●	●
5,5	19	8	67	16	19	4	.0055	●	●	○
6	20	8	67	16	19	4	.006	●	●	●
6,5	21	8	71	16	23	4	.0065	●	●	○
7	22	8	71	16	23	4	.007	●	●	●
7,5	23	8	71	16	23	4	.0075	●	●	○
8	24	8	71	16	23	4	.008	●	●	●
8,5	25	8	85	25	29	4	.0085	●	●	○
9	26	8	85	25	29	4	.009	●	●	●
9,5	27	8	85	25	29	4	.0095	●	●	○
10	28	8	85	25	29	4	.010	●	●	●
11	32	10	90	25	34	4	.011	●	●	○
12	34	10	90	25	34	4	.012	●	●	●
12,5	41	16	100	25	44	6	.0125	●	●	●
13	42	16	100	25	44	6	.013	●	●	○
14	44	16	100	25	44	6	.014	●	●	○
15	46	16	100	25	44	6	.015	●	●	●
16	48	16	100	25	44	6	.016	●	●	●
18	52	16	112	32	52	6	.018	●	●	○
20	56	16	112	32	52	6	.020	●	●	○



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burs
- v_c / f_z

- Mit flachen, überdeckenden Spanteilern
- 3-seitig schneidend
- Erzeugt annähernd Schlichtoberflächen
- Universelle Geometrie
- Nur an der Spanfläche nachschärfbar

- With flat, overlapping chip breakers
- 3 side cutting
- Generates nearly finishing surfaces
- Versatile tool geometry
- Resharpenable only on the rake face

NF

mittel
medium

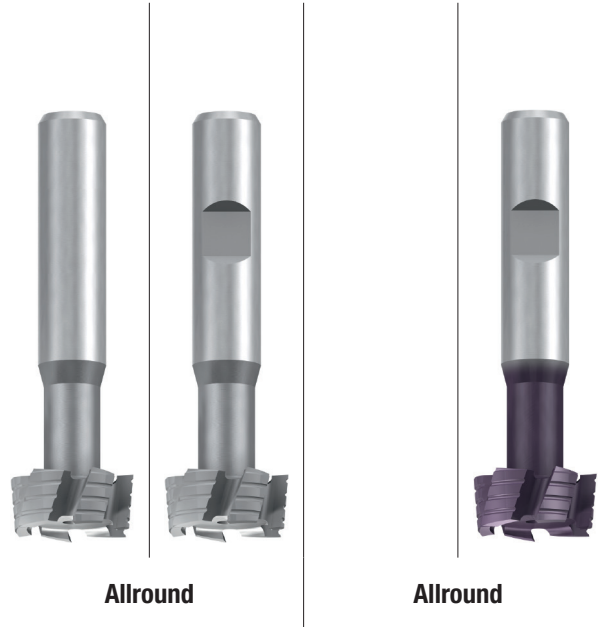
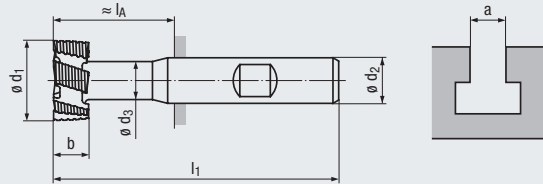
HSSE

DIN 1835
A
B

20°

v_c / f_z

326



Allround

Allround

Stirnausführung · Face design



Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 300)** **Applications – material (see page 300)**
- In fast allen Werkstoffen einsetzbar
 - Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²

- For almost all materials
- For materials with a tensile strength of up to 1200 N/mm²

P	1.1-2.1	3.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

TICN

P	1.1-3.1	4.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

DIN 851 A – Für T-Nuten nach DIN 650 · For t-slots acc. to DIN 650

Bestell-Code · Order code									3050	3058		3058C
$\varnothing d_1$ d11	b d11	$\varnothing d_3$ h12	l_1	$\varnothing d_2$ h6	l_A 	a	Z (Flutes)	Dimens.- Code				
21	9	10	74	12	29	12	6	.021	●	●		●
22	10	10	75	12	30	–	6	.022	●	●		●
25	11	12	82	16	34	14	6	.025	●	●		●
28	12	13	85	16	37	–	6	.028	●	●		●
32	14	15	90	16	42	18	6	.032	●	●		●
36	16	17	103	25	47	–	6	.036	●	●		●
40	18	19	108	25	52	22	8	.040	●	●		●
45	20	21	113	25	57	–	8	.045	●	●		●




- Kreuzverzahnt
- 3-seitig schneidend
- Erzeugt glatte Oberflächen
- Stirnzähne wechselseitig ausgesetzt
- Universelle Geometrie


- Staggered flutes
- 3 side cutting
- Generates finishing surfaces
- Alternate teeth cutting at the face (similar to staggered tooth side mills)
- Versatile tool geometry

N


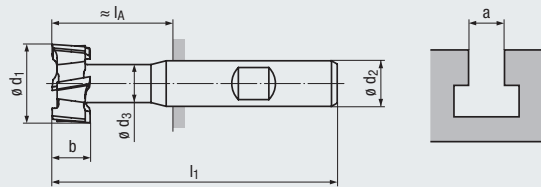
HSSE **DIN 1835**



10°



v_c/f_z

Product Finder

NF

N

HR

H

90°

60°

Frässtifte
Burs

v_c/f_z

Stirnausführung · Face design



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

Applications – material (see page 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²


- For almost all materials
- For materials with a tensile strength of up to 1200 N/mm²

TICN

P	1.1-2.1	3.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

P	1.1-3.1	4.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

DIN 851 A – Für T-Nuten nach DIN 650 · For t-slots acc. to DIN 650

Bestell-Code · Order code									3030	3038	3038C
ø d ₁ d11	b d11	ø d ₃ h12	l ₁	ø d ₂ h6	l _A 	a	Z (Flutes)	Dimens.- Code			
11	4	4	53,5	10	13,5	5	6	.011	●	●	●
12,5	6	5	57	10	17	6	6	.0125	●	●	●
16	8	7	62	10	22	8	6	.016	●	●	●
18	8	8	70	12	25	10	6	.018	●	●	●
19	9	8	71	12	26	–	6	.019	●	●	●
21	9	10	74	12	29	12	6	.021	●	●	●
22	10	10	75	12	30	–	6	.022	●	●	●
25	11	12	82	16	34	14	8	.025	●	●	●
28	12	13	85	16	37	–	8	.028	●	●	●
32	14	15	90	16	42	18	8	.032	●	●	●
36	16	17	103	25	47	–	8	.036	●	●	●
40	18	19	108	25	52	22	10	.040	●	●	●
45	20	21	113	25	57	–	10	.045	●	●	●
50	22	25	124	32	64	28	10	.050	●	●	●
60	28	30	139	32	79	36	10	.060	●	●	●



- Product Finder
- NF
- N**
- HR
- H
- 90°
- 60°
- Frässlifte Burrs
- v_c / f_z

- Kreuzverzahnt
- Nur am Umfang schneidend
- Erzeugt glatte Oberflächen
- Planseitig hohlgeschliffen
- Universelle Geometrie
- Staggered teeth
- Peripheral cutting only
- Generates finishing surfaces
- Hollow ground on the face
- Versatile tool geometry

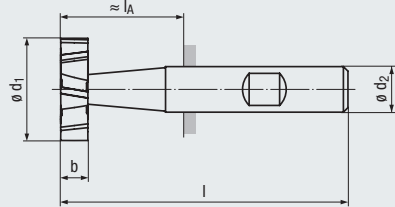
N

HSSE

10°

DIN 1835
A
B

v_c / f_z
328



Allround

Allround

Stirnausführung · Face design



Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 300)** **Applications – material (see page 300)**
- In fast allen Werkstoffen einsetzbar
 - Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
 - Zum Fräsen von Scheibenfedernuten mit Toleranz P9
 - For almost all materials
 - For materials with a tensile strength of up to 1200 N/mm²
 - For milling Woodruff keyseats with P9 tolerance

P	1.1-2.1	3.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

TICN		
P	1.1-3.1	4.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

DIN 850 – Für Nuten nach DIN 6888 · For keyseats acc. to DIN 6888

Bestell-Code · Order code							3010	3018		3018C
ø d ₁ h11	b e8	l	ø d ₂ h6	l _A 	Z (Flutes)	Dimens.- Code				
4,5 ¹⁾	1	50	6	14	6	.00451	●	●		●
7,5 ¹⁾	1,5	50	6	14	6	.007515	●	●		●
7,5 ¹⁾	2	50	6	14	6	.00752	●	●		●
10,5	2	50	6	14	6	.01052	●	●		●
10,5	2,5	50	6	14	6	.010525	●	●		●
10,5	3	50	6	14	6	.01053	●	●		●
13,5	2	56	10	16	6	.01352	●	●		●
13,5	3	56	10	16	6	.01353	●	●		●
13,5	4	56	10	16	6	.01354	●	●		●
16,5	3	56	10	16	6	.01653	●	●		●
16,5	4	56	10	16	6	.01654	●	●		●
16,5	5	56	10	16	6	.01655	●	●		●
19,5	3	63	10	23	8	.01953	●	●		●
19,5	4	63	10	23	8	.01954	●	●		●
19,5	5	63	10	23	8	.01955	●	●		●
19,5	6	63	10	23	8	.01956	●	●		●
22,5	4	63	10	23	8	.02254	●	●		●
22,5	5	63	10	23	8	.02255	●	●		●
22,5	6	63	10	23	8	.02256	●	●		●
22,5	8	63	10	23	8	.02258	●	●		●
25,5	5	63	10	23	10	.02555	●	●		●
25,5	6	63	10	23	10	.02556	●	●		●
28,5	6	63	10	23	10	.02856	●	●		●
28,5	8	63	10	23	10	.02858	●	●		●
28,5	10	71	12	26	10	.028510	●	●		●
32,5	6	71	12	26	10	.03256	●	●		●
32,5	8	71	12	26	10	.03258	●	●		●
32,5	10	71	12	26	10	.032510	●	●		●
38,5	8	71	12	26	10	.03858	●	●		●
45,5	8	71	12	26	12	.04558	●	●		●
45,5	10	71	12	26	12	.045510	●	●		●

¹⁾ Geradeverzahnt
Straight teeth



- Geradeverzahnt
- An Stirn und Umfang schneidend
- Universelle Geometrie
- Straight teeth
- Face and peripheral cutting
- Versatile tool geometry

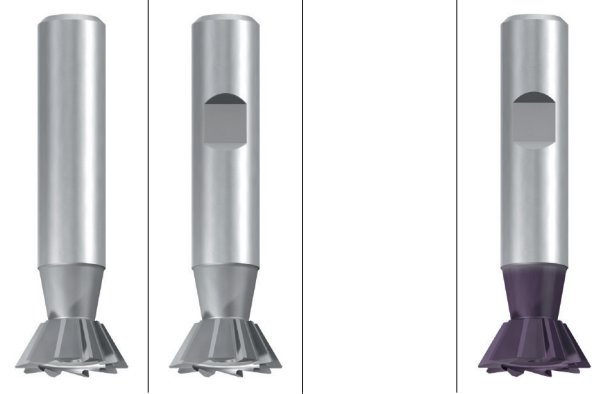
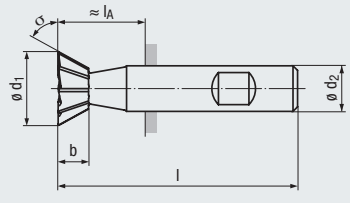
H

HSSE **DIN 1835**

0°

0.3°

V_c/f_z 329



Allround

Allround

- Product Finder
- NF
 - N
 - HR
 - H**
 - 90°
 - 60°
 - Frässlifte Burrs
 - v_c / f_z

Beschichtung · Coating

- Einsatzgebiete – Material (siehe Seite 300)**
- In fast allen Werkstoffen einsetzbar
 - Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
 - Zum Fräsen von Schwalbenschwanznuten und Anfasen von Werkstückkanten

- Applications – material (see page 300)**
- For almost all materials
 - For materials with a tensile strength of up to 1200 N/mm²
 - For cutting dovetail slots and chamfering workpiece edges

TICN

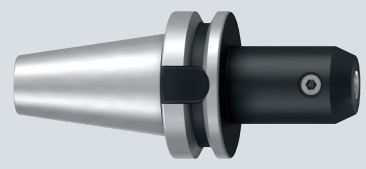
P	1.1-2.1	3.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

P	1.1-3.1	4.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

DIN 1833

Bestell-Code · Order code

σ $\pm 30^\circ$	θd_1 js16	b js14	l	θd_2 h6	l_A 	Z (Flutes)	Dimens.- Code	3200	3208	3208C
45°	16	4	60	12	15	10	.04516	●	●	●
	20	5	63	12	18	10	.04520	●	●	●
	25	6,3	67	12	22	10	.04525	●	●	●
60°	16	6,3	60	12	15	10	.06016	●	●	●
	20	8	63	12	18	10	.06020	●	●	●
	25	10	67	12	22	10	.06025	●	●	●
70°	16	7	60	12	15	10	.07016	●	●	○
	20	9	63	12	18	10	.07020	●	●	○
	25	11	67	16	19	10	.07025	●	●	○



Aufnahmen für Schäfte nach DIN 6535 HB und DIN 1835 B siehe Seite 380 - 382

Holders for shanks according to DIN 6535 HB and DIN 1835 B, see pages 380 - 382



- Product Finder
- NF
- N
- HR
- H**
- 90°
- 60°
- Frässtifte
Burs
- v_c / f_z

- Geradeverzahn
- Nur am Umfang schneidend
- Universelle Geometrie
- Straight teeth
- Peripheral cutting only
- Versatile tool geometry

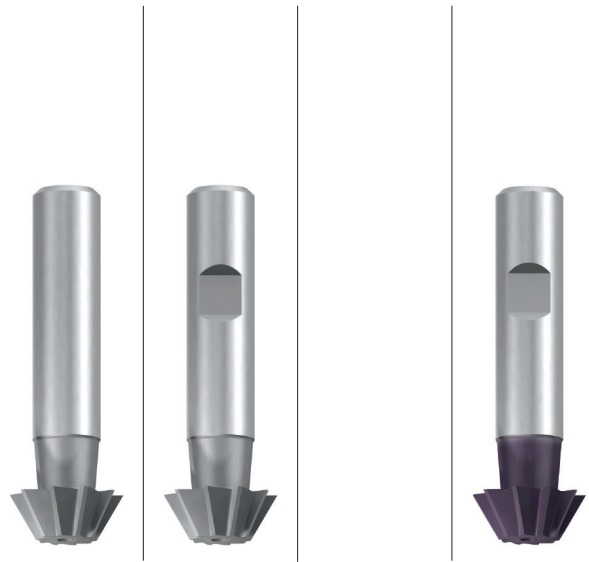
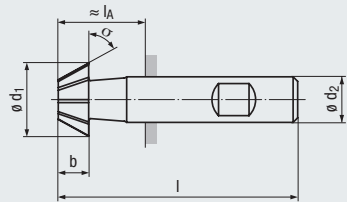
H

HSSE

DIN 1835

0°

v_c / f_z
329



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300) Applications – material (see page 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum Anfasen von Werkstückkanten
- For almost all materials
- For materials with a tensile strength of up to 1200 N/mm²
- For chamfering workpiece edges

		TICN	
P	1.1-2.1 3.1	P	1.1-3.1 4.1
M	1.1-2.1	M	1.1-2.1
K	1.1-2.1 2.2-3.1	K	1.1-2.1 2.2-3.1
K	4.1-4.2	K	4.1-4.2
N	1.1-1.5, 2.1-2.6	N	1.1-1.5, 2.1-2.6
N	3.1-4.2	N	3.1-4.2
S	1.1	S	1.1

DIN 1833

Bestell-Code · Order code								3210	3218	3218C
σ $\pm 30'$	$\varnothing d_1$ js16	b js14	l	$\varnothing d_2$ h6	l_A 	Z (Flutes)	Dimens.- Code			
45°	16	4	60	12	15	10	.04516	●	●	●
	20	5	63	12	18	10	.04520	●	●	●
	25	6,3	67	12	22	10	.04525	●	●	●
60°	16	6,3	60	12	15	10	.06016	●	●	●
	20	8	63	12	18	10	.06020	●	●	●
	25	10	67	12	22	10	.06025	●	●	●
70°	16	7	60	12	15	10	.07016	●	●	○
	20	9	63	12	18	10	.07020	●	●	○
	25	11	67	16	19	10	.07025	●	●	○



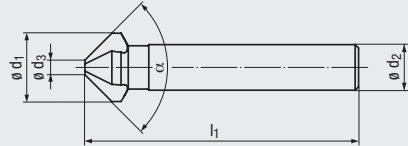
- Mit angelötetem Hartmetall-Kopf
- Am Umfang radial und axial hinterschliffen
- Komplett geschliffene Nuten
- Geometrie für Senkungen ohne Rattermarken

- With brazed carbide head
- Circumference radially and axially relieved
- Fully ground flutes
- Geometry for countersinks without chatter marks

90°

HM

V_c/f
330



Allround

Product Finder

NF

N

HR

H

90°

60°

Frässlifte
Burs

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zum Entgraten und Ansenken von Bohrungen und Kernlöchern
- Senkungen für Schraubenköpfe

Applications – material (see page 300)

- For almost all materials
- For materials with a tensile strength of up to 1400 N/mm²
- For deburring and counterboring drilled holes and tap holes
- Countersink for screw heads

P	1.1-4.1	5.1
M		1.1-3.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N		1.2-2.7
N		3.1-4.2, 5.2
S	1.1-1.2, 2.1-2.2	

≈ DIN 335 C

Bestell-Code · Order code							7581			
α	ø d ₁	ø d ₃	l ₁	ø d ₂ h9	Z (Flutes)	Dimens.- Code				
90°	10	2,5	46	8	3	.09010	●			
	10,4	2,5	46	8	3	.090104	●			
	11,5	2,8	56	8	3	.090115	●			
	12,4	2,8	56	8	3	.090124	●			
	15	3,2	60	10	3	.09015	●			
	16,5	3,2	60	10	3	.090165	●			
	20,5	3,5	63	10	3	.090205	●			
	25	3,8	67	10	3	.09025	●			
	31	4,2	71	12	3	.09031	●			

HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burs
- v_c / f_z

- Am Umfang radial und axial hinterschliffen
- Komplet geschliffene Nuten
- Geometrie für Senkungen ohne Rattermarken
- Circumference radially and axially relieved
- Fully ground flutes
- Geometry for countersinks without chatter marks

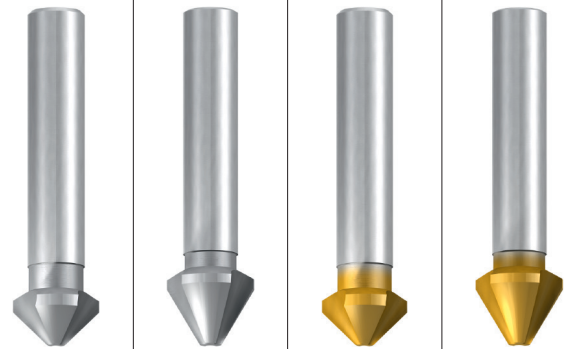
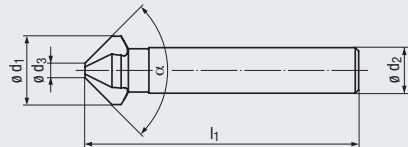
90°

60°

HSS

v_c / f_z

330



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm², mit TIN-Beschichtung bis 1200 N/mm²
- Zum Entgraten und Ansenken von Bohrungen und Kernlöchern
- Senkungen für Schraubenköpfe

Applications – material (see page 300)

- For almost all materials
- For materials with a tensile strength of up to 1000 N/mm², with TIN coating of up to 1200 N/mm²
- For deburring and counterboring drilled holes and tap holes
- Countersink for screw heads

P	1.1-2.1	3.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

TIN

P	1.1-3.1	4.1
M		1.1-2.1
K	1.1-2.1	2.2-3.1
K		4.1-4.2
N	1.1-1.5, 2.1-2.6	
N		3.1-4.2
S		1.1

DIN 335 C

Bestell-Code · Order code

α	$\varnothing d_1$	$\varnothing d_3$	l_1	$\varnothing d_2$ h9	Z (Flutes)	Dimens.- Code	7560	7560T
90°	4,3	1,3	40	4	3	.090043	●	●
	5	1,5	40	4	3	.09005	●	●
	5,3	1,5	40	4	3	.090053	●	●
	5,8	1,5	45	5	3	.090058	●	●
	6	1,5	45	5	3	.09006	●	●
	6,3	1,5	45	5	3	.090063	●	●
	7	1,8	50	6	3	.09007	●	●
	7,3	1,8	50	6	3	.090073	●	●
	8	2	50	6	3	.09008	●	●
	8,3	2	50	6	3	.090083	●	●
	9,4	2,2	50	6	3	.090094	●	●
	10	2,5	50	6	3	.09010	●	●
	10,4	2,5	50	6	3	.090104	●	●
	11,5	2,8	56	8	3	.090115	●	●
	12,4	2,8	56	8	3	.090124	●	●
	13,4	2,9	56	8	3	.090134	●	●
	15	3,2	60	10	3	.09015	●	●
	16,5	3,2	60	10	3	.090165	●	●
	19	3,5	63	10	3	.09019	●	●
	20,5	3,5	63	10	3	.090205	●	●
23	3,8	67	10	3	.09023	●	●	
25	3,8	67	10	3	.09025	●	●	
28	4	71	12	3	.09028	●	●	
31	4,2	71	12	3	.09031	●	●	

DIN 334 C

Bestell-Code · Order code

α	$\varnothing d_1$	$\varnothing d_3$	l_1	$\varnothing d_2$ h9	Z (Flutes)	Dimens.- Code	7550	7550T
60°	6,3	1,6	45	5	3	.060063	●	●
	8	2	50	6	3	.06008	●	●
	12,5	3,2	56	8	3	.060125	●	●
	16	4	63	10	3	.06016	●	●
	20	5	67	10	3	.06020	●	●
25	6,3	71	10	3	.06025	●	●	



Frässtifte der heutigen Fertigung sind Präzisionswerkzeuge. Diese sind in unserer modernen Industrie unentbehrlich und haben einen weit gezogenen Anwendungsbereich. Die zu bearbeitenden Materialien reichen von Aluminium über Bronze, Stahl, Guss bis zu gehärteten Stählen.

Wählen Sie bitte aus unserem Sortiment die für Ihre Bearbeitung optimale Ausführung.

Ab Lager lieferbar:

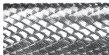
Zahnung 3



Standard-Teilung

Besonders zur Bearbeitung von Stahl, Stahlguss und ähnlichen metallischen Werkstoffen geeignet. Bei optimaler Schnittleistung werden gute Oberflächen erreicht.

Zahnung 6



Kreuzverzahnt

Universal für alle metallischen Werkstoffe einzusetzen. Die spezielle Verzahnung sorgt für eine gute Spanunterbrechung, reduziert Vibrationen und erleichtert dadurch gezielten Handeinsatz.

Auf Anfrage, mit kurzer Lieferzeit:

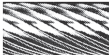
Zahnung 1



Besonders grobe Teilung

Geeignet, um Aluminium, Magnesium und Hartgummi zu bearbeiten. Große Spankammern verhindern, dass diese sich zusetzen.

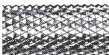
Zahnung 2



Grobe Teilung

Zur Bearbeitung von Bronze, Messing, Zink, Kupfer usw. geeignet.

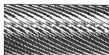
Zahnung 4



Diamant-Verzahnung

Wird zur Bearbeitung von hochlegierten Stählen, Inox, Grauguss usw. eingesetzt. Die Verzahnung verhindert die Bildung von langen Spänen.

Zahnung 5



Feine Teilung

Eignet sich zur Bearbeitung von gehärteten Werkstoffen mit einer Härte bis ca. 65 HRC.

Burrs as produced these days are precision tools: as such they are indispensable in our modern industry and can be used for a wide range of applications. The materials to be machined cover everything from aluminium, bronze, steel and cast materials to hardened steels.

Please select the appropriate type for your application from our product range.

Available ex stock:

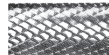
Toothing 3



Standard spacing

Suitable for machining steel, cast steel and similar metallic materials. Combines excellent cutting performance with good surface quality.

Toothing 6



Staggered teeth

For universal use with all metallic materials. The special toothing ensures good chip breaking, reduces vibrations and makes precise hand operation easier.

Available ex stock:

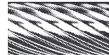
Toothing 1



Extra coarse spacing

Suitable for machining aluminium, magnesium and hard rubber; large chip spaces prevent loading and clogging.

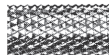
Toothing 2



Coarse spacing

Suitable for machining bronze, brass, zinc, copper etc.

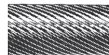
Toothing 4



Diamond teeth

Suitable for machining high-alloyed steels, Inox, cast iron etc. The toothing prevents the formation of long chips.

Toothing 5



Fine spacing

Suitable for machining hardened materials with a hardness of up to approximately 65 HRC.

Product
Finder

NF

N

HR

90°

60°

Frässtifte
Burrs

v_c / f_z

HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

- Zylinder-Form
- Ohne Stirnverzahnung 1)
- Baumaße ≈ DIN 8033

- Cylindrical form
- Without cutting face 1)
- Dimensions ≈ DIN 8033

ZYA

HM

Zahnung · Tothing					1	2	3	4	5	6
Bestell-Code · Order code					1721	1722	1723	1724	1725	1726
$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code						
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
8	18	63	6	.008	○	○	●	○	○	●
10	20	65	6	.010	○	○	●	○	○	●
12	25	70	6	.012	○	○	●	○	○	●

- Walzenrund-Form
- Baumaße ≈ DIN 8033

- Round nose form
- Dimensions ≈ DIN 8033

WRC

HM

Zahnung · Tothing					1	2	3	4	5	6
Bestell-Code · Order code					1731	1732	1733	1734	1735	1736
$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code						
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
8	18	63	6	.008	○	○	●	○	○	●
10	20	65	6	.010	○	○	●	○	○	●
12	25	70	6	.012	○	○	●	○	○	●

- Tropfen-Form
- Baumaße ≈ DIN 8033

- Oval form
- Dimensions ≈ DIN 8033

TRE

HM

Zahnung · Tothing					1	2	3	4	5	6
Bestell-Code · Order code					1741	1742	1743	1744	1745	1746
$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code						
3	5	40	3	.003	○	○	●	○	○	●
6	9	44	3	.00603	○	○	●	○	○	●
6	9	50	6	.006	○	○	●	○	○	●
8	14	59	6	.008	○	○	●	○	○	●
10	16	61	6	.010	○	○	●	○	○	●
12	21	66	6	.012	○	○	●	○	○	●

- Kugel-Form
- Baumaße ≈ DIN 8033

- Spherical form
- Dimensions ≈ DIN 8033

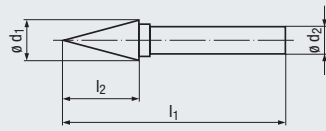
KUD

HM

Zahnung · Tothing					1	2	3	4	5	6
Bestell-Code · Order code					1751	1752	1753	1754	1755	1756
$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code						
3	2,5	40	3	.003	○	○	●	○	○	●
6	5	40	3	.00603	○	○	●	○	○	●
6	5	50	6	.006	○	○	●	○	○	●
10	9	54	6	.010	○	○	●	○	○	●
12	11	56	6	.012	○	○	●	○	○	●
16	15	60	6	.016	○	○	●	○	○	●

- Spitzkegel-Form
- Baumaße ≈ DIN 8033

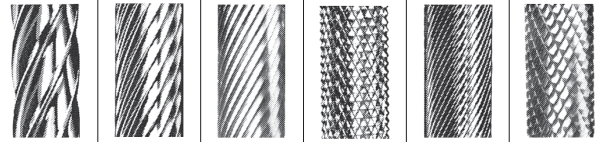
- Conical pointed nose form
- Dimensions ≈ DIN 8033



SKM



HM



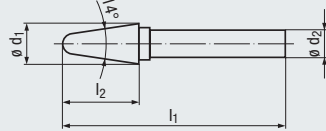
Zahnung · Tothing

Bestell-Code · Order code

$\varnothing d_1$	l_2	l_1	$\varnothing d_2$	Dimens.-Code	1	2	3	4	5	6
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
12	20	65	6	.012	○	○	●	○	○	●

- Rundkegel-Form
- Baumaße ≈ DIN 8033

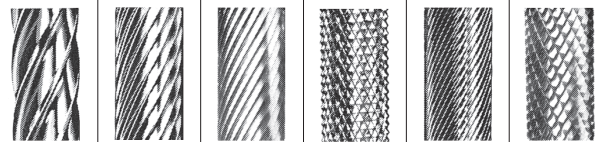
- Conical round nose form
- Dimensions ≈ DIN 8033



KEL



HM



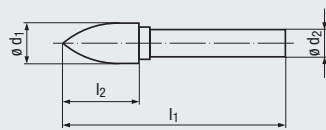
Zahnung · Tothing

Bestell-Code · Order code

$\varnothing d_1$	l_2	l_1	$\varnothing d_2$	Dimens.-Code	1	2	3	4	5	6
3	14	40	3	.003	○	○	●	○	○	●
6	20	50	6	.006	○	○	●	○	○	●
8	24	69	6	.008	○	○	●	○	○	●
10	28	73	6	.010	○	○	●	○	○	●
12	30	75	6	.012	○	○	●	○	○	●

- Spitzbogen-Form
- Baumaße ≈ DIN 8033

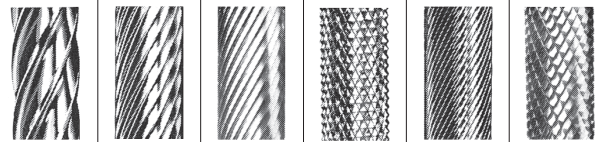
- Arch pointed nose form
- Dimensions ≈ DIN 8033



SPG



HM



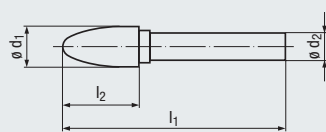
Zahnung · Tothing

Bestell-Code · Order code

$\varnothing d_1$	l_2	l_1	$\varnothing d_2$	Dimens.-Code	1	2	3	4	5	6
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
8	16	61	6	.008	○	○	●	○	○	●
10	20	65	6	.010	○	○	●	○	○	●
12	25	70	6	.012	○	○	●	○	○	●

- Rundbogen-Form
- Baumaße ≈ DIN 8033

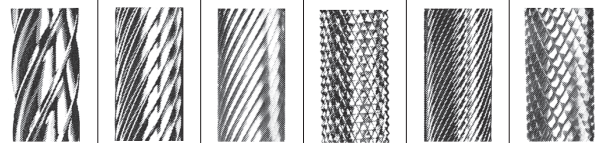
- Arch round nose form
- Dimensions ≈ DIN 8033



RBF



HM



Zahnung · Tothing

Bestell-Code · Order code

$\varnothing d_1$	l_2	l_1	$\varnothing d_2$	Dimens.-Code	1	2	3	4	5	6
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
8	16	61	6	.008	○	○	●	○	○	●
10	20	65	6	.010	○	○	●	○	○	●
12	25	70	6	.012	○	○	●	○	○	●
16	28	73	6	.016	○	○	●	○	○	●

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

Product Finder

NF

N

HR

90°

60°

Frässtifte
Burrs

v_c / f_z

HSS/HM



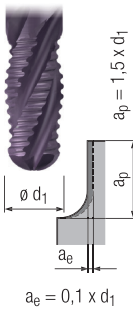
- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burs
- v_c / f_z



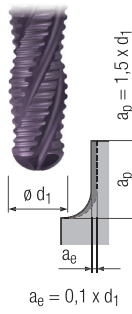
HSS-Kugelfräser – kurze und lange Ausführung HSS ball nose end mills – short and long design

HR

kurze Ausführung
short design



lange Ausführung
long design



Gültig für · Valid for

3333 3338
3333C 3338C

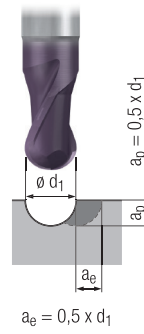
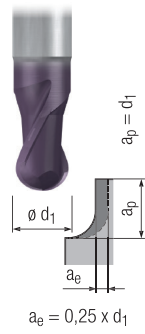
	v_c [m/min]		f_z [mm] $d_1 \leq 20$ mm	v_c [m/min]		f_z [mm] $d_1 \leq 40$ mm	TICN		Unbesch. Uncoated		
	Unbeschichtet Uncoated	TICN		Unbeschichtet Uncoated	TICN				MMS MQL		
P	1.1	35	60	0,0052 x d_1	21	35	0,0019 x d_1			□	■
	2.1	30	55	0,0047 x d_1	18	33	0,0018 x d_1				■
	3.1	25	40	0,0043 x d_1	15	15	0,0016 x d_1				■
	4.1		38	0,0039 x d_1		15	0,0014 x d_1				■
	5.1										
M	1.1	15	28	0,0043 x d_1	14	15	0,0016 x d_1				■
	2.1		24	0,0039 x d_1		14	0,0014 x d_1				■
	3.1		20	0,0034 x d_1		12	0,0013 x d_1				■
	4.1		18	0,0030 x d_1		11	0,0011 x d_1				■
K	1.1	25	48	0,0052 x d_1	15	29	0,0019 x d_1	□	□	□	■
	1.2	22	42	0,0047 x d_1	13	25	0,0018 x d_1	□	□	□	■
	2.1	20	38	0,0047 x d_1	12	23	0,0018 x d_1			□	■
	2.2	18	34	0,0043 x d_1	11	15	0,0016 x d_1			□	■
	3.1		29	0,0039 x d_1		15	0,0014 x d_1				■
	3.2		25	0,0039 x d_1		15	0,0014 x d_1				■
	4.1	21	40	0,0047 x d_1	13	24	0,0018 x d_1			□	■
	4.2	14	27	0,0043 x d_1	10	15	0,0016 x d_1			□	■
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1		43	0,0052 x d_1		26	0,0019 x d_1				■
	2.2	26	47	0,0047 x d_1	15	28	0,0018 x d_1				■
	2.3		85	0,0052 x d_1		40	0,0019 x d_1			□	■
	2.4	25	44	0,0039 x d_1	15	27	0,0014 x d_1				■
	2.5	37	67	0,0043 x d_1	22	40	0,0016 x d_1			□	■
	2.6	43	77	0,0052 x d_1	26	40	0,0019 x d_1				■
	2.7		45	0,0039 x d_1		23	0,0014 x d_1				■
	2.8										
	3.1										
	3.2										
4.1											
4.2											
4.3											
4.4											
5.1											
5.2		28	0,0039 x d_1		17	0,0014 x d_1					■
5.3											
S	1.1		40	0,0043 x d_1		15	0,0016 x d_1				■
	1.2		28	0,0039 x d_1		15	0,0014 x d_1				■
	1.3		20	0,0034 x d_1		12	0,0013 x d_1				■
	2.1		26	0,0043 x d_1		15	0,0016 x d_1				■
	2.2		12	0,0034 x d_1		10	0,0013 x d_1				■
	2.3		7	0,0034 x d_1		7	0,0013 x d_1				■
2.4											
2.5											
2.6											
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										





HSS-Kugelfräser – extra kurze und kurze Ausführung
HSS ball nose end mills – extra short and short design

N H



Gültig für · Valid for
3323 3262 3268C
3323C 3268

Product Finder

NF

N

HR

90°

60°

Frässlifte
Burrs

v_c / f_z

	Unbeschichtet Uncoated	v_c [m/min]	f_z [mm]		f_z [mm]		TICN		Unbesch. Uncoated
			TICN	$d_1 \leq 25$ mm	$d_1 > 25$ mm	$d_1 \leq 25$ mm	$d_1 > 25$ mm		
P	1.1	35	60	$0,0054 \times d_1$	$0,0048 \times d_1$	$0,0048 \times d_1$	$0,0036 \times d_1$		■
	2.1	30	55	$0,0050 \times d_1$	$0,0044 \times d_1$	$0,0044 \times d_1$	$0,0033 \times d_1$		■
	3.1	25	40	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
	4.1		38	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	5.1								
M	1.1	15	28	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
	2.1		24	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	3.1		20	$0,0036 \times d_1$	$0,0032 \times d_1$	$0,0032 \times d_1$	$0,0024 \times d_1$		■
	4.1		18	$0,0032 \times d_1$	$0,0028 \times d_1$	$0,0028 \times d_1$	$0,0021 \times d_1$		■
K	1.1	25	48	$0,0054 \times d_1$	$0,0048 \times d_1$	$0,0048 \times d_1$	$0,0036 \times d_1$	□	■
	1.2	22	42	$0,0050 \times d_1$	$0,0044 \times d_1$	$0,0044 \times d_1$	$0,0033 \times d_1$		■
	2.1	20	38	$0,0050 \times d_1$	$0,0044 \times d_1$	$0,0044 \times d_1$	$0,0033 \times d_1$	□	■
	2.2	18	34	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
	3.1		29	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	3.2		25	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	4.1	21	40	$0,0050 \times d_1$	$0,0044 \times d_1$	$0,0044 \times d_1$	$0,0033 \times d_1$		■
	4.2	14	27	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
N	1.1	100		$0,0072 \times d_1$	$0,0064 \times d_1$	$0,0064 \times d_1$	$0,0048 \times d_1$		■
	1.2	85	130	$0,0068 \times d_1$	$0,0060 \times d_1$	$0,0060 \times d_1$	$0,0045 \times d_1$		■
	1.3	55	100	$0,0063 \times d_1$	$0,0056 \times d_1$	$0,0056 \times d_1$	$0,0042 \times d_1$		■
	1.4		80	$0,0059 \times d_1$	$0,0052 \times d_1$	$0,0052 \times d_1$	$0,0039 \times d_1$		■
	1.5		60	$0,0054 \times d_1$	$0,0048 \times d_1$	$0,0048 \times d_1$	$0,0036 \times d_1$		■
	1.6								
	2.1		43	$0,0054 \times d_1$	$0,0048 \times d_1$	$0,0048 \times d_1$	$0,0036 \times d_1$		■
	2.2	26	47	$0,0050 \times d_1$	$0,0044 \times d_1$	$0,0044 \times d_1$	$0,0033 \times d_1$		■
	2.3		85	$0,0054 \times d_1$	$0,0048 \times d_1$	$0,0048 \times d_1$	$0,0036 \times d_1$		■
	2.4	25	44	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	2.5	37	67	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
	2.6	43	77	$0,0054 \times d_1$	$0,0048 \times d_1$	$0,0048 \times d_1$	$0,0036 \times d_1$		■
	2.7		45	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	2.8								
	3.1	80	110	$0,0059 \times d_1$	$0,0052 \times d_1$	$0,0052 \times d_1$	$0,0039 \times d_1$	□	■
	3.2	65	90	$0,0068 \times d_1$	$0,0060 \times d_1$	$0,0060 \times d_1$	$0,0045 \times d_1$	□	■
4.1	70	100	$0,0090 \times d_1$	$0,0080 \times d_1$	$0,0080 \times d_1$	$0,0060 \times d_1$	□	■	
4.2	100	190	$0,0090 \times d_1$	$0,0080 \times d_1$	$0,0080 \times d_1$	$0,0060 \times d_1$	□	■	
4.3									
4.4									
5.1		50	$0,0032 \times d_1$	$0,0028 \times d_1$	$0,0028 \times d_1$	$0,0021 \times d_1$		■	
5.2		28	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■	
5.3									
S	1.1		40	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
	1.2		28	$0,0041 \times d_1$	$0,0036 \times d_1$	$0,0036 \times d_1$	$0,0027 \times d_1$		■
	1.3		20	$0,0036 \times d_1$	$0,0032 \times d_1$	$0,0032 \times d_1$	$0,0024 \times d_1$		■
	2.1		26	$0,0045 \times d_1$	$0,0040 \times d_1$	$0,0040 \times d_1$	$0,0030 \times d_1$		■
	2.2		12	$0,0036 \times d_1$	$0,0032 \times d_1$	$0,0032 \times d_1$	$0,0024 \times d_1$		■
	2.3								
2.4		7	$0,0036 \times d_1$	$0,0032 \times d_1$	$0,0032 \times d_1$	$0,0024 \times d_1$		■	
2.5									
2.6									
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

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

HSS/HM

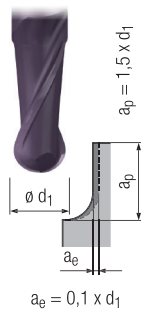


- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burs
- v_c / f_z



HSS-Kugelfräser – lange Ausführung HSS ball nose end mills – long design

N H



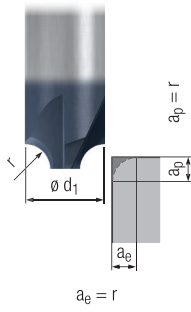
Gültig für · Valid for
3272 3328
3278 3328C
3278C

		v_c [m/min]		f_z [mm]		TICN		Unbesch. Uncoated	
		Unbeschichtet Uncoated	TICN	$d_1 \leq 25$ mm	$d_1 > 25$ mm				
P	1.1	21	35	$0,0044 \times d_1$	$0,0036 \times d_1$			□	■
	2.1	18	33	$0,0041 \times d_1$	$0,0033 \times d_1$				■
	3.1	15	15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	4.1		15	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	5.1								
M	1.1	14	15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	2.1		14	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	3.1		12	$0,0030 \times d_1$	$0,0024 \times d_1$				■
	4.1		11	$0,0026 \times d_1$	$0,0021 \times d_1$				■
K	1.1	15	29	$0,0044 \times d_1$	$0,0036 \times d_1$		□	□	■
	1.2	13	25	$0,0041 \times d_1$	$0,0033 \times d_1$				■
	2.1	12	23	$0,0041 \times d_1$	$0,0033 \times d_1$		□	□	■
	2.2	11	15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	3.1		15	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	3.2		15	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	4.1	13	24	$0,0041 \times d_1$	$0,0033 \times d_1$				■
	4.2	10	15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
N	1.1	50		$0,0059 \times d_1$	$0,0048 \times d_1$				■
	1.2	50	50	$0,0056 \times d_1$	$0,0045 \times d_1$				■
	1.3	40	45	$0,0052 \times d_1$	$0,0042 \times d_1$				■
	1.4		50	$0,0048 \times d_1$	$0,0039 \times d_1$				■
	1.5		40	$0,0044 \times d_1$	$0,0036 \times d_1$				■
	1.6								
	2.1		26	$0,0044 \times d_1$	$0,0036 \times d_1$				■
	2.2	15	28	$0,0041 \times d_1$	$0,0033 \times d_1$				■
	2.3		40	$0,0044 \times d_1$	$0,0036 \times d_1$				■
	2.4	15	27	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	2.5	22	40	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	2.6	26	40	$0,0044 \times d_1$	$0,0036 \times d_1$				■
	2.7		23	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	2.8								
	3.1	50		$0,0048 \times d_1$	$0,0039 \times d_1$	□	■		□
	3.2	40		$0,0056 \times d_1$	$0,0045 \times d_1$	□	■		□
4.1	60	90	$0,0074 \times d_1$	$0,0060 \times d_1$	□	□	□	■	
4.2	80	100	$0,0074 \times d_1$	$0,0060 \times d_1$	□	□	□	■	
4.3									
4.4									
5.1		30	$0,0026 \times d_1$	$0,0021 \times d_1$				■	
5.2		17	$0,0033 \times d_1$	$0,0027 \times d_1$				■	
5.3									
S	1.1		15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	1.2		15	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	1.3		12	$0,0030 \times d_1$	$0,0024 \times d_1$				■
	2.1		15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	2.2		10	$0,0030 \times d_1$	$0,0024 \times d_1$				■
	2.3								
2.4		7	$0,0030 \times d_1$	$0,0024 \times d_1$				■	
2.5									
2.6									
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

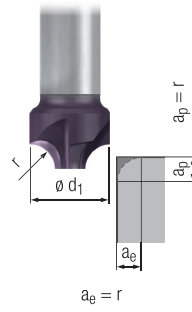


Viertelrund-Profilfräser
Corner-rounding end mills

HM



HSS



Gültig für · Valid for

3281 3282 3288C
3281A 3288

Product Finder

NF

N

HR

90°

60°

Frässtifte
Burs

V_c / f_z

HM HM-TIALN HSS-TICN			HSS Unbesch. Uncoated

		Vc [m/min]		fz [mm]		Vc [m/min]	fz [mm]			No Coolant	Coolant	MQL	Water	
		Unbeschichtet Uncoated	TIALN	r ≤ 2,5 mm	r > 2,5 - 5 mm		Unbeschichtet Uncoated	TICN	r ≤ 2,5 mm					r > 2,5 - 12 mm
P	1.1	100	135	0,0024 x d ₁	0,0030 x d ₁	30	33	0,0030 x d ₁	0,0036 x d ₁	0,0024 x d ₁	□	□	□	■
	2.1	95	120	0,0022 x d ₁	0,0028 x d ₁	25	28	0,0028 x d ₁	0,0033 x d ₁	0,0022 x d ₁		□	□	■
	3.1	68	88	0,0020 x d ₁	0,0025 x d ₁	20	22	0,0025 x d ₁	0,0030 x d ₁	0,0020 x d ₁			□	■
	4.1	65	85	0,0018 x d ₁	0,0023 x d ₁		17	0,0023 x d ₁	0,0027 x d ₁	0,0018 x d ₁				■
	5.1	52	67	0,0016 x d ₁	0,0020 x d ₁									■
M	1.1	48	62	0,0020 x d ₁	0,0025 x d ₁	12	15	0,0025 x d ₁	0,0030 x d ₁	0,0020 x d ₁				■
	2.1	40	53	0,0018 x d ₁	0,0023 x d ₁	10	12	0,0023 x d ₁	0,0027 x d ₁	0,0018 x d ₁				■
	3.1	34	44	0,0016 x d ₁	0,0020 x d ₁									■
	4.1	25	25	0,0014 x d ₁	0,0018 x d ₁									■
K	1.1	81	105	0,0024 x d ₁	0,0030 x d ₁	25	28	0,0030 x d ₁	0,0036 x d ₁	0,0024 x d ₁	□	□	□	■
	1.2	71	92	0,0022 x d ₁	0,0028 x d ₁	22	24	0,0028 x d ₁	0,0033 x d ₁	0,0022 x d ₁	□	□	□	■
	2.1	65	84	0,0022 x d ₁	0,0028 x d ₁	20	22	0,0028 x d ₁	0,0033 x d ₁	0,0022 x d ₁			□	■
	2.2	58	76	0,0020 x d ₁	0,0025 x d ₁	18	20	0,0025 x d ₁	0,0030 x d ₁	0,0020 x d ₁			□	■
	3.1	48	63	0,0018 x d ₁	0,0023 x d ₁	15	17	0,0023 x d ₁	0,0027 x d ₁	0,0018 x d ₁				■
	3.2	42	55	0,0018 x d ₁	0,0023 x d ₁									■
	4.1	68	88	0,0022 x d ₁	0,0028 x d ₁	21	23	0,0028 x d ₁	0,0033 x d ₁	0,0022 x d ₁		□		■
	4.2	45	58	0,0020 x d ₁	0,0025 x d ₁	14	15	0,0025 x d ₁	0,0030 x d ₁	0,0020 x d ₁		□		■
N	1.1					100	110	0,0040 x d ₁	0,0048 x d ₁	0,0032 x d ₁				■
	1.2	300	390	0,0030 x d ₁	0,0038 x d ₁	90	100	0,0038 x d ₁	0,0045 x d ₁	0,0030 x d ₁			□	■
	1.3	250	320	0,0028 x d ₁	0,0035 x d ₁	70	80	0,0035 x d ₁	0,0042 x d ₁	0,0028 x d ₁			□	■
	1.4	220	290	0,0026 x d ₁	0,0033 x d ₁	60	65	0,0033 x d ₁	0,0039 x d ₁	0,0026 x d ₁			□	■
	1.5	200	260	0,0024 x d ₁	0,0030 x d ₁	40	45	0,0030 x d ₁	0,0036 x d ₁	0,0024 x d ₁			□	■
	1.6	70	95	0,0022 x d ₁	0,0028 x d ₁									■
	2.1	70	90	0,0024 x d ₁	0,0030 x d ₁	40	45	0,0030 x d ₁	0,0036 x d ₁	0,0024 x d ₁			□	■
	2.2	80	105	0,0022 x d ₁	0,0028 x d ₁	50	55	0,0028 x d ₁	0,0033 x d ₁	0,0022 x d ₁			□	■
	2.3	145	190	0,0024 x d ₁	0,0030 x d ₁	50	55	0,0030 x d ₁	0,0036 x d ₁	0,0024 x d ₁			□	■
	2.4	75	95	0,0018 x d ₁	0,0023 x d ₁	18	20	0,0023 x d ₁	0,0027 x d ₁	0,0018 x d ₁			□	■
	2.5	110	145	0,0020 x d ₁	0,0025 x d ₁	42	46	0,0025 x d ₁	0,0030 x d ₁	0,0020 x d ₁			□	■
	2.6	130	170	0,0024 x d ₁	0,0030 x d ₁	48	54	0,0030 x d ₁	0,0036 x d ₁	0,0024 x d ₁			□	■
	2.7	75	100	0,0018 x d ₁	0,0023 x d ₁								□	■
	2.8		30	0,0016 x d ₁	0,0020 x d ₁								□	■
	3.1	290	380	0,0026 x d ₁	0,0033 x d ₁	100	110	0,0033 x d ₁	0,0039 x d ₁	0,0026 x d ₁	□	■		■
	3.2	210	270	0,0030 x d ₁	0,0038 x d ₁	65	90	0,0038 x d ₁	0,0045 x d ₁	0,0030 x d ₁	□	■		■
4.1	170	220	0,0040 x d ₁	0,0050 x d ₁	60	65	0,0050 x d ₁	0,0060 x d ₁	0,0040 x d ₁	□	□	□	■	
4.2	320	410	0,0040 x d ₁	0,0050 x d ₁	100	110	0,0050 x d ₁	0,0060 x d ₁	0,0040 x d ₁	□	□	□	■	
4.3		70	0,0034 x d ₁	0,0043 x d ₁									■	
4.4													■	
5.1		70	0,0014 x d ₁	0,0018 x d ₁								■		
5.2	48	62	0,0018 x d ₁	0,0023 x d ₁									■	
5.3		28	0,0016 x d ₁	0,0020 x d ₁								■		
S	1.1	68	88	0,0020 x d ₁	0,0025 x d ₁	22	24	0,0025 x d ₁	0,0030 x d ₁	0,0020 x d ₁				■
	1.2	60	77	0,0018 x d ₁	0,0023 x d ₁									■
	1.3		25	0,0016 x d ₁	0,0020 x d ₁									■
	2.1	58	76	0,0020 x d ₁	0,0025 x d ₁									■
	2.2	20	30	0,0016 x d ₁	0,0020 x d ₁									■
	2.3													
	2.4													
2.5														
2.6														
H	1.1													
	1.2													
	1.3													
	1.4													
	1.5													

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

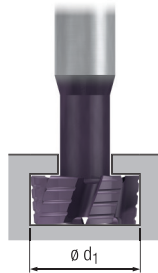
HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässlifte
Burrs
- v_c / f_z**

HSS-T-Nutenfräser HSS T-slot end mills

NF



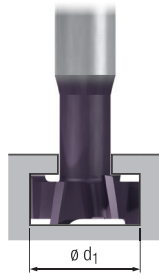
Gültig für · Valid for
3050 3058 3058C

	v_c [m/min]		f_z [mm] $d_1 \leq 45$ mm	TICN		Unbesch. Uncoated	
	Unbeschichtet Uncoated	TICN					
P	1.1	33	35	0,0036 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	28	30	0,0033 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	22	25	0,0030 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1		20	0,0027 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M	1.1	13	16	0,0030 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	11	14	0,0027 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K	1.1	28	32	0,0036 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	24	30	0,0033 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	22	25	0,0033 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	20	23	0,0030 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	17	20	0,0027 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	23	26	0,0033 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2	15	18	0,0030 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N	1.1	110	120	0,0048 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	100	110	0,0045 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3	80	90	0,0042 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4	65	70	0,0039 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5	45	50	0,0036 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.6				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	26	50	0,0036 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	29	60	0,0033 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.3	52	60	0,0036 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.4	20	22	0,0027 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.5	41	50	0,0030 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.6	47	50	0,0036 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.7				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.8				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	88	120	0,0039 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	72	100	0,0045 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.1	65	70	0,0060 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	110	120	0,0060 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.4				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.2				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
S	1.1	24	30	0,0030 x d_1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H	1.1				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



HSS-T-Nutenfräser
HSS T-slot end mills

N



Gültig für · Valid for
3030 3038 3038C

Product Finder

NF

N

HR

90°

60°

Frässlifte
Burrs

v_c / f_z

		v_c [m/min]		f_z [mm]				TICN				Unbesch. Uncoated	
		Unbeschichtet Uncoated	TICN	$d_1 \leq 16$ mm	$d_1 > 16-22$ mm	$d_1 > 22-32$ mm	$d_1 > 32-60$ mm			MMS MQL			
P	1.1	28	33	$0,0013 \times d_1$	$0,0018 \times d_1$	$0,0012 \times d_1$	$0,0008 \times d_1$					□	■
	2.1	24	28	$0,0012 \times d_1$	$0,0017 \times d_1$	$0,0011 \times d_1$	$0,0008 \times d_1$						■
	3.1	18	22	$0,0011 \times d_1$	$0,0015 \times d_1$	$0,0010 \times d_1$	$0,0007 \times d_1$						■
	4.1		17	$0,0010 \times d_1$	$0,0014 \times d_1$	$0,0009 \times d_1$	$0,0006 \times d_1$						■
	5.1												
M	1.1	11	13	$0,0011 \times d_1$	$0,0015 \times d_1$	$0,0010 \times d_1$	$0,0007 \times d_1$						■
	2.1	10	11	$0,0010 \times d_1$	$0,0014 \times d_1$	$0,0009 \times d_1$	$0,0006 \times d_1$						■
	3.1												
	4.1												
K	1.1	24	28	$0,0013 \times d_1$	$0,0018 \times d_1$	$0,0012 \times d_1$	$0,0008 \times d_1$	□	□	□	□	□	■
	1.2	21	24	$0,0012 \times d_1$	$0,0017 \times d_1$	$0,0011 \times d_1$	$0,0008 \times d_1$	□	□	□	□	□	■
	2.1	19	22	$0,0012 \times d_1$	$0,0017 \times d_1$	$0,0011 \times d_1$	$0,0008 \times d_1$					□	■
	2.2	17	20	$0,0011 \times d_1$	$0,0015 \times d_1$	$0,0010 \times d_1$	$0,0007 \times d_1$						■
	3.1	14	17	$0,0010 \times d_1$	$0,0014 \times d_1$	$0,0009 \times d_1$	$0,0006 \times d_1$						■
	3.2												
	4.1	20	23	$0,0012 \times d_1$	$0,0017 \times d_1$	$0,0011 \times d_1$	$0,0008 \times d_1$					□	■
	4.2	13	15	$0,0011 \times d_1$	$0,0015 \times d_1$	$0,0010 \times d_1$	$0,0007 \times d_1$						■
N	1.1	95	110	$0,0018 \times d_1$	$0,0024 \times d_1$	$0,0016 \times d_1$	$0,0011 \times d_1$						■
	1.2	85	100	$0,0017 \times d_1$	$0,0023 \times d_1$	$0,0015 \times d_1$	$0,0011 \times d_1$					□	■
	1.3	67	80	$0,0015 \times d_1$	$0,0021 \times d_1$	$0,0014 \times d_1$	$0,0010 \times d_1$					□	■
	1.4	57	65	$0,0014 \times d_1$	$0,0020 \times d_1$	$0,0013 \times d_1$	$0,0009 \times d_1$					□	■
	1.5	38	45	$0,0013 \times d_1$	$0,0018 \times d_1$	$0,0012 \times d_1$	$0,0008 \times d_1$					□	■
	1.6												
	2.1	23	45	$0,0013 \times d_1$	$0,0018 \times d_1$	$0,0012 \times d_1$	$0,0008 \times d_1$						■
	2.2	25	55	$0,0012 \times d_1$	$0,0017 \times d_1$	$0,0011 \times d_1$	$0,0008 \times d_1$						■
	2.3	45	55	$0,0013 \times d_1$	$0,0018 \times d_1$	$0,0012 \times d_1$	$0,0008 \times d_1$					□	■
	2.4	17	20	$0,0010 \times d_1$	$0,0014 \times d_1$	$0,0009 \times d_1$	$0,0006 \times d_1$						■
	2.5	35	46	$0,0011 \times d_1$	$0,0015 \times d_1$	$0,0010 \times d_1$	$0,0007 \times d_1$						■
	2.6	41	54	$0,0013 \times d_1$	$0,0018 \times d_1$	$0,0012 \times d_1$	$0,0008 \times d_1$					□	■
	2.7												
	2.8												
	3.1	76	110	$0,0014 \times d_1$	$0,0020 \times d_1$	$0,0013 \times d_1$	$0,0009 \times d_1$	□	■			□	■
	3.2	62	90	$0,0017 \times d_1$	$0,0023 \times d_1$	$0,0015 \times d_1$	$0,0011 \times d_1$	□	■			□	■
4.1	57	65	$0,0022 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$	$0,0014 \times d_1$	□	□	□	□		■	
4.2	95	110	$0,0022 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$	$0,0014 \times d_1$	□	□	□	□		■	
4.3													
4.4													
5.1													
5.2													
5.3													
S	1.1	21	24	$0,0011 \times d_1$	$0,0015 \times d_1$	$0,0010 \times d_1$	$0,0007 \times d_1$						■
	1.2												
	1.3												
	2.1												
	2.2												
	2.3												
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

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

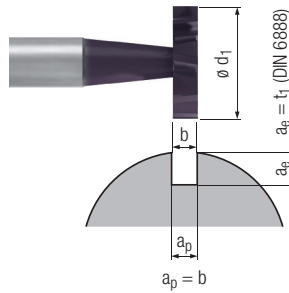
HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässlifte
Burrs
- v_c / f_z

HSS-Schlitzfräser HSS Woodruff keyseat end mills

Gültig für · Valid for
3010 3018 3018C



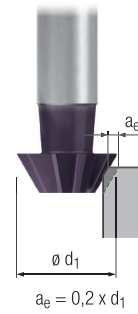
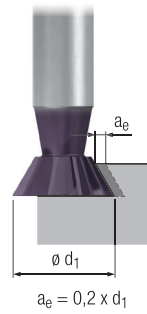
		v_c [m/min]		f_z [mm]			TICN				Unbesch. Uncoated
		Unbeschichtet Uncoated	TICN	$d_1 \leq 10,5$ mm	$d_1 > 10,5 - 19,5$ mm	$d_1 > 19,5 - 45,5$ mm			MMS MQL		
P	1.1	33	35	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$				<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	28	30	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$					<input checked="" type="checkbox"/>
	3.1	22	25	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$					<input checked="" type="checkbox"/>
	4.1		20	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$					<input checked="" type="checkbox"/>
	5.1										
M	1.1	13	16	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$					<input checked="" type="checkbox"/>
	2.1	11	14	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$					<input checked="" type="checkbox"/>
	3.1										
	4.1										
K	1.1	28	32	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	24	30	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1	22	25	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.2	20	23	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$				<input checked="" type="checkbox"/>	
	3.1	17	20	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$				<input checked="" type="checkbox"/>	
	3.2										<input checked="" type="checkbox"/>
	4.1	23	26	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.2	15	18	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$					<input checked="" type="checkbox"/>
N	1.1	110	120	$0,0024 \times d_1$	$0,0021 \times d_1$	$0,0019 \times d_1$					<input checked="" type="checkbox"/>
	1.2	100	110	$0,0023 \times d_1$	$0,0020 \times d_1$	$0,0018 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3	80	90	$0,0021 \times d_1$	$0,0018 \times d_1$	$0,0017 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.4	65	70	$0,0020 \times d_1$	$0,0017 \times d_1$	$0,0016 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.5	45	50	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.6										<input checked="" type="checkbox"/>
	2.1	26	50	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$					<input checked="" type="checkbox"/>
	2.2	29	60	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$					<input checked="" type="checkbox"/>
	2.3	52	60	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4	20	22	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$					<input checked="" type="checkbox"/>
	2.5	41	50	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$					<input checked="" type="checkbox"/>
	2.6	47	60	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.7										<input checked="" type="checkbox"/>
	2.8										<input checked="" type="checkbox"/>
	3.1	88	120	$0,0020 \times d_1$	$0,0017 \times d_1$	$0,0016 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>
	3.2	72	100	$0,0023 \times d_1$	$0,0020 \times d_1$	$0,0018 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>
4.1	65	70	$0,0030 \times d_1$	$0,0026 \times d_1$	$0,0024 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	110	120	$0,0030 \times d_1$	$0,0026 \times d_1$	$0,0024 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3											
4.4											
5.1											
5.2											
5.3											
S	1.1	24	30	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$					<input checked="" type="checkbox"/>
	1.2										
	1.3										
	2.1										
	2.2										
	2.3										
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										



HSS-Winkelfräser
HSS dovetail end mills

Gültig für · Valid for

3200 3210
3208 3218
3208C 3218C



		V_c [m/min]		f_z [mm]		TICN				Unbesch. Uncoated
		Unbeschichtet Uncoated	TICN	45° - 70°	45° - 70°			MMS MQL		
P	1.1	28	33	0,0007 x d_1	0,0010 x d_1			□	■	
	2.1	24	28	0,0006 x d_1	0,0009 x d_1				■	
	3.1	18	22	0,0006 x d_1	0,0008 x d_1				■	
	4.1		17	0,0005 x d_1	0,0007 x d_1				■	
	5.1									
M	1.1	11	13	0,0006 x d_1	0,0008 x d_1				■	
	2.1	10	11	0,0005 x d_1	0,0007 x d_1				■	
	3.1									
	4.1									
K	1.1	24	28	0,0007 x d_1	0,0010 x d_1	□	□	□	■	
	1.2	21	24	0,0006 x d_1	0,0009 x d_1	□	□	□	■	
	2.1	19	22	0,0006 x d_1	0,0009 x d_1			□	■	
	2.2	17	20	0,0006 x d_1	0,0008 x d_1				■	
	3.1	14	17	0,0005 x d_1	0,0007 x d_1				■	
	3.2								■	
	4.1	20	23	0,0006 x d_1	0,0009 x d_1			□	■	
	4.2	13	15	0,0006 x d_1	0,0008 x d_1				■	
N	1.1	95	110	0,0009 x d_1	0,0013 x d_1				■	
	1.2	85	100	0,0008 x d_1	0,0012 x d_1			□	■	
	1.3	67	80	0,0008 x d_1	0,0011 x d_1			□	■	
	1.4	57	65	0,0007 x d_1	0,0010 x d_1			□	■	
	1.5	38	45	0,0007 x d_1	0,0010 x d_1			□	■	
	1.6									
	2.1	38	45	0,0007 x d_1	0,0010 x d_1				■	
	2.2	48	55	0,0006 x d_1	0,0009 x d_1				■	
	2.3	48	55	0,0007 x d_1	0,0010 x d_1			□	■	
	2.4	17	20	0,0005 x d_1	0,0007 x d_1				■	
	2.5	40	46	0,0006 x d_1	0,0008 x d_1				■	
	2.6	46	54	0,0007 x d_1	0,0010 x d_1			□	■	
	2.7									
	2.8									
	3.1	95	110	0,0007 x d_1	0,0010 x d_1	□	■		□	
	3.2	76	90	0,0008 x d_1	0,0012 x d_1	□	■		□	
4.1	57	65	0,0011 x d_1	0,0016 x d_1	□	□	□	■		
4.2	95	110	0,0011 x d_1	0,0016 x d_1	□	□	□	■		
4.3										
4.4										
5.1										
5.2										
5.3										
S	1.1	21	24	0,0006 x d_1	0,0008 x d_1				■	
	1.2									
	1.3									
	2.1									
	2.2									
	2.3									
H	1.1									
	1.2									
	1.3									
	1.4									
	1.5									

Product Finder

NF

N

HR

90°

60°

Frässtifte
Burs

V_c / f_z

HSS/HM



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

- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässlifte
Burrs
- v_c / f**

Kegelsenker 60° und 90° Countersinks 60° and 90°



HM



HSS

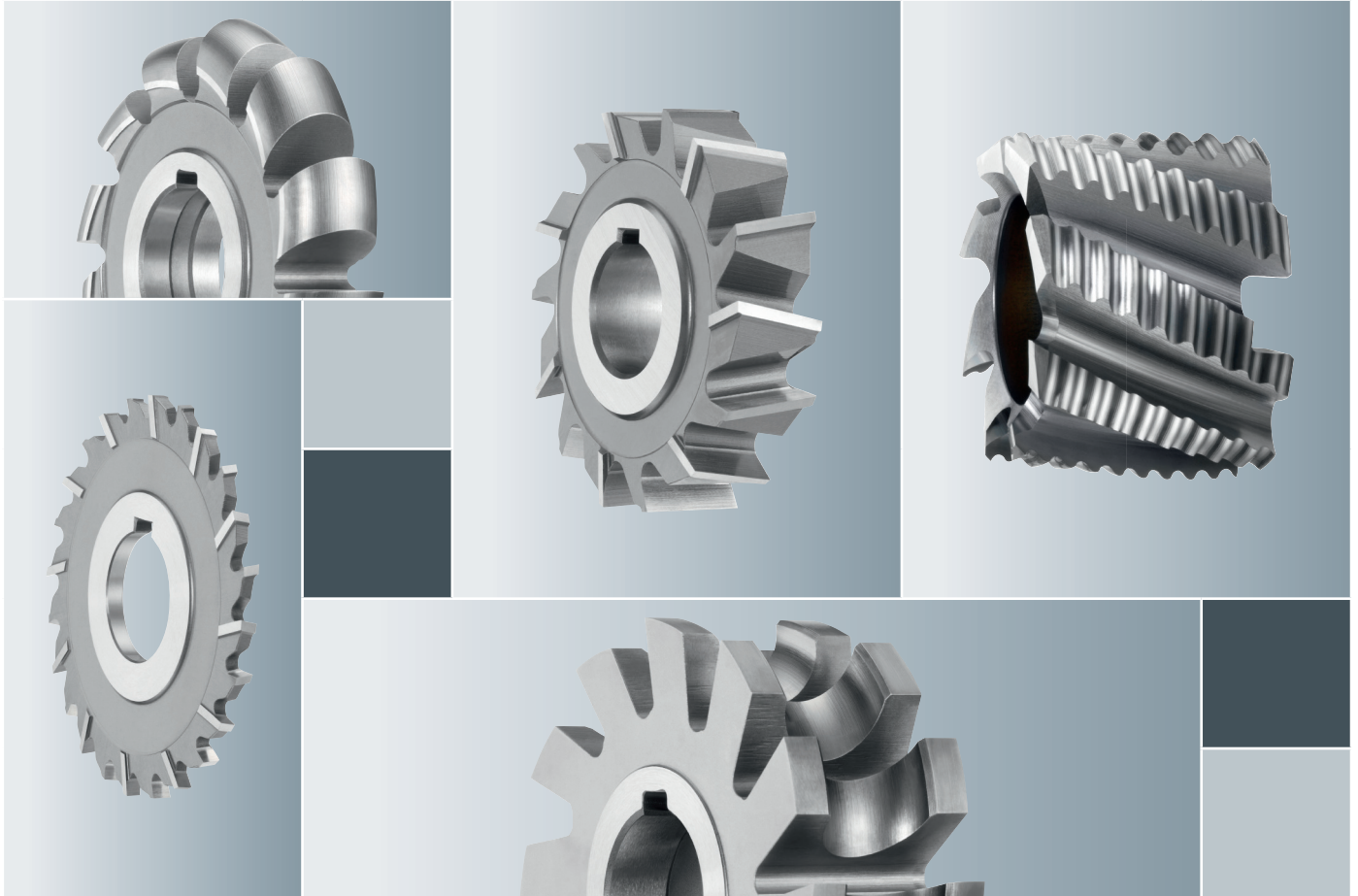
Gültig für · Valid for

7550 7560 7581
7550T 7560T

HM HSS-TIN	HSS Unbesch. Uncoated

	HM Unbeschichtet Uncoated		HSS Unbeschichtet Uncoated		HSS TIN		60°, 90°	
	v _c [m/min]	f [mm]	v _c [m/min]	f [mm]	v _c [m/min]	f [mm]	60°	90°
P	1.1	35	0,060	15	25	0,050	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	25	0,060	12	15	0,050	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	18	0,036	10	12	0,030	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	12	0,036		8	0,030	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	10	0,024				<input type="checkbox"/>	<input type="checkbox"/>
M	1.1	9	0,036	6	8	0,030	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	8	0,036	4	6	0,030	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	7	0,024				<input type="checkbox"/>	<input type="checkbox"/>
	4.1						<input type="checkbox"/>	<input type="checkbox"/>
K	1.1	40	0,096	20	30	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	30	0,096	15	20	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	28	0,096	11	14	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	20	0,096	10	12	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	15	0,084	8	10	0,070	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	12	0,084				<input type="checkbox"/>	<input type="checkbox"/>
	4.1	20	0,096	8	10	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	4.2	18	0,096	7	9	0,080	<input type="checkbox"/>	<input type="checkbox"/>
N	1.1			40	50	0,060	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	60	0,072	30	40	0,060	<input type="checkbox"/>	<input type="checkbox"/>
	1.3	50	0,072	25	30	0,060	<input type="checkbox"/>	<input type="checkbox"/>
	1.4	45	0,072	20	25	0,060	<input type="checkbox"/>	<input type="checkbox"/>
	1.5	30	0,072	15	20	0,060	<input type="checkbox"/>	<input type="checkbox"/>
	1.6	10	0,065				<input type="checkbox"/>	<input type="checkbox"/>
	2.1	45	0,096	25	30	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	60	0,096	30	40	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	2.3	80	0,096	35	55	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	2.4	30	0,084	15	20	0,070	<input type="checkbox"/>	<input type="checkbox"/>
	2.5	45	0,084	20	30	0,070	<input type="checkbox"/>	<input type="checkbox"/>
	2.6	30	0,096	15	20	0,080	<input type="checkbox"/>	<input type="checkbox"/>
	2.7	15	0,078				<input type="checkbox"/>	<input type="checkbox"/>
	2.8						<input type="checkbox"/>	<input type="checkbox"/>
	3.1	85	0,120	50	60	0,100	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	75	0,120	45	50	0,100	<input type="checkbox"/>	<input type="checkbox"/>
4.1	90	0,060	55	65	0,050	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	100	0,060	60	70	0,050	<input type="checkbox"/>	<input type="checkbox"/>	
4.3						<input type="checkbox"/>	<input type="checkbox"/>	
4.4						<input type="checkbox"/>	<input type="checkbox"/>	
5.1						<input type="checkbox"/>	<input type="checkbox"/>	
5.2	15	0,070				<input type="checkbox"/>	<input type="checkbox"/>	
5.3						<input type="checkbox"/>	<input type="checkbox"/>	
S	1.1	15	0,048	6	8	0,040	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	10	0,048				<input type="checkbox"/>	<input type="checkbox"/>
	1.3						<input type="checkbox"/>	<input type="checkbox"/>
	2.1	6	0,038				<input type="checkbox"/>	<input type="checkbox"/>
	2.2	5	0,033				<input type="checkbox"/>	<input type="checkbox"/>
	2.3						<input type="checkbox"/>	<input type="checkbox"/>
2.4						<input type="checkbox"/>	<input type="checkbox"/>	
2.5						<input type="checkbox"/>	<input type="checkbox"/>	
2.6						<input type="checkbox"/>	<input type="checkbox"/>	
H	1.1						<input type="checkbox"/>	<input type="checkbox"/>
	1.2						<input type="checkbox"/>	<input type="checkbox"/>
	1.3						<input type="checkbox"/>	<input type="checkbox"/>
	1.4						<input type="checkbox"/>	<input type="checkbox"/>
	1.5						<input type="checkbox"/>	<input type="checkbox"/>





Fräser mit Bohrung Milling Cutters with Bore

Seite · Page

Wegweiser	Product finder	332 - 335
Produktseiten	Product pages	336 - 349
Schnittwerte	Cutting conditions	350 - 356

HSS/HM



Wegweiser

Bitte beachten:

Die Eignung der Fräser mit Bohrung ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Die zugehörigen Schnittdaten sind auf den Seiten 350 - 356 zu finden.

Internationaler Werkstoffvergleich siehe Seite 416 - 429.

Product finder

Please note:

The suitability of the milling cutters with bore is indicated as follows:

- = very suitable
- = suitable

Please find the cutting conditions on pages 350 - 356.

International comparison of materials, see page 416 - 429.

Einsatzgebiete – Material Applications – material		Material-Beispiele Material examples	Material-Nummern Material numbers
P	Stahlwerkstoffe Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Steel materials Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	Cq15 1.1132 S235JR (S137-2) 1.0037 10SPb20 1.0722 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	2.1 Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	
	5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	
M	Nichtrostende Stahlwerkstoffe 1.1 Ferritisch, martensitisch	Stainless steel materials Ferritic, martensitic	X2CrTi12 1.4512
	2.1 Austenitisch	Austenitic	X6CrNiMoTi17-12-2 1.4571
	3.1 Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	X2CrNiMoN22-5-3 1.4462
	4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	X2CrNiMoN25-7-4 1.4410
K	Gusswerkstoffe 1.1 Gusseisen mit Lamellengrafit (GJL)	Cast materials Cast iron with lamellar graphite (GJL)	EN-GJL-200 (GG20) EN-JL-1030
	1.2	250-450 N/mm ²	EN-GJL-300 (GG30) EN-JL-1050
	2.1 Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	EN-GJS-400-15 (GGG40) EN-JS-1030
	2.2	350-500 N/mm ²	EN-GJS-700-2 (GGG70) EN-JS-1070
	3.1 Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	GJV 300
	3.2	300-400 N/mm ²	GJV 450
4.1 Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	EN-GJMW-350-4 (GTW-35) EN-JM-1010	
4.2	250-500 N/mm ²	EN-GJMB-450-6 (GTS-45) EN-JM-1140	
N	Nichteisenwerkstoffe 1.1 Aluminium-Legierungen	Non-ferrous materials Aluminium alloys	
	1.2 Aluminium-Knetlegierungen	Wrought aluminium alloys	EN AW-AlMn1 EN AW-3103
	1.3	≤ 200 N/mm ²	EN AW-AlMgSi EN AW-6060
	1.4	≤ 350 N/mm ²	EN AW-AlZn5Mg3Cu EN AW-7022
	1.5 Aluminium-Gusslegierungen	Aluminium cast alloys	EN AC-AlMg5 EN AC-307 G
	1.6	Si ≤ 7%	EN AC-AISi9Cu3 EN AC-46500
	2.1 Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	E-Cu 57 EN CW 004 A
	2.2 Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	CuZn37 (Ms63) EN CW 508 L
	2.3 Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	CuZn36Pb3 (Ms58) EN CW 603 N
	2.4 Kupfer-Aluminium-Legierungen (Alubronze, langspanend)	Copper-aluminium alloys (alu bronze, long-chipping)	CuAl10Ni5Fe4 EN CW 307 G
	2.5 Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	CuSn8P EN CW 459 K
	2.6 Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	CuSn7 ZnPb (Rg7) 2.1090
	2.7 Kupfer-Sonderlegierungen	Special copper alloys	(AMPPO® 8)
	2.8	≤ 400 N/mm ²	(AMPPO® 45)
	3.1 Magnesium-Knetlegierungen	Magnesium wrought alloys	MgAl6Zn 3.5612
	3.2 Magnesium-Gusslegierungen	Magnesium cast alloys	EN-MCMgAl9Zn1 EN-MC21120
S	Kunststoffe 4.1 Duroplaste (kurzspanend)	Synthetics 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 5.1 Graphit	Special materials Graphite	C 8000
	5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys	W-Cu 80/20
	5.3 Verbundwerkstoffe	Composite materials	Hyllite, Alucobond
	Spezialwerkstoffe 1.1 Titan-Legierungen	Special materials Titanium alloys	
1.2 Reintitan	Pure titanium	Ti1 3.7025	
1.3 Titan-Legierungen	Titanium alloys	TiAl6V4 3.7165 TiAl4Mo4Sn2 3.7185	
H	Nickel-, Kobalt- und Eisen-Legierungen 2.1 Reinnickel	Nickel alloys, cobalt alloys and iron alloys Pure nickel	Ni 99.6 2.4060
	2.2 Nickel-Basis-Legierungen	Nickel-base alloys	Monel 400 2.4360 Inconel 718 2.4668
	2.3	≤ 600 N/mm ²	Udimet 605
	2.4 Kobalt-Basis-Legierungen	Cobalt-base alloys	Haynes 25 2.4964
	2.5 Eisen-Basis-Legierungen	Iron-base alloys	Incloy 800 1.4958
	2.6	≤ 1000 N/mm ²	
H	Harte Werkstoffe 1.1 Hochfeste Stähle, gehärtete Stähle, Hartguss	Hard materials High strength steels, hardened steels, hard castings	Weldox 1100 Hardox 550 ArmoX 600T Ferro-Titanit HSSE
	1.2	44 - 50 HRC	
	1.3	50 - 55 HRC	
	1.4	55 - 60 HRC	
	1.5	60 - 63 HRC	



HSS-Walzenstirnfräser
HSS shell end mills



Steel		Allround						Al
NR	grob · coarse	NF	mittel · medium	N		HR	fein · fine	W
ø 40 - 125 mm	ø 40 - 125 mm	ø 40 - 100 mm	ø 40 - 100 mm	ø 40 - 125 mm	ø 40 - 125 mm	ø 40 - 100 mm	ø 40 - 100 mm	ø 40 - 125 mm
7 - 12	7 - 12	7 - 12	7 - 12	8 - 14	8 - 14	7 - 12	7 - 12	6 - 8
4050	4050C	4070	4070C	4010	4010C	4090	4090C	4040
337	337	337	337	338	338	338	338	339
350	350	350	350	351	351	350	350	352

Product Finder

NR

NF

N

H

H

W

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
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					□		□		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
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	□	□					■		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

Seite - Page

v_c / f_z

P

M

K

N

S

H

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

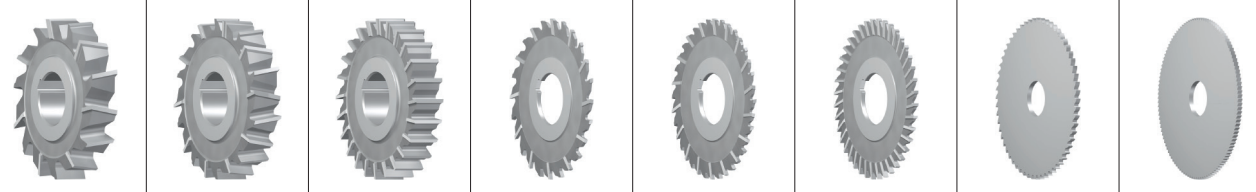


- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

HSS-Scheibenfräser
HSS side and face milling cutters

Schmale HSS-Scheibenfräser
Narrow HSS side and face milling cutters

Hartmetall-Metallkreissägeblätter
Solid carbide metal slitting saws



	Allround	Steel		Allround	Steel		Allround	Steel
	N	H		N	H		N	H
	ø 50 - 200 mm	ø 50 - 200 mm	ø 50 - 125 mm	ø 63 - 160 mm	ø 63 - 160 mm	ø 63 - 160 mm	ø 20 - 125 mm	ø 20 - 125 mm
Z (Flutes)	12 - 24	16 - 32	16 - 24	16 - 30	28 - 48	32 - 52	20 - 70	40 - 140
	4410	4435	4455	4490	4461	4471	4515	4505
Seite · Page	340	340	340	341	341	341	342-343	342-343
v_c / f_z	353	353	353	353	353	353	354	354

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							□	
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	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									
2.6									
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

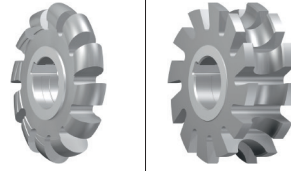
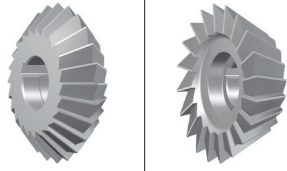
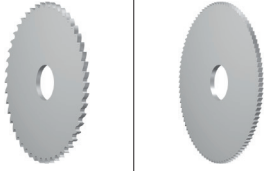


HSS-Metallkreissägeblätter
HSS metal slitting saws

HSS-Winkelfräser
HSS angle milling cutters

HSS-Halbrund-Profilfräser
HSS radius cutters

HSS-Zahnformfräser
HSS spur wheel milling cutters



Steel

Allround

Product Finder

NR

NF

N

H

H

W

v_c / f_z

N

H

N

N

N

ø50 - 160 mm

ø20 - 160 mm

ø50 - 100 mm

ø40 - 160 mm

r=0,75 - 12 mm

r=1 - 12 mm

Mod.1 - 4

24 - 80

32 - 160

16 - 28

14 - 28

12 - 14

12 - 14

12 - 14

Z (Flutes)

4510

4500

4660

4670

4645

4640

5500

344 - 345

344 - 345

346

347

348

348

349

Seite · Page

354

354

355

355

356

356

356

v_c / f_z

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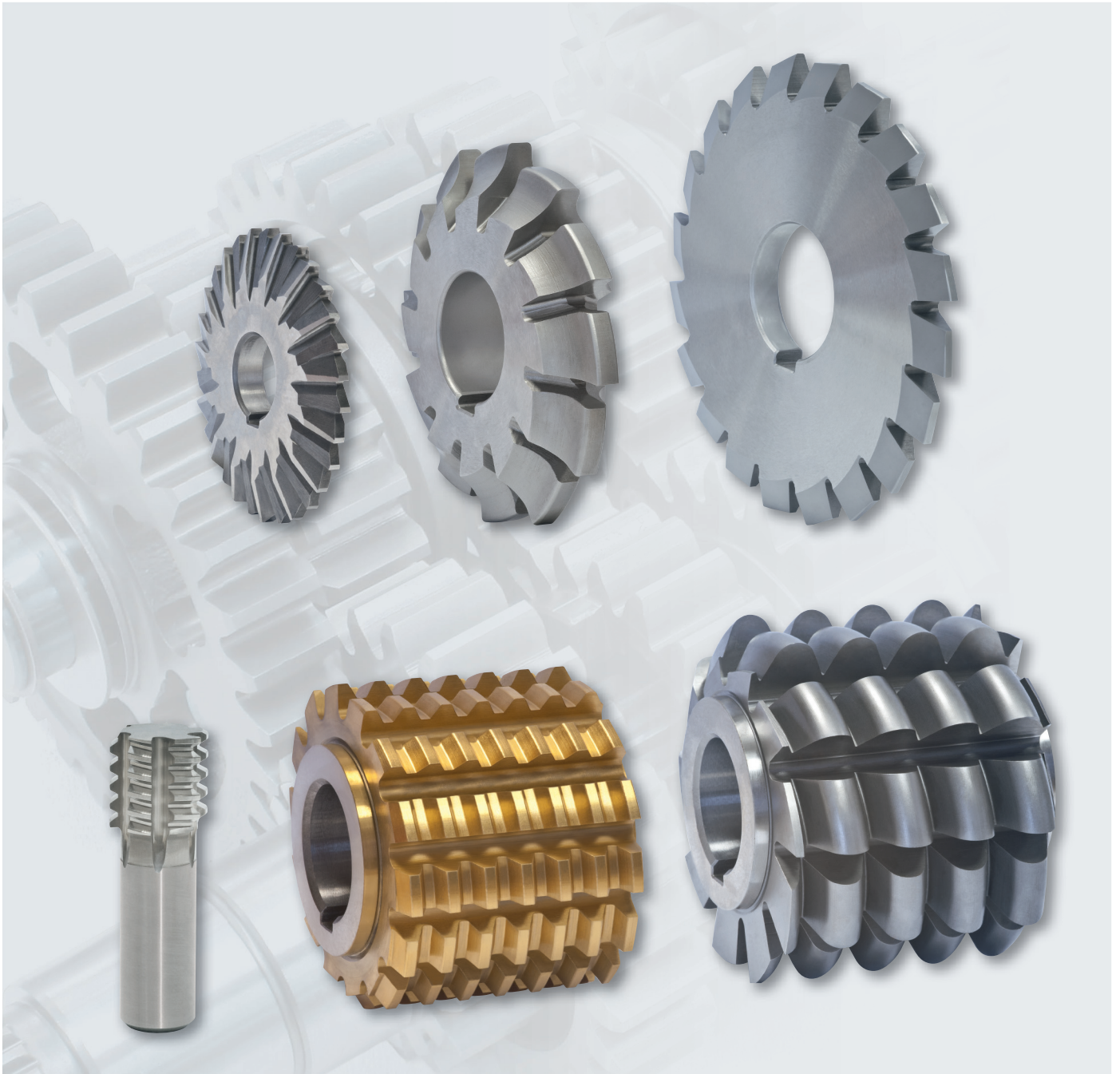
□

3.2

□

□

- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z



Auf Anfrage fertigen wir auch:

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

On request we also produce:

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



- Schruppfräser mit groben, runden Spanteilern
- Niedrige Schnittkräfte
- Mit Längs- und Quernut

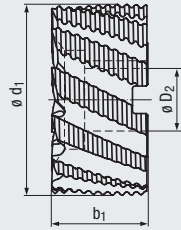
- Roughing shell end mill with coarse, round chip breakers
- Low cutting forces
- With standard keyway and driving slot

NR **grob coarse**

HSSE **DIN 138**

25° 45°

v_c / f_z 350



Steel



Steel

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 332)

- Für einfache Stahl- und Gusswerkstoffe sowie Kupferlegierungen verwendbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Plan- und Eckfräsen mit großem Abtragsvolumen

Applications – material (see page 332)

- For steel, cast materials and copper alloys
- For materials with a tensile strength of up to 1000 N/mm²
- For face and shoulder milling with high material removal rates

TICN

P 1.1 2.1

K 1.1 1.2-2.1, 4.1

N 2.2-2.3, 2.5

N 3.1-4.2

P 1.1-2.1 3.1

M 1.1-2.1

K 1.1-1.2 2.1-2.2

K 4.1-4.2

N 2.1-2.7, 5.2

S 1.1

DIN 1880

Bestell-Code · Order code

Ø d ₁ „+“ js14	b ₁	Ø D ₂	Z (Flutes)	Dimens.- Code
40	32	16	7	.040
50	36	22	8	.050
63	40	27	8	.063
80	45	27	10	.080
100	50	32	12	.100
125	56	40	12	.125

4050

4050C

- Schrupp-Schlichtfräser mit flachen, überdeckenden Spanteilern
- Erzeugt annähernd Schlichtoberflächen
- Mit Längs- und Quernut

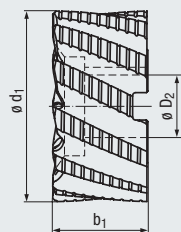
- Semi-finishing shell end mill with flat, overlapping chip breakers
- Generates nearly finishing surfaces
- With standard keyway and driving slot

NF **mittel medium**

HSSE **DIN 138**

25° 45°

v_c / f_z 350



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 332)

- In fast allen Eisenwerkstoffen und Buntmetallen bis 1200 N/mm² einsetzbar
- Kurze Späne lassen sich leicht abtransportieren
- Zum Plan- und Eckfräsen

Applications – material (see page 332)

- For almost all ferrous materials and non-ferrous metals with a tensile strength of up to 1200 N/mm²
- Easy removal of short chips
- For face and shoulder milling

TICN

P 1.1 2.1-3.1

M 1.1

K 1.1-1.2 2.1-2.2, 4.1

N 2.2-2.3, 2.5

N 3.1-3.2

S 1.1

P 1.1-2.1 3.1-4.1

M 1.1-2.1

K 1.1-1.2 2.1-4.2

N 2.1-2.7

S 1.1-1.2, 2.1

DIN 1880

Bestell-Code · Order code

Ø d ₁ „+“ js14	b ₁	Ø D ₂	Z (Flutes)	Dimens.- Code
40	32	16	7	.040
50	36	22	8	.050
63	40	27	8	.063
80	45	27	10	.080
100	50	32	12	.100

4070

4070C

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



- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

- Schlächtfräser
- Erzeugt glatte Oberflächen
- Mit Längs- und Quernut

- Finishing shell end mill
- Generates smooth surfaces
- With standard keyway and driving slot

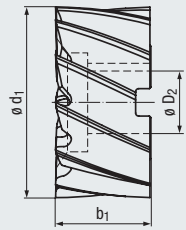
N

HSSE

DIN 138

25°

v_c / f_z
351



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 332)

- In fast allen Eisenwerkstoffen und Buntmetallen bis 1200 N/mm² einsetzbar
- Zum Plan- und Eckfräsen mit geringen Schnitttiefen

Applications – material (see page 332)

- For almost all ferrous materials and non-ferrous metals with a tensile strength of up to 1200 N/mm²
- For face and shoulder milling with low cutting depths

P	1.1	2.1
M	1.1	1.1
K	1.1	1.2-2.2
K	4.1	4.1-4.2
N	2.2-2.3, 2.5	

TICN

P	1.1-2.1	3.1-4.1
M	1.1	2.1-3.1
K	1.1-2.1	2.2-3.2
K	4.1	4.2
N	2.1-2.7	
S	1.1-2.1	

DIN 1880

Bestell-Code · Order code

$\varnothing d_1$ k10	b_1	$\varnothing D_2$	Z (Flutes)	Dimens.- Code
40	32	16	8	.040
50	36	22	8	.050
63	40	27	8	.063
80	45	27	10	.080
100	50	32	12	.100
125	56	40	14	.125

Scharfkantig · Sharp-edged

4010

4010C

•	•
•	•
•	•
•	•
•	•
•	•

- Schruppfräser mit feinen, runden Spanteilern
- Niedrige Schnittkräfte
- Mit Längs- und Quernut

- Roughing shell end mill with fine, round chip breakers
- Low cutting forces
- With standard keyway and driving slot

HR

fein
fine

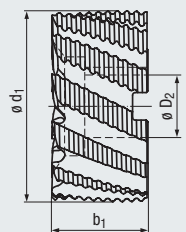
HSSE

DIN 138

25°

45°

v_c / f_z
350



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 332)

- In fast allen Eisenwerkstoffen und Buntmetallen bis 1200 N/mm² einsetzbar
- Zum Plan- und Eckfräsen mit großem Abtragsvolumen

Applications – material (see page 332)

- For almost all ferrous materials and non-ferrous metals with a tensile strength of up to 1200 N/mm²
- For face and shoulder milling with high material removal rates

P	2.1	1.1, 3.1
M	1.1	1.1
K	1.1	1.2-2.2
K	4.1	4.1-4.2
N	2.3, 2.6	

TICN

P	2.1	1.1, 3.1-4.1
M	1.1	2.1-3.1
K	1.1-1.2	2.1-3.2
K	4.1	4.2
N	2.2-2.7, 5.2	
S	1.1-2.1	

DIN 1880

Bestell-Code · Order code

$\varnothing d_1$ „+“ js14	b_1	$\varnothing D_2$	Z (Flutes)	Dimens.- Code
40	32	16	7	.040
50	36	22	8	.050
63	40	27	8	.063
80	45	27	10	.080
100	50	32	12	.100

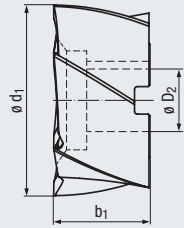
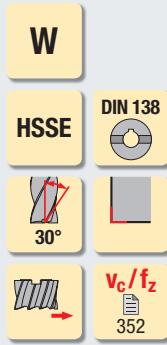
4090

4090C

•	•
•	•
•	•
•	•
•	•
•	•

- Schlichtfräser
- Erzeugt glatte Oberflächen
- Große Spanräume
- Schneidfreudige Geometrie
- Niedrige Schnittkräfte
- Mit Längs- und Quernut

- Finishing shell end mill
- Generates smooth surfaces
- Large chip space
- High positive rake angle
- Low cutting forces
- With standard keyway and driving slot



Al

Product Finder

NR

NF

N

HR

H

H

W

v_c / f_z

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 332)

- Für Leichtmetalle und faserfreie Kunststoffe mit einer Zugfestigkeit bis 500 N/mm²
- Zum Plan- und Eckfräsen mit großem Abtragsvolumen

Applications – material (see page 332)

- For light metals and fibre-free synthetics with a tensile strength of up to 500 N/mm²
- For face and shoulder milling with high material removal rates

N 1.1-1.3 1.4, 2.1
N 3.1-4.2

DIN 1880

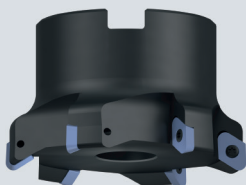
Scharfkantig · Sharp-edged

Bestell-Code · Order code

4040

$\varnothing d_1$ k10	b_1	$\varnothing D_2$	Z (Flutes)	Dimens.- Code		
40	32	16	6	.040	●	
50	36	22	6	.050	●	
63	40	27	6	.063	●	
80	45	27	6	.080	●	
100	50	32	6	.100	●	
125	56	40	8	.125	●	

Beschichtete Ausführung auf Anfrage lieferbar
Coated design available on request



Aufsteckfräskörper für rhombische
Wendeschneidplatten siehe Seite 223

Indexable milling cutters for rhombic inserts,
see page 223

HSS/HM



- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

- 3-seitig schneidend
- Keine Klemmneigung bei tiefen Nuten
- Bei kreuzverzahnter Ausführung wechselseitig ausgesetzte Seitenzähne
- Geradeverzahnte Ausführung für verlaufsicheres Nutenfräsen

- 3 side cutting
- No tendency to jam in deep slots
- Staggered teeth version with alternating peripheral teeth
- Straight teeth version for reliable slot cutting

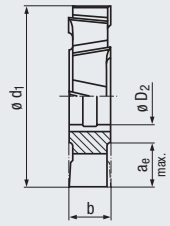
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DIN 138

HSSE

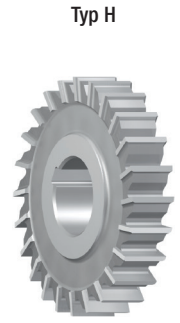
v_c / f_z
353



Allround



Steel



Steel

Einsatzgebiete – Material (siehe Seite 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspanende Nichteisenmetalle
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen tiefer Nuten geeignet
- Zum Trennfräsen oder Ablängen verwendbar

Applications – material (see page 332)

- For steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- Suitable for machining deep slots
- For cutting off and cutting to size

P	1.1	2.1	P	2.1	1.1, 3.1	P	2.1	1.1, 3.1
M		1.1	M		1.1	K	1.1-1.2	2.1-2.2
K	1.1	1.2-2.2	K	1.1-1.2	2.1-2.2	K		4.1-4.2
K		4.1-4.2	K		4.1-4.2	N		2.3-2.6
N		1.3-1.4	N		2.2-2.5	S		1.1
N		2.1-2.3, 2.5						
N		3.1-4.2						

DIN 885

Bestell-Code · Order code

Kreuzverzahnt, grob
Staggered teeth, coarse

Kreuzverzahnt
Staggered teeth

Geradeverzahnt
Straight teeth

Bestell-Code · Order code					4410		4435		4455	
ø d ₁	a _e max.	b k11	ø D ₂	Dimens.- Code	Z (Flutes)		Z (Flutes)		Z (Flutes)	
50	9	4	16	.05004	12	●	16	●	16	●
50	9	5	16	.05005	12	●	16	●	16	●
50	9	6	16	.05006	12	●	16	●	16	●
50	9	8	16	.05008	12	●	16	●	16	●
50	9	10	16	.05010	12	●	16	●	16	●
63	12	4	22	.06304	12	●	18	●	18	●
63	12	5	22	.06305	12	●	18	●	18	●
63	12	6	22	.06306	12	●	18	●	18	●
63	12	8	22	.06308	12	●	18	●	18	●
63	12	10	22	.06310	12	●	18	●	18	●
63	12	12	22	.06312	12	●	18	●	18	●
63	12	14	22	.06314	12	●	18	●	18	●
63	12	16	22	.06316	12	●	18	●	18	●
80	12	5	27	.08005	14	●	20	●	20	●
80	17	6	27	.08006	14	●	20	●	20	●
80	17	8	27	.08008	14	●	20	●	20	●
80	17	10	27	.08010	14	●	18	●	20	●
80	17	12	27	.08012	14	●	18	●	20	●
80	17	14	27	.08014	14	●	18	●	20	●
80	17	16	27	.08016	14	●	18	●	20	●
80	17	18	27	.08018	14	●	18	●	20	●
80	17	20	27	.08020	14	●	18	●	20	●
100	22	6	32	.10006	14	●	20	●	24	●
100	22	8	32	.10008	14	●	20	●	24	●
100	22	10	32	.10010	14	●	20	●	24	●
100	22	12	32	.10012	14	●	20	●	24	●
100	22	14	32	.10014	14	●	20	●	24	●
100	22	16	32	.10016	14	●	20	●	24	●
100	22	18	32	.10018	14	●	20	●	24	●
100	22	20	32	.10020	14	●	20	●	24	●
100	22	25	32	.10025	14	●	20	●	24	●
125	34	8	32	.12508	16	●	24	●	24	●
125	34	10	32	.12510	16	●	22	●	24	●
125	34	12	32	.12512	16	●	22	●	24	●
125	34	14	32	.12514	16	●	22	●	24	●
125	34	16	32	.12516	16	●	22	●	24	●
125	34	18	32	.12518	16	●	22	●	24	●
125	34	20	32	.12520	16	●	22	●	24	●
125	34	25	32	.12525	16	●	22	●	24	●
160	45	10	40	.16010	18	●	26	●		
160	45	12	40	.16012	18	●	26	●		
160	45	14	40	.16014	18	●	26	●		
160	45	16	40	.16016	18	●	26	●		
160	45	18	40	.16018	18	●	26	●		
160	45	20	40	.16020	18	●	26	●		
160	45	25	40	.16025	18	●	26	●		
160	45	32	40	.16032	18	●	26	●		
200	65	12	40	.20012	24	●	32	●		
200	65	14	40	.20014	24	●	32	●		
200	65	16	40	.20016	24	●	32	●		
200	65	18	40	.20018	24	●	32	●		
200	65	20	40	.20020	24	●	32	●		
200	65	25	40	.20025	24	●	32	●		
200	65	32	40	.20032	24	●	32	●		



- 3-seitig schneidend
- Keine Klemmneigung bei tiefen Nuten
- Bei Kreuzverzahnter Ausführung wechselseitig ausgesetzte Seitenzähne
- Geradeverzahnte Ausführung für verlaufsicheres Nutenfräsen

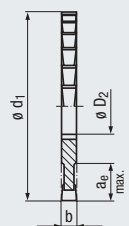
- 3 side cutting
- No tendency to jam in deep slots
- Staggered teeth version with alternating peripheral teeth
- Straight teeth version for reliable slot cutting

N **H**

DIN 138

HSSE

V_c/f_z 353



Allround



Steel



Steel

Einsatzgebiete – Material (siehe Seite 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspanende Nichteisenmetalle
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen tiefer Nuten geeignet
- Zum Schlitz- und Trennfräsen oder Ablängen verwendbar

Applications – material (see page 332)

- For steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- Suitable for machining deep slots
- For slitting, cutting off and cutting to size

P	1.1	2.1	P	2.1	1.1, 3.1	P	2.1	1.1, 3.1
M		1.1	M		1.1	K	1.1-1.2	2.1-2.2
K	1.1-1.2	2.1-2.2	K	1.1-1.2	2.1-2.2	K		4.1-4.2
K		4.1-4.2	K		4.1-4.2	N		2.3-2.6
N		1.3-1.4	N		2.2-2.5	S		1.1
N		2.1-2.3, 2.5						
N		3.1-4.2						

DIN 1834

Bestell-Code · Order code					4490		4461		4471	
ø d ₁	a _e max.	b k11	ø D ₂	Dimens.-Code	Z (Flutes)		Z (Flutes)		Z (Flutes)	
63	12	1,6	22	.063016	16	●	28	●	32	●
63	12	2	22	.06302	16	●	28	●	32	●
63	12	2,5	22	.063025	16	●	28	●	32	●
63	12	3	22	.06303	16	●	28	●	32	●
80	17	1,6	27	.080016	20	●	32	●	36	●
80	17	2	27	.08002	20	●	32	●	36	●
80	17	2,5	27	.080025	20	●	32	●	36	●
80	17	3	27	.08003	20	●	32	●	36	●
80	17	4	27	.08004	20	●	32	●	36	●
100	22	1,6	32	.100016	24	●	36	●	40	●
100	22	2	32	.10002	24	●	36	●	40	●
100	22	2,5	32	.100025	24	●	36	●	40	●
100	22	3	32	.10003	24	●	36	●	40	●
100	22	4	32	.10004	24	●	36	●	40	●
100	22	5	32	.10005	24	●	36	●	40	●
125	34	1,6	32	.125016	26	●	40	●	44	●
125	34	2	32	.12502	26	●	40	●	44	●
125	34	2,5	32	.125025	26	●	40	●	44	●
125	34	3	32	.12503	26	●	40	●	44	●
125	34	4	32	.12504	26	●	40	●	44	●
125	34	5	32	.12505	26	●	40	●	44	●
125	34	6	32	.12506	26	●	40	●	44	●
160	45	2	40	.16002			48	●	52	●
160	45	2,5	40	.160025	30	●	48	●	52	●
160	45	3	40	.16003	30	●	48	●	52	●
160	45	4	40	.16004	30	●	48	●	52	●
160	45	5	40	.16005	30	●	48	●	52	●
160	45	6	40	.16006	30	●	48	●	52	●
160	45	8	40	.16008	22	●	36	●	40	●

Beschichtete Ausführungen auf Anfrage lieferbar
Coated designs available on request

Product Finder

NR

NF

N

H

H

W

v_c / f_z



- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

- Planseitig hohlgeschliffen
- Zahnform A, feingezahnt: Winkelzahn mit kleinen Spankammern
- Zahnform B, grobgezahnt: Bogenzahn mit großen Spankammern

- Hollow ground on the flat side
- Fine toothing, type A: herringbone toothing with small chip space
- Coarse toothing, type B: curved tooth with large chip space

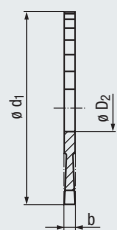
N

H

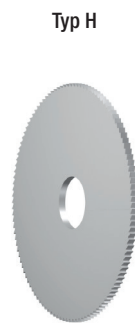
DIN 138

HM

v_c / f_z
354



Typ N



Typ H

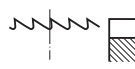
Steel

Steel

Zahnform · Tooth form

DIN 1840 B

DIN 1840 A



Einsatzgebiete – Material (siehe Seite 332)

Applications – material (see page 332)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zum Fräsen von Nuten mit geringer Tiefe
- Zum Trennfräsen oder Ablängen verwendbar

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- Suitable for slot milling, low depth
- For cutting off and cutting to size

P	1.1-3.1	4.1-5.1	P	1.1-3.1	4.1-5.1
M	1.1-2.1	3.1-4.1	M	1.1-2.1	3.1-4.1
K	1.1-2.2	3.1-3.2	K	1.1-2.2	3.1-3.2
K	4.1	4.2	K	4.1	4.2
N	1.4-4.2, 5.2		N	2.8, 5.2	
S	1.1-2.2		S	1.1-2.2	

DIN 1838 / DIN 1837

Grobgezahnt
Coarse teeth

Feingezahnt
Fine teeth

Bestell-Code · Order code

4515

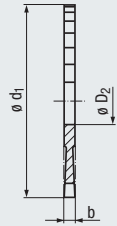
4505

$\varnothing d_1$	b	$\varnothing D_2$	Dimens.-Code	4515		4505	
				Z (Flutes)		Z (Flutes)	
20	0,3	5	.02003	20	●	40	●
20	0,5	5	.02005	20	●	40	●
20	0,8	5	.02008	20	●	40	●
20	1	5	.0201	20	●	40	●
20	1,2	5	.02012	20	●	40	●
25	0,3	8	.02503	24	●	48	●
25	0,5	8	.02505	24	●	48	●
25	0,8	8	.02508	24	●	48	●
25	1	8	.0251	24	●	48	●
25	1,2	8	.02512	24	●	48	●
32	0,3	8	.03203	30	●	60	●
32	0,5	8	.03205	30	●	60	●
32	0,8	8	.03208	30	●	60	●
32	1	8	.0321	30	●	60	●
32	1,2	8	.03212	30	●	60	●
32	1,6	8	.03216	30	●	60	●
32	2	8	.0322	30	●	60	●
40	0,3	10	.04003	36	●	72	●
40	0,4	10	.04004	36	●	72	●
40	0,5	10	.04005	36	●	72	●
40	0,6	10	.04006	36	●	72	●
40	0,8	10	.04008	36	●	72	●
40	1	10	.0401	36	●	72	●
40	1,2	10	.04012	36	●	72	●
40	1,6	10	.04016	36	●	72	●
40	2	10	.0402	36	●	72	●
50	0,4	13	.05004	40	●	80	●
50	0,5	13	.05005	40	●	80	●
50	0,6	13	.05006	40	●	80	●
50	0,8	13	.05008	40	●	80	●
50	1	13	.0501	40	●	80	●
50	1,2	13	.05012	40	●	80	●
50	1,6	13	.05016	40	●	80	●
50	2	13	.0502	40	●	80	●
50	2,5	13	.05025	40	●	80	●
50	3	13	.0503	40	●	80	●
63	0,4	16	.06304	40	●	80	●
63	0,5	16	.06305	40	●	80	●
63	0,6	16	.06306	40	●	80	●
63	0,8	16	.06308	40	●	80	●
63	1	16	.0631	40	●	80	●
63	1,2	16	.06312	40	●	80	●
63	1,6	16	.06316	40	●	80	●
63	2	16	.0632	40	●	80	●
63	2,5	16	.06325	40	●	80	●
63	3	16	.0633	40	●	80	●



- Planseitig hohlgeschliffen
- Zahnform A, feingezahnt: Winkelzahn mit kleinen Spankammern
- Zahnform B, grobgezahnt: Bogenzahn mit großen Spankammern

- Hollow ground on the flat side
- Fine toothing, type A: herringbone toothing with small chip space
- Coarse toothing, type B: curved tooth with large chip space



Typ N



Steel

Typ H



Steel

Product Finder

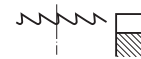
- NR
- NF
- N**
- HR
- H**
- W
- v_c / f_z

Zahnform · Tooth form

DIN 1840 B



DIN 1840 A



Einsatzgebiete – Material (siehe Seite 332)

- In fast allen Eisenwerkstoffen und Buntmetallen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1400 N/mm²
- Zum Fräsen von Nuten mit geringer Tiefe
- Zum Trennfräsen oder Ablängen verwendbar

Applications – material (see page 332)

- For almost all ferrous materials and non-ferrous metals
- For materials with a tensile strength of up to 1400 N/mm²
- Suitable for slot milling, low depth
- For cutting off and cutting to size

P	1.1-3.1	4.1-5.1	P	1.1-3.1	4.1-5.1
M	1.1-2.1	3.1-4.1	M	1.1-2.1	3.1-4.1
K	1.1-2.2	3.1-3.2	K	1.1-2.2	3.1-3.2
K	4.1	4.2	K	4.1	4.2
N		1.4-4.2, 5.2	N		2.8, 5.2
S		1.1-2.2	S		1.1-2.2

DIN 1838 / DIN 1837

Bestell-Code · Order code

$\varnothing d_1$	b	$\varnothing D_2$	Dimens.-Code	4515		4505	
				Z (Flutes)		Z (Flutes)	
80	0,5	22	.08005	48	●	100	●
80	0,6	22	.08006	48	●	100	●
80	0,8	22	.08008	48	●	100	●
80	1	22	.0801	48	●	100	●
80	1,2	22	.08012	48	●	100	●
80	1,6	22	.08016	48	●	100	●
80	2	22	.0802	48	●	100	●
80	2,5	22	.08025	48	●	100	●
80	3	22	.0803	48	●	100	●
100	1	22	.1001	60	●	120	●
100	1,2	22	.10012	60	●	120	●
100	1,6	22	.10016	60	●	120	●
100	2	22	.1002	60	●	120	●
100	2,5	22	.10025	60	●	120	●
100	3	22	.1003	60	●	120	●
125	1	22	.1251	70	●	140	●
125	1,6	22	.12516	70	●	140	●
125	2	22	.1252	70	●	140	●
125	2,5	22	.12525	70	●	140	●
125	3	22	.1253	70	●	140	●



- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

- Planseitig hohlgeschliffen
- Zahnform A, feingezahnt: Winkelzahn mit kleinen Spankammern
- Zahnform B, grobgezahnt: Bogenzahn mit großen Spankammern

- Hollow ground on the flat side
- Fine toothing, type A: herringbone toothing with small chip space
- Coarse toothing, type B: curved tooth with large chip space

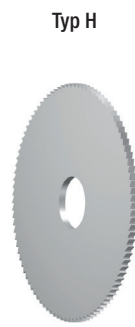
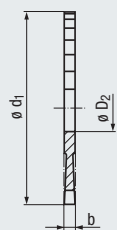
N

H

DIN 138

HSS

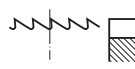
v_c / f_z
354



Zahnform · Tooth form

DIN 1840 B

DIN 1840 A



Einsatzgebiete – Material (siehe Seite 332)

Applications – material (see page 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspannende Nichteisenmetalle
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen von Nuten mit geringer Tiefe
- Zum Trennfräsen oder Ablängen verwendbar

- For steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- Suitable for slot milling, low depth
- For cutting off and cutting to size

P	1.1	2.1-3.1
M	1.1	
K	1.1-1.2	2.1-2.2
K		4.1-4.2
N		2.1-2.6
N		3.1-4.2
S	1.1	

P	1.1	2.1-3.1
K	1.1-1.2	2.1-2.2
K		4.1-4.2

DIN 1838 / DIN 1837

Bestell-Code · Order code

Grobgezahnt
Coarse teeth

Feingezahnt
Fine teeth

Bestell-Code · Order code				4510		4500	
$\varnothing d_1$	b	$\varnothing D_2$	Dimens.-Code	Z (Flutes)		Z (Flutes)	
20	0,5	5	.02005			48	●
20	0,6	5	.02006			48	●
20	0,8	5	.02008			48	●
20	1	5	.0201			40	●
20	1,2	5	.02012			40	●
20	1,6	5	.02016			40	●
20	2	5	.0202			32	●
25	0,5	8	.02505			64	●
25	0,6	8	.02506			64	●
25	0,8	8	.02508			48	●
25	1	8	.0251			48	●
25	1,2	8	.02512			48	●
25	1,6	8	.02516			40	●
25	2	8	.0252			40	●
32	0,5	8	.03205			80	●
32	0,6	8	.03206			64	●
32	0,8	8	.03208			64	●
32	1	8	.0321			64	●
32	1,2	8	.03212			48	●
32	1,6	8	.03216			48	●
32	2	8	.0322			48	●
40	0,3	10	.04003			100	●
40	0,4	10	.04004			100	●
40	0,5	10	.04005			80	●
40	0,6	10	.04006			80	●
40	0,8	10	.04008			80	●
40	1	10	.0401			64	●
40	1,2	10	.04012			64	●
40	1,6	10	.04016			64	●
40	2	10	.0402			48	●
40	2,5	10	.04025			48	●
40	3	10	.0403			48	●
40	4	10	.0404			40	●
50	1	13	.0501	40	●	80	●
50	1,2	13	.05012	40	●	80	●
50	1,6	13	.05016	32	●	64	●
50	2	13	.0502	32	●	64	●
50	2,5	13	.05025	32	●	64	●
50	3	13	.0503	24	●	48	●
50	4	13	.0504	24	●	48	●
63	0,5	16	.06305	64	●	128	●
63	0,6	16	.06306	48	●	100	●
63	0,8	16	.06308	48	●	100	●
63	1	16	.0631	48	●	100	●
63	1,2	16	.06312	40	●	80	●



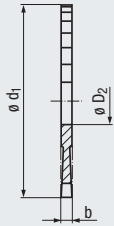
- Planseitig hohlgeschliffen
- Zahnform A, feingezahnt: Winkelzahn mit kleinen Spankammern
- Zahnform B, grobgezahnt: Bogenzahn mit großen Spankammern

- Hollow ground on the flat side
- Fine toothing, type A: herringbone toothing with small chip space
- Coarse toothing, type B: curved tooth with large chip space

N **H**

DIN 138

HSS **V_c/f_z 354**



Allround



Steel

Product Finder

NR

NF

N

H

H

W

v_c / f_z

Zahnform · Tooth form

DIN 1840 B



DIN 1840 A



Einsatzgebiete – Material (siehe Seite 332)

Applications – material (see page 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspanende Nichteisenmetalle
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen von Nuten mit geringer Tiefe
- Zum Trennfräsen oder Ablängen verwendbar

- For steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- Suitable for slot milling, low depth
- For cutting off and cutting to size

P	1.1	2.1-3.1	P	1.1	2.1-3.1
M		1.1	K	1.1-1.2	2.1-2.2
K	1.1-1.2	2.1-2.2	K		4.1-4.2
K		4.1-4.2			
N		2.1-2.6			
N		3.1-4.2			
S		1.1			

DIN 1838 / DIN 1837

Bestell-Code · Order code

ø d ₁	b	ø D ₂	Dimens.-Code	4510		4500	
				Z (Flutes)		Z (Flutes)	
63	1,6	16	.06316	40	●	80	●
63	2	16	.0632	40	●	80	●
63	2,5	16	.06325	32	●	64	●
63	3	16	.0633	32	●	64	●
63	4	16	.0634	32	●	64	●
80	0,5	22	.08005	64	●	128	●
80	0,6	22	.08006	64	●	128	●
80	0,8	22	.08008	64	●	128	●
80	1	22	.0801	48	●	100	●
80	1,2	22	.08012	48	●	100	●
80	1,6	22	.08016	48	●	100	●
80	2	22	.0802	40	●	80	●
80	2,5	22	.08025	40	●	80	●
80	3	22	.0803	40	●	80	●
80	4	22	.0804	32	●	64	●
100	0,5	22	.10005	80	●	160	●
100	0,6	22	.10006	80	●	160	●
100	0,8	22	.10008	64	●	128	●
100	1	22	.1001	64	●	128	●
100	1,2	22	.10012	64	●	128	●
100	1,6	22	.10016	48	●	100	●
100	2	22	.1002	48	●	100	●
100	2,5	22	.10025	48	●	100	●
100	3	22	.1003	40	●	80	●
100	4	22	.1004	40	●	80	●
100	5	22	.1005	40	●	80	●
100	6	22	.1006	32	●	64	●
125	1	22	.1251	80	●	160	●
125	1,2	22	.12512	64	●	128	●
125	1,6	22	.12516	64	●	128	●
125	2	22	.1252	64	●	128	●
125	2,5	22	.12525	48	●	100	●
125	3	22	.1253	48	●	100	●
125	4	22	.1254	48	●	100	●
125	5	22	.1255	40	●	80	●
125	6	22	.1256	40	●	80	●
160	1	32	.1601	80	●	160	●
160	1,2	32	.16012	80	●	160	●
160	1,6	32	.16016	80	●	160	●
160	2	32	.1602	64	●	128	●
160	2,5	32	.16025	64	●	128	●
160	3	32	.1603	64	●	128	●
160	4	32	.1604	48	●	100	●
160	5	32	.1605	48	●	100	●
160	6	32	.1606	48	●	100	●

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



- Product Finder
- NR
- NF
- N**
- HR
- H
- W
- v_c / f_z

- Geradegenutet
- Am Umfang schneidend
- Universell verwendbar

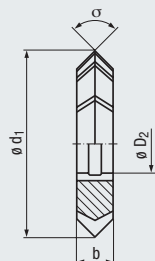
- Straight flutes
- Peripheral cutting
- Highly versatile

N

DIN 138

HSS

v_c / f_z
355



Allround

Einsatzgebiete – Material (siehe Seite 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspannende Nichteisenwerkstoffe verwendbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen von prismatischen Kerben und Führungen, sowie zum Anfasen von Werkstückkanten

Applications – material (see page 332)

- Suitable for steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- For machining v-shaped slots, dovetails, angular slots or chamfers

P	1.1	2.1-3.1
M		1.1
K	1.1	1.2-2.2
K		4.1-4.2
N		1.3-1.4, 2.1-2.7
N		3.1-4.2
S		1.1

DIN 847

Bestell-Code · Order code

						4660	
σ $\pm 30^\circ$	$\varnothing d_1$	b	$\varnothing D_2$	Z (Flutes)	Dimens.- Code		
45°	50	8	16	22	.045050	●	
	63	10	22	24	.045063	●	
	80	12	27	26	.045080	●	
	100	18	32	28	.045100	●	
60°	50	10	16	18	.060050	●	
	63	14	22	20	.060063	●	
	80	18	27	22	.060080	●	
	100	25	32	24	.060100	●	
90°	50	14	16	16	.090050	●	
	63	20	22	18	.090063	●	
	80	22	27	20	.090080	●	
	100	32	32	24	.090100	●	
120°	50	14	16	16	.120050	●	
	63	20	22	16	.120063	●	
	80	25	27	20	.120080	●	
	100	36	32	24	.120100	●	

Beschichtete Ausführung auf Anfrage lieferbar
Coated design available on request



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- Geradegenutet
- 2-seitig schneidend
- Universell verwendbar

- Straight flutes
- 2 side cutting
- Highly versatile

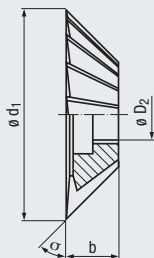
N

DIN 138

HSS

0,3

v_c / f_z
355



Allround

Product Finder

NR

NF

N

HR

H

W

v_c / f_z

Einsatzgebiete – Material (siehe Seite 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspanende Nichteisenwerkstoffe verwendbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen von Winkelführungen und Winkelnuten, sowie zum Anfasen von Werkstückkanten

Applications – material (see page 332)

- Suitable for steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- For machining dovetails, angular slots or chamfers

P 1.1 2.1-3.1

M 1.1

K 1.1 1.2-2.2

K 4.1-4.2

N 1.3-1.4, 2.1-2.7

N 3.1-4.2

S 1.1

DIN 842

Bestell-Code · Order code						4670
σ $\pm 20^\circ$	$\varnothing d_1$	b	$\varnothing D_2$	Z (Flutes)	Dimens.- Code	
45°	40	10	10	14	.045040	●
	50	13	13	16	.045050	●
	63	18	16	18	.045063	●
	80	22	22	20	.045080	●
	100	28	27	22	.045100	●
50°	40	13	10	14	.050040	●
	50	16	13	16	.050050	●
	63	20	16	18	.050063	●
	80	25	22	20	.050080	●
	100	32	27	22	.050100	●
	125	40	32	24	.050125	●
55°	40	13	10	14	.055040	●
	50	16	13	16	.055050	●
	63	20	16	18	.055063	●
	80	25	22	20	.055080	●
	100	32	27	22	.055100	●
	125	40	32	24	.055125	●
60°	40	13	10	14	.060040	●
	50	16	13	16	.060050	●
	63	20	16	18	.060063	●
	80	25	22	20	.060080	●
	100	32	27	22	.060100	●
	125	40	32	26	.060125	●
	160	50	40	28	.060160	●

Beschichtete Ausführung auf Anfrage lieferbar
Coated design available on request



- Product Finder
- NR
- NF
- N**
- HR
- H
- W
- v_c / f_z

- Konvex und konkav
- Geradenutet
- Formkonstant hinterdreht
- Universell verwendbar
- Convex and concave
- Straight flutes
- Constant-form relieved, turned
- Highly versatile

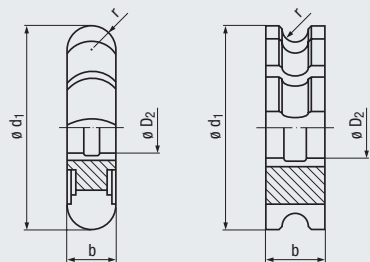
N

DIN 138

180°

HSSE

v_c / f_z
356



Allround



Allround

Einsatzgebiete – Material (siehe Seite 332) Applications – material (see page 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspannende Nichteisenwerkstoffe verwendbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Suitable for steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²

P	1.1	2.1-3.1
M		1.1
K	1.1	1.2-2.2
K		4.1-4.2
N		1.3-1.4, 2.1-2.7
N		3.1-4.2
S		1.1

DIN 856

Bestell-Code · Order code						4645	
r _{h11}	Ø d ₁	b	Ø D ₂	Z (Flutes)	Dimens.-Code		
0,75	50	1,5	16	14	.00075	●	
1	50	2	16	14	.001	●	
1,25	50	2,5	16	14	.00125	●	
1,5	50	3	16	14	.0015	●	
1,6	50	3,2	16	14	.0016	●	
1,75	50	3,5	16	14	.00175	●	
2	50	4	16	14	.002	●	
2,25	63	4,5	22	12	.00225	●	
2,5	63	5	22	12	.0025	●	
3	63	6	22	12	.003	●	
3,5	63	7	22	12	.0035	●	
4	63	8	22	12	.004	●	
4,5	63	9	22	12	.0045	●	
5	63	10	22	12	.005	●	
5,5	80	11	27	12	.0055	●	
6	80	12	27	12	.006	●	
6,5	80	13	27	12	.0065	●	
7	80	14	27	12	.007	●	
7,5	80	15	27	12	.0075	●	
8	80	16	27	12	.008	●	
8,5	100	17	32	12	.0085	●	
9	100	18	32	12	.009	●	
10	100	20	32	12	.010	●	
11	100	22	32	12	.011	●	
12	100	24	32	12	.012	●	

DIN 855

Bestell-Code · Order code						4640	
r _{H11}	Ø d ₁	b	Ø D ₂	Z (Flutes)	Dimens.-Code		
1	50	6	16	14	.001		●
1,5	50	8	16	14	.0015		●
2	50	9	16	14	.002		●
2,5	63	10	22	12	.0025		●
3	63	12	22	12	.003		●
3,5	63	16	22	12	.0035		●
4	63	16	22	12	.004		●
4,5	63	18	22	12	.0045		●
5	63	20	22	12	.005		●
5,5	80	22	27	12	.0055		●
6	80	24	27	12	.006		●
6,5	80	28	27	12	.0065		●
7	80	32	27	12	.007		●
7,5	80	32	27	12	.0075		●
8	80	32	27	12	.008		●
10	100	36	32	12	.010		●
12	100	40	32	12	.012		●

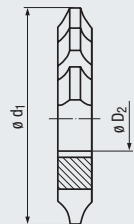
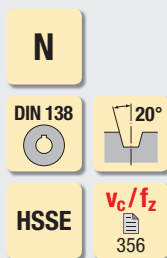
Beschichtete Ausführungen auf Anfrage lieferbar
Coated designs available on request

Hinterschliffene Ausführungen auf Anfrage lieferbar
Relief-ground designs available on request



- Für Stirnräder nach Modul
- 8-teiliger Satz
- Geradegenutet
- Formkonstant hinterdreht
- Eingriffswinkel 20°
- Bezugsprofil I nach DIN 3972
- Universell verwendbar

- For spur wheels to module
- Set of 8
- Straight flutes
- Constant-form relieved, turned
- Pressure angle 20°
- Basic profile I acc. DIN 3972
- Highly versatile



Allround

Einsatzgebiete – Material (siehe Seite 332)

- Für Stahl- und Gusswerkstoffe sowie kurzspannende Nichteisenwerkstoffe verwendbar
- Für Materialien mit einer Zugfestigkeit bis 1000 N/mm²
- Zum Fräsen der Stirnradverzahnung im Einzelteilverfahren

Applications – material (see page 332)

- Suitable for steel and cast materials and short-chipping, non-ferrous metals
- For materials with a tensile strength of up to 1000 N/mm²
- For milling of spur gear teeth in single indexing method

P	1.1	2.1-3.1
M		1.1
K	1.1	1.2-2.2
K		4.1-4.2
N		1.3-1.4, 2.1-2.7
N		3.1-4.2
S		1.1

Mod. 1

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
50	16	14	1	12 - 13	.0011	●
			2	14 - 16	.0012	●
			3	17 - 20	.0013	●
			4	21 - 25	.0014	●
			5	26 - 34	.0015	●
			6	35 - 54	.0016	●
			7	55 - 134	.0017	●
			8	135 - ∞	.0018	●

Mod. 2

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
60	22	12	1	12 - 13	.0021	●
			2	14 - 16	.0022	●
			3	17 - 20	.0023	●
			4	21 - 25	.0024	●
			5	26 - 34	.0025	●
			6	35 - 54	.0026	●
			7	55 - 134	.0027	●
			8	135 - ∞	.0028	●

Mod. 1,25

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
50	16	14	1	12 - 13	.001251	●
			2	14 - 16	.001252	●
			3	17 - 20	.001253	●
			4	21 - 25	.001254	●
			5	26 - 34	.001255	●
			6	35 - 54	.001256	●
			7	55 - 134	.001257	●
			8	135 - ∞	.001258	●

Mod. 2,5

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
65	22	12	1	12 - 13	.00251	●
			2	14 - 16	.00252	●
			3	17 - 20	.00253	●
			4	21 - 25	.00254	●
			5	26 - 34	.00255	●
			6	35 - 54	.00256	●
			7	55 - 134	.00257	●
			8	135 - ∞	.00258	●

Mod. 1,5

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
60	22	14	1	12 - 13	.00151	●
			2	14 - 16	.00152	●
			3	17 - 20	.00153	●
			4	21 - 25	.00154	●
			5	26 - 34	.00155	●
			6	35 - 54	.00156	●
			7	55 - 134	.00157	●
			8	135 - ∞	.00158	●

Mod. 3

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
70	27	12	1	12 - 13	.0031	●
			2	14 - 16	.0032	●
			3	17 - 20	.0033	●
			4	21 - 25	.0034	●
			5	26 - 34	.0035	●
			6	35 - 54	.0036	●
			7	55 - 134	.0037	●
			8	135 - ∞	.0038	●

Mod. 1,75

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
60	22	14	1	12 - 13	.001751	●
			2	14 - 16	.001752	●
			3	17 - 20	.001753	●
			4	21 - 25	.001754	●
			5	26 - 34	.001755	●
			6	35 - 54	.001756	●
			7	55 - 134	.001757	●
			8	135 - ∞	.001758	●

Mod. 4

Bestell-Code · Order code						5500
$\varnothing d_1$	$\varnothing D_2$	Z (Flutes)	Fräser-Nr. Cutter no.	für Zähne for teeth	Dimens.-Code	
80	27	12	1	12 - 13	.0041	●
			2	14 - 16	.0042	●
			3	17 - 20	.0043	●
			4	21 - 25	.0044	●
			5	26 - 34	.0045	●
			6	35 - 54	.0046	●
			7	55 - 134	.0047	●
			8	135 - ∞	.0048	●

Beschichtete Ausführung auf Anfrage lieferbar
Coated design available on request

Product Finder

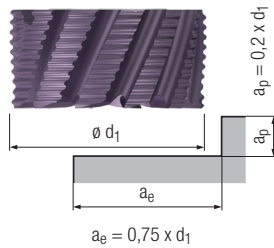
- NR
- NF
- N**
- H
- H
- W
- V_c / f_z



- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

HSS-Walzenstirnfräser HSS shell end mills

NR NF HR



Gültig für · Valid for

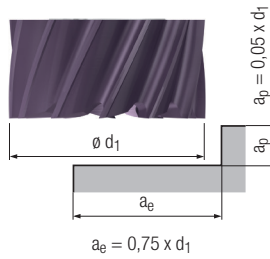
4050 4070 4090
4050C 4070C 4090C

		v_c [m/min]		f_z [mm]			TICN				Unbesch. Uncoated
		Unbeschichtet Uncoated	TICN	$d_1 \leq 50$ mm	$d_1 > 50 - 80$ mm	$d_1 > 80$ mm			MMS MQL		
P	1.1	28	36	$d_1 \div 560$	$d_1 \div 760$	$d_1 \div 1250$			□	■	
	2.1	24	33	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$				■	
	3.1	20	24	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	4.1		22	$d_1 \div 740$	$d_1 \div 1010$	$d_1 \div 1670$				■	
	5.1										
M	1.1	15	21	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	2.1		14	$d_1 \div 740$	$d_1 \div 1010$	$d_1 \div 1670$				■	
	3.1		12	$d_1 \div 830$	$d_1 \div 1140$	$d_1 \div 1870$				■	
	4.1										
K	1.1	20	29	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$	□	□	□	■	
	1.2	18	28	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$	□	□	□	■	
	2.1	16	23	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$			□	■	
	2.2	14	21	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$			□	■	
	3.1		17	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	3.2		15	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	4.1	17	24	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$			□	■	
	4.2	14	19	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$			□	■	
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1		30	$d_1 \div 560$	$d_1 \div 760$	$d_1 \div 1250$				■	
	2.2	25	33	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$				■	
	2.3	45	60	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$			□	■	
	2.4		40	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$				■	
	2.5	35	45	$d_1 \div 610$	$d_1 \div 830$	$d_1 \div 1360$			□	■	
	2.6	40	70	$d_1 \div 560$	$d_1 \div 760$	$d_1 \div 1250$				■	
	2.7		40	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	2.8										
	3.1	64		$d_1 \div 510$	$d_1 \div 700$	$d_1 \div 1150$	□	■		□	
	3.2	54		$d_1 \div 440$	$d_1 \div 610$	$d_1 \div 1000$	□	■		□	
4.1	70		$d_1 \div 330$	$d_1 \div 450$	$d_1 \div 750$				■		
4.2	80		$d_1 \div 330$	$d_1 \div 450$	$d_1 \div 750$				■		
4.3											
4.4											
5.1											
5.2		17	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■		
5.3											
S	1.1	20	24	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	1.2		21	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	1.3		12	$d_1 \div 830$	$d_1 \div 1140$	$d_1 \div 1870$				■	
	2.1		21	$d_1 \div 670$	$d_1 \div 910$	$d_1 \div 1500$				■	
	2.2										
	2.3										
2.4											
2.5											
2.6											
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

HSS-Walzenstirfräser
HSS shell end mills

N

Gültig für · Valid for
4010 4010C



Product Finder

NR

NF

N

H

H

W

v_c / f_z

	v_c [m/min]		f_z [mm]			TICN		Unbesch. Uncoated		
	Unbeschichtet Uncoated	TICN	$d_1 \leq 50$ mm	$d_1 > 50 - 80$ mm	$d_1 > 80$ mm					
P	1.1	28	36	$d_1 \div 670$	$d_1 \div 1040$	$d_1 \div 1520$		<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1	24	33	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$			<input checked="" type="checkbox"/>	
	3.1		24	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$			<input checked="" type="checkbox"/>	
	4.1		22	$d_1 \div 890$	$d_1 \div 1390$	$d_1 \div 2020$			<input checked="" type="checkbox"/>	
	5.1									
M	1.1	15	21	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$			<input checked="" type="checkbox"/>	
	2.1		14	$d_1 \div 890$	$d_1 \div 1390$	$d_1 \div 2020$			<input checked="" type="checkbox"/>	
	3.1		12	$d_1 \div 1000$	$d_1 \div 1560$	$d_1 \div 2270$			<input checked="" type="checkbox"/>	
	4.1									
K	1.1	20	29	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	18	28	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	16	23	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$				<input checked="" type="checkbox"/>
	2.2	14	21	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$				<input checked="" type="checkbox"/>
	3.1		17	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$				<input checked="" type="checkbox"/>
	3.2		15	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$				<input checked="" type="checkbox"/>
	4.1	17	24	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$				<input checked="" type="checkbox"/>
	4.2	14	19	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$				<input checked="" type="checkbox"/>
N	1.1									
	1.2									
	1.3									
	1.4									
	1.5									
	1.6									
	2.1		30	$d_1 \div 670$	$d_1 \div 1040$	$d_1 \div 1520$			<input checked="" type="checkbox"/>	
	2.2	25	33	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$			<input checked="" type="checkbox"/>	
	2.3	45	60	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$			<input checked="" type="checkbox"/>	
	2.4		40	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$			<input checked="" type="checkbox"/>	
	2.5	35	45	$d_1 \div 730$	$d_1 \div 1140$	$d_1 \div 1650$			<input checked="" type="checkbox"/>	
	2.6		70	$d_1 \div 670$	$d_1 \div 1040$	$d_1 \div 1520$			<input checked="" type="checkbox"/>	
	2.7		40	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$			<input checked="" type="checkbox"/>	
	2.8									
	3.1									
	3.2									
4.1										
4.2										
4.3										
4.4										
5.1										
5.2										
5.3										
S	1.1		24	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$			<input checked="" type="checkbox"/>	
	1.2		21	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$			<input checked="" type="checkbox"/>	
	1.3		12	$d_1 \div 1000$	$d_1 \div 1560$	$d_1 \div 2270$			<input checked="" type="checkbox"/>	
	2.1		21	$d_1 \div 800$	$d_1 \div 1250$	$d_1 \div 1820$			<input checked="" type="checkbox"/>	
	2.2									
	2.3									
	2.4									
2.5										
2.6										
H	1.1									
	1.2									
	1.3									
	1.4									
	1.5									

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

HSS/HM

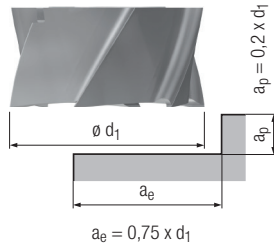


- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z

HSS-Walzenstirnfräser
HSS shell end mills

W

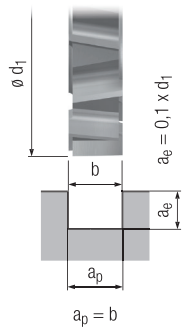
Gültig für · Valid for
4040



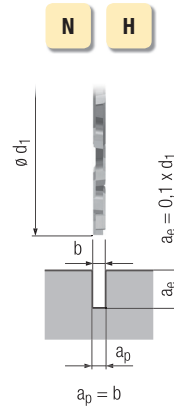
	v_c [m/min] Unbeschichtet Uncoated	f_z [mm]					MMS MQL	
		$d_1 \leq 50$ mm	$d_1 > 50 - 80$ mm	$d_1 > 80$ mm				
P	1.1							
	2.1							
	3.1							
	4.1							
	5.1							
M	1.1							
	2.1							
	3.1							
	4.1							
K	1.1							
	1.2							
	2.1							
	2.2							
	3.1							
	3.2							
	4.1							
	4.2							
N	1.1	160	$d_1 \div 510$	$d_1 \div 740$	$d_1 \div 1110$			■
	1.2	135	$d_1 \div 510$	$d_1 \div 740$	$d_1 \div 1110$			■
	1.3	85	$d_1 \div 510$	$d_1 \div 740$	$d_1 \div 1110$			■
	1.4	70	$d_1 \div 590$	$d_1 \div 850$	$d_1 \div 1280$			■
	1.5							
	1.6							
	2.1	22	$d_1 \div 640$	$d_1 \div 930$	$d_1 \div 1390$			■
	2.2							
	2.3							
	2.4							
	2.5							
	2.6							
	2.7							
	2.8							
	3.1	64	$d_1 \div 590$	$d_1 \div 850$	$d_1 \div 1280$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	3.2	54	$d_1 \div 510$	$d_1 \div 740$	$d_1 \div 1110$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4.1	70	$d_1 \div 380$	$d_1 \div 560$	$d_1 \div 830$		<input type="checkbox"/>	<input type="checkbox"/>	
4.2	80	$d_1 \div 380$	$d_1 \div 560$	$d_1 \div 830$		<input type="checkbox"/>	<input type="checkbox"/>	
4.3								
4.4								
5.1								
5.2								
5.3								
S	1.1							
	1.2							
	1.3							
	2.1							
	2.2							
	2.3							
	2.6							
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							



HSS-Scheibenfräser
HSS side and face milling cutters



Schmale HSS-Scheibenfräser
Narrow HSS side and face milling cutters



Gültig für · Valid for

4410	4455	4471
4435	4461	4490

Product Finder

NR

NF

N

H

H

W

v_c / f_z

	V_c [m/min]	f_z [mm]		V_c [m/min]	f_z [mm]				MMS MQL		
		N	H		$b \leq 3 \text{ mm}$	$b > 3 \text{ mm}$					
P	1.1	25	$d_1 \div 2450$	$d_1 \div 3470$	29	$d_1 \div 8330$	$d_1 \div 5210$				■
	2.1	22	$d_1 \div 2670$	$d_1 \div 3790$	25	$d_1 \div 9090$	$d_1 \div 5680$				■
	3.1	18	$d_1 \div 2940$	$d_1 \div 4170$	21	$d_1 \div 10000$	$d_1 \div 6250$				■
	4.1										
	5.1										
M	1.1	14	$d_1 \div 2940$	$d_1 \div 4170$	16	$d_1 \div 10000$	$d_1 \div 6250$				■
	2.1										
	3.1										
	4.1										
K	1.1	18	$d_1 \div 2670$	$d_1 \div 3790$	21	$d_1 \div 9090$	$d_1 \div 5680$		□	□	■
	1.2	16	$d_1 \div 2670$	$d_1 \div 3790$	19	$d_1 \div 9090$	$d_1 \div 5680$				■
	2.1	14	$d_1 \div 2940$	$d_1 \div 4170$	17	$d_1 \div 10000$	$d_1 \div 6250$				■
	2.2	13	$d_1 \div 2940$	$d_1 \div 4170$	15	$d_1 \div 10000$	$d_1 \div 6250$				■
	3.1										
	3.2										
	4.1	15	$d_1 \div 2940$	$d_1 \div 4170$	18	$d_1 \div 10000$	$d_1 \div 6250$				■
	4.2	13	$d_1 \div 2940$	$d_1 \div 4170$	15	$d_1 \div 10000$	$d_1 \div 6250$				■
N	1.1										
	1.2										
	1.3	75	$d_1 \div 1960$	$d_1 \div 2780$	90	$d_1 \div 6670$	$d_1 \div 4170$				■
	1.4	60	$d_1 \div 2260$	$d_1 \div 3210$	80	$d_1 \div 7690$	$d_1 \div 4810$				■
	1.5										
	1.6										
	2.1	20	$d_1 \div 2450$	$d_1 \div 3470$	25	$d_1 \div 8330$	$d_1 \div 5210$				■
	2.2	22	$d_1 \div 2670$	$d_1 \div 3790$	30	$d_1 \div 9090$	$d_1 \div 5680$				■
	2.3	40	$d_1 \div 2670$	$d_1 \div 3790$	50	$d_1 \div 9090$	$d_1 \div 5680$				■
	2.4	20	$d_1 \div 2670$	$d_1 \div 3790$	25	$d_1 \div 9090$	$d_1 \div 5680$				■
	2.5	32	$d_1 \div 2670$	$d_1 \div 3790$	36	$d_1 \div 9090$	$d_1 \div 5680$				■
	2.6	38	$d_1 \div 2450$	$d_1 \div 3470$							■
	2.7										
	2.8										
	3.1	60	$d_1 \div 2260$	$d_1 \div 3210$	68	$d_1 \div 7690$	$d_1 \div 4810$	□	■	□	□
	3.2	50	$d_1 \div 1960$	$d_1 \div 2780$	58	$d_1 \div 6670$	$d_1 \div 4170$	□	■	□	□
4.1	65	$d_1 \div 1470$	$d_1 \div 2080$	75	$d_1 \div 5000$	$d_1 \div 3130$		□	□	■	
4.2	70	$d_1 \div 1470$	$d_1 \div 2080$	80	$d_1 \div 5000$	$d_1 \div 3130$		□	□	■	
4.3											
4.4											
5.1											
5.2											
5.3											
S	1.1	22	$d_1 \div 2940$	$d_1 \div 4170$	25	$d_1 \div 10000$	$d_1 \div 6250$				■
	1.2										
	1.3										
	2.1										
	2.2										
	2.3										
	2.6										
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										

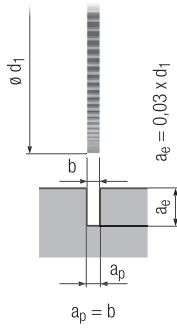
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

HSS/HM

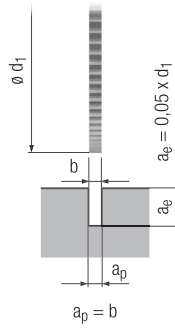


- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z**

Hartmetall-Metallkreissägeblätter Solid carbide metal slitting saws



HSS-Metallkreissägeblätter HSS metal slitting saws

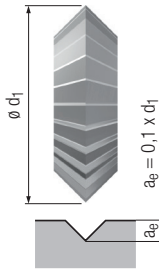


Gültig für · Valid for
4500 4510
4505 4515

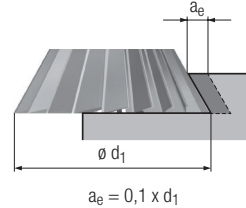
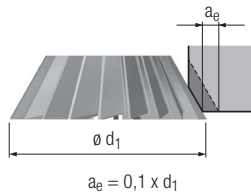
	v_c [m/min]	f_z [mm]		v_c [m/min]	f_z [mm]		Gültigkeit				
		N	H		N	H	HM	MMS MQL	HSS		
P	1.1	120	$d_1 \div 11900$	$d_1 \div 20830$	32	$d_1 \div 8330$	$d_1 \div 13890$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	100	$d_1 \div 12990$	$d_1 \div 22730$	28	$d_1 \div 9090$	$d_1 \div 15150$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	90	$d_1 \div 14290$	$d_1 \div 25000$	28	$d_1 \div 10000$	$d_1 \div 16670$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	85	$d_1 \div 15870$	$d_1 \div 27780$							<input checked="" type="checkbox"/>
	5.1	80	$d_1 \div 15870$	$d_1 \div 27780$							<input checked="" type="checkbox"/>
M	1.1	70	$d_1 \div 14290$	$d_1 \div 25000$	20	$d_1 \div 10000$					<input checked="" type="checkbox"/>
	2.1	65	$d_1 \div 15870$	$d_1 \div 27780$							<input checked="" type="checkbox"/>
	3.1	60	$d_1 \div 17860$	$d_1 \div 31250$							<input checked="" type="checkbox"/>
	4.1	55	$d_1 \div 23810$	$d_1 \div 41670$							<input checked="" type="checkbox"/>
K	1.1	110	$d_1 \div 12990$	$d_1 \div 22730$	23	$d_1 \div 9090$	$d_1 \div 15150$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	95	$d_1 \div 12990$	$d_1 \div 22730$	20	$d_1 \div 9090$	$d_1 \div 15150$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	85	$d_1 \div 14290$	$d_1 \div 25000$	18	$d_1 \div 10000$	$d_1 \div 16670$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	80	$d_1 \div 14290$	$d_1 \div 25000$	16	$d_1 \div 10000$	$d_1 \div 16670$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	70	$d_1 \div 14290$	$d_1 \div 25000$				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	65	$d_1 \div 14290$	$d_1 \div 25000$				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	85	$d_1 \div 14290$	$d_1 \div 25000$	19	$d_1 \div 10000$	$d_1 \div 16670$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	80	$d_1 \div 14290$	$d_1 \div 25000$	18	$d_1 \div 10000$	$d_1 \div 16670$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1										
	1.2										
	1.3										
	1.4	270	$d_1 \div 10990$								<input checked="" type="checkbox"/>
	1.5	240	$d_1 \div 10990$								<input checked="" type="checkbox"/>
	1.6	160	$d_1 \div 10990$								<input checked="" type="checkbox"/>
	2.1	150	$d_1 \div 11900$		30	$d_1 \div 8330$					<input checked="" type="checkbox"/>
	2.2	220	$d_1 \div 12990$		35	$d_1 \div 9090$					<input checked="" type="checkbox"/>
	2.3	230	$d_1 \div 12990$		55	$d_1 \div 9090$					<input checked="" type="checkbox"/>
	2.4	95	$d_1 \div 12990$		30	$d_1 \div 9090$					<input checked="" type="checkbox"/>
	2.5	170	$d_1 \div 12990$		40	$d_1 \div 9090$					<input checked="" type="checkbox"/>
	2.6	190	$d_1 \div 11900$		45	$d_1 \div 8330$					<input checked="" type="checkbox"/>
	2.7	85	$d_1 \div 14290$								<input checked="" type="checkbox"/>
	2.8	50	$d_1 \div 12990$	$d_1 \div 22730$							<input checked="" type="checkbox"/>
	3.1	120	$d_1 \div 10990$		75	$d_1 \div 7690$		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	110	$d_1 \div 9520$		63	$d_1 \div 6670$		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.1	110	$d_1 \div 7140$		82	$d_1 \div 5000$		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.2	150	$d_1 \div 7140$		90	$d_1 \div 5000$		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
4.3											
4.4											
5.1											
5.2	95	$d_1 \div 14290$	$d_1 \div 25000$							<input checked="" type="checkbox"/>	
5.3											
S	1.1	70	$d_1 \div 14290$	$d_1 \div 25000$	28	$d_1 \div 10000$					<input checked="" type="checkbox"/>
	1.2	55	$d_1 \div 14290$	$d_1 \div 25000$							<input checked="" type="checkbox"/>
	1.3	35	$d_1 \div 17860$	$d_1 \div 31250$							<input checked="" type="checkbox"/>
	2.1	55	$d_1 \div 14290$	$d_1 \div 25000$							<input checked="" type="checkbox"/>
	2.2	30	$d_1 \div 15870$	$d_1 \div 27780$							<input checked="" type="checkbox"/>
	2.3										
	2.4										
2.5											
2.6											
H	1.1										
	1.2										
	1.3										
	1.4										
	1.5										



HSS-Prismenfräser
HSS V-shaped milling cutters, symmetrical



HSS-Aufsteck-Winkelstirnfräser
HSS angle milling cutters



Gültig für · Valid for
4660 4670

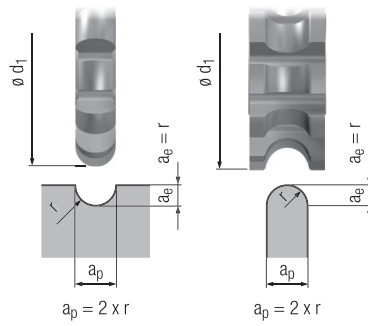
	v_c [m/min]	f_z [mm]	f_z [mm]	f_z [mm]			MMS MQL	
P	1.1	22	$d_1 \div 5210$	$d_1 \div 4900$	$d_1 \div 6940$			■
	2.1	20	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$			■
	3.1	17	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	4.1							
	5.1							
M	1.1	13	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	2.1							
	3.1							
	4.1							
K	1.1	19	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$		□	■
	1.2	15	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$		□	■
	2.1	14	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	2.2	13	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	3.1							■
	3.2							■
	4.1	16	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	4.2	13	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
N	1.1							
	1.2							
	1.3	72	$d_1 \div 4170$	$d_1 \div 3920$	$d_1 \div 5560$			■
	1.4	62	$d_1 \div 4810$	$d_1 \div 4520$	$d_1 \div 6410$			■
	1.5							
	1.6							
	2.1	18	$d_1 \div 5210$	$d_1 \div 4900$	$d_1 \div 6940$			■
	2.2	22	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$			■
	2.3	40	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$			■
	2.4	20	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$			■
	2.5	32	$d_1 \div 5680$	$d_1 \div 5350$	$d_1 \div 7580$			■
	2.6	35	$d_1 \div 5210$	$d_1 \div 4900$	$d_1 \div 6940$			■
	2.7	20	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	2.8							
	3.1	55	$d_1 \div 4810$	$d_1 \div 4520$	$d_1 \div 6410$	□	■	□
	3.2	46	$d_1 \div 4170$	$d_1 \div 3920$	$d_1 \div 5560$	□	■	□
4.1	60	$d_1 \div 3130$	$d_1 \div 2940$	$d_1 \div 4170$		□	□	
4.2	65	$d_1 \div 3130$	$d_1 \div 2940$	$d_1 \div 4170$		□	□	
4.3								
4.4								
5.1								
5.2								
5.3								
S	1.1	20	$d_1 \div 6250$	$d_1 \div 5880$	$d_1 \div 8330$			■
	1.2							
	1.3							
	2.1							
	2.2							
	2.3							
	2.6							
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

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

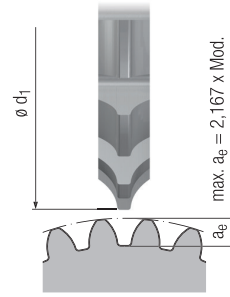


- Product Finder
- NR
- NF
- N
- HR
- H
- W
- v_c / f_z**

HSS-Halbrund-Profilfräser HSS radius cutters



HSS-Zahnformfräser HSS spur wheel milling cutters



Gültig für · Valid for
4640 4645 5500

	v_c [m/min]	f_z [mm]		f_z [mm]	Mod. 1 - 4			MMS MQL	
		$r \leq 5 \text{ mm}$	$r > 5 \text{ mm}$						
P	1.1	20	$d_1 \div 3330$	$d_1 \div 1670$	$d_1 \div 3210$				■
	2.1	18	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$				■
	3.1	15	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	4.1								
	5.1								
M	1.1	20	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	2.1								
	3.1								
	4.1								
K	1.1	18	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$				■
	1.2	14	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$	□	□		■
	2.1	12	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	2.2	11	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	3.1								
	3.2								
	4.1	14	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	4.2	12	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
N	1.1								
	1.2								
	1.3	68	$d_1 \div 2670$	$d_1 \div 1330$	$d_1 \div 2560$				■
	1.4	58	$d_1 \div 3080$	$d_1 \div 1540$	$d_1 \div 2960$				■
	1.5								
	1.6								
	2.1	16	$d_1 \div 3330$	$d_1 \div 1670$	$d_1 \div 3210$				■
	2.2	20	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$				■
	2.3	35	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$				■
	2.4	18	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$				■
	2.5	30	$d_1 \div 3640$	$d_1 \div 1820$	$d_1 \div 3500$				■
	2.6	32	$d_1 \div 3330$	$d_1 \div 1670$	$d_1 \div 3210$				■
	2.7	18	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	2.8								
	3.1	52	$d_1 \div 3080$	$d_1 \div 1540$	$d_1 \div 2960$	□	■		□
	3.2	42	$d_1 \div 2670$	$d_1 \div 1330$	$d_1 \div 2560$	□	■		□
4.1	56	$d_1 \div 2000$	$d_1 \div 1000$	$d_1 \div 1920$			□	□	
4.2	63	$d_1 \div 2000$	$d_1 \div 1000$	$d_1 \div 1920$			□	□	
4.3									
4.4									
5.1									
5.2									
5.3									
S	1.1	18	$d_1 \div 4000$	$d_1 \div 2000$	$d_1 \div 3850$				■
	1.2								
	1.3								
	2.1								
	2.2								
	2.3								
	2.4								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								



Fräterspannmittel und Zubehör Clamping Systems, Tool Holders and Accessories

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Wegweiser

Product finder

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Produktseiten

Product pages

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- Product Finder
- Shrink
- ER
- M
- Zubehör
Accessories



Induktionsschrumpfgerät und Zubehör

Induction shrink-fit work station and accessories



SHRINK-MASTER HL-2

6936

Seite · Page

362 · 366



Schrumpf-Aufnahmen

Shrink-fit chucks

			COOL JET	SAFE-LOCK™				
HSK-A63	HSK-A80	HSK-A100	HSK-A63	HSK-A63	HSK-A100	HSK-A63	HSK-E40	HSK-E50
ø 3 - 32 mm	ø 6 - 32 mm	ø 6 - 32 mm	ø 6 - 32 mm	ø 12 - 32 mm	ø 12 - 25 mm	ø 6 - 12 mm	ø 3 - 16 mm	ø 3 - 16 mm
6465	6469	6405	6465C	6473S	6403S	6467	6445	6455
Seite · Page 367 - 368			367	369		370	371	



Schrumpf-Aufnahmen

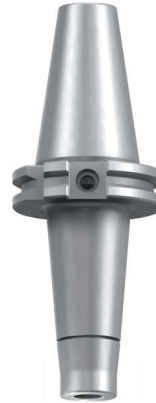
Shrink-fit chucks

		COOL JET	SAFE-LOCK™				COOL JET
SK40	SK50	SK40	SK40	SK50	BT40	BT50	BT40
ø 3 - 32 mm	ø 6 - 32 mm	ø 6 - 32 mm	ø 12 - 32 mm	ø 12 - 25 mm	ø 3 - 32 mm	ø 6 - 32 mm	ø 6 - 32 mm
6442	6452	6442C	6439S	6457S	6470	6475	6470C
Seite · Page 372		372	373		374		374

ER



ER-Spannzangen-Aufnahmen
ER collet chucks



HSK-A63	HSK-E32	HSK-E40	HSK-E50	SK40	BT40
ER 16	ER 11	ER 16	ER 16	ER 16	ER 16
ø 1 - 10 mm	ø 3 - 6 mm	ø 1 - 10 mm	ø 1 - 10 mm	ø 1 - 10 mm	ø 1 - 10 mm
6463	6471	6443	6446	6418	6408
Seite · Page 375		376		377	378

Product Finder

Shrink

ER

M

Zubehör

Accessories

ER



ER-Spannzangen-Aufnahmen
ER collet chucks



HSK-A63	HSK-A100	SK40	SK50	BT40	BT50
ER 16 - ER 40	ER 16 - ER 40	ER 16 - ER 32	ER 32	ER 16 - ER 32	ER 32
ø 1 - 25 mm	ø 1 - 25 mm	ø 1 - 20 mm	ø 2 - 20 mm	ø 1 - 20 mm	ø 2 - 20 mm
6460	6461	6417	6419	6407	6409
Seite · Page 375		377		378	

ER



ER-Spannzangen und Zubehör
ER collets and accessories



ER 11	ER 16	ER 25	ER 32	ER 40
ø 3 - 6 mm	ø 1 - 10 mm	ø 1 - 16 mm	ø 2 - 20 mm	ø 3 - 25 mm
		6615		
Seite · Page		379		



- Product Finder
- Shrink
- ER
- M
- Zubehör Accessories



Aufnahmen für Schäfte DIN 6535 HB / DIN 1835 B Holders for shanks acc. DIN 6535 HB / DIN 1835 B



HSK-A63	HSK-A80	HSK-A100	SK40	SK50	BT40	BT50
ø 6 - 32 mm	ø 6 - 32 mm	ø 6 - 32 mm	ø 6 - 32 mm	ø 6 - 40 mm	ø 6 - 32 mm	ø 6 - 32 mm
6563	6564	6565	6540	6550	6570	6571
Seite · Page 380			381		382	



Aufnahmen für Einschraubfräser Holders for screw-in end mills

Zwischenadapter für Einschraubfräser Intermediate adapters for screw-in end mills

Verlängerungen für Einschraubfräser Extensions for screw-in end mills



HSK-A63	HSK-E40	HSK-E50	SK40	SK50	BT40	M6 - M16	M6 - M12	ø 10 - 32 mm	ø 12 - 32 mm		
M6 - M16	M6 - M10	M6 - M12	M6 - M16	M8 - M16	M6 - M16	M6 - M16	M8 - M16	M6 - M16	M6 - M16		
6363	6343	6353	6340	6350	6370	6290	6291	6271	6272		
Seite · Page 383		384		385		386		387		388	



Aufnahmen für Aufsteckfräser Holders for shell-type milling cutters



HSK-A63	SK40	SK50	BT40		
ø 22 - 27 mm	ø 22 - 27 mm	ø 22 - 40 mm	ø 22 - 27 mm		
6163	6140	6150	6170		
Seite · Page 389		390		391	

Kaltluftdüse und Zubehör
Cold-air nozzle and accessories



6910

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Kühlschmierstoffrohre und Montageschlüssel für Aufnahmen mit Kegelhohlschaft HSK-A
Coolant tubes and assembly wrenches for holders with HSK-A shanks



HSK-A32 - HSK-A100

6690



HSK-A32 - HSK-A100

6691

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Anzugsbolzen für Steilkegelschäfte nach DIN ISO 7388-1
Pull studs for ISO taper shanks according to DIN ISO 7388-1



DIN ISO 7388-3 Form AD

SK40 - SK50

6650



DIN ISO 7388-3 Form AF

SK40 - SK50

6651



Mit Spannrinne · With clamping groove

SK40 - SK50

6652



DIN ISO 7388-3 Form UD

SK40 - SK50

6654

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SHRINK-MASTER HL-2

Leistungsmerkmale

- Schnelle und schonende Erwärmung der Schrumpf-Aufnahme durch leistungsstarke 13 kW Spule
- Energiezufuhr passt sich dem Werkzeugdurchmesser an
- Universell einsetzbar für verschiedene Schrumpf-Aufnahmen
- Ein- und Ausschumpfen von VHM- und HSS-Werkzeugen mit Schaftdurchmessern von 3-32 mm in Schafttoleranz h6 oder h5
- Großer Freiraum von max. 550 mm für lange Werkzeuge oder Aufnahmen
- Einfache und ergonomische Bedienung
- Spule abnehmbar und als Handspule verwendbar
- Ein- und Ausschumpfzeit ca. 5 Sekunden

Zusätzliche Leistungsmerkmale der einstellbaren Hochleistungsspule

- Abdeckscheiben sind in Spule integriert, es werden keine weiteren Scheiben zum Schrumpfen benötigt
- Zur optimalen Wärmeverteilung passt sich die Spule der Schrumpf-Aufnahme an
- Ausschumpfen von Werkzeugen mit größerem Schneidendurchmesser als Schaftdurchmesser ist problemlos möglich (z.B. T-Nutenfräser)

Features

- Fast and gentle heating of the shrink-fit chuck by means of a powerful 13 kW induction coil
- Self-regulating power input depending on tool diameter
- For use with a wide range of different shrink-fit chuck types
- Shrinking and unshrinking of solid carbide and HSS tools with a shank diameter of 3 to 32 mm and a shank tolerance h6 or h5
- Large clearance of 550 mm for extra long tools or chucks
- Simple and ergonomic handling
- Detachable induction coil for hand-held operation if required
- Shrinking and unshrinking time approx. 5 seconds

Additional features of the adjustable high-performance coil

- Cover discs are integrated into the coil, no additional discs are needed for shrink-fitting
- The coil adjusts to the shrink-fit chuck for best possible heat dissipation
- Unshrinking of tools with a cutting diameter larger than the shank diameter (e.g. T-slot cutters) is easily possible



Standard-Hochleistungsspule
Standard high-performance induction coil

Einstellbare Hochleistungsspule
Adjustable high-performance induction coil

SHRINK-MASTER HL-2

Induktionsschrumpfgerät
Induction Shrink-Fit Work Station









Technische Daten

Netzspannung: 3 x 400 bis 480 V
 Netzfrequenz: 50 bis 60 Hz
 Nennleistung: 13 kW
 Abmessung (B x T x H): 700 x 730 x 920 mm
 Gewicht: ca. 45 kg
 Schrumpfbereich: 3 - 32 mm
 Einschrumpfzeit: ca. 5 Sekunden
 Ausschumpfzeit: ca. 5 Sekunden
 Freiraum: 550 mm

Technical data

Power supply: 3 x 400 to 480 V
 Mains frequency: 50 to 60 Hz
 Nominal power: 13 kW
 Dimensions (W x D x H): approx. 700 x 730 x 920 mm
 Weight: approx. 45 kgs
 Shrink dia. range: 3 - 32 mm
 Shrinking time: approx. 5 seconds
 Unshrinking time: approx. 5 seconds
 Clearance: 550 mm

Bestell-Code · Order code		6936
Ausführung Design	Dimens.- Code	
1	.001	●
2	.002	●
3	.003	●
4	.004	●

Lieferumfang Delivery includes					
Standard-Hochleistungsspule Standard high-performance induction coil 	Einstellbare Hochleistungsspule Adjustable high-performance induction coil 	Kühlaggregat mit 5 Kühlkörpern Cooling unit with 5 cooling adapters 	Grundhalter mit 1 Aufnahmehalter nach Wahl 1 basic holder with 1 chuck base selected by the customer 	1 Satz Abdeckscheiben 1 set of cover discs 	1 Paar Schutzhandschuhe 1 pair of protective gloves 
✓	✓	✓	✓	✓	✓

Einstellbare Hochleistungsspule Adjustable High-Performance Induction Coil



Bestell-Code · Order code			6936
Leistung der Spule Coil power	Schrumpfbereich Shrink dia. range	Dimens.- Code	
13 kW	3 - 32 mm	.01	●

- Product Finder
- Shrink
- ER
- M
- Zubehör Accessories

SHRINK-MASTER HL-2

Kühlaggregat mit 5 Kühlkörpern für kürzeste Abkühlzeiten

Leistungsmerkmale

- Aufnahmen bleiben trocken
- Heiße Teile müssen nicht in die Hand genommen werden
- Keine Verletzungsgefahr
- Kühlzeit 20-150 Sekunden
- Steuergerät zum automatischen Ein- und Ausschalten des Kühlaggregats

Technische Daten

Netzspannung: 230 V bzw. 110 V
 Netzfrequenz: 50 bis 60 Hz
 Nennleistung: 1 kW
 Abmessung (B x T x H): 565 x 440 x 335 mm
 Gewicht: ca. 45 kg
 Inhalt: ca. 5 Liter
 Mischungsverhältnis: 2 : 1 (Leitungswasser und Korrosionsschutz)

Cooling Unit with 5 Cooling Adapters for Shortest Cooling Times

Features

- Chucks remain dry
- No need to handle hot components
- No danger of injury
- Cooling times 20-150 seconds
- Control unit for switching the cooling unit on and off automatically

Technical data

Power supply: 230 V resp. 110 V
 Mains frequency: 50 to 60 Hz
 Nominal power: 1 kW
 Dimensions (W x D x H): approx. 565 x 440 x 335 mm
 Weight: approx. 45 kgs
 Contents: approx. 5 litres
 Mixing ratio: 2 : 1 (tap water and anti-corrosion agent)

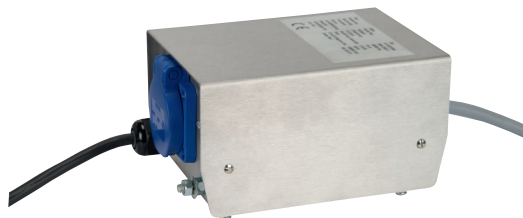


Bestell-Code · Order code		6933
Netzspannung Voltage	Dimens.- Code	
230 V	.001	●
110 V	.003	●

Auf Anfrage sind einzelne Kühlkörper lieferbar sowie einzelne Größen austauschbar

Cooling adapters are available individually on request and individual sizes can also be substituted

Steuergerät zum automatischen Ein- und Ausschalten des Kühlaggregats
 Control Unit for the Automatic Activation and De-activation of the Cooling Unit



Bestell-Code · Order code		6933
Netzspannung Power supply	Dimens.- Code	
230 V	.01	●
110 V	.02	●

SHRINK-MASTER HL-2

Fahrbarer System-Wagen mit Schublade
Mobile System Cart with Drawer



Grundhalter
Basic Holder



Aufnahmehalter
Chuck Base



1 Satz Abdeckscheiben
1 Set of Cover Discs



Halterung für Abdeckscheiben
Storage Stand for Cover Discs



Bestell-Code · Order code		6938
	Dimens.-Code	
Wagen · Cart	.100	●

Für Induktionsschrumpfgerät und Zubehör

For induction shrink-fit work station and accessories

Bestell-Code · Order code		6936
	Dimens.-Code	
Grundhalter · Basic holder	.100	●

Zur Aufnahme des Aufnahmehalters

For the accommodation of the chuck base

Bestell-Code · Order code		6936
Für Werkzeugschäfte For shank sizes	Dimens.-Code	
SK30 / BT30	.130	●
SK40 / BT40	.140	●
SK50 / BT50	.150	●
HSK25	.225	●
HSK32	.232	●
HSK40	.240	●
HSK50	.250	●
HSK63	.263	●
HSK80	.280	●
HSK100	.2100	●

Andere Größen auf Anfrage lieferbar

Other sizes available on request

Bestell-Code · Order code		6936
Größe Size	Dimens.-Code	
1 - 5	.300	●

Auf Anfrage auch einzelne Größen lieferbar

Individual sizes are available on request

Bestell-Code · Order code		6936
	Dimens.-Code	
Halterung · Storage stand	.301	●

- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör Accessories

SHRINK-MASTER HL-2

1 Satz Voreinstellringe
1 Set of Pre-Adjustment Rings



Bestell-Code · Order code		6936
		Dimens.-Code
∅ 6, 8, 10, 12, 16 mm		.350 ●
∅ 20, 25, 32 mm		.351 ●

Voreinstellringe werden benötigt, um Werkzeuge auf ein genaues Maß einschrumpfen zu können

Pre-adjustment rings are required for shrink-fitting tools to an exact length

Ablageblech für 5 Werkzeuge
Storage Tray for 5 Tools



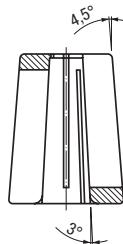
Bestell-Code · Order code			6925
Länge Length	Breite Width	Dimens.-Code	
245 mm	80 mm	.93	●

Kühladapter für Schrumpf-Aufnahmen mit Spanndurchmesser 3-5 mm
Cooling Adapters for Shrink-Fit Chucks with a Clamping Diameter of 3-5 mm



Bestell-Code · Order code		6933
Verwendung mit Kühlkörper For use with cooling adapter		Dimens.-Code
∅ 14-16 mm		.103 ●

Schrumpf- und Kühlhülsen für schlanke Schrumpf-Aufnahmen
Shrink-Fit and Cooling Sleeves for Slender Shrink-Fit Chucks



Bestell-Code · Order code		6250
Spanndurchmesser D ₂ Clamping diameter D ₂	Dimens.-Code	
6	.06	●
8	.08	●
10	.10	●
12	.12	●

Schützt schlanke Schrumpf-Aufnahmen vor Überhitzung

For the protection of slender shrink-fit chucks against overheating

1 Paar Schutzhandschuhe
1 Pair Protective Gloves



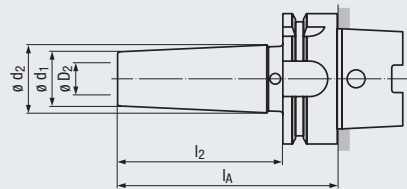
Bestell-Code · Order code		6920
		Dimens.-Code
1 Paar · 1 pair		.99 ●

- Kegel-Hohlschaft nach DIN 69893-1
- Verstellweg ± 5 mm (ab Spanndurchmesser 6 mm)
- Rundlaufabweichung ≤ 3 µm
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-1
- Adjustment range ± 5 mm (from clamping dia. 6 mm)
- Concentricity ≤ 3 µm
- Fine balanced
- Internal coolant supply

HSK-A

Shrink ± 5 mm

≤ 3 µm G2,5 25000min⁻¹



COOL JET



Product Finder

Shrink

ER

M

Zubehör Accessories

HSK-A63

Bestell-Code · Order code						6465	6465C
∅ D ₂	∅ d ₁	∅ d ₂	l ₂	l _A	Dimens.-Code		
3	10	16	54	80	.03080	●	
4	10	16	54	80	.04080	●	
5	10	16	54	80	.05080	●	
6	21	27	54	80	.06080	●	●
6	21	27	134	160	.06160	●	
8	21	27	54	80	.08080	●	●
8	21	27	134	160	.08160	●	
10	24	32	59	85	.10085	●	●
10	24	32	134	160	.10160	●	
12	24	32	64	90	.12090	●	●
12	24	32	134	160	.12160	●	
14	27	34	64	90	.14090	●	●
14	27	34	134	160	.14160	●	
16	27	34	69	95	.16095	●	●
16	27	34	134	160	.16160	●	
18	33	42	69	95	.18095	●	●
18	33	42	134	160	.18160	●	
20	33	42	74	100	.20100	●	●
20	33	42	134	160	.20160	●	
25	44	53	89	115	.25115	●	●
25	44	53	134	160	.25160	●	
32	44	53	94	120	.32120	●	●
32	44	53	134	160	.32160	●	

HSK-A80

Bestell-Code · Order code						6469	
∅ D ₂	∅ d ₁	∅ d ₂	l ₂	l _A	Dimens.-Code		
6	21	27	59	85	.06085	●	
8	21	27	59	85	.08085	●	
8	21	27	134	160	.08160	●	
10	24	32	64	90	.10090	●	
10	24	32	134	160	.10160	●	
12	24	32	69	95	.12095	●	
14	27	34	69	95	.14095	●	
16	27	34	74	100	.16100	●	
16	27	34	134	160	.16160	●	
18	33	42	74	100	.18100	●	
20	33	42	79	105	.20105	●	
25	44	53	89	115	.25115	●	
25	44	53	134	160	.25160	●	
32	44	53	94	120	.32120	●	

- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395
- Stellschrauben auf Anfrage lieferbar
- Aufnahmen auch in Inch-Größen lieferbar

- Coolant tubes and assembly wrenches, see page 395
- Adjusting screws on request
- Chucks also available in inch sizes



Product Finder

Shrink

ER

M

M

Zubehör

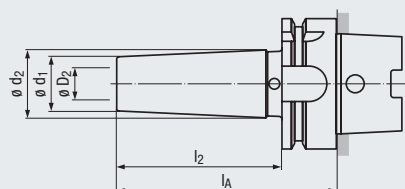
Accessories

- Kegel-Hohlschaft nach DIN 69893-1
- Verstellweg ± 5 mm
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-1
- Adjustment range ± 5 mm
- Concentricity $\leq 3 \mu\text{m}$
- Fine balanced
- Internal coolant supply

HSK-A

Shrink ± 5 mm

$\leq 3 \mu\text{m}$ G2,5
25 000 min⁻¹



HSK-A100

Bestell-Code · Order code						6405
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
6	21	27	56	85	.06085	●
6	21	27	131	160	.06160	●
8	21	27	56	85	.08085	●
8	21	27	131	160	.08160	●
10	24	32	61	90	.10090	●
10	24	32	131	160	.10160	●
12	24	32	66	95	.12095	●
12	24	32	131	160	.12160	●
14	27	34	66	95	.14095	●
14	27	34	131	160	.14160	●
16	27	34	71	100	.16100	●
16	27	34	131	160	.16160	●
18	33	42	71	100	.18100	●
18	33	42	131	160	.18160	●
20	33	42	76	105	.20105	●
20	33	42	131	160	.20160	●
25	44	53	86	115	.25115	●
25	44	53	131	160	.25160	●
32	44	53	91	120	.32120	●
32	44	53	131	160	.32160	●

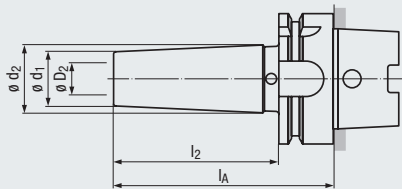
- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395
- Stellschrauben auf Anfrage lieferbar
- Aufnahmen auch in Inch-Größen lieferbar

- Coolant tubes and assembly wrenches, see page 395
- Adjusting screws on request
- Chucks also available in inch sizes

- Kegel-Hohlschaft nach DIN 69893-1
- Verstellweg ± 5 mm
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-1
- Adjustment range ± 5 mm
- Concentricity $\leq 3 \mu\text{m}$
- Fine balanced
- Internal coolant supply

HSK-AShrink ± 5 mm $\leq 3 \mu\text{m}$ G2,5 25000min⁻¹

SAFE-LOCK™



Product Finder

Shrink

ER

M

Zubehör

Accessories

HSK-A63

Bestell-Code · Order code

6473S

$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
12	26,5	33,5	44	70	.12070	●
14	29,5	37,3	49	75	.14075	●
16	29,5	37,3	49	75	.16075	●
18	35,5	43,3	49	75	.18075	●
20	35,5	43,3	49	75	.20075	●
25	45	54,3	59	85	.25085	●
32	45	54,3	59	85	.32085	●

HSK-A100

Bestell-Code · Order code

6403S

$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
12	27	37	66	95	.12095	●
14	33	43	66	95	.14095	●
16	33	44	71	100	.16100	●
18	44	55	71	100	.18100	●
20	44	56	76	105	.20105	●
25	44	58	86	115	.25115	●

- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395
- Stellschrauben auf Anfrage lieferbar

- Coolant tubes and assembly wrenches, see page 395
- Adjusting screws on request

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
For information on the SAFE-LOCK™ clamping system, see page 415



- Product Finder
- Shrink
- ER
- M
- Zubehör
Accessories

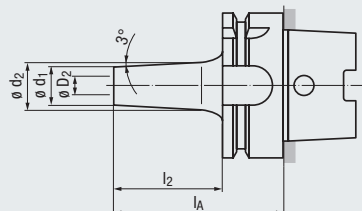
- Kegelhohlschaft nach DIN 69893-1
- Schlanke Ausführung
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-1
- Slender design
- Concentricity $\leq 3 \mu\text{m}$
- Fine balanced
- Internal coolant supply

HSK-A

Shrink

$\leq 3 \mu\text{m}$

G2,5
25000 min⁻¹



HSK-A63

Bestell-Code · Order code						6467
$\emptyset D_2$	$\emptyset d_1$	$\emptyset d_2$	l_2	l_A	Dimens.-Code	
6	9	14,7	54	80	.06080	●
8	11	16,7	54	80	.08080	●
10	13	18,7	54	80	.10080	●
12	15	20,7	54	80	.12080	●

- Kühlschmierstoffrohr und Montageschlüssel siehe Seite 395
- Stellschrauben auf Anfrage lieferbar

- Coolant tube and assembly wrench, see page 395
- Adjusting screws on request



Schrumpf- und Kühlhülsen für schlanke Ausführung siehe Seite 366

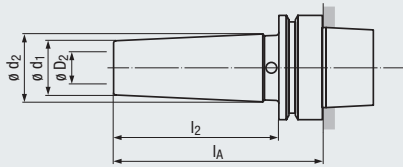
Shrink-fit and cooling sleeves for slender shrink-fit chucks, see page 366

- Kegel-Hohlschaft nach DIN 69893-5
- Verstellweg ± 5 mm (ab Spanndurchmesser 6 mm)
- Rundlaufabweichung ≤ 3 µm
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-5
- Adjustment range ± 5 mm (from clamping dia. 6 mm)
- Concentricity ≤ 3 µm
- Fine balanced
- Internal coolant supply

HSK-E

Shrink ± 5 mm

≤ 3 µm G2,5 25000min⁻¹



Product Finder

Shrink

ER

M

Zubehör Accessories

HSK-E40

Bestell-Code · Order code						6445
Ø D ₂	Ø d ₁	Ø d ₂	l ₂	l _A	Dimens.-Code	
3	10	16	40	60	.03060	●
4	10	16	40	60	.04060	●
5	10	16	40	60	.05060	●
6	21	27	60	80	.06080	●
8	21	27	60	80	.08080	●
10	24	32	60	80	.10080	●
12	24	32	70	90	.12090	●
14	27	34	70	90	.14090	●
16	27	34	70	90	.16090	●

HSK-E50

Bestell-Code · Order code						6455
Ø D ₂	Ø d ₁	Ø d ₂	l ₂	l _A	Dimens.-Code	
3	10	16	34	60	.03060	●
4	10	16	34	60	.04060	●
5	10	16	34	60	.05060	●
6	21	27	54	80	.06080	●
6	21	27	134	160	.06160	●
8	21	27	54	80	.08080	●
8	21	27	134	160	.08160	●
10	24	32	59	85	.10085	●
10	24	32	134	160	.10160	●
12	24	32	64	90	.12090	●
12	24	32	134	160	.12160	●
14	27	34	64	90	.14090	●
14	27	34	134	160	.14160	●
16	27	34	69	95	.16095	●
16	27	34	134	160	.16160	●

- Stellschrauben auf Anfrage lieferbar
- Aufnahmen auch in Inch-Größen lieferbar

- Adjusting screws on request
- Chucks also available in inch sizes



- Product Finder
- Shrink
- ER
-
- M
- Zubehör Accessories

- Steilkegelschaft nach DIN ISO 7388-1 (vormals DIN 69871)
- Verstellweg ± 5 mm (ab Spanndurchmesser 6 mm)
- Kegel in Qualität AT3
- Rundlaufabweichung ≤ 3 µm
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-1 (formerly DIN 69871)
- Adjustment range ± 5 mm (from clamping dia. 6 mm)
- Taper quality AT3
- Concentricity ≤ 3 µm
- Fine balanced
- Internal coolant supply

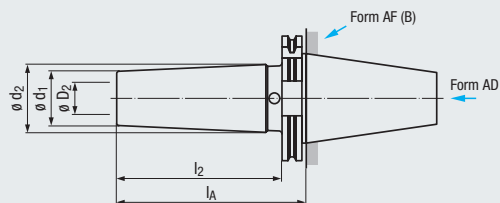
SK (ISO)

Shrink ± 5 mm

≤ 3 µm

G2,5
25 000 min⁻¹

AT3



COOL JET



SK40

Bestell-Code · Order code

Ø D ₂	Ø d ₁	Ø d ₂	l ₂	l _A	Dimens.-Code
3	10	16	60,9	80	.03080
4	10	16	60,9	80	.04080
5	10	16	60,9	80	.05080
6	21	27	60,9	80	.06080
6	21	27	140,9	160	.06160
8	21	27	60,9	80	.08080
8	21	27	140,9	160	.08160
10	24	32	60,9	80	.10080
10	24	32	140,9	160	.10160
12	24	32	60,9	80	.12080
12	24	32	140,9	160	.12160
14	27	34	60,9	80	.14080
14	27	34	140,9	160	.14160
16	27	34	60,9	80	.16080
16	27	34	140,9	160	.16160
18	33	42	60,9	80	.18080
18	33	42	140,9	160	.18160
20	33	42	60,9	80	.20080
20	33	42	140,9	160	.20160
25	44	53	80,9	100	.25100
25	44	53	140,9	160	.25160
32	44	53	80,9	100	.32100
32	44	53	140,9	160	.32160

AD + AF (B)

6442

AD + AF (B)

6442C

SK50

Bestell-Code · Order code

Ø D ₂	Ø d ₁	Ø d ₂	l ₂	l _A	Dimens.-Code
6	21	27	60,9	80	.06080
6	21	27	140,9	160	.06160
8	21	27	60,9	80	.08080
8	21	27	140,9	160	.08160
10	24	32	60,9	80	.10080
10	24	32	140,9	160	.10160
12	24	32	60,9	80	.12080
12	24	32	140,9	160	.12160
14	27	34	60,9	80	.14080
14	27	34	140,9	160	.14160
16	27	34	60,9	80	.16080
16	27	34	140,9	160	.16160
18	33	42	60,9	80	.18080
18	33	42	140,9	160	.18160
20	33	42	60,9	80	.20080
20	33	42	140,9	160	.20160
25	44	53	80,9	100	.25100
25	44	53	140,9	160	.25160
32	44	53	80,9	100	.32100
32	44	53	140,9	160	.32160

AD + AF (B)

6452

- Anzugsbolzen siehe Seite 396
- Stellschrauben auf Anfrage lieferbar

- Pull studs, see page 396
- Adjusting screws on request

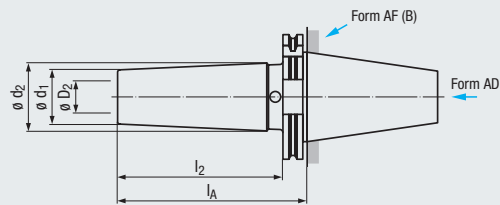
- Steilkegelschaft nach DIN ISO 7388-1 (vormals DIN 69871)
- Verstellweg ± 5 mm
- Kegel in Qualität AT3
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-1 (formerly DIN 69871)
- Adjustment range ± 5 mm
- Taper quality AT3
- Concentricity $\leq 3 \mu\text{m}$
- Fine balanced
- Internal coolant supply

SK (ISO)

Shrink ± 5 mm $\leq 3 \mu\text{m}$ G2,5 25000min⁻¹

AT3

SAFE-LOCK™



SK40						AD + AF (B)	
Bestell-Code · Order code						6439S	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code		
12	26,5	33,8	45,9	65	.12065	●	
14	29,5	36,8	45,9	65	.14065	●	
16	29,5	36,8	45,9	65	.16065	●	
18	35,5	42,8	45,9	65	.18065	●	
20	35,5	42,8	45,9	65	.20065	●	
25	45,5	54,3	55,9	75	.25075	●	
32	45,5	55,1	60,9	80	.32080	●	

SK50						AD + AF (B)	
Bestell-Code · Order code						6457S	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code		
12	27	37	60,9	80	.12080	●	
14	33	43	60,9	80	.14080	●	
16	33	43	60,9	80	.16080	●	
18	44	54	60,9	80	.18080	●	
20	44	54	60,9	80	.20080	●	
25	44	57	80,9	100	.25100	●	

- Anzugsbolzen siehe Seite 396
- Stellschrauben auf Anfrage lieferbar

- Pull studs, see page 396
- Adjusting screws on request

Informationen zum SAFE-LOCK™-Spannsystem siehe Seite 415
 For Information on the SAFE-LOCK™ clamping system, see page 415



- Product Finder
- Shrink
- ER
-
- M
- Zubehör Accessories

- Steilkegelschaft nach DIN ISO 7388-2 (vormals JIS B 6339/MAS 403BT)
- Verstellweg ± 5 mm (ab Spanndurchmesser 6 mm)
- Kegel in Qualität AT3
- Rundlaufabweichung ≤ 3 µm
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-2 (formerly JIS B 6339/MAS 403BT)
- Adjustment range ± 5 mm (from clamping dia. 6 mm)
- Taper quality AT3
- Concentricity ≤ 3 µm
- Fine balanced
- Internal coolant supply

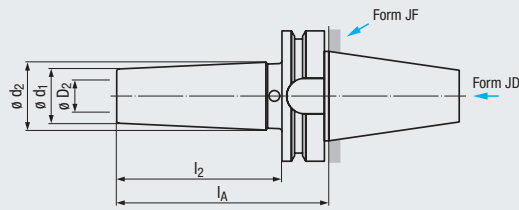
BT

Shrink ± 5 mm

≤ 3µm

G2,5
25 000 min⁻¹

AT3



BT40							JD + JF	JD + JF
Bestell-Code · Order code							6470	6470C
Ø D ₂	Ø d ₁	Ø d ₂	l ₂	l _A	Dimens.-Code			
3	10	16	63	90	.03090	•		
4	10	16	63	90	.04090	•		
5	10	16	63	90	.05090	•		
6	21	27	63	90	.06090	•	•	
6	21	27	133	160	.06160	•		
8	21	27	63	90	.08090	•	•	
8	21	27	133	160	.08160	•		
10	24	32	63	90	.10090	•	•	
10	24	32	133	160	.10160	•		
12	24	32	63	90	.12090	•	•	
12	24	32	133	160	.12160	•		
14	27	34	63	90	.14090	•	•	
14	27	34	133	160	.14160	•		
16	27	34	63	90	.16090	•	•	
16	27	34	133	160	.16160	•		
18	33	42	63	90	.18090	•		
18	33	42	133	160	.18160	•		
20	33	42	63	90	.20090	•	•	
20	33	42	133	160	.20160	•		
25	44	53	73	100	.25100	•	•	
25	44	53	133	160	.25160	•		
32	44	53	73	100	.32100	•	•	

BT50							JD + JF	
Bestell-Code · Order code							6475	
Ø D ₂	Ø d ₁	Ø d ₂	l ₂	l _A	Dimens.-Code			
6	21	27	62	100	.06100	•		
6	21	27	122	160	.06160	•		
8	21	27	62	100	.08100	•		
8	21	27	122	160	.08160	•		
10	24	32	62	100	.10100	•		
10	24	32	122	160	.10160	•		
12	24	32	62	100	.12100	•		
12	24	32	122	160	.12160	•		
14	27	34	62	100	.14100	•		
14	27	34	122	160	.14160	•		
16	27	34	62	100	.16100	•		
16	27	34	122	160	.16160	•		
18	33	42	62	100	.18100	•		
18	33	42	122	160	.18160	•		
20	33	42	62	100	.20100	•		
20	33	42	122	160	.20160	•		
25	44	53	62	100	.25100	•		
25	44	53	122	160	.25160	•		
32	44	53	62	100	.32100	•		
32	44	53	122	160	.32160	•		

- Anzugsbolzen auf Anfrage lieferbar
- Stellschrauben auf Anfrage lieferbar

- Pull studs on request
- Adjusting screws on request

- Kegel-Hohlschaft nach DIN 69893-1
- Rundlaufabweichung $\leq 3 \mu\text{m}$ bei Auskraglänge bis $3 \times D$
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Abdichtung mit Dichtscheibe

- Hollow taper shank acc. DIN 69893-1
- Concentricity $\leq 3 \mu\text{m}$ at projection length of $3 \times \text{dia.}$
- Fine balanced
- Internal coolant supply
- Sealing with sealing disc

HSK-A

ER

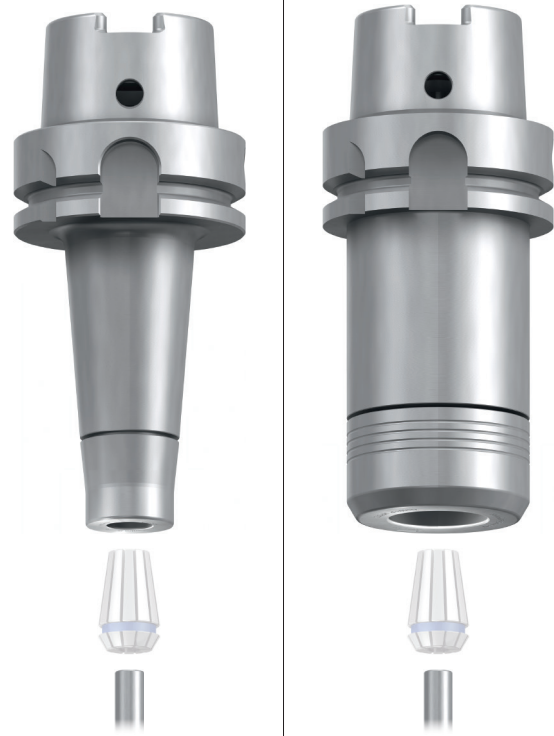
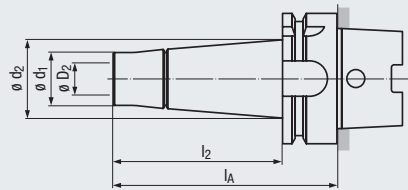


$\leq 3 \mu\text{m}$



G2,5
25000 min⁻¹

Spannmutter ist im Lieferumfang enthalten
Clamping nut is included in the delivery



Product Finder

Shrink

ER

M

M

Zubehör
Accessories

HSK-A63

Bestell-Code · Order code							6463	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code		
1 - 10	24	33,8	77	103	ER 16	.16100	●	
1 - 10	24	36	137	163	ER 16	.16160	●	

HSK-A63

Bestell-Code · Order code							6460	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code		
1 - 10	30	30	77	103	ER 16	.16100		●
1 - 10	30	30	107	133	ER 16	.16130		●
1 - 10	30	30	137	163	ER 16	.16160		●
1 - 10	30	30	177	203	ER 16	.16200		●
1 - 16	40	40	37,5	63,5	ER 25	.25060		●
1 - 16	40	40	77,5	103,5	ER 25	.25100		●
1 - 16	40	40	107,5	133,5	ER 25	.25130		●
1 - 16	40	40	137,5	163,5	ER 25	.25160		●
1 - 16	40	40	177,5	203,5	ER 25	.25200		●
2 - 20	50	50	47,5	73,5	ER 32	.32070		●
2 - 20	50	50	77,5	103,5	ER 32	.32100		●
2 - 20	50	50	107,5	133,5	ER 32	.32130		●
2 - 20	50	50	137,5	163,5	ER 32	.32160		●
3 - 25	63	63	54	80	ER 40	.40080		●
3 - 25	63	63	134	160	ER 40	.40160		●

HSK-A100

Bestell-Code · Order code							6461	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code		
1 - 10	30	30	74	103	ER 16	.16100		●
1 - 10	30	30	134	163	ER 16	.16160		●
1 - 16	40	40	74,5	103,5	ER 25	.25100		●
1 - 16	40	40	134,5	163,5	ER 25	.25160		●
2 - 20	50	50	74,5	103,5	ER 32	.32100		●
2 - 20	50	50	134,5	163,5	ER 32	.32160		●
3 - 25	63	63	71	100	ER 40	.40100		●

- Spannzangen mit Dichtscheibe siehe Seite 379, bitte extra bestellen
- Rollenschlüssel siehe Seite 379
- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395
- Stellschrauben auf Anfrage lieferbar

- Collets with sealing disc see page 379, please order separately
- Roller bearing wrenches, see page 379
- Coolant tubes and assembly wrenches, see page 395
- Adjusting screws on request



- Product Finder
- Shrink
- ER
- M
- Zubehör
Accessories

- Kegel-Hohlschaft nach DIN 69893-5
- Rundlaufabweichung $\leq 3 \mu\text{m}$ bei Auskraglänge bis 3 x D
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- HSK-E32: Spannmutter mit integrierter Abdichtung
- HSK-E40, HSK-E50: Abdichtung mit Dichtscheibe
- Hollow taper shank acc. DIN 69893-5
- Concentricity $\leq 3 \mu\text{m}$ at projection length of 3 x dia.
- Fine balanced
- Internal coolant supply
- HSK-E32: clamping nut with integrated sealing
- HSK-E40, HSK-E50: sealing with sealing disc

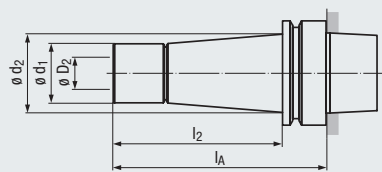
HSK-E



G2,5
30 000 min⁻¹



Spannmutter ist im Lieferumfang enthalten
Clamping nut is included in the delivery



HSK-E32

Bestell-Code · Order code							6471
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code	
3	16	26	27	50	ER 11	.110350	●
4	16	26	27	50	ER 11	.110450	●
6	16	26	27	50	ER 11	.110650	●

HSK-E40

Bestell-Code · Order code							6443
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code	
1 - 10	22	24	38	58	ER 16	.16055	●
1 - 10	22	27	83	103	ER 16	.16100	●

HSK-E50

Bestell-Code · Order code							6446
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code	
1 - 10	22	23,5	37	63	ER 16	.16060	●
1 - 10	22	26	77	103	ER 16	.16100	●

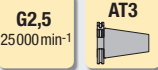
- Spannzangen mit Dichtscheibe siehe Seite 379, bitte extra bestellen
- Rollenschlüssel siehe Seite 379
- Stellschrauben auf Anfrage lieferbar

- Collets with sealing disc see page 379, please order separately
- Roller bearing wrenches, see page 379
- Adjusting screws on request

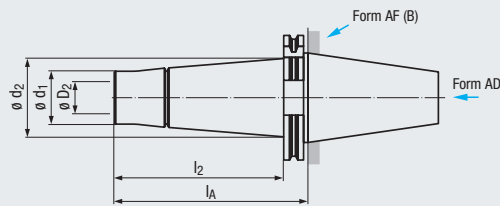


- Steilkegelschaft nach DIN ISO 7388-1 (vormals DIN 69871)
- Rundlaufabweichung $\leq 3 \mu\text{m}$ bei Auskraglänge bis $3 \times D$
- Feingewuchtet
- Kegel in Qualität AT3
- Innere Kühlschmierstoff-Zufuhr
- Abdichtung mit Dichtscheibe
- ISO taper shank acc. DIN ISO 7388-1 (formerly DIN 69871)
- Concentricity $\leq 3 \mu\text{m}$ at projection length of $3 \times \text{dia.}$
- Fine balanced
- Taper quality AT3
- Internal coolant supply
- Sealing with sealing disc

SK (ISO)



Spannmutter ist im Lieferumfang enthalten
Clamping nut is included in the delivery



Product Finder

Shrink

ER

M

Zubehör Accessories

SK40							AD + AF (B)	
Bestell-Code · Order code							6418	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code		
1 - 10	24	36,1	83,9	103	ER 16	.16100	•	
1 - 10	24	37,7	143,9	163	ER 16	.16160	•	

SK40							AD + AF (B)	
Bestell-Code · Order code							6417	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code		
1 - 10	30	30	54	73	ER 16	.16070		•
1 - 10	30	30	84	103	ER 16	.16100		•
1 - 10	30	30	114	133	ER 16	.16130		•
1 - 10	30	30	144	163	ER 16	.16160		•
1 - 10	30	30	185	204	ER 16	.16200		•
1 - 16	40	40	29,5	48,5	ER 25	.25045		•
1 - 16	40	40	54,5	73,5	ER 25	.25070		•
1 - 16	40	40	84,5	103,5	ER 25	.25100		•
1 - 16	40	40	114,5	133,5	ER 25	.25130		•
1 - 16	40	40	144,5	163,5	ER 25	.25160		•
1 - 16	40	40	184,5	203,5	ER 25	.25200		•
2 - 20	50	50	34,5	53,5	ER 32	.32050		•
2 - 20	50	50	54,5	73,5	ER 32	.32070		•
2 - 20	50	50	84,5	103,5	ER 32	.32100		•
2 - 20	50	50	114,5	133,5	ER 32	.32130		•
2 - 20	50	50	144,5	163,5	ER 32	.32160		•

SK50							AD + AF (B)	
Bestell-Code · Order code							6419	
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code		
2 - 20	50	50	54,5	73,5	ER 32	.32070		•
2 - 20	50	50	84,5	103,5	ER 32	.32100		•
2 - 20	50	50	144,5	163,5	ER 32	.32160		•

- Spannzangen mit Dichtscheibe siehe Seite 379, bitte extra bestellen
- Rollenschlüssel siehe Seite 379
- Anzugsbolzen siehe Seite 396
- Stellschrauben auf Anfrage lieferbar


- Collets with sealing disc see page 379, please order separately
- Roller bearing wrenches, see page 379
- Pull studs, see page 396
- Adjusting screws on request





- Product Finder
- Shrink
- ER
- M
- Zubehör
Accessories


- Steilkegelschaft nach DIN ISO 7388-2 (vormals JIS B 6339/MAS 403BT)
- Kegel in Qualität AT3
- Rundlaufabweichung $\leq 3 \mu\text{m}$ bei Auskraglänge bis 3 x D
- Feingewuchtet
- Innere Kühlschmierstoff-Zufuhr
- Abdichtung mit Dichtscheibe
- ISO taper shank acc. DIN ISO 7388-2 (formerly JIS B 6339/MAS 403BT)
- Taper quality AT3
- Concentricity $\leq 3 \mu\text{m}$ at projection length of 3 x dia.
- Fine balanced
- Internal coolant supply
- Sealing with sealing disc

BT

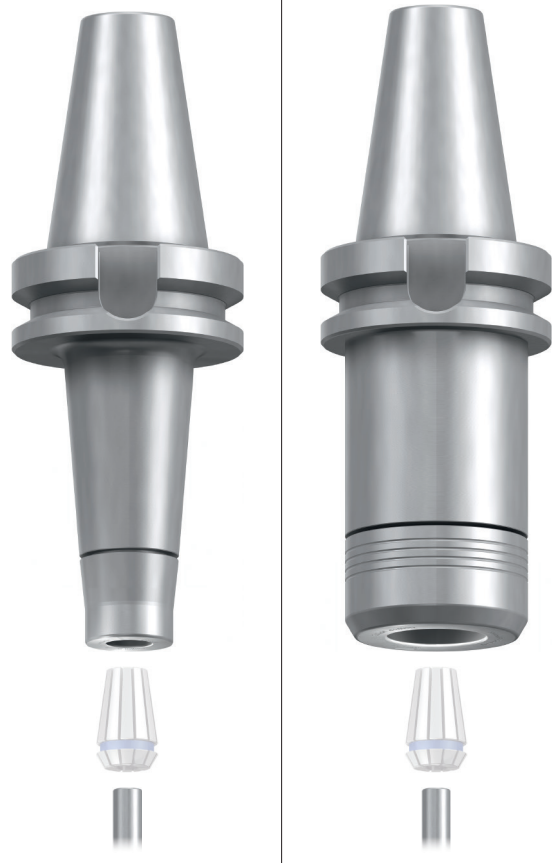
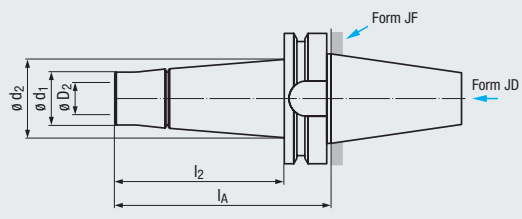
 ER




 $\leq 3 \mu\text{m}$

 G2,5
25 000 min⁻¹

 AT3

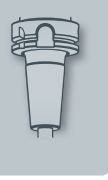
Spannmutter ist im Lieferumfang enthalten
Clamping nut is included in the delivery



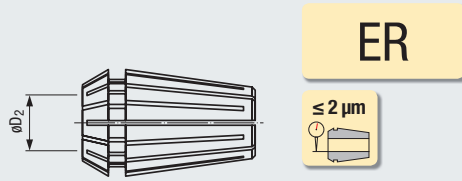
BT40							JD + JF
Bestell-Code · Order code							6408
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code	
1 - 10	24	33,7	76	103	ER 16	.16100	•
1 - 10	24	43,8	136	163	ER 16	.16160	•
BT40							JD + JF
Bestell-Code · Order code							6407
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code	
1 - 10	30	30	46	73	ER 16	.16070	•
1 - 10	30	30	76	103	ER 16	.16100	•
1 - 10	30	30	96	123	ER 16	.16120	•
1 - 10	30	30	136	163	ER 16	.16160	•
1 - 10	30	30	176	203	ER 16	.16200	•
1 - 16	40	40	31,3	58,3	ER 25	.25055	•
1 - 16	40	40	46,3	73,3	ER 25	.25070	•
1 - 16	40	40	76,3	103,3	ER 25	.25100	•
1 - 16	40	40	96,3	123,3	ER 25	.25120	•
1 - 16	40	40	136,3	163,3	ER 25	.25160	•
1 - 16	40	40	176,3	203,3	ER 25	.25200	•
2 - 20	50	50	31,2	58,2	ER 32	.32055	•
2 - 20	50	50	46,2	73,2	ER 32	.32070	•
2 - 20	50	50	76,2	103,2	ER 32	.32100	•
2 - 20	50	50	96,2	123,2	ER 32	.32120	•
2 - 20	50	50	136,2	163,2	ER 32	.32160	•
BT50							JD + JF
Bestell-Code · Order code							6409
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A		Dimens.-Code	
2 - 20	50	50	65,2	103,2	ER 32	.32100	•
2 - 20	50	50	125,2	163,2	ER 32	.32160	•

- Spannzangen mit Dichtscheibe siehe Seite 379, bitte extra bestellen
- Rollenschlüssel siehe Seite 379
- Anzugsbolzen auf Anfrage lieferbar
- Stellschrauben auf Anfrage lieferbar

- Collets with sealing disc see page 379, please order separately
- Roller bearing wrenches, see page 379
- Pull studs on request
- Adjusting screws on request



- ER-Spannzange nach DIN ISO 15488 B (vormals DIN 6499 B)
- Rundlaufabweichung $\leq 2 \mu\text{m}$
- Eine Dichtscheibe ist im Lieferumfang enthalten (nicht bei ER 11)
- ER collets acc. DIN ISO 15488 B (formerly DIN 6499 B)
- Concentricity $\leq 2 \mu\text{m}$
- One sealing disc is included with the collet (not for ER 11)



Product Finder

Shrink

ER

M

Zubehör Accessories

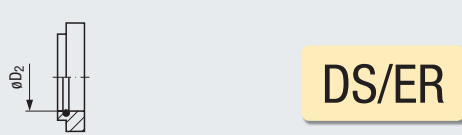
	ER 11		ER 16		ER 25		ER 32		ER 40	
Bestell-Code · Order code	6615									
$\varnothing D_2$	Dimens.-Code		Dimens.-Code		Dimens.-Code		Dimens.-Code		Dimens.-Code	
1			.1601	●	.2501	●				
2			.1602	●	.2502	●	.3202	●		
3	.1103	●	.1603	●	.2503	●	.3203	●	.4003	●
4	.1104	●	.1604	●	.2504	●	.3204	●	.4004	●
5			.1605	●	.2505	●	.3205	●	.4005	●
6			.1606	●	.2506	●	.3206	●	.4006	●
8	.1106	●	.1608	●	.2508	●	.3208	●	.4008	●
10			.1610	●	.2510	●	.3210	●	.4010	●
12					.2512	●	.3212	●	.4012	●
14					.2514	●	.3214	●	.4014	●
16					.2516	●	.3216	●	.4016	●
18							.3218	●	.4018	●
20							.3220	●	.4020	●
25									.4025	●

- ER-Spannzangen auch in Inch-Abmessungen lieferbar

- ER collets also available in inch sizes

Zubehör · Accessories

Dichtscheiben · Sealing Discs



	DS/ER 16		DS/ER 25		DS/ER 32		DS/ER 40	
Bestell-Code · Order code	6622							
$\varnothing D_2$	Dimens.-Code		Dimens.-Code		Dimens.-Code		Dimens.-Code	
1	.1601	●	.2501	●				
2	.1602	●	.2502	●	.3202	●		
3	.1603	●	.2503	●	.3203	●	.4003	●
4	.1604	●	.2504	●	.3204	●	.4004	●
5	.1605	●	.2505	●	.3205	●	.4005	●
6	.1606	●	.2506	●	.3206	●	.4006	●
8	.1608	●	.2508	●	.3208	●	.4008	●
10	.1610	●	.2510	●	.3210	●	.4010	●
12			.2512	●	.3212	●	.4012	●
14			.2514	●	.3214	●	.4014	●
16			.2516	●	.3216	●	.4016	●
18					.3218	●	.4018	●
20					.3220	●	.4020	●
25							.4025	●

- Dichtscheiben auch in Inch-Abmessungen lieferbar

- Sealing discs also available in inch sizes

Rollenschlüssel · Roller Bearing Wrenches



Bestell-Code · Order code		6687			
	Dimens.-Code				
	ER 11	.11		●	
	ER 16	.16	●		
	ER 16 (HSK-E)	.16E		●	
	ER 16	.16Z			●
	ER 25	.25			●
	ER 32	.32			●
	ER 40	.40			●

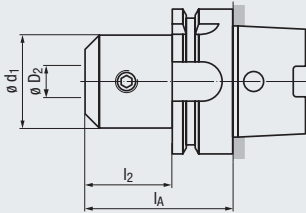
● = Lagerwerkzeug, siehe Preisliste · Stock tool, see price list
 ○ = Kurzfristig lieferbar, Preis auf Anfrage · Available at short notice, price on request

- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör
Accessories

- Kegel-Hohlschaft nach DIN 69893-1
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-1
- Internal coolant supply

HSK-A

HB / B



HSK-A63

Bestell-Code · Order code					6563
$\varnothing D_2$	$\varnothing d_1$	l_2	l_A	Dimens.-Code	
6	25	39	65	.06065	●
8	28	39	65	.08065	●
10	35	39	65	.10065	●
12	42	54	80	.12080	●
14	44	54	80	.14080	●
16	48	54	80	.16080	●
18	50	54	80	.18080	●
20	52	54	80	.20080	●
25	65	84	110	.25110	●
32	72	84	110	.32110	●

HSK-A80

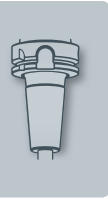
Bestell-Code · Order code					6564
$\varnothing D_2$	$\varnothing d_1$	l_2	l_A	Dimens.-Code	
6	25	54	80	.06080	●
8	28	54	80	.08080	●
10	35	54	80	.10080	●
12	42	54	80	.12080	●
16	48	74	100	.16100	●
20	52	74	100	.20100	●
25	65	74	100	.25100	●
32	72	84	110	.32110	●

HSK-A100

Bestell-Code · Order code					6565
$\varnothing D_2$	$\varnothing d_1$	l_2	l_A	Dimens.-Code	
6	25	51	80	.06080	●
8	28	51	80	.08080	●
10	35	51	80	.10080	●
12	42	51	80	.12080	●
14	44	51	80	.14080	●
16	48	71	100	.16100	●
18	50	71	100	.18100	●
20	52	71	100	.20100	●
25	65	71	100	.25100	●
32	72	71	100	.32100	●

- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395
- Ersatz-Spannschrauben auf Anfrage lieferbar

- Coolant tubes and assembly wrenches, see page 395
- Spare clamping screws on request

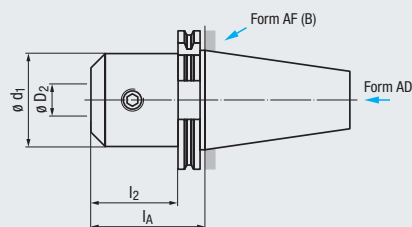


- Steilkegelschaft nach DIN ISO 7388-1 (vormals DIN 69871)
- Kegel in Qualität AT3
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-1 (formerly DIN 69871)
- Taper quality AT3
- Internal coolant supply

SK (ISO)

HB / B

AT3



Product Finder

Shrink

ER

M

M

Zubehör

Accessories

SK40

AD + AF (B)

Bestell-Code · Order code					6540
$\varnothing D_2$	$\varnothing d_1$	l_2	l_A	Dimens.-Code	
6	25	30,9	50	.06050	●
8	28	30,9	50	.08050	●
10	35	30,9	50	.10050	●
12	42	30,9	50	.12050	●
14	42	30,9	50	.14050	●
16	48	43,9	63	.16063	●
18	48	43,9	63	.18063	●
20	52	43,9	63	.20063	●
25	65	80,9	100	.25100	●
32	72	80,9	100	.32100	●

SK50

AD + AF (B)

Bestell-Code · Order code					6550
$\varnothing D_2$	$\varnothing d_1$	l_2	l_A	Dimens.-Code	
6	25	43,9	63	.06063	●
8	28	43,9	63	.08063	●
10	35	43,9	63	.10063	●
12	42	43,9	63	.12063	●
14	42	43,9	63	.14063	●
16	48	43,9	63	.16063	●
18	48	43,9	63	.18063	●
20	52	43,9	63	.20063	●
25	65	60,9	80	.25080	●
32	72	80,9	100	.32100	●
40	78	80,9	100	.40100	●

- Anzugsbolzen siehe Seite 396
- Ersatz-Spannschrauben auf Anfrage lieferbar

- Pull studs, see page 396
- Spare clamping screws on request



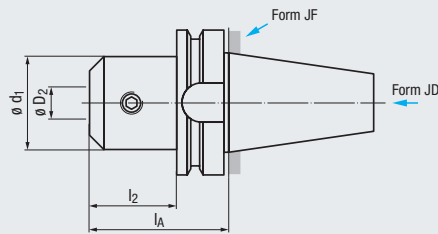
- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör
Accessories

- Steilkegelschaft nach DIN ISO 7388-2 (vormals JIS B 6339/MAS 403BT)
- Kegel in Qualität AT3
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-2 (formerly JIS B 6339/MAS 403BT)
- Taper quality AT3
- Internal coolant supply

BT

HB / B

AT3



BT40

JD + JF

Bestell-Code · Order code

6570

ø D ₂	ø d ₁	l ₂	l _A	Dimens.-Code	
6	25	23	50	.06050	●
8	28	23	50	.08050	●
10	35	36	63	.10063	●
12	42	36	63	.12063	●
14	44	36	63	.14063	●
16	48	36	63	.16063	●
18	50	36	63	.18063	●
20	52	36	63	.20063	●
25	65	63	90	.25090	●
32	72	73	100	.32100	●

BT50

JD + JF

Bestell-Code · Order code

6571

ø D ₂	ø d ₁	l ₂	l _A	Dimens.-Code	
6	25	25	63	.06063	●
8	28	25	63	.08063	●
10	35	32	70	.10070	●
12	42	42	80	.12080	●
16	48	42	80	.16080	●
20	52	42	80	.20080	●
25	65	62	100	.25100	●
32	72	67	105	.32105	●

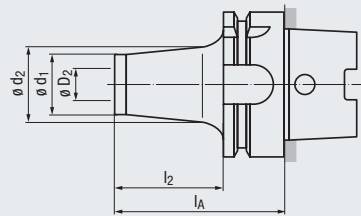
- Anzugsbolzen auf Anfrage lieferbar
- Ersatz-Spannschrauben auf Anfrage lieferbar

- Pull studs on request
- Spare clamping screws on request



- Kegel-Hohlschaft nach DIN 69893-1
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-1
- Internal coolant supply

HSK-A



- Product Finder
- Shrink
- ER
- M
- Zubehör Accessories

HSK-A63

Bestell-Code · Order code						6363
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
M 6	10	10	33	59	.06059	●
M 6	10	23	83	109	.06109	●
M 8	13	15	33	59	.08059	●
M 8	13	23	83	109	.08109	●
M10	18	20	33	59	.10059	●
M10	18	28	83	109	.10109	●
M10	18	30	108	134	.10134	●
M12	21	24	33	59	.12059	●
M12	21	31	83	109	.12109	●
M12	21	31	108	134	.12134	●
M12	21	34	133	159	.12159	●
M12	21	39	158	184	.12184	●
M16	29	34	33	59	.16059	●
M16	29	34	83	109	.16109	●
M16	29	39	108	134	.16134	●
M16	29	39	133	159	.16159	●
M16	29	39	158	184	.16184	●

- Zwischenadapter für Einschraubfräser siehe Seite 387
- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395

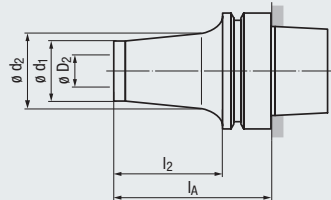
- Intermediate adapters for screw-in end mills, see page 387
- Coolant tubes and assembly wrenches, see page 395



- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör
Accessories

- Kegel-Hohlschaft nach DIN 69893-5
- Innere Kühlschmierstoff-Zufuhr
- Hollow taper shank acc. DIN 69893-5
- Internal coolant supply

HSK-E



HSK-E40

Bestell-Code · Order code						6343
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
M 6	10	10	33	53	.06053	●
M 6	10	23	83	103	.06103	●
M 8	13	15	33	53	.08053	●
M 8	13	23	83	103	.08103	●
M10	18	20	33	53	.10053	●
M10	18	28	83	103	.10103	●

HSK-E50

Bestell-Code · Order code						6353
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
M 6	10	10	33	59	.06059	●
M 6	10	23	83	109	.06109	●
M 8	13	15	33	59	.08059	●
M 8	13	23	83	109	.08109	●
M10	18	20	33	59	.10059	●
M10	18	28	83	109	.10109	●
M10	18	30	108	134	.10134	●
M12	21	24	33	59	.12059	●
M12	21	31	83	109	.12109	●
M12	21	31	108	134	.12134	●

- Zwischenadapter für Einschraubfräser siehe Seite 387

- Intermediate adapters for screw-in end mills, see page 387



Sie haben Fragen zu einem unserer Produkte?
Sprechen Sie doch einfach den für Sie zuständigen
EMUGE-FRANKEN Vertriebspartner an.

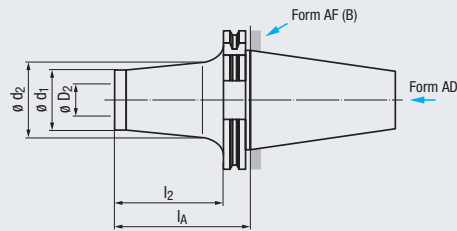
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Just ask your EMUGE-FRANKEN sales contact.

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- Steilkegelschaft nach DIN ISO 7388-1 (vormals DIN 69871)
- Kegel in Qualität AT3
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-1 (formerly DIN 69871)
- Taper quality AT3
- Internal coolant supply

SK (ISO)



Product Finder

Shrink

ER

M

Zubehör Accessories

SK40

AD + AF (B)

Bestell-Code · Order code						6340
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
M 6	10	10	16,9	36	.06036	●
M 6	10	13	36,9	56	.06056	●
M 8	13	15	36,9	56	.08056	●
M 8	13	23	56,9	76	.08076	●
M 8	13	23	76,9	96	.08096	●
M10	18	20	36,9	56	.10056	●
M10	18	25	56,9	76	.10076	●
M10	18	28	76,9	96	.10096	●
M12	21	24	36,9	56	.12056	●
M12	21	24	56,9	76	.12076	●
M12	21	31	76,9	96	.12096	●
M12	21	31	96,9	116	.12116	●
M16	29	29	16,9	36	.16036	●
M16	29	34	36,9	56	.16056	●
M16	29	34	56,9	76	.16076	●
M16	29	34	76,9	96	.16096	●
M16	29	39	96,9	116	.16116	●

SK50

AD + AF (B)

Bestell-Code · Order code						6350
$\varnothing D_2$	$\varnothing d_1$	$\varnothing d_2$	l_2	l_A	Dimens.-Code	
M 8	13	15	38,9	58	.08058	●
M10	18	25	58,9	78	.10078	●
M12	21	25	58,9	78	.12078	●
M16	29	35	78,9	98	.16098	●

- Zwischenadapter für Einschraubfräser siehe Seite 387
- Anzugsbolzen siehe Seite 396

- Intermediate adapters for screw-in end mills, see page 387
- Pull studs, see page 396



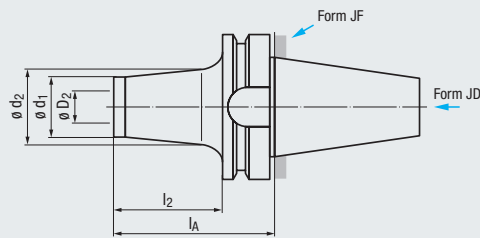
- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör
Accessories

- Steilkegelschaft nach DIN ISO 7388-2 (vormals JIS B 6339/MAS 403BT)
- Kegel in Qualität AT3
- Innere Kühlschmierstoff-Zufuhr
- ISO taper shank acc. DIN ISO 7388-2 (formerly JIS B 6339/MAS 403BT)
- Taper quality AT3
- Internal coolant supply

BT

M

AT3



BT40

JD + JF

Bestell-Code · Order code

6370

ø D ₂	ø d ₁	ø d ₂	l ₂	l _A	Dimens.-Code	
M 6	10	12	10	37	.06037	●
M 6	10	23	36	63	.06063	●
M 8	13	15	36	63	.08063	●
M 8	13	23	56	83	.08083	●
M 8	13	23	76	103	.08103	●
M10	18	20	36	63	.10063	●
M10	18	25	56	83	.10083	●
M10	18	28	76	103	.10103	●
M12	21	24	36	63	.12063	●
M12	21	24	56	83	.12083	●
M12	21	31	76	103	.12103	●
M16	29	34	10	37	.16037	●
M16	29	34	36	63	.16063	●
M16	29	34	56	83	.16083	●
M16	29	34	76	103	.16103	●

- Zwischenadapter für Einschraubfräser siehe Seite 387
- Anzugsbolzen auf Anfrage lieferbar

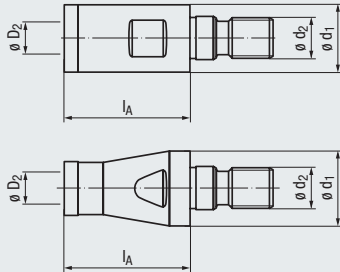
- Intermediate adapters for screw-in end mills, see page 387
- Pull studs on request



- Ab $\varnothing D_2 = M8$ mit innerer
Kühlschmierstoff-Zufuhr

- From dia. $D_2 = M8$ with
internal coolant supply

M6-M16



Product
Finder

Shrink

ER

M

Zubehör
Accessories

Bestell-Code · Order code

6290

$\varnothing D_2$	$\varnothing d_2$	$\varnothing d_1$	l_A	Dimens.- Code		
M 6	M 6	10	30	.060630	●	
M 6	M 6	10	60	.060660	●	
M 8	M 8	13	30	.080830	●	
M 8	M 8	13	60	.080860	●	
M10	M10	18	30	.101030	●	
M10	M10	18	60	.101060	●	
M12	M12	21	50	.121250	●	
M12	M12	21	80	.121280	●	
M16	M16	29	40	.161640	●	
M16	M16	29	90	.161690	●	

Bestell-Code · Order code

6291

$\varnothing D_2$	$\varnothing d_2$	$\varnothing d_1$	l_A	Dimens.- Code		
M 6	M 8	13	25	.060825	●	
M 8	M10	18	30	.081030	●	
M10	M12	21	35	.101235	●	
M12	M16	29	40	.121640	●	



- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör
Accessories

- Innere Kühlschmierstoff-Zufuhr - Internal coolant supply

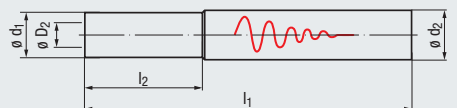
ø10-ø32



Hartmetall · Solid carbide



HSS



Schwingungsgedämpft,
mit Hartmetall-Kern
Special design for reduced
vibration, with carbide core

Hartmetall-Verlängerungen · Solid carbide extensions

Bestell-Code · Order code						6271
ø D ₂	ø d ₂ h6	ø d ₁	l ₂	l ₁	Dimens.- Code	
M 6	10	9,8	28	150	.061015	●
M 6	12	10,8	31	150	.061215	●
M 8	16	14,4	25	200	.081620	●
M10	20	18	41	200	.102020	●
M12	25	22,5	49	250	.122525	●
M16	32	28,6	58	300	.163230	●

HSS-Verlängerungen · HSS extensions

Bestell-Code · Order code						6272
ø D ₂	ø d ₂ h6	ø d ₁	l ₂	l ₁	Dimens.- Code	
M 6	12	11	3	70	.061207	●
M 6	12	11	53	120	.061212	●
M 8	16	14,5	3	70	.081607	●
M 8	16	14,5	53	120	.081612	●
M10	20	18	3	64	.102006	●
M10	20	18	19	90	.102009	●
M10	20	18	60	130	.102013	●
M12	25	22,6	11	81	.122508	●
M12	25	22,6	41	111	.122511	●
M12	25	22,6	110	180	.122518	●
M16	32	29,4	11	103	.163210	●
M16	32	29,4	90	160	.163216	●
M16	32	29,4	108	200	.163220	●

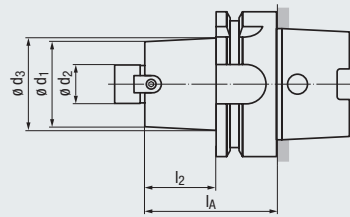


- Kegel-Hohlschaft nach DIN 69893-1
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- Hollow taper shank acc. DIN 69893-1
- Concentricity $\leq 3 \mu\text{m}$

HSK-A

DIN 138

$\leq 3 \mu\text{m}$



Product Finder

Shrink

ER

M

M

Zubehör

Accessories

HSK-A63

Bestell-Code · Order code						6163
ϕd_2	ϕd_1	ϕd_3	l_2	l_A	Dimens.-Code	
22	40	45	24	50	.22050	●
27	50	50	34	60	.27060	●

- Die Fräseranzugsschraube ist im Lieferumfang enthalten
- Kühlschmierstoffrohre und Montageschlüssel siehe Seite 395

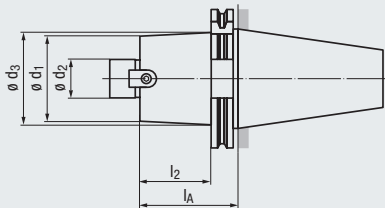
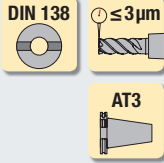
- The cutter clamping screw is included in the delivery
- Coolant tubes and assembly wrenches, see page 395



- Product Finder
- Shrink
- ER
-
- M
-
- Zubehör
Accessories

- Steilkegelschaft nach DIN ISO 7388-1 (vormals DIN 69871)
- ISO taper shank acc. DIN ISO 7388-1 (formerly DIN 69871)
- Kegel in Qualität AT3
- Taper quality AT3
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- Concentricity $\leq 3 \mu\text{m}$

SK (ISO)



SK40						A	
Bestell-Code · Order code						6140	
$\varnothing d_2$	$\varnothing d_1$	$\varnothing d_3$	l_2	l_A	Dimens.-Code		
22	40	50	35,9	55	.22055	●	
22	40	50	80,9	100	.22100	●	
27	50	50	40,9	60	.27060	●	
27	50	50	80,9	100	.27100	●	

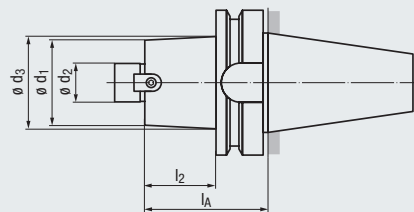
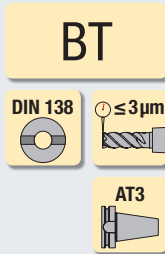
SK50						A	
Bestell-Code · Order code						6150	
$\varnothing d_2$	$\varnothing d_1$	$\varnothing d_3$	l_2	l_A	Dimens.-Code		
22	40	50	55,9	75	.22075	●	
22	40	50	105,9	125	.22125	●	
27	50	65	55,9	75	.27075	●	
27	50	65	105,9	125	.27125	●	
32	78	80	55,9	75	.32075	●	
32	78	80	105,9	125	.32125	●	
40	90	90	55,9	75	.40075	●	
40	90	90	105,9	125	.40125	●	

- Die Fräseranzugsschraube ist im Lieferumfang enthalten
- Anzugsbolzen siehe Seite 396

- The cutter clamping screw is included in the delivery
- Pull studs, see page 396



- Steilkegelschaft nach DIN ISO 7388-2 (vormals JIS B 6339/MAS 403 BT)
- Kegel in Qualität AT3
- Rundlaufabweichung $\leq 3 \mu\text{m}$
- ISO taper shank acc. DIN ISO 7388-2 (formerly JIS B 6339/MAS 403 BT)
- Taper quality AT3
- Concentricity $\leq 3 \mu\text{m}$



- Product Finder
- Shrink
- ER
- M
- Zubehör Accessories

BT40

J

Bestell-Code · Order code

6170

$\varnothing d_2$	$\varnothing d_1$	$\varnothing d_3$	l_2	l_A	Dimens.-Code		
22	40	40	28	55	.22055	●	
22	40	40	73	100	.22100	●	
27	50	50	33	60	.27060	●	
27	50	50	73	100	.27100	●	

- Die Fräseranzugsschraube ist im Lieferumfang enthalten
- Anzugsbolzen auf Anfrage lieferbar

- The cutter clamping screw is included in the delivery
- Pull studs on request



- Product Finder
- Shrink
- ER
- M
- Zubehör Accessories

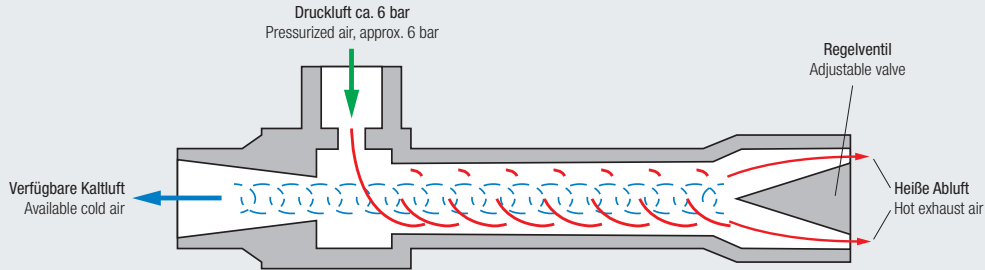
Durch die Verwendung von gekühlter Luft wird die Temperatur im Schneidenbereich herabgesetzt, wodurch höhere Schnittgeschwindigkeiten und Standzeiten erreicht werden können. Moderne Beschichtungen können durch diese Art der Kühlung erst alle Vorteile ausspielen, da eine Schädigung der Schneide durch Thermoschock vermieden wird.

Darüber hinaus werden die beim Kopierfräsen anfallenden sehr leichten Späne auch aus tiefen Aussparungen oder Kavitäten mit Hilfe der Kaltluftdüse entfernt. Die Wirkungsweise der Kaltluftdüse basiert auf dem Prinzip des Wirbelrohrs, in dem zwei gegenläufige, rotierende Luftströme (ohne bewegte Teile) erzeugt werden. An einem Ende tritt die innere Strömung als nutzbare Kaltluft mit bis zu -40 °C aus. Der Anschluss erfolgt über einen Druckluftanschluss.

Cooled air reduces temperatures in the cutting area, which in turn permits higher cutting speeds and longer tool life. This type of cooling enables modern coatings to achieve their full potential, as damage to the cutting edge resulting from thermal shock is avoided.

Moreover, the cold-air nozzle helps to remove the tiny chips produced in copy milling even from deep recesses or cavities.

The function of the cold-air nozzle is based on the principle of the vortex tube, in which two opposed, rotating air streams are generated (without any moving parts). The internal air stream exits from one end, in the form of useable cold air with a temperature as low as -40 °C. All that is required is a normal pressurized air connection.



Temperatur gemessen am effektiven Austritt des Wirbelrohrs (nicht Düsenende)
Temperature, measured at the effective exit of the vortex tube (not the end of the nozzle)

Zuluft-Druck Supply air pressure bar	Temperatur der Nutzluft in °C bei einem Kaltluftanteil von Temperature of usable air in °C, with a cold air percentage of		
	25%	50%	75%
3	-31	-22	- 6
4	-35	-35	- 8
5	-39	-28	-10
6	-42	-31	-11
7	-46	-34	-13

Luftverbrauch bei Eingangstemperatur von 21 °C
Air consumption, with supply air temperature of 21 °C

Eingangsdruck Input pressure bar	Luftverbrauch Air consumption	Kapazität Capacity
6,9	7,08 l/s \cong 25,5 m ³ /h	226 kcal/h \cong 263 W

Anwendungsbeispiel: Standzeiterhöhung durch den Einsatz der Kaltluftdüse

Werkstück: Formeinsatz gehärtet, Material 1.2343 (X38CrMoV5-1) mit 46-48 HRC
Bearbeitung: Schruppen des Formeinsatzes
Werkzeug: Time-S-Cut Einschraub-Fräskörper 9130.350524 (Seite 218) mit Wendeschneidplatten 9585A.08015 (Seite 216)
Schnittwerte: $v_c = 150 \text{ m/min} \cdot n = 1364 \text{ min}^{-1}$
 $f_z = 1,11 \text{ mm} \cdot v_f = 6057 \text{ mm/min}$
 $a_p = 0,4 \text{ mm} \cdot a_e = 20 \text{ mm}$

Standzeit ohne Kühlung	Standzeit mit Kaltluftdüse
50 Minuten	68 Minuten

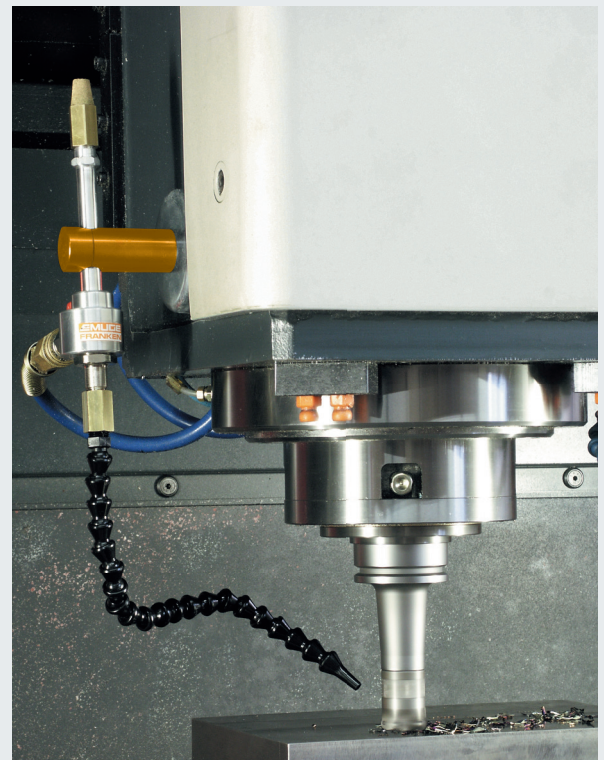
Durch den Einsatz der Kaltluftdüse konnte die Standzeit um 36% erhöht werden.

Application example: Increased tool life using the cold-air nozzle

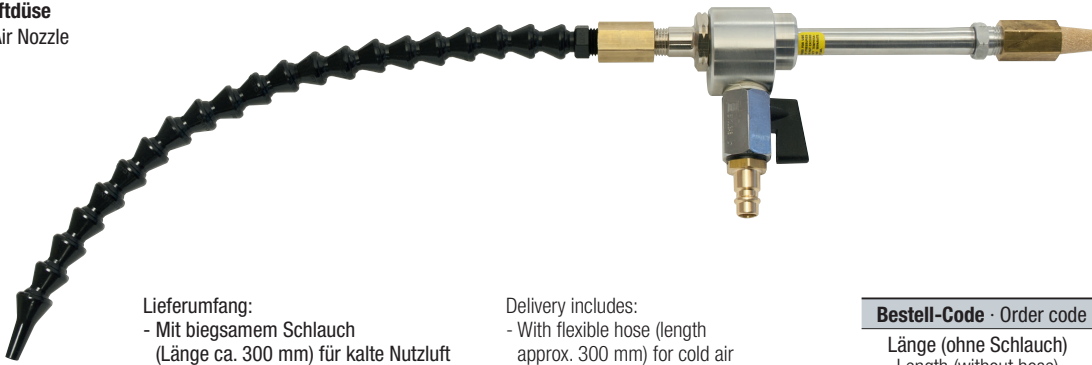
Workpiece: Hardened mould, material hot work tool steel 1.2343 (X38CrMoV5-1) with 46-48 HRC
Operation: Roughing the mould
Tool: Time-S-Cut screw-in end mill 9130.350524 (page 218) with inserts 9585A.08015 (page 216)
Cutting conditions: $v_c = 150 \text{ m/min} \cdot n = 1364 \text{ rpm}$
 $f_z = 1,11 \text{ mm} \cdot v_f = 6057 \text{ mm/min}$
 $a_p = 0,4 \text{ mm} \cdot a_e = 20 \text{ mm}$

Tool life without coolant	Tool life with cold-air nozzle
50 minutes	68 minutes

By using the cold-air nozzle, it was possible to increase the tool life by 36%.



Kaltluftdüse
Cold-Air Nozzle



Lieferumfang:
- Mit biegsamem Schlauch
(Länge ca. 300 mm) für kalte Nutzluft
- Schalldämpfer (SN14) für heiße Abluft
- Kugelhahn mit Anschlussstück (ST 1/4)
für Zuluftschlauch (NW6)
mit Schnellwechselkupplung (NW7.2)

Delivery includes:
- With flexible hose (length
approx. 300 mm) for cold air
- Silencer (SN14) for hot exhaust air
- Ball-valve with fitting (1/4") for inlet
hose (6 mm) with quick-change
attachment (7.2 mm)

Bestell-Code · Order code		6910
Länge (ohne Schlauch) Length (without hose)	Dimens.- Code	
225 mm	.15	●

Ersatzschlauch
Spare Hose



Bestell-Code · Order code		6910
Länge Length	Dimens.- Code	
≈ 300 mm	.20	●
≈ 400 mm	.22	●
≈ 500 mm	.21	●

Halterungen für die Kaltluftdüse
Holders for the Cold-Air Nozzle



Klemmarm mit Grundhalter
Socket with basic holder



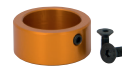
Klemmarm mit Magnethalter
Socket with magnetic shoe



Klemmarm
Socket



Grundhalter für Klemmarm
Basic holder for socket



Magnethalter für Klemmarm
Magnetic shoe for socket



Bestell-Code · Order code		6910			
Abmaße Dimensions	Dimens.- Code				
ø 45 x 68 mm	.24	●			
ø 80 x 80 mm	.25		●		
ø 80 x 17 mm	.26				●
ø 32 x 63 mm	.27			●	
ø 45 x 20 mm	.32			●	



Product Finder

Shrink

ER

M

Zubehör Accessories

Product Finder

Shrink

ER

M

Zubehör

Accessories

Kaltluftdüsen-Anbausset Cold-Air Nozzle Attachment Set

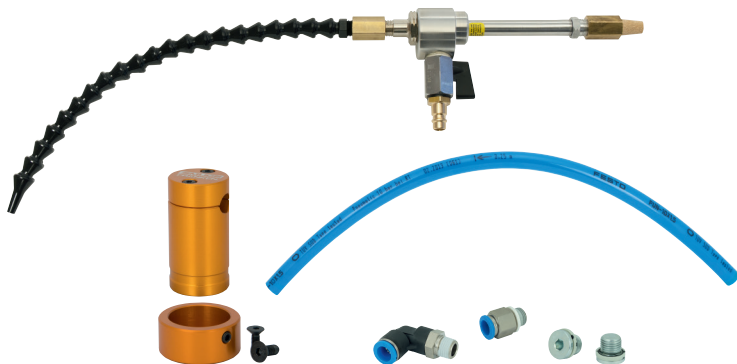


Bestell-Code · Order code		6910
	Dimens.-Code	
	.12	●

- Lieferumfang:
- 1 x Klemmarm mit Grundhalter (Art.-Nr.: 6910.24)
 - 1 x Anschlussschlauch 300 mm
 - 1 x Winkel-Verschraubung G 1/4
 - 1 x Verschraubung G 1/4
 - 2 x Blindstopfen G 1/4

- Delivery includes:
- 1 x Socket with basic holder (art. No. 6910.24)
 - 1 x Connecting hose 300 mm
 - 1 x Elbow coupling G 1/4
 - 1 x Screw G 1/4
 - 2 x Sealing plugs G 1/4

Kaltluftdüsen-Montageset 1 Cold-Air Nozzle Assembly Set 1



Bestehend aus 1 Kaltluftdüse (Art.-Nr.: 6910.15) und 1 Kaltluftdüsen-Anbausset (Art.-Nr.: 6910.12)
Consists of 1 cold-air nozzle (art. no. 6910.15) and 1 cold-air nozzle attachment set (art. no. 6910.12)

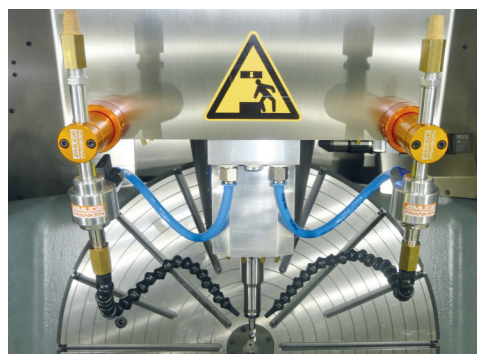


Bestell-Code · Order code		6910
	Dimens.-Code	
	.11	●

Kaltluftdüsen-Montageset 2 Cold-Air Nozzle Assembly Set 2



Bestehend aus 2 Kaltluftdüsen (Art.-Nr.: 6910.15) und 2 Kaltluftdüsen-Anbausets (Art.-Nr.: 6910.12)
Consists of 2 cold-air nozzles (art. no. 6910.15) and 2 cold-air nozzle attachment sets (art. no. 6910.12)

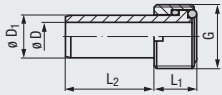


Bestell-Code · Order code		6910
	Dimens.-Code	
	.10	●

- Kühlschmierstoffrohre für Kegel-Hohlschäfte
HSK-A nach DIN 69893-1

- Coolant tubes for HSK-A shanks
according to DIN 69893-1

DIN 69895



Bestell-Code · Order code

6690

für Schaftgröße
for shank size

	$\varnothing D$	$\varnothing D_1$	L_1	L_2	G	Dimens.- Code	
HSK-A32	3,5	6	6	20	M10x1	.032	●
HSK-A40	5	8	8	21,5	M12x1	.040	●
HSK-A50	6,4	10	10	23	M16x1	.050	●
HSK-A63	8	12	12	24,5	M18x1	.063	●
HSK-A80	10	14	14	26	M20x1,5	.080	●
HSK-A100	12	16	16	28	M24x1,5	.100	●

Product
Finder

Shrink

ER

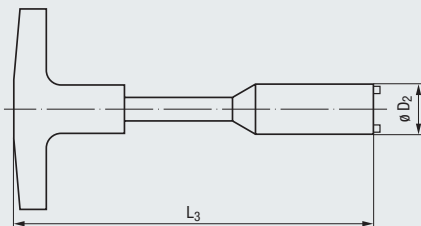
M

M

Zubehör
Accessories

- Montageschlüssel für Kühlschmierstoffrohre

- Assembly wrenches for coolant tubes



Bestell-Code · Order code

6691

für Schaftgröße
for shank size

	$\varnothing D_2$	L_3	Dimens.- Code	
HSK-A32	9	107	.032	●
HSK-A40	11	111	.040	●
HSK-A50	15	120	.050	●
HSK-A63	17	122	.063	●
HSK-A80	18,5	126	.080	●
HSK-A100	22	141	.100	●

**Verwendung von Kühlschmierstoffrohren mit Kegel-Hohlschäften
HSK-A nach DIN 69893-1**

Das Kühlschmierstoffrohr wird benötigt, um die innere Kühlschmierstoff-Zufuhr von der Maschinenspindel an den HSK-Schaft zu übergeben.

Hinweis:

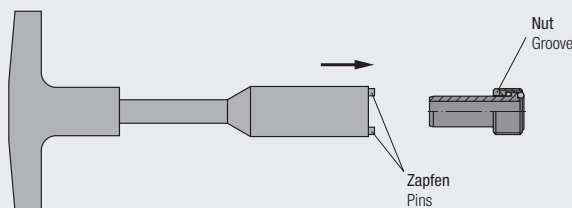
Es wird empfohlen, auch bei Verwendung von Aufnahmen ohne innere Kühlschmierstoff-Zufuhr das Kühlschmierstoffrohr in den HSK-Schaft einzuschrauben, um bei unbeabsichtigtem Einschalten der inneren Kühlschmierstoff-Zufuhr Beschädigungen im HSK-Spannsystem zu verhindern.

Benötigtes Werkzeug:

Montageschlüssel, Größe entsprechend Schaftgröße wählen.

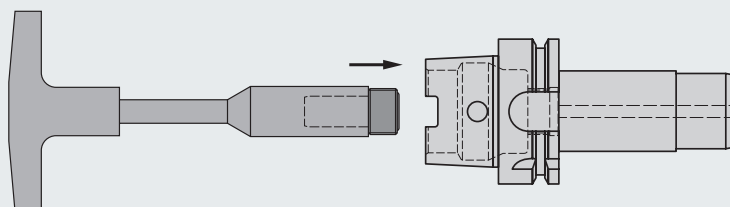
Montage des Kühlschmierstoffrohrs im HSK-Schaft

1. Montageschlüssel auf das Kühlschmierstoffrohr stecken.
Wichtig: Auf die Stellung der Zapfen zu den Nuten achten!



2. Kühlschmierstoffrohr in den Schaft einschrauben.

2. Screw coolant tube into the shank.



**Use of coolant tubes with hollow taper shanks
HSK-A according to DIN 69893-1**

The coolant tube is necessary for connecting the internal coolant supply of the machine spindle with the hollow taper shank of the holder.

Please note:

We recommend screwing the coolant tube into the hollow taper shank even when tap holders without internal coolant supply are used; this prevents damage to the hollow taper shank clamping system in case the internal coolant supply should be switched on unintentionally.

Required tool:

Assembly wrench, choose appropriate size for your shank.

Assembly of the coolant tube in the hollow taper (HSK) shank

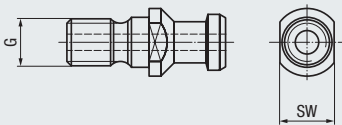
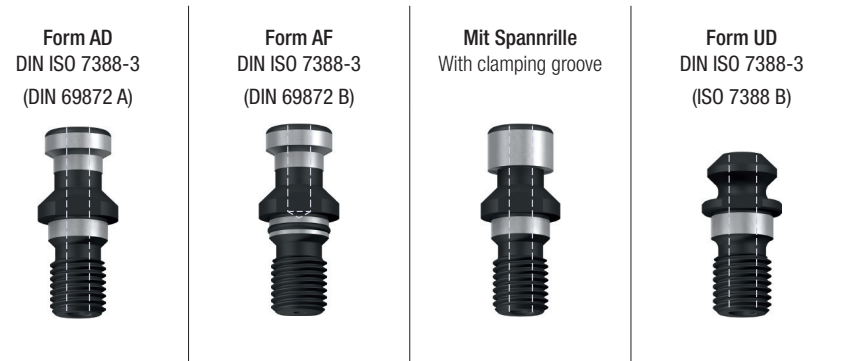
1. Apply the assembly wrench to the coolant tube.
Important: Watch the position of the pins in relation to the grooves.



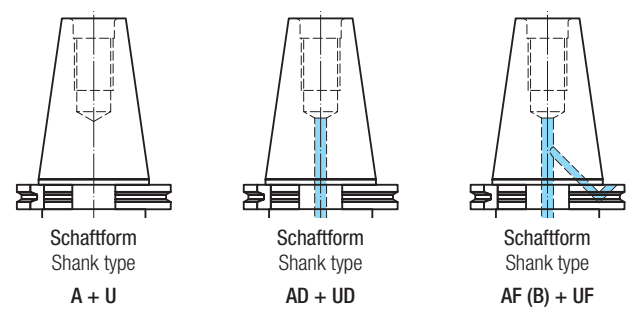
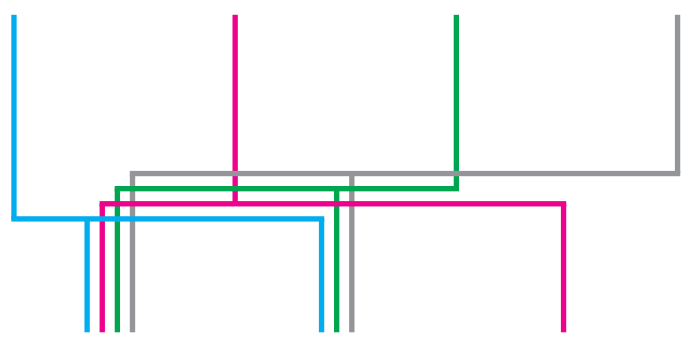
- Product Finder
- Shrink
- ER
- M

- Für Steilkegelschäfte nach DIN ISO 7388-1 (vormals DIN 69871)

- For ISO taper shanks acc. DIN ISO 7388-1 (formerly DIN 69871)

Bestell-Code · Order code				6650	6651	6652	6654
Für Schaftgröße For shank size	G	SW	Dimens.- Code				
SK40	M16	19	.40	•	•	•	•
SK50	M24	30	.50	•	•	•	•



FRANKEN Beschreibung der Symbole · Description of the symbols

Beispiele · **Constructural length**

Die entsprechende Bauteile sind als hervorgehoben. The relevant length of elements is highlighted in grey.

Die entsprechende Bauteile sind als hervorgehoben. The relevant length of elements is highlighted in grey.

Die entsprechende Bauteile sind als hervorgehoben. The relevant length of elements is highlighted in grey.

Schaftschliffung · **Shank design**

Die auf der jeweiligen Seite beschriebenen Schaftschliffungen sind genau vertikal. The shank design is to be made at an exact 90° angle.

Schaftschliffung für mechanische Werkzeuge Shank design for metric tools

Schaftschliffung für hochdruckwerkzeuge Shank design for high tools

Einsatzdatenberechnung · **Shrink-in thread**

Die Einsatzdaten dieser Präzision sind entsprechend den Normen zu berechnen. The data in this table of data are to be calculated according to the standards.

Bohrungsanfertigung · **Bore design**

Zylindrische Bohrung Straight bore

Zylindrische Bohrung mit Längsloch Straight bore with axial hole

Zylindrische Bohrung mit Querschnitt Straight bore with angled cut

Zylindrische Bohrung mit Längs- und Querschnitt Straight bore with axial & hole

Drahtwinkel · **Helix angle**

Der Drahtwinkel ist in Abhängigkeit von der Drehzahl und der Schnittgeschwindigkeit zu berechnen. The helix angle is to be calculated in dependence of the speed and the cutting speed.

Spannvorrichtung · **Chip breaker**

Die Spannvorrichtung ist in Abhängigkeit von der Drehzahl und der Schnittgeschwindigkeit zu berechnen. The chip breaker is to be calculated in dependence of the speed and the cutting speed.

Metrisch ansteigender Spannsystem · **Threaded cone diameter**

Zur Erhöhung der Spannsystemtiefe und -stabilität sind die Spannsysteme mit Metrisch ansteigendem Spannsystem zu verwenden. To increase the depth of the tool and to ensure stable operation, the threaded cone diameter should be used.

FRANKEN Bestell-Code-Verzeichnis · Index of Order Codes										FRANKEN Bestell-Code-Verzeichnis · Index of Order Codes																		
1000 - 1999	2000 - 2999	3000 - 3999	4000 - 4999	5000 - 5999	6000 - 6999	7000 - 7999	8000 - 8999	9000 - 9999	10000 - 10999	11000 - 11999	12000 - 12999	13000 - 13999	14000 - 14999	15000 - 15999	16000 - 16999	17000 - 17999	18000 - 18999	19000 - 19999	20000 - 20999	21000 - 21999	22000 - 22999	23000 - 23999	24000 - 24999	25000 - 25999	26000 - 26999	27000 - 27999	28000 - 28999	29000 - 29999

Zylinderschäfte · Straight Shanks

FRANKEN

Einzel-Zylinderschaft · **Single Shank**

DN 6330 16 · **DN 1623 A**

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 20 mm. For HSC-coated drills with a cutting diameter from 2 mm to 20 mm.

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 63 mm. For HSC-coated drills with a cutting diameter from 2 mm to 63 mm.

Zylinderschaft mit einer vertikalen Wirtschliffung · **Straight shank with one vertical broaching**

DN 6330 16 · **DN 1623 B**

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 20 mm. For HSC-coated drills with a cutting diameter from 2 mm to 20 mm.

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 63 mm. For HSC-coated drills with a cutting diameter from 2 mm to 63 mm.

Zylinderschaft mit zwei vertikalen Wirtschliffungen · **Straight shank with two vertical broaching**

DN 6330 16 · **DN 1623 C**

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 20 mm. For HSC-coated drills with a cutting diameter from 2 mm to 20 mm.

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 63 mm. For HSC-coated drills with a cutting diameter from 2 mm to 63 mm.

Zylinderschaft mit Auszugsbohrung · **Straight shank with pull-out production**

HAFC-ADAPT™

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 20 mm. For HSC-coated drills with a cutting diameter from 2 mm to 20 mm.

Für HSC-Schichtbohrer mit einem Schneidenmesser von 2 mm bis 63 mm. For HSC-coated drills with a cutting diameter from 2 mm to 63 mm.

Minimale von SAFE-LOCK™-Spannsystem siehe Seite 415. Minimum of SAFE-LOCK™ clamping system see page 415.

Allgemeine Informationen General Information








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





	<h3>Baulänge</h3> <p>Die entsprechende Baulänge ist rot hervorgehoben. Alternativ-Baulängen des gleichen Typs sind grau unterlegt. Nicht gekennzeichnete Baulängen sind im Lieferprogramm nicht enthalten.</p>	<h3>Constructional length</h3> <p>The relevant length is marked in red. Alternative lengths of the same type are marked in grey. Lengths without any marking are not available as catalogue products.</p>
	<h3>Schaftausführung</h3> <p>Die auf der jeweiligen Seite befindlichen Schaftausführungen sind grau unterlegt.</p> <p>Schaftausführung für metrische Werkzeuge</p> <p>Schaftausführung für Inch-Werkzeuge</p>	<h3>Shank design</h3> <p>The shank designs to be found on the respective page are marked in grey.</p> <p>Shank design for metric tools</p> <p>Shank design for inch tools</p>
	<h3>Einschraubgewinde</h3> <p>Das Einschraubgewinde dieser Fräser ist kompatibel zu marktüblichen Einschraub-Aufnahmen und Adaptern.</p>	<h3>Screw-in thread</h3> <p>The screw-in thread of these end mills is compatible with commercially available screw-in holders and adapters.</p>
	<h3>Bohrungsausführung</h3> <p>Zylindrische Bohrung</p> <p>Zylindrische Bohrung mit Längsnut</p> <p>Zylindrische Bohrung mit Quernut</p> <p>Zylindrische Bohrung mit Längs- und Quernut</p>	<h3>Bore design</h3> <p>Straight bore</p> <p>Straight bore with standard keyway</p> <p>Straight bore with driving slot</p> <p>Straight bore with standard keyway and driving slot</p>
	<h3>Drallwinkel</h3> <p>Angegeben ist der Drallwinkel dieser Werkzeuge. Bei unterschiedlichen Drallwinkeln sind alle Winkel aufgeführt.</p>	<h3>Helix angle</h3> <p>The helix angle of these tools is shown. If there are variable helix angles, these are all shown.</p>
	<h3>Spanteiler</h3> <p>Je nach Form (z.B. rund oder flach) und Größe (grob, mittel, fein) der Spanteiler erzeugen diese Fräser entsprechende Oberflächenmarkierungen.</p>	<h3>Chip breaker</h3> <p>Depending on form (e.g. round or flat) and size (coarse, medium, fine) of the chip breakers these end mills generate appropriate milling marks.</p>
	<h3>Konisch ansteigender Spannutengrund</h3> <p>Zur Erhöhung der Werkzeugsteifigkeit und Reduzierung der radialen Abdrängung.</p>	<h3>Tapered core diameter</h3> <p>To increase the rigidity of the tool and to reduce radial deflection.</p>










	Schneidstoff	Cutting material
	Hartmetall	Solid carbide
 	Hochleistungs-Schnellarbeitsstahl	High speed steel
	Pulvermetallurgischer Hochleistungs-Schnellarbeitsstahl	Powder metal high speed steel
	Neuentwickelter pulvermetallurgischer Hochleistungs-Schnellarbeitsstahl	Newly developed powder metal high speed steel
	Kubisches Bornitrid	Cubic boron nitride
	Polykristalliner Diamant	Polycrystalline diamond


	Schnittwerte	Cutting conditions
	Die Schnittwerte und Einsatzparameter für diese Werkzeuge sind auf der im Symbol angegebenen Seite zu finden.	The cutting conditions and work parameters for these tools can be found on the page indicated in the symbol.

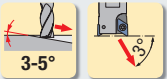
	Schneideckenausführung und Stirnkontur	Cutting edge design and face geometry
	Scharfkantig	Sharp-edged
 	Schutzeckenfase (Kantenbruch)	Bevelled edge
	Eckenradius	Corner radius
	Im CAM zu programmierender Radius	Radius to be programmed in CAM
	Kugel (Vollradius)	Ball nose
	Torus	Torus
	Lollipop	Lollipop
 	Diese Werkzeuge erzeugen einen vollständigen Viertel- bzw. Halbkreis	These tools generate a complete quarter circle or full radius



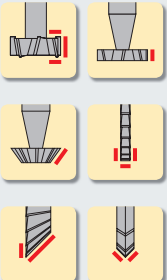
	Innere Kühlschmierstoff-Zufuhr	Internal coolant supply
	ICA = Kühlschmierstoffaustritt axial	ICA = Internal coolant supply, axial exit
	ICR = Kühlschmierstoffaustritt radial	ICR = Internal coolant supply, radial exit
	ICRA = Kühlschmierstoffaustritt radial und axial	ICRA = Internal coolant supply, radial and axial exit

	Kühlung und Schmierung	Coolant and lubrication
	Trockenbearbeitung	Dry machining
	Kaltluftdüse	Cold-air nozzle
	Minimalmengenschmierung (MMS)	Minimum-quantity lubrication (MQL)
	Emulsion	Emulsion

	Vorschubrichtung	Feed direction
	Die roten Pfeile beschreiben die empfohlenen Vorschubrichtungen der abgebildeten Fräser.	The red arrows mark the recommended feed directions of the respective cutters.

	Rampenwinkel	Ramping angle
	Der Rampenwinkel ist der empfohlene Winkel beim Eintauchen in das Werkstück.	The specified angle is the recommended angle for ramping applications.

	Hartfräsen	Hard milling
	Diese Werkzeuge sind zum Hartfräsen geeignet. Angegeben ist der Härtebereich oder die maximale Härte des zu bearbeitenden Materials in Rockwell (HRC).	These tools are suitable for hard milling. The hardness range or the maximum hardness of the material to be machined is indicated in Rockwell (HRC).

	Schneidender Bereich	Cutting areas of tool
	Der schneidende Bereich dieser Werkzeuge ist rot markiert.	The cutting areas of these tools are marked in red.





Maximal zulässige Drehzahl

Die max. zulässige Drehzahl des Fräskörpers in Verbindung mit Wendeschneidplatten ist ein Sicherheitswert und darf keinesfalls überschritten werden.

Dieser Wert ist keine Schnittwertangabe!

Maximum permissible revolution

The maximum permissible revolution of an indexable milling cutter is a safety value and must not be exceeded.

Do not use this value as cutting condition recommendation!



Wechselgenauigkeit

Hohe Wechselgenauigkeit der Wechselschneidplatten durch V-Klemmung.

Exchange precision

High exchange precision of the inserts due to V-clamping.



Spannsysteme

Aufnahmen mit ER-Spannzangen



Aufnahmen zum Einschrumpfen



Aufnahmen für Schäfte mit seitlicher Mitnahmefläche



Aufnahmen für Einschraubfräser



Aufnahmen für Aufsteckfräser

Clamping systems

Chucks with ER collets

Shrink-fit chucks

Holders for shanks with side lock-clamping

Holders for screw-in end mills

Holders for shell-type milling cutters



Rundlaufgenauigkeit

Die angegebene Rundlaufgenauigkeit wird bei einer maximalen Auskraglänge von 3 x D gemessen.

Concentricity

The indicated concentricity is specified for a projection length of 3 x dia.



Verstellweg

Mittels einer Stellschraube kann die Auskraglänge des zu spannenden Werkzeuges bei Bedarf nachjustiert werden.

Adjusting range

The projection length of the tool can be adjusted as necessary using the adjusting screw.



Wuchtgüte

Angegeben ist die Wuchtgüte bei der beim Wuchten verwendeten Drehzahl.

Balance quality

The balance quality stated is valid for the indicated revolution.





Multi-Cut-Fräser wurden gezielt für das Hochleistungsschruppen entwickelt. Durch die ungleiche Teilung in Verbindung mit dem NR-Profil werden Schwingungen und Schnittkräfte minimiert.

Besonderheiten:

- Ungleiche Teilung
- Stabilisierte Schneidkante
- Hochleistungs-Beschichtung
- Optional mit innerer Kühlschmierstoff-Zufuhr mit axialem Austritt (ICA)

Hauptmerkmal:

Prozesssichere Schrubbearbeitung.

DUPLEX

Der Begriff DUPLEX kennzeichnet Kombinationswerkzeuge für das Hochleistungsfräsen (HPC) und das Hochvorschubfräsen (HFC). Die Umfangsschneiden besitzen eine HPC-Geometrie und die Stirnschneiden eine Hochvorschubgeometrie, welche bei geringer axialer Zustellung sehr hohe Zahnvorschübe ermöglicht.

Verfügbare Werkzeuge:

- Hartmetall-Schaftfräser
- Hartmetall-Schaftfräser mit Eckenradius
- Hartmetall-Kugelfräser

Multi-Cut end mills were developed in particular for high-performance roughing operations. Due to variable spacing of flutes combined with the NR profile vibrations and cutting forces are minimised.

Characteristics:

- Variable spacing
- Stabilised cutting edge
- High-performance coating
- Optionally available with internal coolant supply, axial exit (ICA)

Main feature:

Process-reliable roughing.

DUPLEX

The term DUPLEX refers to combination tools for high-performance cutting (HPC) and high-feed cutting (HFC). The peripheral cutting edges are fitted with an HPC geometry, the face cutting edges with high-feed geometry which allow very high feed rates at a low depth of cut.

Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius
- Solid carbide ball nose end mills



Die TiNox-Cut-Serie wurde eigens für die Bearbeitung von Titan-Legierungen, Nickel-basis-Legierungen und rostfreien Stählen entwickelt. Die Baureihen umfassen sowohl Hartmetall- als auch HSS-PM-Schaftfräser. Für die Schlichtbearbeitung dieser schwer zerspanbaren Werkstoffe stehen lange Schlichtfräser mit einem Schneidlängen/Durchmesser-Verhältnis von max. 4:1 zur Verfügung.

Besonderheiten:

- Ungleiche Teilung
- Hochwarmfeste Beschichtung
- Schrupp- und Schruppschlicht-Profile verfügbar
- Optional mit innerer Kühlschmierstoff-Zufuhr mit axialem Austritt (ICA) oder radialem und axialem Austritt (ICRA)

Hauptmerkmal:

Bearbeitung schwer zerspanbarer Materialien.

Verfügbare Werkzeuge:

- Hartmetall-Schaftfräser
- Hartmetall-Schaftfräser mit Eckenradius
- HSS-Schaftfräser mit Eckenradius

The TiNox-Cut series was especially developed for machining titanium alloys, nickel base alloys and stainless steel. This product range consists of both solid carbide and HSS-PM end mills. Long finisher with a flute length/diameter ratio of max. 4:1 are available for finishing of these difficult to cut materials.

Characteristics:

- Variable spacing
- High heat-resistant coating
- Roughing and semi-finishing profiles are available
- Optionally available with internal coolant supply, axial exit (ICA) or radial and axial exit (ICRA)

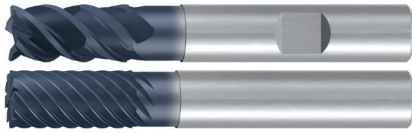
Main feature:

Machining of difficult to cut materials.

Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius
- HSS end mills with corner radius




FRANKEN
Jet-Cut

Die Jet-Cut-Serie wurde speziell für die HPC- bzw. HSC-Bearbeitung entwickelt. Für HPC-Bearbeitungen sind 3 Ausführungen mit unterschiedlichen Spanwinkeln (-10°, 0° und +10°) vorhanden.

Im HSC-Bereich wird durch hohe Schneidzahlen am Werkzeug der maximale Vorschub bei bester Oberflächengüte erreicht.

HPC-Besonderheiten:

- Ungleiche Teilung
- Vergrößerter Spanraum
- Hochleistungs-Beschichtung
- Radiale Spanformer

HSC-Besonderheiten:

- Schneidzahl gleich
Schneidendurchmesser
- Hochleistungs-Beschichtung
- Verschleißfestes Hartmetall-Substrat

Hauptmerkmal:

Hohes Zeitspanvolumen bei bester Oberflächengüte.

DUPLEX

Der Begriff DUPLEX kennzeichnet Kombinationswerkzeuge für das Hochleistungsfräsen (HPC) und das Hochvorschubfräsen (HFC).

Die Umfangsschneiden besitzen eine HPC-Geometrie und die Stirnschneiden eine Hochvorschubgeometrie, welche bei geringer axialer Zustellung sehr hohe Zahnvorschübe ermöglicht.

Verfügbare Werkzeuge:

- Hartmetall-Schafffräser
- Hartmetall-Schafffräser mit Eckenradius

The Jet-Cut series was particularly developed for HPC respectively HSC machining. The HPC area is covered by 3 product ranges with different rake angles (-10°, 0° and +10°).

Due to a high number of flutes on the HSC tool both the maximum feed rate and the best possible surface quality can be achieved.

HPC characteristics:

- Variable spacing
- Enlarged chip gashes
- High-performance coating
- Radial chip formers

HSC characteristics:

- Number of flutes equal
to cutting diameter
- High performance coating
- Wear-resistant carbide substrate

Main feature:

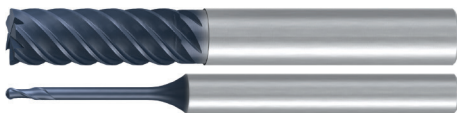
High metal removal rate combined with the best possible surface quality.

DUPLEX

The term DUPLEX refers to combination tools for high-performance cutting (HPC) and high-feed cutting (HFC). The peripheral cutting edges are fitted with an HPC geometry, the face cutting edges with high-feed geometry which allow very high feed rates at a low depth of cut.

Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius


FRANKEN
Hard-Cut

Die Hard-Cut-Serie wurde gezielt für die Bearbeitung von gehärteten Werkstoffen entwickelt. Ein sehr verschleißfestes Hartmetall in Verbindung mit geeigneten PVD-Schichten machen Hard-Cut-Fräser zu Spezialisten für die Anforderungen beim Hartfräsen.

Für den Formen- und Gesenkbau stehen Kugel- und Torusfräser mit sehr engen Schneiden- und Radius-Toleranzen zur Verfügung.

Besonderheiten:

- Ungleiche Teilung
- Hohe Zahnzahlen ermöglichen hohe Vorschubgeschwindigkeiten
- Hochleistungs-Beschichtung
- Stabiles Design durch erhöhten Kerndurchmesser

Hauptmerkmal:

Bearbeitung harter Materialien bis 66 HRC.

Hinweis:

Zur effektiven Kühlung beim Hartfräsen steht die Kaltluftdüse zur Verfügung.

Verfügbare Werkzeuge:

- Hartmetall-Schafffräser
- Hartmetall-Schafffräser mit Eckenradius
- Hartmetall-Kugelfräser
- Hartmetall-Torusfräser

The Hard-Cut series was specifically developed for machining hardened materials. The Hard-Cut end mill is the specialist for the requirements of hard milling due to a very high wear-resistant carbide substrate combined with a suitable PVD coating.

Ball nose end mills and torus end mills with very tight tolerances are available for the die and mould industry.

Characteristics:

- Variable spacing
- High number of flutes enable high feed rates
- High-performance coating
- Stable design due to large core diameter

Main feature:

Machining hard materials up to 66 HRC.

Note:

The cold-air nozzle provides effective cooling in hard milling.

Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius
- Solid carbide ball nose end mills
- Solid carbide torus end mills





FRANKEN
Alu-Cut

Die Alu-Cut-Serie besteht aus Hartmetall- und HSS-Werkzeugen, die gezielt für die prozesssichere Volumenzerspanung von Aluminium-Knetlegierungen bis 5% Siliziumgehalt entwickelt wurden.

Werkstoffe mit höherem Siliziumgehalt sollten ausschließlich mit beschichteten Werkzeugen bearbeitet werden.

Besonderheiten:

- Ungleiche Teilung
- Schruppverzahnung mit grobem WR-Profil
- Spezielle Geometrie zur Aluminium-Bearbeitung
- Optional mit innerer Kühlschmierstoff-Zufuhr mit radialem und axialem Austritt (ICRA)

Hauptmerkmal:

Hohes Zeitspanvolumen.

Verfügbare Werkzeuge:

- Hartmetall-Schaftfräser
- Hartmetall-Schaftfräser mit Eckenradius
- Hartmetall-Kugelfräser
- Hartmetall-Torusfräser
- HSS-Schaftfräser mit Eckenradius

The Alu-Cut series includes tools made from solid carbide and HSS particularly developed for the process-reliable volume machining of wrought aluminum alloys with up to 5% silicon content. Materials with higher silicon content should preferably be machined with coated tools.

Characteristics:

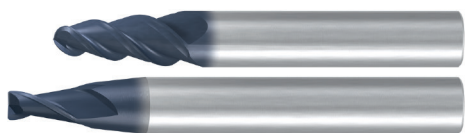
- Variable spacing
- Available with WR profile for roughing
- Special geometry for machining aluminum
- Optionally available with internal coolant supply, radial and axial exit (ICRA)

Main feature:

Highest metal removal rate.

Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius
- Solid carbide ball nose end mills
- Solid carbide torus end mills
- HSS end mills with corner radius



FRANKEN
Turbine

Turbine-Fräser wurden für die Herausforderungen hinsichtlich der Materialien und Bauteilformen in der Luftfahrt- und Turbinenindustrie entwickelt und besitzen eine speziell darauf abgestimmte Geometrie. Darüber hinaus können diese Fräser auch im Formen- und Werkzeugbau z.B. zur Bearbeitung von Reifenformen eingesetzt werden.

Besonderheiten:

- Stabiles Design durch konische Ausführung
- Neu entwickelte Geometrie zur Aluminium-Bearbeitung
- Hochwarmfeste Beschichtung
- Schrupp- und Schruppschlicht-Profile verfügbar

Hauptmerkmal:

Bearbeitung geometrisch komplexer Bauteile.

Verfügbare Werkzeuge:

- Konische Hartmetall-Kugelfräser
- Konische Hartmetall-Torusfräser

Turbine tools with specially tailored geometry were developed for the requirements of materials and component designs in the aircraft and turbine industry. In addition these tools can be used in the die and mould industry as well, for example for machining tyre moulds.

Characteristics:

- Stable design due to taper design
- Newly developed geometry for machining aluminum
- Highly heat-resistant coating
- Roughing and semi-finishing profiles available

Main feature:

Machining components with complex geometry.

Available tools:

- Tapered solid carbide ball nose end mills
- Tapered solid carbide torus end mills




FRANKEN
Micro

Micro-Fräser sind durch verschiedene Aspektverhältnisse universell in den Bereichen wie Werkzeug- und Formenbau, Modellbau sowie der Dental- und Medizintechnik einsetzbar. Tiefe Nuten und Kavitäten können problemlos bearbeitet werden. Die Werkzeuge sind erhältlich in den Schneidstoffen Hartmetall und CBN.

Besonderheiten:

- Patentierte Halsausführung
- Kurzes, stabiles Schneidenteil
- Hochleistungs-Beschichtung
- Ab Schneiddurchmesser 0,2 mm erhältlich

Hauptmerkmal:

Universeller Einsatz.

Verfügbare Werkzeuge:

- Hartmetall-Schafffräser
- Hartmetall-Kugelfräser
- Hartmetall-Torusfräser
- CBN-Kugelfräser
- CBN-Torusfräser

The Micro tool series can be universally used in various industrial sectors such as die and mould industry, model-making as well as in the dental and medical technology. Due to the different aspect ratios deep grooves and cavities can be machined without any problems. The tools are available in the cutting materials solid carbide and CBN.

Characteristics:

- Patented neck design
- Short, stable cutting part
- High-performance coating
- Available from cutting diameter 0.2 mm

Main feature:

Versatile use.

Available tools:

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


FRANKEN
TOP-Cut

TOP-Cut-Fräser sind Universalfräser sowohl aus Hartmetall als auch HSS, die durch ihre speziellen Geometrieigenschaften in nahezu allen Materialien und Fräsverfahren eingesetzt werden können.

Besonderheiten:

- Ungleicher Drallwinkel
- Konisch ansteigender Spannutengrund
- Hochleistungs-Beschichtung
- Optional mit innerer Kühlschmierstoff-Zufuhr mit axialem Austritt (ICA)

Hauptmerkmal:

Für alle Werkstoffgruppen einsetzbar.

Verfügbare Werkzeuge:

- Hartmetall-Schafffräser
- Hartmetall-Schafffräser mit Eckenradius
- Hartmetall-Kugelfräser
- Hartmetall-Torusfräser
- Hartmetall-Kreissegmentfräser
- HSS-Schafffräser
- HSS-Langlochfräser

TOP-Cut tools are versatile end mills made from solid carbide or HSS which can be used in nearly all materials and milling strategies due to their special geometry properties.

Characteristics

- Variable helix angle
- Tapered core diameter
- High-performance coating
- Optionally available with internal coolant supply, axial exit (ICA)

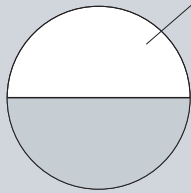
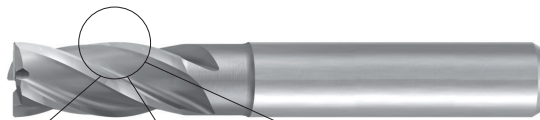
Main feature:

Universal use, for all material groups.

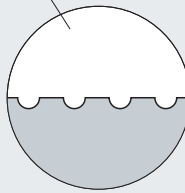
Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius
- Solid carbide ball nose end mills
- Solid carbide torus end mills
- Solid carbide circle segment end mills
- HSS end mills
- HSS slot drills

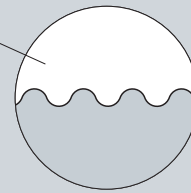




Schlichtfräser
ohne Spanteiler
Finishing end mill
without chip breaker


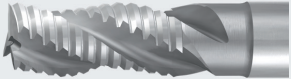
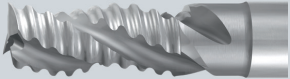
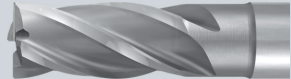
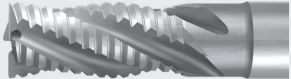

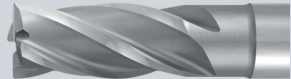
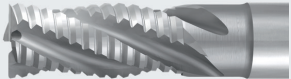



Schruppschlichtfräser
mit flachen Spanteilern
Semi-finishing end mill
with flat chip breaker



Schrupfräser
mit runden Spanteilern
Roughing end mill
with round chip breaker

weicher
softer
 ↑
 Zu bearbeitender Werkstoff
Material to be machined
 ↓
 härter
harder

Typ W 	Typ WF 	Typ WR 
Typ N 	Typ NF 	Typ NR 
Typ H 	Typ HF 	Typ HR 

besser
better

Oberflächengüte
Surface quality

schlechter
worse

weniger
less

Spanvolumen
Removal rate

mehr
more



Glatter Zylinderschaft

Straight shank

**DIN 6535 HA**

Für Hartmetall-Schaftfräser mit einem Schaftdurchmesser von 2 mm bis 32 mm

For solid carbide end mills with a shank diameter from 2 mm to 32 mm

DIN 1835 A

Für HSS-Schaftfräser mit einem Schaftdurchmesser von 3 mm bis 63 mm

For HSS end mills with a shank diameter from 3 mm to 63mm

Zylinderschaft mit einer seitlichen Mitnahmefläche

Straight shank with one side-lock clamping flat

**DIN 6535 HB**

Für Hartmetall-Schaftfräser mit einem Schaftdurchmesser von 6 mm bis 20 mm

For solid carbide end mills with a shank diameter from 6 mm to 20 mm

DIN 1835 B

Für HSS-Schaftfräser mit einem Schaftdurchmesser von 6 mm bis 20 mm

For HSS end mills with a shank diameter from 6 mm to 20 mm

Zylinderschaft mit zwei seitlichen Mitnahmeflächen

Straight shank with two side-lock clamping flats

**DIN 6535 HB**

Für Hartmetall-Schaftfräser mit einem Schaftdurchmesser von 25 mm bis 32 mm

For solid carbide end mills with a shank diameter from 25 mm to 32 mm

DIN 1835 B

Für HSS-Schaftfräser mit einem Schaftdurchmesser von 25 mm bis 63 mm

For HSS end mills with a shank diameter from 25 mm to 32 mm

Zylinderschaft mit Auszugssicherung

Straight shank with pull-out protection



Für Hartmetall-Schaftfräser mit einem Schaftdurchmesser von 6 mm bis 32 mm

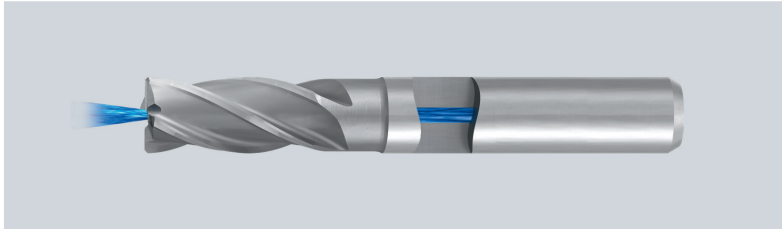
For solid carbide end mills with a shank diameter from 6 mm to 32 mm

Für HSS-Schaftfräser mit einem Schaftdurchmesser von 6 mm bis 32 mm

For HSS end mills with a shank diameter from 6 mm to 32 mm

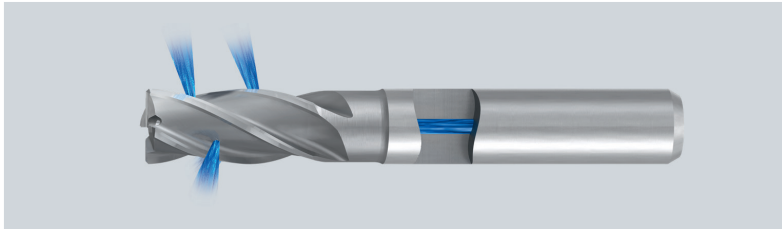


Kühlschmierstoffaustritt axial (ICA)
Internal coolant supply, axial exit (ICA)



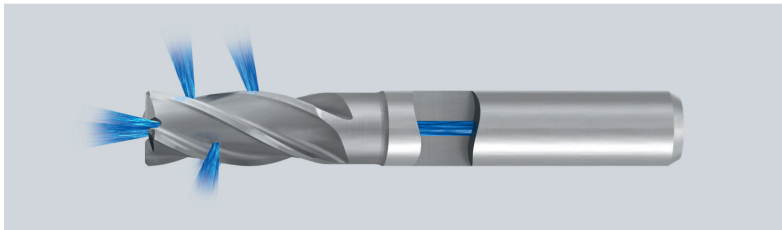
Axialer Kühlschmierstoffaustritt zum Einsatz bei der Bearbeitung von Taschen und Nuten. Durch die durchgehende Bohrung im Werkzeugzentrum wird die Werkzeugstabilität nicht beeinträchtigt.
Axial exit of the coolant-lubricant for machining of pockets and grooves. The stability of the tool is not affected by the continuous bore in the center of the tool.

Kühlschmierstoffaustritt radial (ICR)
Internal coolant supply, radial exit (ICR)



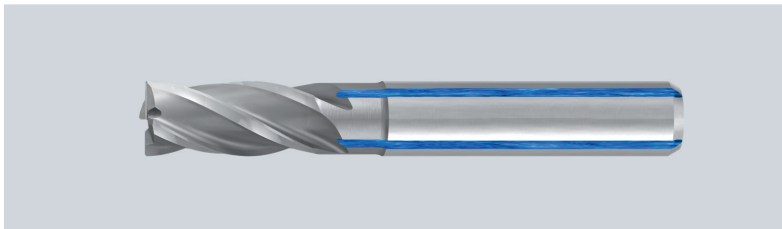
Radialer Kühlschmierstoffaustritt zum Besäumen von Bauteilen. Die Bohrungen sind versetzt im Spanraum angeordnet.
Radial exit of the coolant-lubricant for peripheral milling operations. The channels are offset in the chip flutes.

Kühlschmierstoffaustritt radial und axial (ICRA)
Internal coolant supply, radial and axial exit (ICRA)



Die Kombination aus radialem und axialem Kühlschmierstoffaustritt ist – bei maximalem Volumenstrom – universell einsetzbar.
The combination of radial and axial coolant-lubricant exits offers a versatile scope of use – with a maximum flow-rate.

Schaftkühlnuten
Coolant grooves along the shank

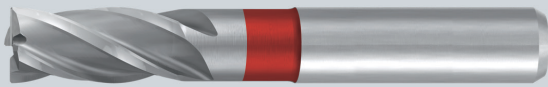


Schaftkühlnuten ermöglichen es, das Kühlmedium möglichst nahe an die Werkzeugschneide zu leiten.
Coolant grooves along the shank transport the coolant medium as close as possible to the cutting edge of the tool.



Halsfreischliff verlängern

Extending the neck



Um ein kollisionsfreies Nachsetzen bei Besäumarbeiten zu ermöglichen, kann der Werkzeughals auf das gewünschte Maß verlängert werden.

In order to enable a collision-free repositioning in peripheral milling operations, the neck of the tool can be extended to the desired length.

Eckenradius/Kantenbruch anbringen

Adding a corner radius/chamfer



Oft ist es erforderlich, vorgegebene Radien/Fasen an Bauteilen einzuhalten. Hierzu kann ein Eckenradius/Kantenbruch am Werkzeug angebracht werden.

Many times it is necessary to meet predefined radii/chamfers on components. To do so, the tool can be provided with a corner radius/chamfer.

Seitliche Mitnahmeffläche anbringen

Adding a side-lock clamping flat

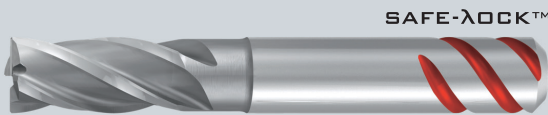


Eine gängige und sichere Lösung vor allem zum Spannen von Schruppfräsern sind Aufnahmen für Werkzeuge mit seitlicher Mitnahmeffläche.

A common and safe solution in particular for clamping of roughing end mills are tool holders for tools with a side-lock clamping flat.

SAFE-LOCK™-Nuten einschleifen

Grinding SAFE-LOCK™ grooves

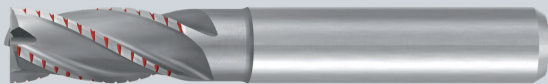


Eine hervorragende axiale Auszugssicherung bei sehr gutem Rundlaufverhalten bietet das SAFE-LOCK™-Spannsystem. Informationen siehe Seite 415.

The SAFE-LOCK™ clamping system provides excellent pull-out protection while guaranteeing superior radial run-out characteristics. For more information please refer to page 415.

Spanbrecher einschleifen

Grinding chip breakers

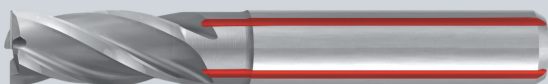


Entstehen bei der Fräsbearbeitung zu hoher Schnittdruck oder zu lange Späne, können die Umfangsschneiden mit Spanbrechern versehen werden.

If the arising cutting pressure during milling becomes too high or the swarf become too long, the peripheral cutting edges can be fitted with chip breakers.

Schaftkühlritzen einschleifen

Grinding coolant grooves along the shank

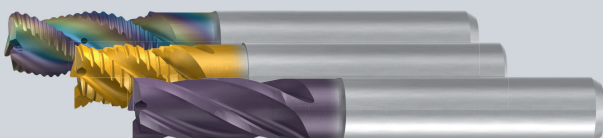


Um bei Standardwerkzeugen die zentrale Kühlschmierstoff-Zufuhr der Maschine nutzen zu können ist es möglich, Schaftkühlritzen in den Werkzeugschaft zu schleifen.

In order to use the central coolant supply of the machine for standard tools, it is possible to grind coolant grooves into the tool shank.

Beschichtung aufbringen

Coatings



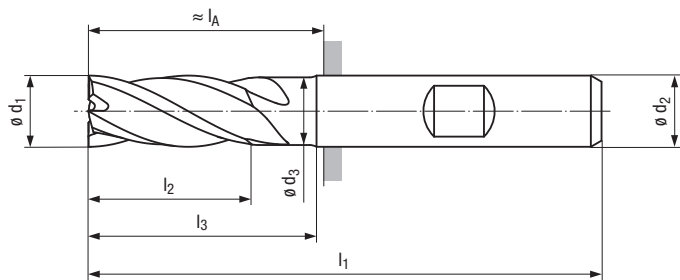
Durch moderne Beschichtungen, abgestimmt auf die Bearbeitung und das zu bearbeitende Material, wird maximale Standzeit und Prozesssicherheit erreicht.

Modern coatings tailored to the type of machining and the workpiece to be machined provide maximum tool life and process reliability.

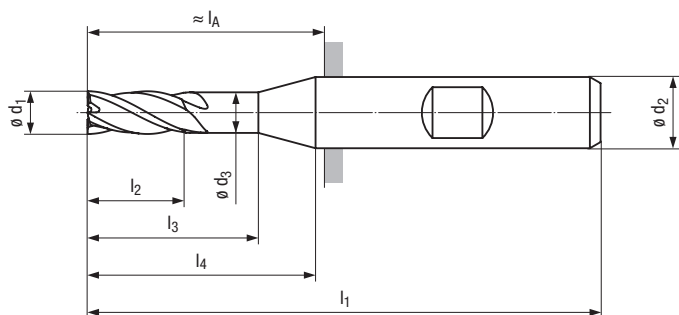


Benennungen und Definitionen am Schaftfräser

Descriptions and definitions of the end mill



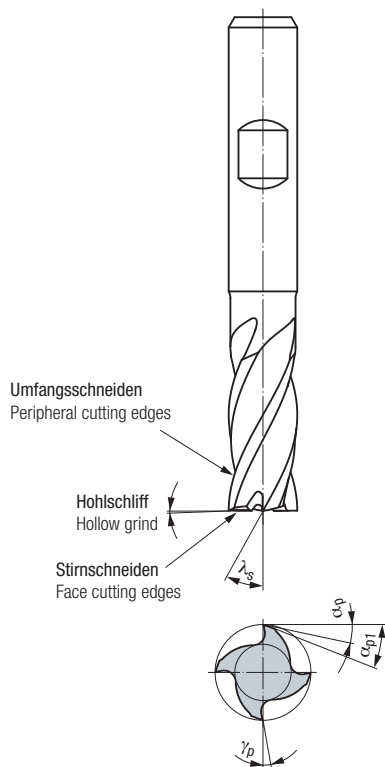
Design I₄:



l_1	Gesamtlänge Overall length
l_2	Schneidenlänge Cutting length
l_3	Freie Halslänge Neck length
l_4	Schaftanschlusslänge Length of shank connection
l_A	Auskraglänge Projecting length
d_1	Schneidendurchmesser Cutting diameter
d_2	Schaftdurchmesser Shank diameter
d_3	Halsdurchmesser Neck diameter

Wichtige Winkel am Schaftfräser

Important angles of the end mill



α_p	1. Freiwinkel der Umfangsschneide 1. Relief angle of the peripheral cutting edge
α_{p1}	2. Freiwinkel der Umfangsschneide 2. Relief angle of the peripheral cutting edge
γ_p	Spanwinkel der Umfangsschneide Rake angle of the peripheral cutting edge
λ_s	Drallwinkel Helix angle

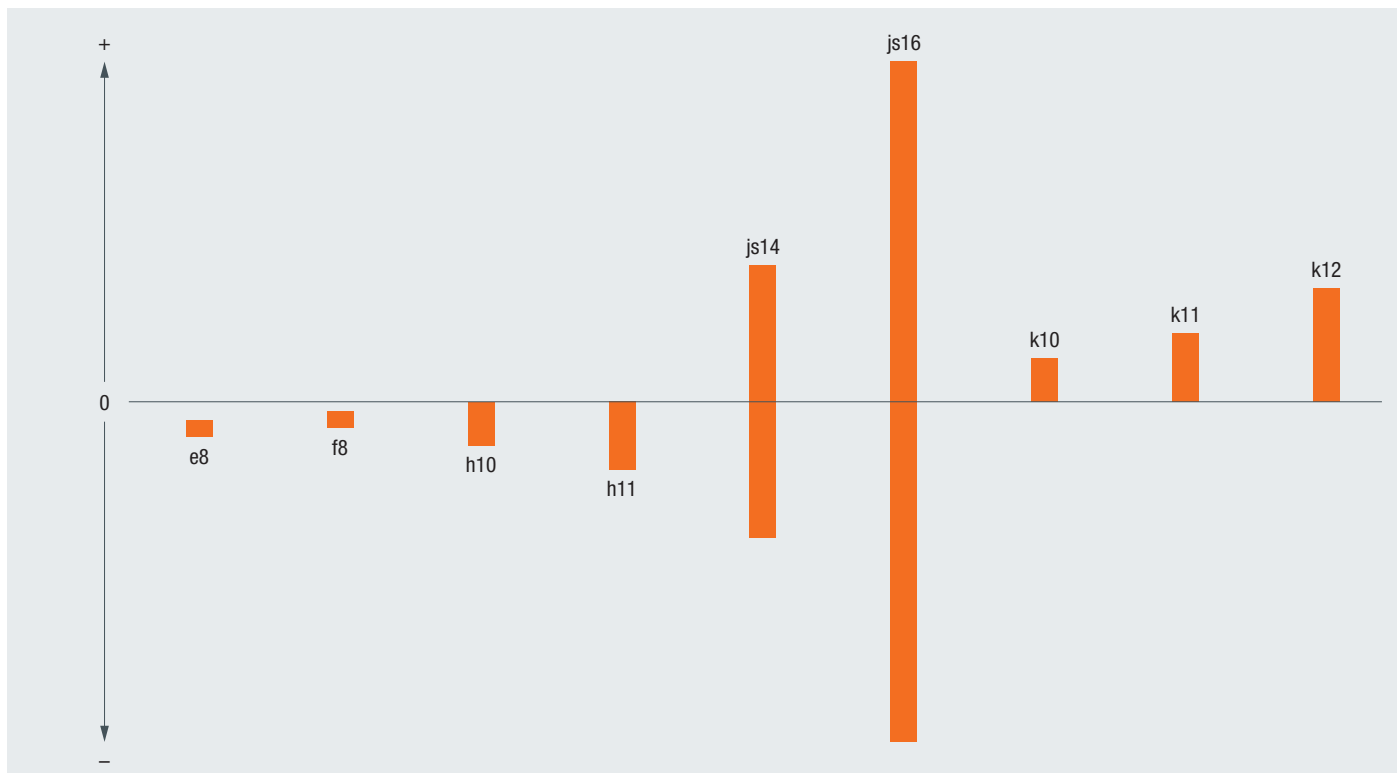


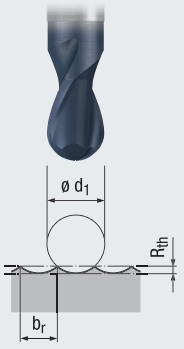
Toleranzfelder
Tolerance fields

	e8	f8	h10	h11	js14	js16	k10	k11	k12	
Abmaße in µm · Dimensions in µm										
Nennmaßbereich in mm · Nominal value range in mm	≤ 3	- 14 - 28	- 6 - 20	0 - 40	0 - 60	+ 125 - 125	+ 300 - 300	+ 40 0	+ 60 0	+ 100 0
	> 3 ≤ 6	- 20 - 38	- 10 - 28	0 - 48	0 - 75	+ 150 - 150	+ 375 - 375	+ 48 0	+ 75 0	+ 120 0
	> 6 ≤ 10	- 25 - 47	- 13 - 35	0 - 58	0 - 90	+ 180 - 180	+ 450 - 450	+ 58 0	+ 90 0	+ 150 0
	> 10 ≤ 18	- 32 - 59	- 16 - 43	0 - 70	0 - 110	+ 215 - 215	+ 550 - 550	+ 70 0	+ 110 0	+ 180 0
	> 18 ≤ 30	- 40 - 73	- 20 - 53	0 - 84	0 - 130	+ 260 - 260	+ 650 - 650	+ 84 0	+ 130 0	+ 210 0
	> 30 ≤ 50	- 50 - 89	- 25 - 64	0 - 100	0 - 160	+ 310 - 310	+ 800 - 800	+ 100 0	+ 160 0	+ 250 0
	> 50 ≤ 80	- 60 - 106	- 30 - 76	0 - 120	0 - 190	+ 370 - 370	+ 950 - 950	+ 120 0	+ 190 0	+ 300 0
	> 80 ≤ 120	- 72 - 126	- 36 - 90	0 - 140	0 - 220	+ 435 - 435	+ 1100 - 1100	+ 140 0	+ 220 0	+ 350 0
	> 120 ≤ 180	- 85 - 148	- 43 - 106	0 - 160	0 - 250	+ 500 - 500	+ 1250 - 1250	+ 160 0	+ 250 0	+ 400 0
	> 180 ≤ 250	- 100 - 172	- 50 - 122	0 - 185	0 - 290	+ 575 - 575	+ 1450 - 1450	+ 185 0	+ 290 0	+ 460 0

Lage der Toleranzfelder zur Nulllinie

Position of the tolerance fields relative to the zero line



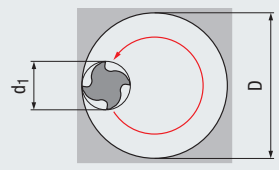


$$R_{th} = \frac{d_1}{2} - \sqrt{\frac{d_1^2 - b_r^2}{4}}$$

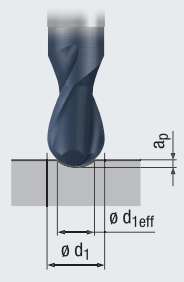
$$b_r = 2 \sqrt{R_{th} (d_1 - R_{th})}$$

d_1 = Schneidendurchmesser [mm]
 Cutting diameter
 R_{th} = Rautiefe [mm]
 Surface roughness
 b_r = Zeilensprung [mm]
 Line offset

Innenkontur
Internal contour

$$v_{fM} = \frac{v_f \times (D - d_1)}{D} \text{ [mm/min]}$$


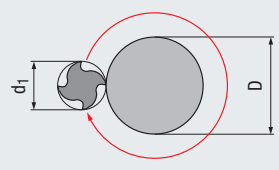
Effektiver Schneidendurchmesser d_{1eff}
Effective cutting diameter d_{1eff}



$$d_{1eff} = 2 \sqrt{a_p (d_1 - a_p)}$$

d_1 = Schneidendurchmesser [mm]
 Cutting diameter
 d_{1eff} = Effektiver Schneidendurchmesser [mm]
 Effective cutting diameter
 a_p = Axiale Zustellung [mm]
 Axial depth of cut

Außenkontur
External contour

$$v_{fM} = \frac{v_f \times (D + d_1)}{D} \text{ [mm/min]}$$


Drehzahl
Speed/rpm

$$n = \frac{v_c \times 1000}{d_1 \times \pi} \text{ [min}^{-1}\text{]}$$

Vorschub pro Umdrehung
Feed per revolution

$$f = f_z \times Z \text{ (flutes) [mm]}$$

Schnittgeschwindigkeit
Cutting speed

$$v_c = \frac{d_1 \times \pi \times n}{1000} \text{ [m/min]}$$

Vorschubgeschwindigkeit
Feed speed

$$v_f = f_z \times Z \text{ (flutes) } \times n \text{ [mm/min]}$$

Vorschub pro Zahn
Feed per tooth

$$f_z = \frac{v_f}{Z \text{ (flutes) } \times n} \text{ [mm]}$$

Mittenspanndicke
Chip thickness

$$h_m = f_z \times \sqrt{\frac{a_e}{d_1}} \text{ [mm]}$$

a_e = Radiale Zustellung [mm]
 Radial depth of cut



Eine sehr wirtschaftliche Art der Bohrungsherstellung auf HSC-Maschinen ist das Bohrfräsen (Spiralinterpolation).

Mit modernen HSC-Werkzeugen kann diese Bearbeitung mit sehr hohen Bahngeschwindigkeiten ausgeführt werden. Viele CNC Steuerungen haben entsprechende Zyklen vordefiniert.

Beispiel:

Es soll eine Bohrung mit einem Durchmesser von 63 mm und einer Tiefe von 50 mm hergestellt werden. Für die Herstellung dieser Bohrung wird ein Werkzeug mit einem Durchmesser von $d_1 = 32$ mm benötigt.

Programmiert wird eine helixförmige Kreisbahn über den Werkzeugmittelpunkt. Die axiale Zustellung a_p erfolgt kontinuierlich über die Kreisbahn.

Durch dieses Verfahren können in kürzester Zeit sehr große Bohrungsdurchmesser auch auf leistungsschwachen Maschinen hergestellt werden.

Helical interpolation is a very economical way of producing drill holes on HSC machines.

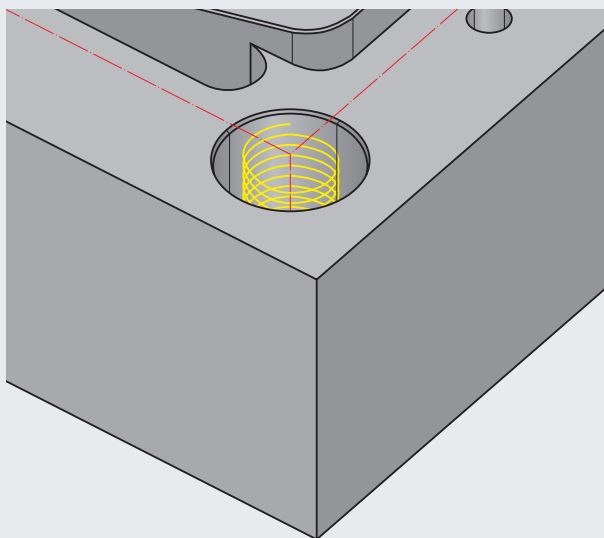
With modern HSC tools, this type of machining can be carried out at extremely high path speeds. Many CNC controls already feature pre-defined work cycles for this purpose.

Example:

A drill hole with a diameter of 63 mm and a depth of 50 mm is required. For machining this hole, a tool with a diameter of $d_1 = 32$ mm is needed.

A helical circular path is programmed using the tool centre. The axial feed a_p is applied continuously over the circular path.

In this way, it is possible to produce very large drill holes in an extremely short time, even on low performance machines.



Zustellwerte für Wendeschneidplattenfräser Time-S-Cut

Cutting depth values for indexable milling cutters Time-S-Cut

Werkzeugdurchmesser Tool diameter d_1 mm	Bohrungsdurchmesser Bore diameter		Axiale Zustellung pro Helixbahn Axial feed per helix turn a_p mm
	$D_{min.}$ mm	$D_{max.}$ mm	
20	30	40	0,5
25	40	50	0,5
35	60	70	0,5
42	74	84	0,5
52	94	104	0,5
66	115	132	0,8

Zustellwerte für Fräser mit runden Wendeschneidplatten

Cutting depth values for indexable milling cutters with round inserts

Werkzeugdurchmesser Tool diameter d_1 mm	Bohrungsdurchmesser Bore diameter		Axiale Zustellung pro Helixbahn Axial feed per helix turn a_p mm
	$D_{min.}$ mm	$D_{max.}$ mm	
12	17	24	0,5
16	23	32	0,5
20	30	40	0,5
25	40	50	0,5
32	50	64	0,5
40	70	80	0,8
50	84	100	1
63	106	126	1
80	140	160	1



Zugfestigkeit Tensile strength MPa (=N/mm ²)	Vickers HV10	Brinell HB 1)	Rockwell HRC
255	80	76,0	
270	85	80,7	
285	90	85,5	
305	95	90,2	
320	100	95,0	
335	105	99,8	
350	110	105	
370	115	109	
385	120	114	
400	125	119	
415	130	124	
430	135	128	
450	140	133	
465	145	138	
480	150	143	
495	155	147	
510	160	152	
530	165	156	
545	170	162	
560	175	166	
575	180	171	
595	185	176	
610	190	181	
625	195	185	
640	200	190	
660	205	195	
675	210	199	
690	215	204	
705	220	209	
720	225	214	
740	230	219	
755	235	223	
770	240	228	20,3
785	245	233	21,3
800	250	238	22,2
820	255	242	23,1
835	260	247	24,0
850	265	252	24,8
865	270	257	25,6
880	275	261	26,4
900	280	266	27,1
915	285	271	27,8
930	290	276	28,5
950	295	280	29,2
965	300	285	29,8
995	310	295	31,0
1030	320	304	32,2
1060	330	314	33,3
1095	340	323	34,4
1125	350	333	35,5

Zugfestigkeit Tensile strength MPa (=N/mm ²)	Vickers HV10	Brinell HB 1)	Rockwell HRC
1155	360	342	36,6
1190	370	352	37,7
1220	380	361	38,8
1255	390	371	39,8
1290	400	380	40,8
1320	410	390	41,8
1350	420	399	42,7
1385	430	409	43,6
1420	440	418	44,5
1455	450	428	45,3
1485	460	437	46,1
1520	470	447	46,9
1555	480	456	47,7
1595	490	466	48,4
1630	500	475	49,1
1665	510	485	49,8
1700	520	494	50,5
1740	530	504	51,1
1775	540	513	51,7
1810	550	523	52,3
1845	560	532	53,0
1880	570	542	53,6
1920	580	551	54,1
1955	590	561	54,7
1995	600	570	55,2
2030	610	580	55,7
2070	620	589	56,3
2105	630	599	56,8
2145	640	608	57,3
2180	650	618	57,8
	660		58,3
	670		58,8
	680		59,2
	690		59,7
	700		60,1
	720		61,0
	740		61,8
	760		62,5
	780		63,3
	800		64,0
	820		64,7
	840		65,3
	860		65,9
	880		66,4
	900		67,0
	920		67,5
	940		68,0

1) Die Brinellhärtewerte bis 450 HB wurden mit der Stahlkugel als Eindringkörper bestimmt, die darüber liegenden mit der Hartmetallkugel.
The Brinell hardness numbers up to 450 HB were determined using a steel ball indenter, those above with a carbide ball.



SAFE-LOCK™ by HAIMER



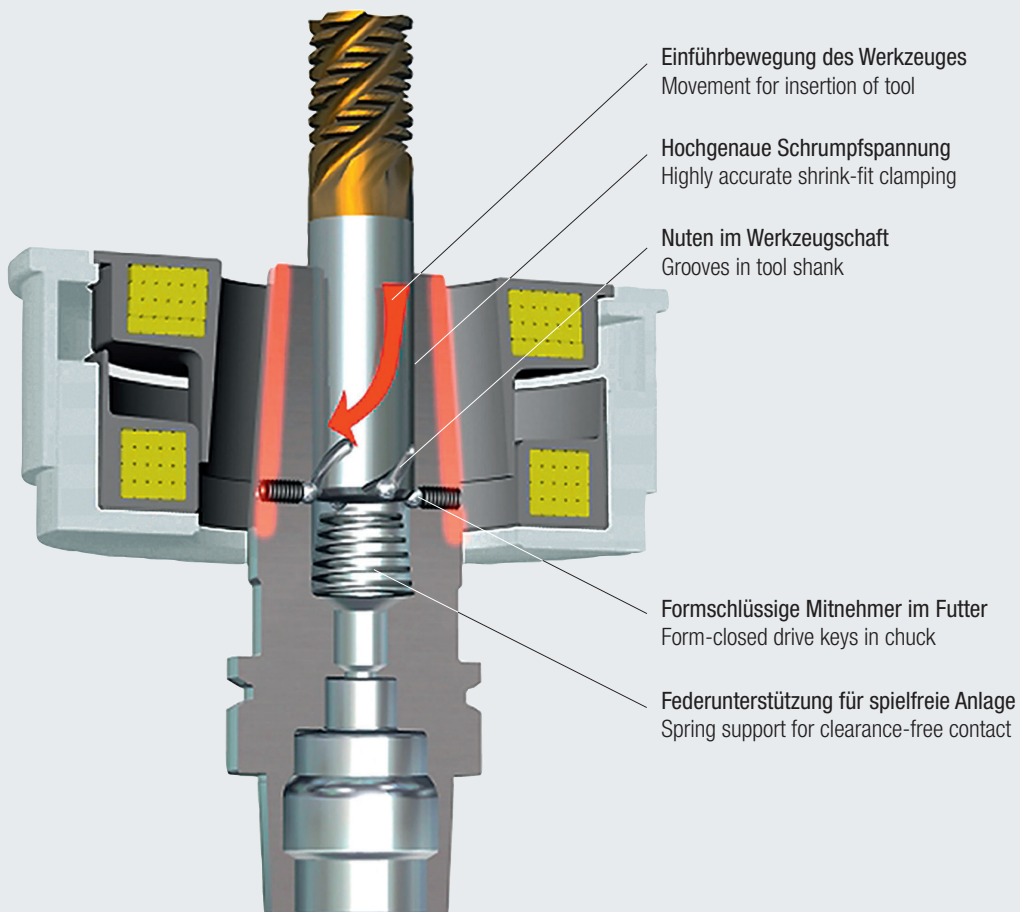
In der Hochleistungszerspanung (HPC) kann es vorkommen, dass das Werkzeug aus dem Futter herausgezogen wird. Ursache dafür ist eine langsame Mikrokriechbewegung. Sie entsteht bei Zerspanung mit hoher Drehzahl und hohen Auszugskräften. Auch Spannfutter mit extrem hoher Haltekraft können das Mikrokriechen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

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

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

The SAFE-LOCK™ system solves the problem.

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



Einführungsbewegung des Werkzeuges
Movement for insertion of tool

Hochgenaue Schrumpfspannung
Highly accurate shrink-fit clamping

Nuten im Werkzeugschaft
Grooves in tool shank

Formschlüssige Mitnehmer im Futter
Form-closed drive keys in chuck

Federunterstützung für spielfreie Anlage
Spring support for clearance-free contact



Mit SAFE-LOCK™ auf der sicheren Seite:

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






On the safe side with SAFE-LOCK™:

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






	R _m [N/mm ²]	Rockwell [HRC]						EN
			Mat.-Nr.	DIN	AFNOR	BS	EN	
P Automatenstähle · Free-cutting steels								
1.1	> 500		1.0711	9S20	-	220 M 07	-	
1.1	380 - 570		1.0715	9SMn28	S 250	230 M 07	-	
1.1	380 - 570		1.0718	9SMnPb28	S 250 Pb	-	-	
1.1	360 - 530		1.0721	10S20	10 F 1	210 M 15	-	
1.1	360 - 530		1.0722	10SPb20	10 PbF 2	-	-	
1.1	380 - 570		1.0723	15S20	-	210 A 15	-	
1.1	390 - 590		1.0736	9SMn36	S 300	240 M 07	1B	
1.1	390 - 580		1.0737	9SMnPb36	S 300 Pb	-	-	
1.2	580 - 730		1.0726	35S20	35 MF 4	212 M 36	8M	
1.2	660 - 800		1.0727	45S20	45 MF 4	212 M 44	-	
1.2	740 - 880		1.0728	60S20	60 MF 4	-	-	
P Baustähle legiert · Alloyed construction steels								
1.1	440 - 590		1.5415	15Mo3	15 D 3	1501-240	-	
1.1	450 - 590		1.5423	16Mo5	-	1503-245-420	-	
2.1	490 - 640		1.5622	14Ni6	16 N 6	-	-	
2.1	530 - 710		1.5680	12Ni19	Z 18 N 5	-	-	
2.1	450 - 660		1.7335	13CrMo4-4	15 CD 3.5	1501-620 Gr. 27	-	
2.1	540 - 690		1.7337	16CrMo4-4	15 CD 4.5	1501-620 Gr. 27	-	
2.1	480 - 630		1.7380	10CrMo9-10	10 CD 9.10	1501-622 Gr. 31; 45	-	
3.1	700 - 850		1.7709	21CrMoV5-7	-	-	-	
2.1	490 - 640		1.7715	14MoV6-3	14 Mo 6	1503-660-440	-	
P Baustähle unlegiert / Unalloyed construction steels								
1.1	> 500		1.0037	St37-2	-	-	-	
1.1	410 - 560		1.0044	St44-2	E 28-2	4360-43 B	-	
1.1	340 - 470		1.0116	St37-3	E 24-3; E 24-4	4360-40 C	-	
1.1	410 - 560		1.0144	St44-3	E 28-3; E 28-4	4360-43 C	-	
2.1	470 - 610		1.0050	St50-2	A 50-2	4360-50 B	-	
2.1	490 - 630		1.0570	St52-3	E 36-3; E 36-4	4360-50 B	-	
2.1	570 - 710		1.0060	St60-2	A 60-2	4360-SSE; SS	-	
1.1	340 - 470		1.0038	RSt37-2	E24-2 Ne	4360 40C	1A	
P Stahlguss · Steel castings								
2.1	> 380		1.0420	GS-38	-	AM 1	-	
2.1	700 - 800		1.1118	GS-24Mn6	-	-	-	
2.1	480 - 620		1.1120	GS-20Mn5	-	-	-	
2.1	> 500		1.5419	GS-22Mo4	-	245	-	
2.1	> 500		1.5633	GS-24Ni8	-	-	-	
2.1	> 500		1.5681	GS-10Ni19	-	-	-	
2.1	> 500		1.6309	GS-20MnMoNi5-5	-	-	-	
3.1	< 850		1.6582	GS-34CrNiMo6	-	-	24	
3.1	> 800		1.6748	GS-40NiCrMo6-5-6	-	-	-	
3.1	> 800		1.6750	GS-20NiCrMo3-7	-	-	-	
3.1	> 800		1.6760	GS-22NiMoCr5-6	-	-	-	
2.1	490 - 640		1.7357	GS-17CrMo5-5	-	621	-	
2.1	> 500		1.7379	GS-18CrMo9-10	-	622	-	
P Einsatzstähle / Case-hardening steels								
1.1	< 500		1.0301	C10	AF 34 C 10; XC 10	045 M 10	-	
1.1	< 500		1.0401	C15	AF 34 C 12; XC 18	080 M 15	-	
1.1	< 500		1.0402	C22	CC20	050 A 20	2C	
1.1	< 500		1.1121	CK10	XC 10	045 M 10	-	
1.1	< 500		1.1141	CK15	XC 15; XC 18	080 M 15	32C	
1.1	< 500		1.7012	13Cr2	-	-	-	
2.1	500 - 700		1.7015	15Cr3	12 C 3	523 M 15	-	
2.1	500 - 700		1.5732	14NiCr10	14 NC 11	-	-	
3.1	700 - 850	< 24	1.5752	14NiCr14	12 NC 15	655 M 13	36A	
3.1	700 - 850	< 24	1.5860	14NiCr18	-	-	-	
3.1	700 - 850	< 24	1.5919	15CrNi6	16 NC 6	S 107	-	
3.1	700 - 850	< 24	1.5920	18NiCr8	20 NC 6	-	-	
3.1	700 - 850	< 24	1.6523	21NiCrMo2	20 NCD 2	805 M 20	362	
3.1	700 - 850	< 24	1.6587	17CrNiMo6	18 NCD 6	820 A 16	-	
3.1	700 - 850	< 24	1.7131	16MnCr5	16 MC 5	527 M 17	-	
3.1	700 - 850	< 24	1.7139	16MnCrS5	-	-	-	
3.1	700 - 850	< 24	1.7147	20MnCr5	20 MC 5	-	-	
3.1	700 - 850	< 24	1.7149	20MnCrS5	-	-	-	
3.1	700 - 850	< 24	1.7262	15CrMo5	12 CD 4	-	-	
3.1	700 - 850	< 24	1.7264	20CrMo5	18 CD 4	-	-	
3.1	700 - 850	< 24	1.7271	23CrMoB3-3	-	-	-	
2.1	500 - 700	< 24	1.7311	20CrMo2	-	-	-	
3.1	700 - 850	< 24	1.7321	20MoCr4	-	-	-	
3.1	700 - 850	< 24	1.7323	20MoCrS4	-	-	-	
3.1	700 - 850	< 24	1.7325	25MoCr4	-	-	-	








					
UNI	UNE	JIS	SIS	AISI/SAE/ASTM	
					P
CF 9 S 22	-	SUM 21	-	1212	1.1
CF 9 SMn 28	11SMn28	SUM 22	1912	1213	1.1
CF 9 SMnPb 2	11SMnPb28	SUM 22 L	1914	12 L 13	1.1
CF 10 S 20	10S20	-	-	1108	1.1
CF 10 SPb 20	10SPb20	-	-	11 L 08	1.1
-	F.210.F	SUM 32	1922	-	1.1
CF 9 SMn 36	12SMn36	-	-	1215	1.1
CF 9 SMnPb 36	12SMnPb36	-	1926	12 L 14	1.1
-	F210G	-	1957	1140	1.2
-	-	-	1973	1146	1.2
-	-	-	-	-	1.2
					P
16 Mo 3	16Mo3	-	2912	A 204; Gr. A	1.1
16 Mo 5	16Mo5	-	-	4520	1.1
14 Ni 6	15Ni6	-	-	A 350-LF 5	2.1
-	-	-	-	2515	2.1
14 CrMo 4 5	14CrMo45	-	2216	A 182-F11; F12	2.1
15 CrMo 4 5	-	-	2216	A 387; Gr. 12 C	2.1
12 CrMo 9 10	-	-	2218	A 182-F22	2.1
-	-	-	-	-	3.1
-	13MoCrV6	-	-	-	2.1
					P
-	-	STKM 12 C	-	-	1.1
Fe 430 B FN	-	SM 41 B	1412	A 570; Gr. 40	1.1
Fe 360 D FF	-	-	1312; 1313	A 573; Gr. 58	1.1
Fe 430 D FF	-	SM 41 C	1412; 1414	A 573; Gr. 70	1.1
Fe 490	-	SS 50	2172	A 570; Gr. 50	2.1
Fe 510 B; C; D	-	SM 50 YA	2132	-	2.1
Fe 590; Fe 600	-	SM 58	-	-	2.1
-	-	STKM 12A;C	1311	A570.36	1.1
					P
-	-	-	-	A 27	2.1
-	-	-	-	-	2.1
-	F.8310	-	-	-	2.1
-	-	SCPH 11	-	-	2.1
-	-	-	-	-	2.1
-	-	-	-	A 757	2.1
-	-	-	-	-	2.1
-	-	SNCM 9	2541	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	F-8383	SCPH 21	-	A 217	2.1
-	-	SCPH 32	-	-	2.1
					P
C 10	-	S 10 C	-	1010	1.1
C 15; C 16	F.111	-	1350	1015	1.1
C20;C21	F.112	-	1450	1020	1.1
C 10	-	S 10 C; S 9 CK	1265	1010	1.1
C 15; C 16	C15K	S 15 C; S 15 CK	1370	1015	1.1
-	-	-	-	-	1.1
-	-	SCR 415 (H)	-	5015	2.1
16 NiCr 11	15NiCr11	SNC 415 (H)	-	3415	2.1
-	-	SNC 815 (H)	-	3310; 9314	3.1
-	-	-	-	-	3.1
16 CrNi 4	-	-	-	-	3.1
-	-	-	-	-	3.1
20 NiCrMo 2	20NiCrMo2	SNCM 220 (H)	2506	8620	3.1
18 NiCrMo 7	14NiCrMo13	-	-	-	3.1
16 MnCr 5	16MnCr5	SCR 415	2511	5115	3.1
-	-	-	-	-	3.1
20 MnCr 5	-	SMnC 420 (H)	-	5120	3.1
-	-	-	-	-	3.1
12 CrMo 4	F.155	SCM 415 (H)	-	-	3.1
-	-	SCM 421	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	2.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1






P	R _m [N/mm ²]	Rockwell [HRC]						
			Mat.-Nr.	DIN	AFNOR	BS	EN	
P Federstähle · Spring steels								
3.1	< 850	< 24	1.0904	55Si7	55 S 7	250 A 53	45	
3.1	< 850	< 24	1.0961	60SiCr7	60 SC 7		-	
3.1	< 850	< 24	1.1231	CK67	XC 68	060 A 67	-	
3.1	< 850	< 24	1.1248	CK75	XC 75	060 A 78	-	
3.1	< 850	< 24	1.1274	CK101	XC 100	060 A 96	-	
3.1	< 850	< 24	1.7103	67SiCr5	-	-	-	
3.1	< 850	< 24	1.7176	55Cr3	55 C 3	527 A 60	48	
3.1	< 850	< 24	1.8159	50CrV4	50 CV 4	735 A 50	47	
3.1	< 850	< 24	1.5026	55 Si 7	55 S 7	250 A 53	-	
P Vergütungsstähle legiert · Alloyed heat-treatable steels								
2.1	< 800	< 21	1.1133	20Mn5	20 M 5	120 M 19	-	
2.1	< 800	< 21	1.7735	14CrMoV6-9	15 CDV 6	-	-	
2.1	< 800	< 21	1.3505	100Cr6	100 C 6	534 A 99	31	
2.1	< 800	< 21	1.5120	38MnSi4	-	-	-	
2.1	< 800	< 21	1.5121	46MnSi4	-	-	-	
2.1	< 800	< 21	1.5141	53MnSi4	-	-	-	
2.1	< 800	< 21	1.5710	36NiCr6	35 NC 6	640 A 35	111A	
2.1	< 800	< 21	1.6546	40NiCrMo2-2	40 NCD 2	311-Type7	-	
2.1	< 800	< 21	1.6565	40NiCrMo6	-	311-Type6	-	
2.1	< 800	< 21	1.7003	38Cr2	38 C 2	-	-	
2.1	< 800	< 21	1.7006	46Cr2	42 C 2	-	-	
2.1	< 800	< 21	1.7020	32Cr2	-	-	-	
2.1	< 800	< 21	1.7030	28Cr4	-	530 A 30	-	
2.1	< 800	< 21	1.7033	34Cr4	32 C 4	530 A 32	18B	
2.1	< 800	< 21	1.7218	25CrMo4	25 CD 4 S	1717 CDS 110	-	
2.1	< 800	< 21	1.7220	34CrMo4	35 CD 4	708 A 37	19B	
2.1	< 800	< 21	1.7223	41CrMo4	42 CD 4 TS	708 M 40	19A	
2.1	< 800	< 21	1.7225	42CrMo4	42 CD 4 TS	708 M 40	19A	
2.1	< 800	< 21	1.7228	50CrMo4	-	708 A 47	-	
3.1	> 800 - 1000	> 21 - 30	1.7182	27MnCrB5-2	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5532	38MnB5	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.1157	40Mn4	35 M 5	150 M 36	15	
3.1	> 800 - 1000	> 21 - 30	1.1165	30Mn5	35 M 5	120 M 36	-	
3.1	> 800 - 1000	> 21 - 30	1.1167	36Mn5	40 M 5	150 M 36	-	
3.1	> 800 - 1000	> 21 - 30	1.1170	28Mn5	20 M 5	150 M 28	14A	
3.1	> 800 - 1000	> 21 - 30	1.3561	44Cr2	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.3563	43CrMo4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.3565	48CrMo4	-	817 M 40	-	
3.1	> 800 - 1000	> 21 - 30	1.5120	38MnSi4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5121	46MnSi4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5122	37MnSi4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5131	50MnSi4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5141	53MnSi4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5223	42MnV7	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5710	36NiCr6	35 NC 6	640 A 35	111A	
3.1	> 800 - 1000	> 21 - 30	1.5736	36NiCr10	30 NC 11	-	-	
3.1	> 800 - 1000	> 21 - 30	1.5755	31NiCr14	18 NC 13	653 M 31	-	
3.1	> 800 - 1000	> 21 - 30	1.6511	36CrNiMo4	40 NCD 3	816 M 40	110	
3.1	> 800 - 1000	> 21 - 30	1.6513	28NiCrMo4	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.7003	38Cr2	38 C 2	-	-	
3.1	> 800 - 1000	> 21 - 30	1.7006	46Cr2	42 C 2	-	-	
3.1	> 800 - 1000	> 21 - 30	1.7030	28Cr4	-	530 A 30	-	
3.1	> 800 - 1000	> 21 - 30	1.7033	34Cr4	32 C 4	530 A 32	18B	
3.1	> 800 - 1000	> 21 - 30	1.7034	37Cr4	38 C 4	530 A 36	-	
3.1	> 800 - 1000	> 21 - 30	1.7035	41Cr4	42 C 4	530 M 40	18	
3.1	> 800 - 1000	> 21 - 30	1.7218	25CrMo4	25 CD 4 S	1717 CDS 110	-	
3.1	> 800 - 1000	> 21 - 30	1.7220	34CrMo4	35 CD 4	708 A 37	19B	
3.1	> 800 - 1000	> 21 - 30	1.7223	41CrMo4	42 CD 4 TS	708 M 40	19A	
3.1	> 800 - 1000	> 21 - 30	1.7225	42CrMo4	42 CD 4 TS	708 M 40	19A	
3.1	> 800 - 1000	> 21 - 30	1.7228	50CrMo4	-	708 A 47	-	
3.1	> 800 - 1000	> 21 - 30	1.7561	42CrV6	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.7735	14CrMoV6-9	15 CDV 6	-	-	
3.1	> 800 - 1000	> 24 - 30	1.8159	50CrV4	50 CV 4	735 A 50	47	
5.1	> 1000 - 1300	> 30 - 40	1.3563	43CrMo4	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.3565	48CrMo4	-	817 M 40	-	
5.1	> 1000 - 1300	> 30 - 40	1.5120	38MnSi4	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.5121	46MnSi4	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.5122	37MnSi4	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.5223	42MnV7	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.5710	36NiCr6	35 NC 6	640 A 35	111A	








					
UNI	UNE	JIS	SIS	AISI/SAE/ASTM	P
55 Si 8	-	-	2085; 2090	9255	3.1
60 SiCr 8	-	SUP 7	-	9262	3.1
C 70	-	-	1770	1070	3.1
C 75	-	-	1774; 1778	1078; 1080	3.1
-	-	SUP 4	1870	1095	3.1
-	-	-	-	-	3.1
55 Cr 3	-	SUP 9 (A)	2253	5155	3.1
51 CrV 4	51CrV4	SUP 10	2230	6150	3.1
55 Si 8	-	-	2085; 2090	9255	3.1
					P
G 22 Mn 3	-	-	-	1022; 1518	2.1
-	-	-	-	-	2.1
100 Cr 6	-	SUJ 2	2258	52100	2.1
-	-	-	-	-	2.1
-	-	-	-	-	2.1
-	-	-	-	-	2.1
-	-	SNC 236	-	3135	2.1
40 NiCrMo 2 (KB)	40NiCrMo2	SNCM 240	-	8740	2.1
-	-	SNCM 439	-	4340	2.1
38 Cr 2	-	-	-	-	2.1
45 Cr 2	-	-	-	5045	2.1
-	-	-	-	-	2.1
-	-	-	-	5130	2.1
34 Cr 4 (KB)	35Cr4	SCr 430 (H)	-	5132	2.1
25 CrMo 4 (KB)	55Cr3	SCM 420; SCM 430	2225	4130	2.1
35 CrMo4	34CrMo4	SCM 432; SCCrM 3	2234	4135; 4137	2.1
41 CrMo 4	42CrMo4	SCM 440	2244	4142; 4140	2.1
41 CrMo 4	F-1252	SCM 440	2244	4142; 4140	2.1
-	-	SCM 445 (H)	-	4150	2.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	1039	3.1
-	-	SMn 433 H; SCMn 2	-	1330	3.1
-	-	SMn 438 H; SCMn 3	2120	1335	3.1
C 28 Mn	-	SCMn 1	-	1330	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	SNC 836	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	SNC 236	-	3135	3.1
35 NiCr 9	-	SNC 631 (H)	-	3435	3.1
-	-	SNC 836	-	-	3.1
38 NiCrMo 4 (KB)	33NiCrMo4	SNC 836	-	9840	3.1
-	-	-	-	-	3.1
38 Cr 2	-	-	-	-	3.1
45 Cr 2	-	-	-	5045	3.1
-	-	-	-	5130	3.1
34 Cr 4 (KB)	35Cr4	SCr 430 (H)	-	5132	3.1
38 Cr 4	-	SCr 435 (H)	-	5135	3.1
41 Cr 4	42Cr4	SCr 440 (H)	-	5140	3.1
25 CrMo 4 (KB)	55Cr3	SCM 420; SCM 430	2225	4130	3.1
35 CrMo4	34CrMo4	SCM 432; SCCrM 3	2234	4135; 4137	3.1
41 CrMo 4	42CrMo4	SCM 440	2244	4142; 4140	3.1
41 CrMo 4	F-1252	SCM 440	2244	4142; 4140	3.1
-	-	SCM 445 (H)	-	4150	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
51 CrV 4	51CrV4	SUP 10	2230	6150	3.1
-	-	-	-	-	5.1
-	-	SNC 836	-	-	5.1
-	-	-	-	-	5.1
-	-	-	-	-	5.1
-	-	-	-	-	5.1
-	-	-	-	-	5.1
-	-	-	-	-	5.1
-	-	SNC 236	-	3135	5.1






	R _m [N/mm ²]	Rockwell [HRC]						
			Mat.-Nr.	DIN	AFNOR	BS	EN	
5.1	> 1000 - 1300	> 30 - 40	1.5736	36NiCr10	30 NC 11	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.5864	35NiCr18	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.6511	36CrNiMo4	40 NCD 3	816 M 40	110	
5.1	> 1000 - 1300	> 30 - 40	1.6580	30CrNiMo8	30 CND 8	823 M 30	-	
5.1	> 1000 - 1300	> 30 - 40	1.6582	34CrNiMo6	35 NCD 6	817 M 40	24	
5.1	> 1000 - 1300	> 30 - 40	1.7033	34Cr4	32 C 4	530 A 32	18B	
5.1	> 1000 - 1300	> 30 - 40	1.7034	37Cr4	38 C 4	530 A 36	-	
5.1	> 1000 - 1300	> 30 - 40	1.7035	41Cr4	42 C 4	530 M 40	18	
5.1	> 1000 - 1300	> 30 - 40	1.7045	42Cr4	42 C 4 TS	530 A 40	-	
5.1	> 1000 - 1300	> 30 - 40	1.7218	25CrMo4	25 CD 4 S	1717 CDS 110	-	
5.1	> 1000 - 1300	> 30 - 40	1.7220	34CrMo4	35 CD 4	708 A 37	19B	
5.1	> 1000 - 1300	> 30 - 40	1.7223	41CrMo4	42 CD 4 TS	708 M 40	19A	
5.1	> 1000 - 1300	> 30 - 40	1.7225	42CrMo4	42 CD 4 TS	708 M 40	19A	
5.1	> 1000 - 1300	> 30 - 40	1.7228	50CrMo4	-	708 A 47	-	
5.1	> 1000 - 1300	> 30 - 40	1.7361	32CrMo12	30 CD 12	722 M 24	40B	
5.1	> 1000 - 1300	> 30 - 40	1.7561	42CrV6	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.7707	30CrMoV9	-	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.7735	14CrMoV6-9	15 CDV 6	-	-	
5.1	> 1000 - 1300	> 30 - 40	1.8159	50CrV4	50 CV 4	735 A 50	47	
5.1	> 1000 - 1300	> 30 - 40	1.8161	58CrV4	-	-	-	
P	Vergütungsstähle unlegiert · Unalloyed heat-treatable steels							
2.1	< 800	< 21	1.0402	C22	AF 42 C 20	050 A 20	2D	
2.1	< 800	< 21	1.0406	C25	AF 50 C 30	070 M 26	-	
2.1	< 800	< 21	1.0501	C35	AF 55 C 35	060 A 35	-	
2.1	< 800	< 21	1.0503	C45	AF 65 C 45	080 M 46	-	
2.1	< 800	< 21	1.0511	C40	AF 60 C 40	-	-	
2.1	< 800	< 21	1.0528	C30	-	-	-	
2.1	< 800	< 21	1.1151	Ck22	XC 25; XC 18	050 A 20	-	
2.1	< 800	< 21	1.1158	Ck25	XC 25	070 M 26	-	
2.1	< 800	< 21	1.1178	Ck30	-	-	-	
2.1	< 800	< 21	1.1181	Ck35	XC 38 H1; XC 32	080 M 36	-	
2.1	< 800	< 21	1.1186	Ck40	XC 42 H1	080 M 40	-	
2.1	< 800	< 21	1.1191	Ck45	XC 42	080 M 46	-	
3.1	> 800 - 1000	> 21 - 30	1.0535	C55	-	070 M 55	-	
3.1	> 800 - 1000	> 21 - 30	1.0540	C50	-	-	-	
3.1	> 800 - 1000	> 21 - 30	1.0601	C60	CC 55	080 A 62	43D	
3.1	> 800 - 1000	> 21 - 30	1.1203	Ck55	XC 55	070 M 55	-	
3.1	> 800 - 1000	> 21 - 30	1.1206	Ck50	XC 48 H1	080 M 50	-	
3.1	> 800 - 1000	> 21 - 30	1.1221	Ck60	XC 60	080 A 62	43D	
P	Kaltarbeitstähle · Cold work steels							
3.1	760	19	1.2067	100Cr6	Y 100 C 6	BL 3	-	
3.1	760	19	1.2103	58SiCr8	-	-	-	
3.1	760	19	1.2108	90CrSi5	-	-	-	
3.1	720		1.2162	21MnCr5	20 NC 5	-	-	
3.1	730		1.2210	115CrV3	100 C 3	-	-	
3.1	730		1.2330	35CrMo4	34 CD 4	708 A 37	-	
3.1	750		1.2332	47CrMo4	42 CD 4	709 M 40	-	
3.1	760	19	1.2419	105WCr6	105 WC 13	-	-	
3.1	720		1.2510	100MnCrW4	90 MWCV 5	BO 1	-	
3.1	730		1.2516	120W4	110 WC 20	BF 1	-	
3.1	750		1.2542	45WCrV7	-	BS 1	-	
3.1	750		1.2550	60WCrV7	55 WC 20	-	-	
3.1	830	23	1.2721	50NiCr13	-	-	-	
3.1	670		1.2735	15NiCr14	10 NC 12	-	-	
3.1	710		1.2762	75CrMoNiW6-7	-	-	-	
3.1	750		1.2826	60MnSiCr4	-	-	-	
3.1	760	19	1.2833	100V1	Y1 105 V	BW 2	-	
3.1	730		1.2842	90MnCrV8	90 MV 8	BO 2	-	
3.1	830	23	1.2080	X210Cr12	Z 200 C 12	BD 3	-	
3.1	380		1.2341	X6CrMo4	-	-	-	
3.1	760	19	1.2363	X100CrMoV5-1	Z 100 CDV 5	BA 2	-	
3.1	640 - 840		1.5662	X8Ni9	9 Ni	1501.509	-	
3.1	760	19	1.2379	X155CrVMo12-1	Z 160 CDV 12	BD 2	-	
3.1	760	19	1.2436	X210CrW12	-	-	-	
3.1	760	19	1.2601	X165CrMoV12	-	-	-	
P	Werkzeugstähle unlegiert · Unalloyed tool steels							
2.1	640		1.1520	C70W1	-	-	-	
2.1	640		1.1525	C80W1	Y1 90; Y1 80	-	-	
2.1	640		1.1545	C105W1	Y1 105	-	-	
2.1	640		1.1620	C70W2	-	-	-	
2.1	640		1.1625	C80W2	Y1 80	BW 1B	-	








 UNI	 UNE	 JIS	 SIS	 AISI/SAE/ASTM	
35 NiCr 9	-	SNC 631 (H)	-	3435	5.1
-	-	-	-	-	5.1
38 NiCrMo 4 (KB)	33NiCrMo4	SNC 836	-	9840	5.1
30 NiCrMo 8		SNCM 431	-	-	5.1
35 NiCrMo 6 (KW)		SNCM 447	2541	4340	5.1
34 Cr 4 (KB)	35Cr4	SCr 430 (H)	-	5132	5.1
38 Cr 4	-	SCr 435 (H)	-	5135	5.1
41 Cr 4	42Cr4	SCr 440 (H)	-	5140	5.1
41 Cr 4	42Cr4	SCr 440	2245	5140	5.1
25 CrMo 4 (KB)	55Cr3	SCM 420; SCM 430	2225	4130	5.1
35 CrMo4	34CrMo4	SCM 432; SCCrM 3	2234	4135; 4137	5.1
41 CrMo 4	42CrMo4	SCM 440	2244	4142; 4140	5.1
41 CrMo 4	F-1252	SCM 440	2244	4142; 4140	5.1
-	-	SCM 445 (H)	-	4150	5.1
31 CrMo 12	F.124.A	-	2240	-	5.1
-	-	-	-	-	5.1
-	-	-	-	-	5.1
-	-	-	-	-	5.1
51 CrV 4	51CrV4	SUP 10	2230	6150	5.1
-	-	-	-	-	5.1
					P
C 20; C 21	F.112	-	1450	1020	2.1
C 25	-	-	-	1025	2.1
C 35	F.113	-	1550	1035	2.1
C 45	F.114	-	1650	1045	2.1
C 40	-	-	-	1040	2.1
-	-	-	-	-	2.1
C 20	-	S 20 C; S 20 CK	-	1023	2.1
C 25	-	S 25 C	-	1025	2.1
-	-	-	-	-	2.1
C 35	-	S 35 C	1572	1035	2.1
C 40	-	S 40 C	-	1040	2.1
C 45	C45K	S 45 C	1672	1045	2.1
C 55	-	-	1655	1055	3.1
-	-	-	-	-	3.1
C 60	-	-	-	1060	3.1
C 50	C55K	S 55 C	-	1055	3.1
-	-	-	-	1050	3.1
C 60	-	S 58 C	1665; 1678	1060	3.1
					P
-	100Cr6	-	-	L 3	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	SCR 420 H	-	-	3.1
107 CrV 3 KU	-	-	-	L 2	3.1
35 CrMo4	-	-	2234	4135	3.1
40 CrMo 4	-	-	2244	4142	3.1
107 WvR 5 KU	105WCr5	SKS 31	-	-	3.1
95 MnWCr 5 KU	-	SKS 3	2140	O 1	3.1
110 W 4 KU	-	-	-	-	3.1
45 WCrV 8 KU	45WCrS18	-	2710	S 1	3.1
55 WCrV 8 KU	-	-	-	-	3.1
-	-	-	-	-	3.1
-	-	SNC 22	-	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
102 V 2 KU	-	SKS 43	-	W 210	3.1
90 MnVCr 8 KU	-	-	-	O 2	3.1
X 210 Cr 13 KU	X210Cr12	SKD 1	-	D 3	3.1
-	-	-	-	-	3.1
X 100 CrMoV 5 1KU	-	SKD 12	2260	A 2	3.1
X 10Ni9	XBNi09	STBL 690	-	A353	3.1
X 155 CrVMo 12 1KU	-	SKD 11	-	D 2	3.1
X 215 CrW 12 1KU	X210CrW12	SKD 2	2312	-	3.1
X 165 CrMoV 12 KU	X160crMoV12	-	2310	-	3.1
					P
-	-	-	-	-	2.1
C 80 KU	-	-	-	W 108	2.1
C 100 KU	-	-	-	W 110	2.1
-	-	-	-	-	2.1
C 80 KU	-	SKC 3; SK 5; SK 6	-	W 1	2.1






	R _m [N/mm ²]	Rockwell [HRC]					EN
			Mat.-Nr.	DIN	AFNOR	BS	
2.1	640		1.1645	C105W2	Y1 105		-
2.1	660		1.1654	C110W	-	-	-
2.1	710		1.1663	C125W	Y2 120		-
2.1	760	19	1.1673	C135W	Y2 140		-
2.1	640		1.1730	C45W	Y3 42		-
2.1	760	19	1.1740	C60W	Y3 55		-
2.1	730		1.1744	C67W	-	-	-
2.1	730		1.1750	C75W	-	BW 1A	-
2.1	570		1.1820	C55W	-	-	-
2.1	750		1.1830	C85W	Y3 90	-	-
P	Warmarbeitsstähle · Hot work steels						
2.1	< 770		1.2311	40CrMnMo7	-	-	-
2.1	< 770		1.2312	40CrMnMoS8-6	-	-	-
2.1	< 770		1.2711	54NiCrMoV6	55 NCDV 6		-
2.1	< 800		1.2713	55NiCrMoV6	55 NCDV 7	Bh 224	-
2.1	> 800		1.2738	40CrMnNiMo8	-	-	-
3.1	> 840		1.2744	57NiCrMoV7-7	-	-	-
3.1	> 860		1.2764	X19NiCrMo4	-	-	-
3.1	< 870		1.2767	X45NiCrMo4	Y 35 NCD 16		-
2.1	< 770		1.2083	X42Cr13	Z 40 C 14		-
2.1	< 800		1.2343	X38CrMoV5-1	Z 38 CDV 5	BH 11	-
2.1	< 800		1.2344	X40CrMoV5-1	Z 40 CDV 5	BH 13	-
2.1	< 800		1.2365	X32CrMoV3-3	Z 32 CDV 28	BH 10	-
2.1	< 800		1.2567	X30WCrV5-3	Z 32 WCV 5		-
2.1	< 800		1.2581	X30WCrV9-3	Z 30 WCV 9	BH 21	-
2.1	< 770		1.2885	X32CrMoV3-3-3	-	BH 10 A	-
3.1	< 840		1.2316	X36CrMo17	-	-	-
4.1	1080	> 29	Toolox 33	-	-	-	-
4.1	1250	43	Hardox 400	-	-	-	-
5.1	1450	45	Toolox 44	-	-	-	-
P	Nitrierstähle · Nitriding steels						
3.1	< 1000	< 30	1.8504	34CrAl6	-	-	-
3.1	< 1000	< 30	1.8506	34CrAlS5	-	-	-
3.1	< 1000	< 30	1.8507	34CrAlMo5	30 CAD 6.12	905 M 31	-
3.1	< 1000	< 30	1.8509	41CrAlMo7	40 CAD 6.12	905 M 39	41B
3.1	> 1000	> 30	1.8515	31CrMo12	30 CD 12	722 M 24	-
3.1	> 1000	> 30	1.8519	31CrMoV9	-	-	-
3.1	> 1000	> 30	1.8521	15CrMoV5-9	-	-	-
3.1	> 1000	> 30	1.8523	39CrMoV13-9	-	897 M 39	40C
3.1	> 1000	> 30	1.8550	34CrAlNi7	-	-	-
M	Rost- und säurebeständige Stähle – ferritisch · Corrosion and acid proof steels – ferritic						
1.1	400 - 600		1.4002	X6CrAl13	Z 6 CA 13	405 S 17	-
1.1	380 - 560		1.4512	X5CrTi12	Z 6 CT 12	409 S 19	-
1.1	400 - 600		1.4000	X6Cr13	Z 6 C 13	403 S 17	-
1.1	450 - 600		1.4016	X6Cr17	Z 8 C 17	430 S 15	960
1.1	500 - 700		1.4742	X10CrAlSi18	Z 10 CAS 18	430 S 15	60
1.1	450 - 630		1.4113	X6CrMo17	Z 8 CD 17.01	434 S 17	-
1.1	420 - 600		1.4510	X3CrTi17	Z 8 CT 17	-	-
1.1	400 - 600		1.4521	X2CrMoTi18-2	Z 3 CDT 18-02	-	-
1.1	450 - 650		1.4724	X10CrAlSi13	Z 13 C 13	-	-
1.1	520 - 720		1.4762	X10CrAl24	Z 10 CAS 24	-	-
M	Rost- und säurebeständige Stähle – austenitisch · Corrosion and acid proof steels – austenitic						
2.1	750 - 950		1.4372	X12CrMnNiN17-7-5	Z 12 CMN 17-07 Az	-	-
2.1	680 - 880		1.4373	X12CrMnNiN18-9-5	-	284 S 16	-
2.1	600 - 950		1.4310	X10CrNi18-8, X12CrNi17-7	Z 11 CN 17-08	301 S 21	-
2.1	630 - 850		1.4318	X2CrNi18-7	Z 3 CN 18-07 Az	-	-
2.1	500 - 700		1.4305	X10CrNiS18-9	Z 10 CNF 18.09	303 S 21	58M
2.1	600 - 951		1.4350	X5CrNi18-9	Z 6 CN 18.09	304 S 31	58E
2.1	520 - 720		1.4301	X5CrNi18-9	Z 6 CN 18.09	304 S 15	58E
2.1	460 - 680		1.4306	X2CrNi19-11	Z 2 CN 18.10	304 S 12	-
2.1	550 - 750		1.4311	X2CrNi18-10	Z 2 CN 18.10	304 S 62	-
2.1	510 - 710		1.4948	X6CrNi18-11	-	304 S 50	-
2.1	520 - 700		1.4307	X2CrNi18-9	Z 2 CN 19-09	-	-
2.1	500 - 750		1.4315	X5CrNi19-9	-	-	-
2.1	500 - 650		1.4303	X5CrNi18-12	Z 8 CN 18.12	305 S 19	-
2.1	500 - 700		1.4833	X12CrNi23-13	Z 15 CN 23-13	309 S 24	-
2.1	500 - 700		1.4845	X8CrNi25-21	Z 8 CN 25-20	310 S 24	-
2.1	550 - 750		1.4841	X15CrNiSi25-21	Z 15 CNS 25-20	314 S 25	-
2.1	520 - 680		1.4401	X5CrNiMo18-10	Z 6 CND 17.11	316 S 16	58J
2.1	530 - 730		1.4436	X5CrNiMo17-13-3	Z 6 CND 17.12	316 S 16	-
2.1	520 - 680		1.4404	X2CrNiMo17-13-2	Z 2 CND 17.12	316 S 11	-








 UNI	 UNE	 JIS	 SIS	 AISI/SAE/ASTM	
C 100 KU	-	SK 3	-	-	2.1
-	-	-	-	-	2.1
C 120 KU	-	SK 2	-	W 112	2.1
C 140 KU	-	SK 1	-	-	2.1
-	-	-	-	-	2.1
-	-	SK 7	-	-	2.1
-	-	-	-	-	2.1
-	-	-	-	W 1	2.1
-	-	-	-	-	2.1
-	-	SK 5	-	-	2.1
					P
35 CrMo8	-	-	-	-	2.1
40 CrMnMo 7	F-5302	-	-	-	2.1
-	-	-	-	-	2.1
-	F.520.S	SKT 4	-	L 6	2.1
-	-	-	-	P20	2.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
42 NiCrMo 15 7	-	-	-	-	3.1
X 41 Cr 13 KU	F-5263	SUS 420 J 2	-	-	2.1
X 37 CrMoV 5 1 KU	F-5317	SKD 6	-	H 11	2.1
X 40 CrMoV 5 1 1 KU	F-5318	SKD 61	-	H 13	2.1
X 30 CrMoV 12 27 KU	F-5313	SKD 7	-	H 10	2.1
X 30 WCrV 5 3 KU	-	SKD 4	-	-	2.1
X 30 WCrV 9 3 KU	X30WCrV9	SKD 5	-	H 21	2.1
-	F-5314	-	-	-	2.1
X 38 CrMo 16 1 KU	F-5267	-	-	-	3.1
-	-	-	-	Toolox 33	4.1
-	-	-	-	Hardox 400	4.1
-	-	-	-	Toolox 44	5.1
					P
-	-	-	-	-	3.1
-	-	-	-	-	3.1
34 CrAlMo 7	-	-	-	A 355 Cl. D	3.1
41 CrAlMo 7	41CrAlMo7	SACM 645	2940	A 355 Cl. A	3.1
31 CrMo 12	-	-	2240	-	3.1
-	-	-	-	-	3.1
-	-	-	-	-	3.1
39 CrMoV 13 9	-	-	-	-	3.1
-	-	-	-	-	3.1
					M
X 6 CrAl 13	-	SUS 405	2302	405	1.1
X 6 CrTi 12	-	SUH 409	-	409	1.1
X 6 Cr 13	F.3110	SUS 403	2301	403	1.1
X 8 Cr 17	F.3113	SUS 430	2320	430	1.1
X 8 Cr 17	F-3153	SUS 430; SUH 21	-	430	1.1
X 8 CrMo 17	F.3116	SUS 434	2325	434	1.1
X 6 CrTi 17	-	SUS 430 LX	-	XM 8; 430 Ti	1.1
-	F-3123	SUS 444	2326	444	1.1
-	F-3152	-	-	-	1.1
X 16 Cr 26	F.3154	SUH 446	-	446	1.1
					M
-	-	-	-	201	2.1
-	-	-	-	202	2.1
X10CrNi18-8	F-3517	SUS 301	2331	301	2.1
-	-	-	-	301LN	2.1
X 10 CrNi 18 9	F.3508	SUS 303	2346	303	2.1
X 5 CrNi 18 10	F.3551	SUS 302	-	304	2.1
X 5 CrNi 18 10	F.3551	SUS 304	2332; 2333	304; 304 H	2.1
X 2 CrNi 18 11	F.3503	SCS 19	2352; 2333	304 L	2.1
X 2 CrNiN 18 11	-	SUS 304 LN	2371	304 LN	2.1
-	-	-	-	304H	2.1
-	-	-	-	304 L	2.1
-	-	-	-	304 N	2.1
X 8 CrNi 19 10	-	SUS 305	-	308; 305	2.1
X 6 CrNi 23 14	-	SUS 309S	-	309 S	2.1
X 6 CrNi 25 20	F.331	SUS 310S	2361	310 S	2.1
-	F.3310	SUH 310	-	314	2.1
X 5 CrNiMo 17 12	F.3543	SUS 316	2347	316	2.1
X 5 CrNiMo 17 13	F.3538	SUS 316	2343	316	2.1
X 2 CrNiMo 17 12	F.3533	SUS 316 L	2348	316 L	2.1






	R _m [N/mm ²]	Rockwell [HRC]					EN
			Mat.-Nr.	DIN	AFNOR	BS	
2.1	520 - 700		1.4435	X2CrNiMo18-14-3	Z 2 CND 17.13	317 S 12	-
2.1	520 - 700		1.4432	X2CrNiMo17-12-3	Z 3 CND 17-02-03	316 S 13	-
2.1	580 - 780		1.4406	X2CrNiMoN17-12-2	Z 2 CND 17.12 AZ	316 S 61	58C
2.1	580 - 780		1.4429	X2CrNiMoN17-13-3	Z 2 CND 17.13 AZ	316 S 62	-
2.1	490 - 740		1.4573	X10CrNiMoTi18-12	-	320 S 33	-
2.1	520 - 690		1.4571	X6CrNiMoTi17-12-2	Z 6 CNT 17.12	320 S 31	58J
2.1	520 - 720		1.4580	X6CrNiMoNb17-12-2	Z 6 CNDNb 17.12	318 S 17	-
2.1	550 - 700		1.4438	X2CrNiMo18-16-4	Z 2 CND 19.15	317 S 12	-
2.1	580 - 780		1.4439	X2CrNiMoN17-13-5	Z 3 CND 18-14-05 Az	-	-
2.1	490 - 740		1.4583	X10CrNiMoNb18-12	-	-	-
2.1	500 - 720		1.4541	X6CrNiTi18-10	Z 6 CNT 18.10	321 S 12	58B
2.1	500 - 720		1.4878	X8CrNiTi18-10	Z 6 CNT 18-10	321 S 31	-
2.1	500 - 720		1.4550	X6CrNiNb18-10	Z 6 CNNb 18.10	347 S 17	58F
2.1	500 - 700		1.4563	X1NiCrMoCu31-27-4	Z 2 NCDU 31-27	-	-
2.1	520 - 730		1.4539	X1NiCrMoCu25-20-5	Z 2 NCDU 25-20	904 S 13	-
2.1	550 - 750		1.4864	X12NiCrSi35-16	Z 20 NCS 33-16	NA 17	-
2.1	620 - 880		1.4460	X8CrNiMo27-5	Z 5 CND 27-05	-	-
2.1	500 - 740		1.4546	X5CrNiNb18-10	Z 6 CNNb 18.10	347 S 18	58F
M	Rost- und säurebeständige Stähle – Duplex · Corrosion and acid proof steels – Duplex						
3.1	340 - 950		1.4462	X2CrNiMoN22-5-3	Z 3 CND 22-05 Az	318 S 13	-
3.1	630 - 850		1.4362	X2CrNiN23-4	Z 3 CN 23-04 Az	-	-
4.1	730 - 1250		1.4410	X2CrNiMoN25-7-4	Z 3 CND 25-06	-	-
3.1	730 - 1000		1.4507	X2CrNiMoCuN25-6-3	Z 3 CNDU 25-06	-	-
3.1	730 - 1000		1.4507	X2CrNiMoCuN25-6-3	Z 3 CNDU 25-06	-	-
M	Rost- und säurebeständige Stähle – martensitisch · Corrosion and acid proof steels – martensitic						
1.1	> 600		1.4006	X10Cr13	Z 12 C 13	410 S 21	56A
1.1	650 - 850		1.4005	X12CrS13	Z 12 CF 13	416 S 21	-
1.1	> 700		1.4021	X20Cr13	Z 20 C 13	420 S 37	-
1.1	> 740		1.4028	X30Cr13	Z 30 C 13	420 S 45	-
1.1	> 760		1.4031	X38Cr13	Z 40 C 14	-	-
1.1	> 780		1.4034	X46Cr13	Z 40 CM	420 S 45	56D
1.1	> 850		1.4116	X50CrMoV15	Z 50 CD 15	-	-
1.1	> 900		1.4122	X39CrMo17-1	Z 38 CD 16-01	-	-
3.1	780 - 980		1.4313	X5CrNi134	Z 5 CN 13.4	425 C 11	-
3.1	840 - 1000		1.4418	X4CrNiMo6-5-1	Z 6 CND 16-05-01	-	-
1.1	> 650		1.4024	X15Cr13	Z 12 C 13 M	420 S 29	56B
1.1	640 - 840		1.4104	X14CrMoS17	Z 13 CF 17	-	-
1.1	750 - 950		1.4057	X17CrNi162	Z 15 CN 16.02	431 S 29	57
1.1			1.4747	X80CrNiSi20	Z 80 CSN 20.02	443 S 65	59
1.1	< 900		1.4125	X105CrMo17	Z 100 CD 17	-	-
M	Rost- und säurebeständige Stähle – ausscheidungshärtend · Corrosion and acid proof steels – precipitation-hardened						
4.1	> 1275		1.4542	X5CrNiCuNb16-4	Z 7 CNU 15-05	-	-
3.1	> 1030		1.4568	X7CrNiAl17-7	Z 9 CNA 17-07	301 S 81	-
K	Gusseisen mit Lamellengrafit (GJL) · Cast iron with lamellar graphite (GJL)						
1.1	100 - 200		0.6010	EN-GJL100 (GG10)	Ft 10 D	-	-
1.1	150 - 250		0.6015	EN-GJL150 (GG15)	Ft 15 D	Grade 150	-
1.2	200 - 300		0.6020	EN-GJL200 (GG20)	Ft 20 D	Grade 220	-
1.2	250 - 350		0.6025	EN-GJL250 (GG25)	Ft 25 D	Grade 260	-
1.2	300 - 400		0.6030	EN-GJL300 (GG30)	Ft 30 D	Grade 300	-
1.2	350 - 450		0.6035	EN-GJL350 (GG35)	Ft 35 D	Grade 350	-
1.2	400 - 500		0.6040	EN-GJLZ (GG40)	Ft 40 D	Grade 400	-
1.1	> 170		0.6655	GGL-NiCuCr15-6-2	L-NUC 15 6 2	L-NUC 15 6 2	-
1.1	> 170		0.6660	GGL-NiCr20-2	L-NC 20 2	L-NC 20 2	-
1.1	> 190		0.6676	GGL-NiCr30-3	L-NC 30 3	L-NC 30 3	-
1.1	> 170		0.6680	GGL-NiSiCr30-5-5	L-NSC 30 5 5	L-NSC 30 5 5	-
K	Gusseisen mit Kugelgrafit (GJS) · Cast iron with nodular graphite (GJS)						
2.1	370 - 400		0.7040	EN-GJS-400-15 (GGG40)	FGS 400-12	SNG 420/12	-
2.1	420 - 500		0.7050	EN-GJS-500-7 (GGG50)	FGS 500-7	SNG 500/7	-
2.2	550 - 600		0.7060	EN-GJS-600-3 (GGG60)	FGS 600-3	SNG 600/3	-
2.2	660 - 700		0.7070	EN-GJS-700-2 (GGG70)	FGS 700-2	SNG 700/2	-
2.2	800		0.7080	EN-GJS-800-2 (GGG80)	FGS 800-2	SNG 800/2	-
2.1	370 - 480		0.7660	GGG-NiCr20-2	S-NC 20 2	S-NiCr 20 2	-
2.1	> 390		0.7661	GGG-NiCr20-3	S-NC 20 3	S-NiCr 20 3	-
2.1	370 - 450		0.7670	EN-GJSA-XNi22	S-N 22	S-Ni 22	-
2.1	440 - 480		0.7673	EN-GJSA-XNiMn23-4	S-NM 23 4	S-NiMn 23 4	-
2.1	370 - 480		0.7676	EN-GJSA-XNiCr30-3	S-NC 30 3	S-NiCr 30 3	-
2.1	> 370		0.7677	GGG-NiCr301	S-NC 30 1	S-NiCr 30 1	-
2.1	390 - 500		0.7680	EN-GJSA-XNiSiCr30-5-5	S-NSC 30 5 5	S-NiSiCr 30 5 5	-
2.1	370 - 420		0.7683	EN-GJSA-XNi35	S-N 35	S-Ni 35	-
2.1	370 - 450		0.7685	EN-GJSA-XNiCr35-3	S-NC 35 3	S-NiCr 35 3	-








 UNI	 UNE	 JIS	 SIS	 AISI/SAE/ASTM	
X 2 CrNiMo 17 13	-	SCS 16; SUS 316 L	2353	316 L	2.1
X 2 CrNiMo 17-12-3	F-3537	-	-	316 L	2.1
X 2 CrNiMoN 17 12	F-3542	SUS 316 LN	-	316 LN	2.1
X 2 CrNiMoN 17 13	F-3543	SUS 316 LN	2375	316 LN	2.1
X 6 CrNiMoTi 17 13	-	SUS 316 Ti	-	316 Ti	2.1
X 6 CrNiMoTi 17 12	F.3535	SUS 316 Ti	2350	316 Ti	2.1
X 6 CrNiMoNb 17 12	F.3536	-	-	316 Cb	2.1
X 2 CrNiMo 18 15	F-3539	SUS 317 L	2367	317 L	2.1
-	F-3544	-	-	317 LMN	2.1
X 6 CrNiMoNb 17 13	-	-	-	318	2.1
X 6 CrNiTi 18 11	F.3553; F.3523	SUS 321	2337	321	2.1
-	-	SUS 321	-	321 H	2.1
X 6 CrNiNb 18 11	F.3552; F.3524	SUS 347	2338	347	2.1
-	-	-	2584	B 668	2.1
-	-	-	2562	904 L	2.1
-	F.3313	SUH 330	-	330	2.1
-	F-35552	SUS 329 J 1	2324	329	2.1
X 6 CrNiNb 18 11	F-3524	SUS 347	2338	348	2.1
M					
-	-	SUS 329J3L	2377	2205	3.1
-	-	-	2327	2304	3.1
-	-	SCS 14A	2328	2507	4.1
-	-	-	-	255	3.1
-	-	-	-	255	3.1
M					
X 12 Cr 13	F.3401	SUS 410	2302	410; CA-15	1.1
X 12 CrS 13	-	SUS 416	2380	416	1.1
X 20 Cr 13	-	SUS 420 J 1	2303	420	1.1
X 30 Cr 13	-	SUS 420 J 2	2304	420	1.1
X 40 Cr 14	-	SUS 420 J 2	2304	420	1.1
X 40 Cr 14	F.3405	SUS 420 J 2	2304	420	1.1
-	F-3422	-	-	-	1.1
-	-	-	-	-	1.1
X 6 CrNi 13 04	-	SCS 5	2385	CA 6-NM	3.1
-	-	-	2387	-	3.1
-	-	SUS 410J1	-	420	1.1
X 14 CrS 17	F-3431	SUS 430 F	2383	430 F	1.1
X 16 CrNi 16	F-3427	SUS 431	2321	431	1.1
X 80 CrSiNi 20	F.320.B	SUH 4	-	HNW 6	1.1
X 105 CrMo 17	-	SUS 440 C	-	440 C	1.1
M					
-	-	SCS 630	-	630	4.1
-	-	SUS 631	2388	631	3.1
K					
G 10	-	FC 10	01 10-00	A48-20 B	1.1
G 15	FG 15	FC 15	01 15-00	A48-25 B	1.1
G 20	FG 20	FC 20	01 200	A48-30 B	1.2
G 25	FG 25	FC 25	01 250	A48-40 B	1.2
G 30	FG 30	FC 30	1 300	A48-45 B	1.2
G 35	FG 35	FC 35	1 350	A48-50 B	1.2
-	-	-	1 400	A48-60 B	1.2
-	-	-	-	A-436 Type 1	1.1
-	-	-	-	A-436 Type 2	1.1
-	-	-	-	A-436 Type 3	1.1
-	-	-	-	A-436 Type 4	1.1
K					
GS 400-12	GGG 40	FCD 40	0717-02	60-40-18	2.1
GS 500/7	GGG 50	FCD 50	0727-02	65-45-12	2.1
GS 600/3	-	FCD 60	0732-03	80-55-06	2.2
GS 700/2	GGG 70	FCD 70	0737-01	100-70-03	2.2
GS 800/2	-	-	-	120-90-02	2.2
-	F 43000	-	-	A 439 Type D-2	2.1
-	F 43001	-	-	A 439 Type D-2B	2.1
-	F 43002	-	-	A 439 Type D-2C	2.1
-	F 43003	-	-	A 439 Type D-2M	2.1
-	-	-	-	A 439 Type D-3	2.1
-	F 43004	-	-	A 439 Type D-3A	2.1
-	F 43005	-	-	A 439 Type D-4	2.1
-	F 43006	-	-	A 439 Type D-5	2.1
-	-	-	-	A 439 Type D-5B	2.1






	R_m [N/mm ²]	Rockwell [HRC]	Mat.-Nr.	 DIN	 AFNOR	 BS	EN
K Gusseisen mit Vermiculargrafit (GJV) · Cast iron with vermicular graphite (GJV)							
3.1	300-375			EN-GJV300	-	-	-
3.2	350-425			EN-GJV350	-	-	-
3.2	400-475			EN-GJV400	-	-	-
3.2	450-525			EN-GJV450	-	-	-
3.2	500-575			EN-GJV500	-	-	-
K Temperguss (GTMW, GTMB) · Malleable cast iron (GTMW, GTMB)							
4.1	> 350		0.8135	EN-GJMB-350-10	MN35-10	B340/12	-
4.1	> 450		0.8145	EN-GJMB-450-6	-	P440/7	-
4.2	> 550		0.8155	EN-GJMB-550-4	MP50-5	P510/4	-
4.2	> 650		0.8165	EN-GJMB-650-2	MP60-3	P570/3	-
4.2	> 700		0.8170	EN-GJMB-700-2	M870-2	P690/2	-
4.1	270 - 360		0.8035	EN-GJMW-350-4	MB35-7	W340/3	-
4.1	300 - 420		0.8040	EN-GJMW-400-5	MB40-10	W410/4	-
4.1	330 - 480		0.8045	EN-GJMW-450-7	-	-	-
4.2	490 - 570		0.8055	EN-GJMW-550-4	-	-	-
N Aluminium unlegiert · Unalloyed aluminium							
1.1	65 - 150		3.0225	Al99.5	A5	1B	-
1.1	40 - 100		3.0305	Al99.9	A9	-	-
N Aluminium-Knetlegierungen, nicht ausgehärtet · Wrought aluminium alloys, not hardened							
1.1	100 - 125		3.0505	AlMn0.5Mg0.5	-	N31	-
1.2	80 - 230		3.0515	AlMn1	-	N3	-
1.2	115 - 290		3.0525	AlMn1Mg0.5	A-M1G0,5	-	-
1.1	100 - 205		3.3315	AlMg1	A-G0,6	N41	-
1.2	180 - 310		3.3535	AlMg3	A-G3M	N5	-
N Aluminium Knetlegierungen, ausgehärtet · Wrought aluminium alloys, hardened							
1.3	150 - 400		3.1325	AlCuMg1	A-U4G	H14	-
1.3	180 - 460		3.1355	AlCuMg2	A-U4G1	2L97	-
1.3	130 - 360		3.2315	AlMgSi1	A-SGM0,7	H30	-
1.2	130 - 270		3.3206	AlMgSi0.5	-	H9	-
1.2	120 - 300		3.3211	AlMg1SiCu	-	H20	-
1.3	410 - 490		3.4345	AlZnMgCu0.5	AZ 4 GU/9051	L86	-
1.3	180 - 560		3.4365	AlZnMgCu1.5	AZ 4 GU/9050 C	L87	-
N Aluminium-Gusslegierungen Si ≤ 7% · Aluminium cast alloys Si ≤ 7%							
1.4	280 - 300		3.2134	G-AlSi5Cu1Mg	-	-	-
1.4	140 - 300		3.3241	G-AlMg3Si	-	-	-
1.4	200		3.3292	GD-AlMg9	A-G10S	-	-
1.4	140 - 210		3.3541	GD-AlMg3	A-G3T	-	-
N Aluminium-Gusslegierungen 7% < Si ≤ 12% · Aluminium cast alloys 7% < Si ≤ 12%							
1.5	160 - 200		3.2161	G-AlSi8Cu3	-	-	-
1.5	230 - 360		3.2373	G-AlSi9Mg	A-S9G	-	-
1.5	240 - 350		3.2163	G-AlSi9Cu3	A-S9U3	LM24	-
1.5	150 - 340		3.2381	G-AlSi10Mg	A-S10G	LM9	-
1.5	160		3.2383	G-AlSi10Mg(Cu)	A-S10GU	LM 9	-
1.5	150 - 170		3.2581	G-AlSi12	A-S13	LM 6	-
1.5	150 - 290		3.2583	G-AlSi12(Cu)	A-S12U	LM 20	-
N Aluminium-Gusslegierungen Si > 12% · Aluminium cast alloys Si > 12%							
1.6	165 - 370			G-AlSi17Cu4Mg	-	-	-
1.6	180 - 220			G-AlSi18CuNiMg	-	-	-
1.6	200 - 240			G-AlSi21CuNiMg	-	-	-
1.6	230 - 300			G-AlSi25CuNiMg	-	-	-
N Reinkupfer, niedriglegiertes Kupfer · Pure copper, low-alloyed copper							
2.2	< 600		2.0240	CuZn15	CuZn15	CZ 102	-
2.2	< 800		2.0265	CuZn30	CuZn30	CZ 106	-
N Kupfer-Zink-Legierungen (Messing, langspanend) · Copper-zinc alloys (brass, long-chipping)							
2.2	< 800		2.0321	CuZn37	CuZn37	CZ 108	-
2.2	< 800		2.0335	CuZn36	Ms63	CZ 108	-
2.2	340 - 480		2.0360	CuZn40	Ms60	DCB1	-
N Kupfer-Zink-Legierungen (Messing, kurzspanend) · Copper-zinc alloys (brass, short-chipping)							
2.3	340 - 570		2.0401	CuZn39Pb3	Ms58	-	-
N Kupfer-Zinn-Legierungen (Zinnbronze, langspanend) · Copper-tin alloys (tin bronze, long-chipping)							
2.5	< 900		2.1016	CuSn4	-	-	-
2.5	390 - 620		2.1030	CuSn8P	-	-	-
N Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend) · Copper-tin alloys (tin bronze, short-chipping)							
2.6	200 - 250		2.1097	G-CuSn5ZnPb	Rg5	-	-
2.6	230 - 320		2.1090.01	G-CuSn7ZnPb	Rg7	-	-
2.6	280		2.1086.01	G-CuSn10Zn	Rg10	-	-
2.6	600 - 650		2.0975	G-CuAl10Ni	CuNiAl11	-	-
N Kupfer-Aluminium-Legierungen (Alubronze) · Copper-aluminium alloys (alu bronze)							
2.7	> 550			Ampco 8	-	-	-
2.8	> 750			Ampco 21	-	-	-








	 UNI	 UNE	 JIS	 SIS	 AISI/SAE/ASTM	
						K
-		-	-	-	-	3.1
-		-	-	-	-	3.2
-		-	-	-	-	3.2
-		-	-	-	-	3.2
-		-	-	-	-	3.2
						K
-		GTS 35	-	0810	32510	4.1
-		GTS 45	-	0852	40010	4.1
-		GTS 55	-	0854	50005	4.2
-		GTS 65	-	0856	70003	4.2
-		GTS 70	-	0862; 0864	90001	4.2
-		GTW 35	FCMW 330	-	MB 350-4	4.1
GMB 40		GTW 40	FCMW 370	-	MB 400-5	4.1
GMB 45		GTW 45	FCMWP 440	-	MB 450-7	4.1
-		GTW 55	-	-	-	4.2
						N
4507		L-3051	A1x1	-	-	1.1
-		-	-	-	-	1.1
						N
-		-	-	-	3105	1.1
3568		L-3810	144054	-	-	1.2
-		-	-	-	-	1.2
5764		L-3350	A2x8	144106	-	1.1
3575		L-3390	-	-	-	1.2
						N
3579		L-3120	-	-	-	1.3
3579		L-3140	A3x4	-	-	1.3
3571		L-3451	-	144212	-	1.3
3569		L-3441	A2x5	144103	-	1.2
-		-	-	-	-	1.2
811-04		-	-	-	7050	1.3
811-05		-	-	-	7175	1.3
						N
-		-	-	-	-	1.4
-		-	-	-	-	1.4
5080		-	-	-	-	1.4
3059		-	ADC6	-	-	1.4
						N
-		-	-	-	-	1.5
3051		-	AC4A	-	-	1.5
5075		-	-	-	-	1.5
3051		L-2560	-	4253	-	1.5
-		-	-	4253	A 360.2	1.5
3051		-	AC3	4261	A 413.2	1.5
3048		-	-	4260	A 413.1	1.5
						N
-		-	-	-	-	1.6
-		-	-	-	-	1.6
-		-	-	-	-	1.6
-		-	-	-	-	1.6
						N
-		-	C2300	-	C23000	2.2
-		-	C2600	-	C26000	2.2
						N
-		-	C 2700	-	C27200	2.2
P-CuZn35		-	C 2700	-	C27000	2.2
-		-	-	-	C28000	2.2
						N
-		-	-	-	C38500	2.3
						N
-		-	C 5111	-	C51100	2.5
-		-	C5210	-	C52100	2.5
						N
-		-	H 5111	-	C83600	2.6
-		-	-	-	C93200	2.6
-		-	-	-	-	2.6
-		-	-	-	-	2.6
						N
-		-	-	-	-	2.7
-		-	-	-	-	2.8



	R _m [N/mm ²]	Rockwell [HRC]						
			Mat.-Nr.	DIN	AFNOR	BS	EN	
2.7	> 500		Ampco 25	-	-	-	-	-
2.8	> 810		Ampco 45	-	-	-	-	-
2.8	> 1000		Ampco M-4	-	-	-	-	-
N Magnesium-Knetlegierungen · Magnesium wrought alloys								
3.1	> 270		3.5612	MgAl6Zn	-	-	-	-
3.2	> 240		3.5912	G-MgAl9Zn1	-	-	-	-
N Kunststoffe · Synthetics								
4.1			Bakelit	-	-	-	-	-
4.1			Pertinax	-	-	-	-	-
4.2			PMMA	-	-	-	-	-
4.2			POM	-	-	-	-	-
4.2			PVC	-	-	-	-	-
N Faserverstärkte Kunststoffe · Fibre-reinforced synthetics								
4.3	155 - 365		GFK	-	-	-	-	-
4.3	190 - 210		CFK uni.	-	-	-	-	-
4.3	190 - 210		CFK multi.	-	-	-	-	-
4.3			AFK	-	-	-	-	-
S Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
2.6	900 - 1100		1.4718	X45CrSi9-3	Z 45 CS 9	401 S 45	52	-
2.6	500 - 750		1.4828	X15CrNiSi20-12	Z 15 CNS 20.12	309 S 24	-	-
2.6	550 - 800		1.4841	X15CrNiSi25-20	Z 15 CNS 25.20	-	-	-
2.6	500 - 750		1.4845	X12CrNi25-21	Z 12 CN 25.20	310 S 24	-	-
2.6	550 - 800		1.4864	X12NiCrSi36-16	Z 12 NCS 37.18	NA 17	-	-
2.6	950 - 1200		1.4871	X53CrMnNiN21-9	Z 52 CMN 21.09	349 S 54	-	-
2.6	500 - 750		1.4876	X10NiCrAlTi33-20	Z 8 NC 32.21	NA 15 (H)	-	-
2.6	500 - 750		1.4878	X12CrNiTi18-9	Z 6 CNT 18.12 (B)	321 S 20	-	-
2.2	500 - 700		2.4360	NiCu30Fe	Nu 30	NA 13	-	-
2.2	620 - 850		2.4375	NiCu30Al	Nu 30 AT	NA 18	-	-
2.2	> 690		2.4685	G-NiMo28	-	-	-	-
2.2	> 740		2.4610	NiMo16Cr16Ti	-	-	-	-
2.2	> 760		2.4617	G-NiMo30	-	-	-	-
2.2	700 - 800		2.4630, 2.4951	NiCr20Ti	NC 20 T	HR 5	-	-
2.2	800 - 1000		2.4631	NiCr20TiAl	-	HR 401; 601	-	-
2.3	1200		2.4632	NiCr20Co18Ti	-	-	-	-
2.3	1180		2.4634	NiCo20Cr15MoAlTi	-	-	-	-
2.2	< 770		2.4662	NiCr13Mo6Ti3	-	HR 53	-	-
2.3	900 - 1200		2.4670	-	-	-	-	-
2.3	900 - 1200		2.4674	-	-	-	-	-
2.3	1270		2.6554	-	-	-	-	-
2.2	890		2.4856	NiCr22Mo9Nb	NC 22 FeDNb	NA 21	-	-
2.3	< 1400		2.4668	NiCr19FeNbMo	NC 19Fe Nb	-	-	-
S Reintitan, Titanlegierungen · Pure titanium, titanium alloys								
1.1	290 - 410		3.7025	Ti99.5 / Ti Gr.1	-	-	-	-
1.1	380 - 540		3.7035	Ti99.4 / Ti Gr.2	-	TA 1	-	-
1.2	460 - 590		3.7055	Ti99.3 / Ti Gr.3	-	TA 2	-	-
1.2	540 - 740		3.7065	Ti99.2 / Ti Gr.4	-	TA 3	-	-
1.1	390 - 540		3.7235	Ti2Pd / Ti Gr.2Pd	-	-	-	-
1.2	> 890		3.7165	TiAl6V4 / Ti Gr. 5	T-A6V	TA 28	-	-
1.3	> 1000		3.7185	TiAl4Mo4Sn2	-	-	-	-
H Gehärtete Stähle, Hartguss · Hardened steels, hard castings								
1.1	1250 - 1550	< 50	Weldox 1100	-	-	-	-	-
1.2	1600 - 1800	< 55	Hardox 500	-	-	-	-	-
1.2	1820 - 1900	< 55	Hardox 550	-	-	-	-	-
1.2	~ 1860	< 55	1.2713	55NiCrMoV6	55 NCDV 7	-	-	-
1.3	1995 - 2300	< 60	Armox 600T	-	-	-	-	-
1.3	~ 2100	< 60	1.2542	45WCv7	-	BS 1	-	-
1.4		< 63	Ferro-Titanit	-	-	-	-	-
1.4		< 63	1.2379	X155CrVMo12-1	Z 160 CDV 12	BD 2	-	-
1.5		< 66	HSSE	-	-	-	-	-
1.5		< 66	1.2436	X210CrW12	-	-	-	-



	 UNI	 UNE	 JIS	 SIS	 AIS/SAE/ASTM	
-	-	-	-	-	-	2.7
-	-	-	-	-	-	2.8
-	-	-	-	-	-	2.8
-	-	-	-	-	-	N
-	-	-	-	-	-	3.1
-	-	-	-	-	-	3.2
-	-	-	-	-	-	N
-	-	-	-	-	-	4.1
-	-	-	-	-	-	4.1
-	-	-	-	-	-	4.2
-	-	-	-	-	-	4.2
-	-	-	-	-	-	4.2
-	-	-	-	-	-	N
-	-	-	-	-	-	4.3
-	-	-	-	-	-	4.3
-	-	-	-	-	-	4.3
-	-	-	-	-	-	4.3
-	-	-	-	-	-	S
X 45 CrSi 8	-	-	SUH 1	-	HNV 3	2.6
-	-	-	SUH 309	-	309	2.6
X 16 CrNiSi 25 20	-	-	SUH 310	-	314; 310	2.6
X 6 CrNi 26 20	F.331	-	SUH 310; SUS 310 S	-	310 S	2.6
-	-	-	SUH 330	-	330	2.6
X 53 CrMnNiN 21 9	-	-	SUH 35; SUH 36	-	EV 8	2.6
-	-	-	NCF 800	-	B 163	2.6
X 6 CrNiTi 18 11	-	-	SUS 321	2337	321	2.6
-	-	-	-	-	Monel 400	2.2
-	-	-	-	-	Monel K-500	2.2
-	-	-	-	-	Hastelloy B	2.2
-	-	-	-	-	Hastelloy C-4	2.2
-	-	-	-	-	Hastelloy B-2	2.2
-	-	-	-	-	Nimonic 75	2.2
-	-	-	NCF 80 A	-	Nimonic 80 A	2.2
-	-	-	-	-	Nimonic 90	2.3
-	-	-	-	-	Nimonic 105	2.3
-	-	-	-	-	Nimonic 901	2.2
-	-	-	-	-	Nimocast 713	2.3
-	-	-	-	-	Nimocast PK 24	2.3
-	-	-	-	-	Waspaloy	2.3
-	-	-	-	-	Inconel 625	2.2
-	-	-	-	-	Inconel 718	2.3
-	-	-	-	-	-	S
-	-	-	-	-	-	1.1
-	-	-	-	-	-	1.1
-	-	-	-	-	-	1.2
-	-	-	-	-	-	1.2
-	-	-	-	-	-	1.1
-	-	-	-	-	R56400	1.2
-	-	-	-	-	-	1.3
-	-	-	-	-	-	H
-	-	-	-	-	Weldox 1100	1.1
-	-	-	-	-	Hardox 500	1.2
-	-	-	-	-	Hardox 550	1.2
-	F.520.S	-	SKT 4	-	L 6	1.2
-	-	-	-	-	Armox 600T	1.3
45 WCrV 8 KU	45WCrSi8	-	-	2710	S 1	1.3
-	-	-	-	-	Ferro-Titanit	1.4
X 155 CrVMo 12 1KU	-	-	SKD 11	-	D 2	1.4
-	-	-	-	-	HSSE	1.5
X 215 CrW 12 1 KU	X210CrW12	-	SKD 2	2312	-	1.5



Der Service ist so wichtig wie das Produkt selbst. Aus diesem Grund hat EMUGE-FRANKEN ein umfangreiches Kommunikations- und Servicesystem geschaffen. Nachfolgend finden Sie einige Beispiele dafür.

Service is just as important as the product itself. For this reason, EMUGE-FRANKEN has created a comprehensive communication and service system. Please see the following examples:

Weltweite Präsenz

Ihren zuständigen Ansprechpartner können Sie über unsere Zentralen in Lauf und Rückersdorf oder im Internet unter www.emuge-franken.com abfragen.

Worldwide presence

Please see our homepage – www.emuge-franken.com –, or contact our service staff in Lauf or Rückersdorf, to find out who is responsible for your area.

Systemlösungen

Eine sehr enge Zusammenarbeit mit den Werkzeugmaschinenherstellern ermöglicht uns einen umfangreichen Überblick über die Prozessparameter. Wenn Sie nach prozesssicheren Fertigungslösungen suchen, ist unser Experten-Team gerne bereit, mit Ihnen gemeinsam die wirtschaftlichste Problemlösung zu erarbeiten.

System solutions

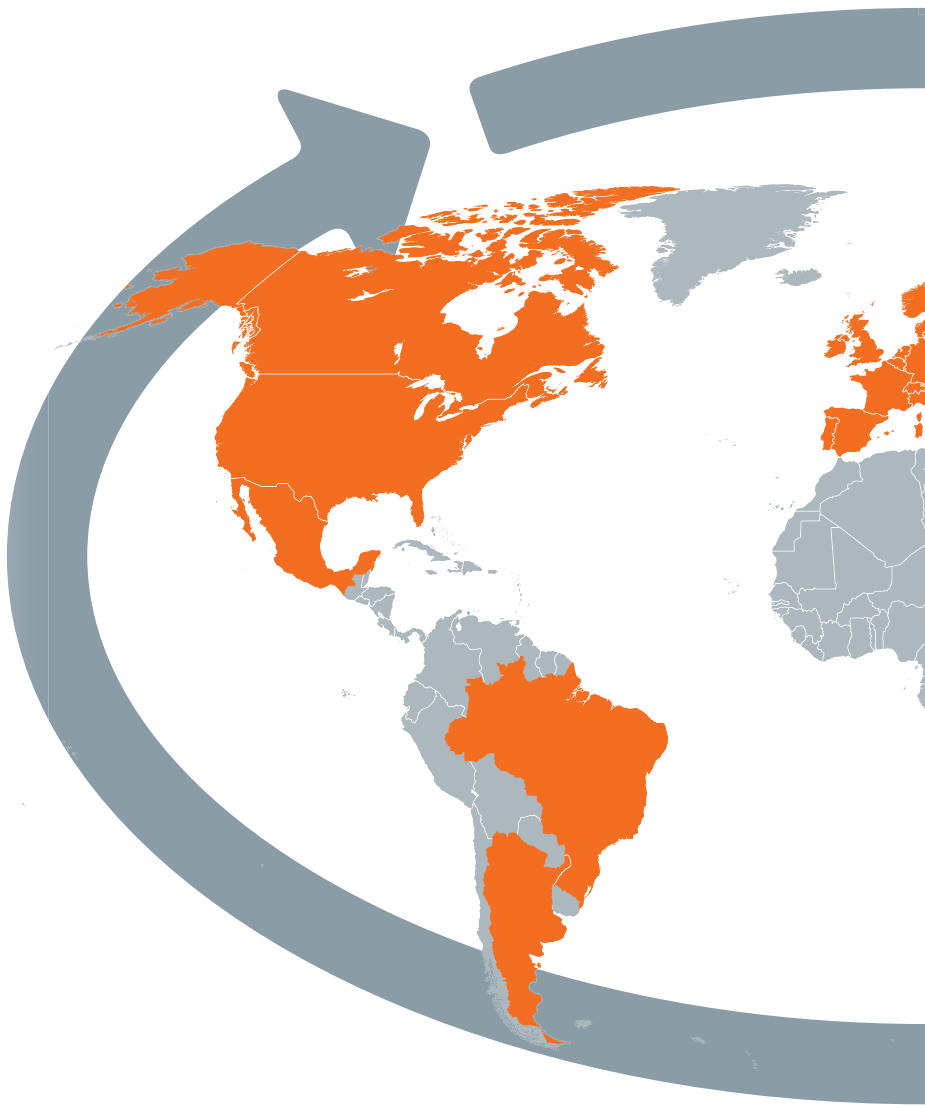
Our close cooperation with machine tool makers means that we have a profound understanding of all aspects of machining. If you are looking for manufacturing solutions with reliable processes, our team of experts will be happy to assist you in finding the most economical solution for your application.

Messen/Informationsveranstaltungen

Über Messebeteiligungen weltweit werden Interessenten ständig über technologische Entwicklungen und Neuprodukte von EMUGE-FRANKEN informiert.

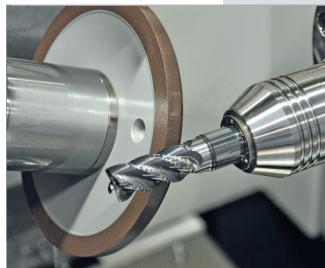
Fairs and exhibitions/Information events

We take part in a variety of international exhibitions to provide you with information about technological developments and new products from EMUGE-FRANKEN.



Nachschleif- und Nachbeschichtungsservice

Auch das leistungsfähigste Zerspanungswerkzeug wird einmal stumpf. Wir bieten Ihnen einen Nachschleif- und Nachbeschichtungsservice in Herstellerqualität. Gerne beraten wir Sie vor Ort oder in unserem Haus.



Regrinding and recoating service

Even the most efficient tool will become blunt eventually. We can offer you a regrinding and recoating service in manufacturer quality. We will be happy to advise you either here at the company or at your premises.



In unseren Unternehmen ist die Abteilung „Anwendungstechnik“ die Service- und Dienstleistungsabteilung für den weltweit bestehenden Kundenkreis. Für die von EMUGE-FRANKEN angebotenen Produkte stellt dieses Expertenteam folgende Leistungen zur Verfügung:

- Weltweite telefonische Beratung und Unterstützung bei der Lösung technischer Probleme
- Mitarbeit bei der Erarbeitung von Konzepten und Vorschlägen zur Optimierung des Fertigungsablaufes beim Kunden
- Durchführung von Versuchen mit spezifischen Kundenmaterialien in einer eigens dafür eingerichteten Versuchsabteilung zur optimalen Werkzeugauswahl und -empfehlung
- Entwicklung und Konstruktion kundenspezifischer Sonderwerkzeuge
- Einsatz von Servicetechnikern
- Durchführung von produktbezogenen Schulungen und Seminaren weltweit

At EMUGE-FRANKEN, the Technical Service Department is the service and consulting partner for our customers worldwide. Our team of service technicians will be happy to help you in any of the following ways:

- Worldwide telephone consulting and support in the solution of technical problems
- Active support in the development of work strategies and in the optimisation of production processes
- Cutting trials with specific customer materials in a special workshop fitted exclusively for that purpose, for the perfect tool selection
- Development and construction of special tools made to customer's specifications
- Visits to customers' workshops and active support on location
- Product-related training courses and seminars arranged at any place worldwide



Zertifikat

Prüfungsnorm **ISO 9001:2008**

Zertifikat-Registrier-Nr. 01 100 020782/02

TÜV Rheinland Cert GmbH bescheinigt:

Zertifikatsinhaber:



FRANKEN GmbH & Co. KG,
Fabrik für Präzisionswerkzeuge
Frankenstraße 7/9a
D - 90607 Rückersdorf

Geltungsbereich: Entwicklung, Herstellung und Vertrieb von Fräswerkzeugen

Durch ein Audit, Bericht Nr. 020782, wurde der Nachweis erbracht, dass die Forderungen der ISO 9001:2008 erfüllt sind.

Gültigkeit: Dieses Zertifikat ist gültig in Verbindung mit dem Hauptzertifikat vom 16.01.2013 bis zum 15.01.2016.

16.01.2013

P. Uitz
TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln



DGA-ZM-58-95-00

www.tuv.com

TÜVRheinland®
Genau. Richtig.



Mit der Produktlinie "Dental" bietet FRANKEN ein umfangreiches Programm an Fräsern, Schleifstiften und Spiralbohrern zur Herstellung von Zahnersatz.

Die Werkzeuge wurden hinsichtlich Substrat, Schneidengeometrie, sowie Finish-Behandlung und Beschichtung für die derzeit aktuellen Dentalmaterialien optimiert bzw. neu entwickelt.

Eine Vielzahl an Praxistests in verschiedenen Dentallaboren und zahlreiche Fachdiskussionen mit Dentalpraktikern führten zu einem Werkzeugangebot, das allen Anforderungen gerecht wird.

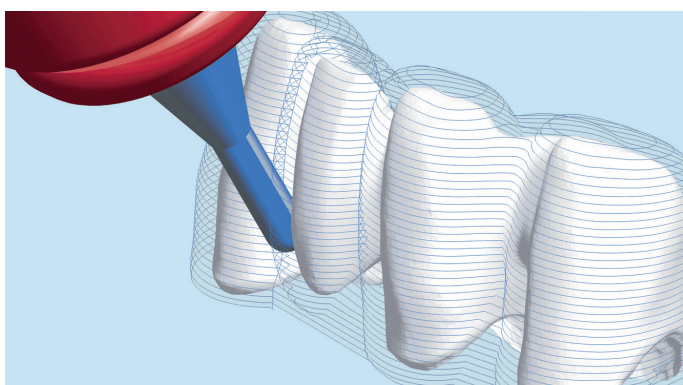
So stehen dem Zahntechniker heute annähernd 100 verschiedene FRANKEN-Dentalwerkzeuge zur Lösung maschineller Bearbeitungsprobleme zur Verfügung.

FRANKEN offers an extensive programme of milling cutters, grinding burrs and twist drills for the production of dental prostheses.

The tools were optimised respectively newly developed for the dental materials currently used with regard to substrate, cutting edge geometry as well as to finish treatment and coating.

A large number of practical tests in various dental laboratories and many expert discussions with dental professionals resulted in a tool programme which meets all requirements.

Now more than approximately 100 different FRANKEN dental tools are available to dental technicians to solve machining problems.



Einsetzbar in offenen und geschlossenen CAD/CAM-Prozessketten
Applicable in open and closed CAD/CAM process chains

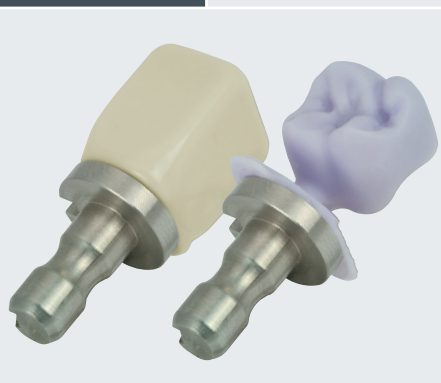


Zirkonoxid
Zirconium oxide

PMMA / PEEK / Wachs
PMMA / PEEK / Wax

Kobalt-Chrom / Titan
Cobalt-chrome / Titanium

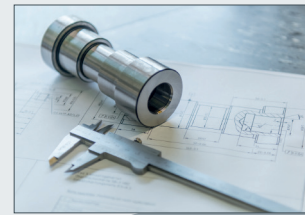
Glaskeramik / e.max®
Glass ceramic / e.max®



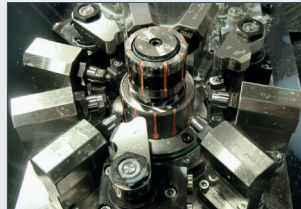
Sie benötigen Sonderwerkzeuge?
Do you need special tools?

Um Ihnen ein maßgeschneidertes Angebot unterbreiten zu können,
benötigen wir noch einige detaillierte Angaben:

In order to be able to submit you an individual offer, we require some
more detailed information:



Werkstückzeichnung
Drawing of the workpiece



Aufspannsituation
Clamping situation



Maschinendaten
Machine data



Material (Werkstück)
Material (workpiece)



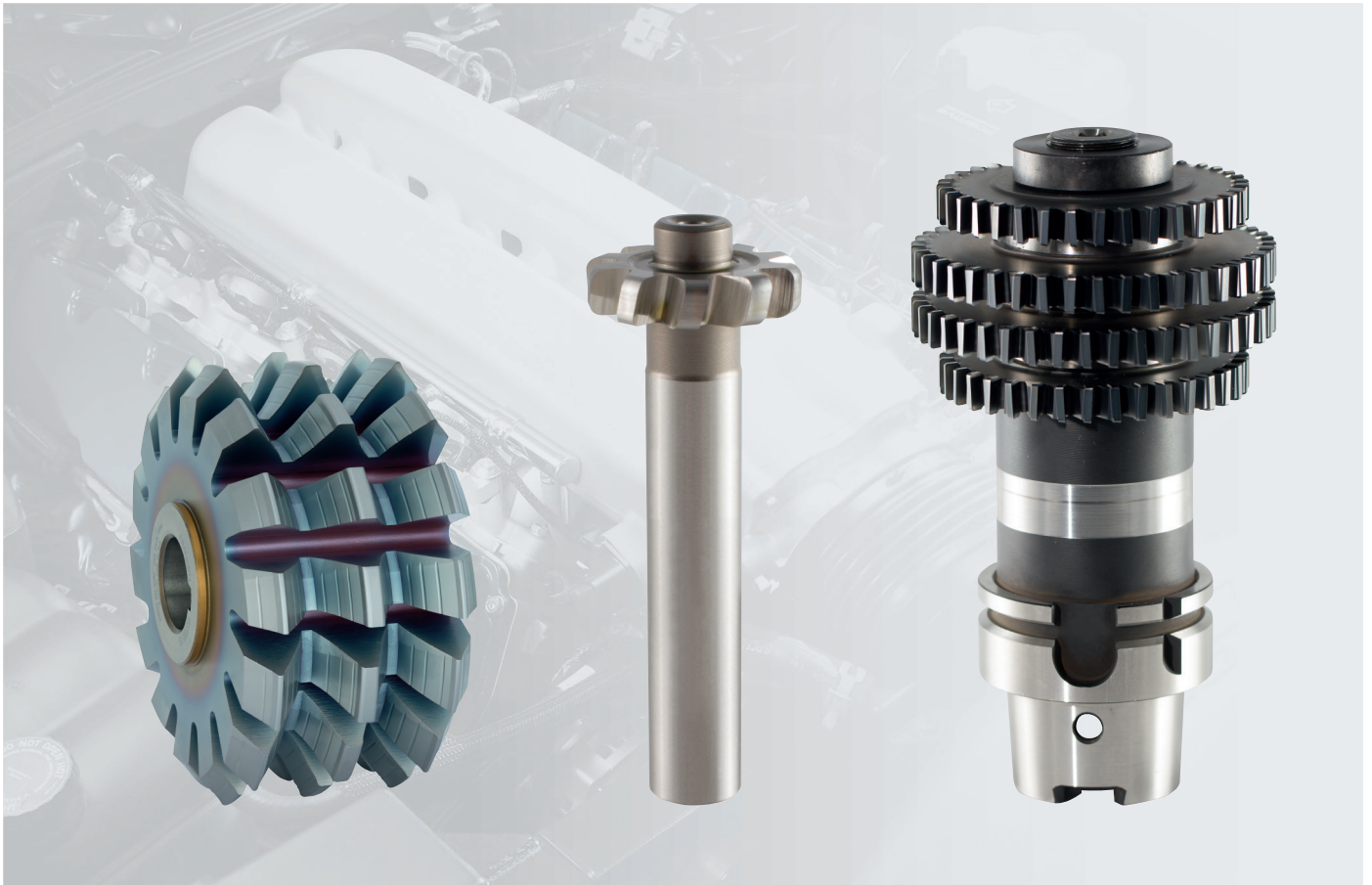
Bedarfsmenge
Requirement



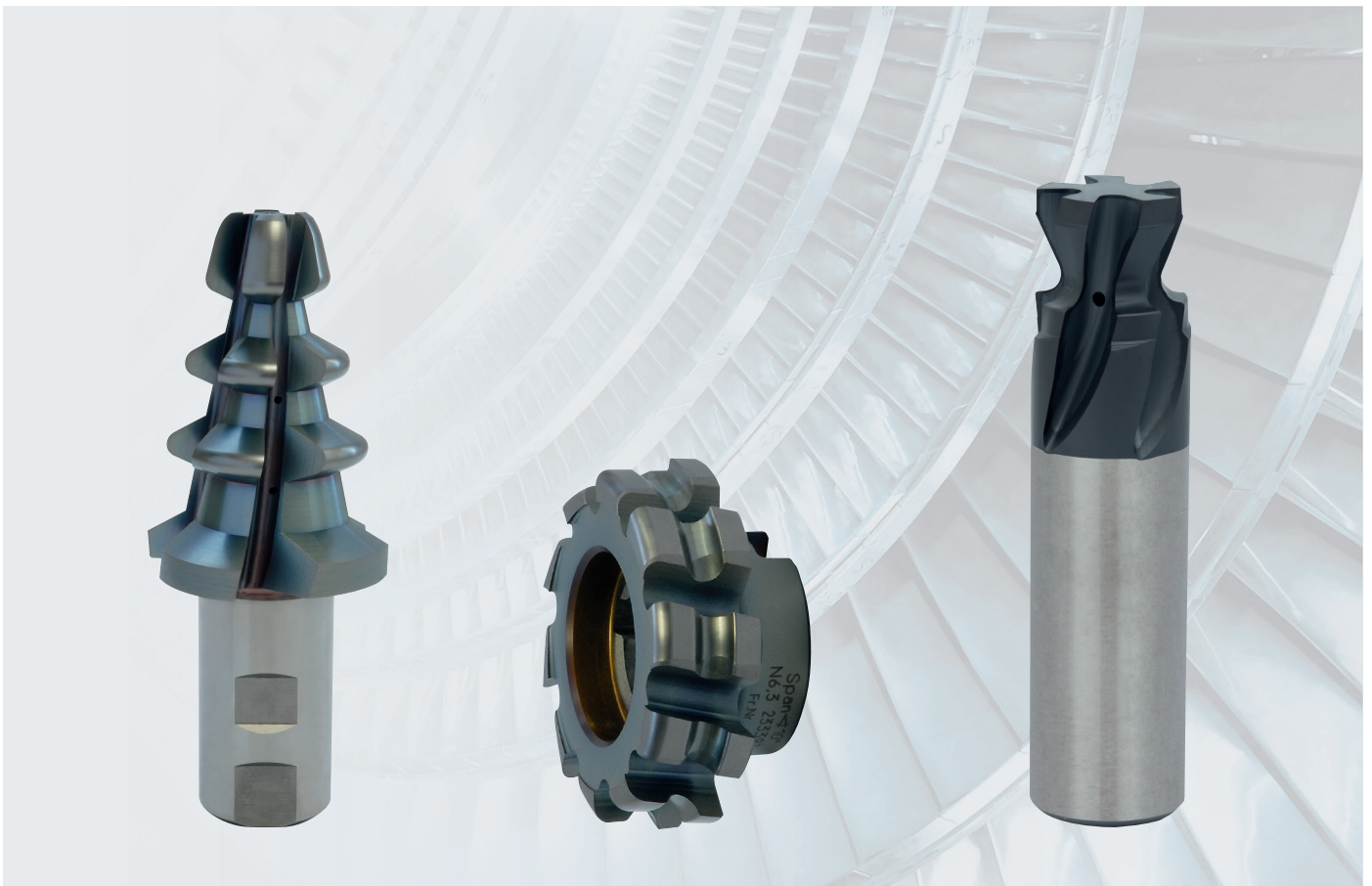
Ihr maßgeschneidertes Angebot!
Your individual offer!



Lösungen für die Serienfertigung
Solutions for series production



Lösungen für die Kraftwerksindustrie
Solutions for power industry



Hinweis:

Die allgemeinen Geschäftsbedingungen können Sie bei der für Sie zuständigen Landesvertretung anfordern.

Please note:

If you want specific General Sales Conditions for your own country, please ask your local contact.

I. Allgemeines

1. Allen Lieferungen und Leistungen liegen diese Bedingungen sowie etwaige gesonderte vertragliche Vereinbarungen zugrunde. Abweichende Einkaufsbedingungen des Bestellers werden auch durch Auftragsannahme nicht Vertragsinhalt.
2. Der Lieferer behält sich an Mustern, Kostenvorschlägen, Zeichnungen u.ä. Informationen körperlicher und unkörperlicher Art – auch in elektronischer Form – Eigentums- und Urheberrechte vor; sie dürfen Dritten nicht zugänglich gemacht werden. Der Lieferer verpflichtet sich, vom Besteller als vertraulich bezeichnete Informationen und Unterlagen nur mit dessen Zustimmung Dritten zugänglich zu machen.
3. Die zu einem Angebot des Lieferers gehörenden Unterlagen, wie Abbildungen, Zeichnungen, Gewichts- und Maßangaben, sind nur annähernd maßgebend, soweit sie nicht ausdrücklich als verbindlich bezeichnet sind. Der Besteller übernimmt für die von ihm beizubringenden Unterlagen, wie Zeichnungen, Lehren, Muster oder dgl., die alleinige Verantwortung. Der Besteller hat dafür einzustehen, dass von ihm vorgelegte Ausführungszeichnungen in Schutzrechte Dritter nicht eingreifen.
4. Muster werden nur gegen Berechnung geliefert.

II. Umfang der Lieferung

1. Für den Umfang der Lieferung ist die schriftliche Auftragsbestätigung des Lieferers maßgebend, im Falle eines Angebots des Lieferers mit zeitlicher Bindung und fristgemäßer Annahme das Angebot, sofern keine rechtzeitige Auftragsbestätigung vorliegt. Nebenabreden und Änderungen bedürfen der schriftlichen Bestätigung des Lieferers.
2. Werden Sonderwerkzeuge in Auftrag gegeben, so darf die Bestellmenge um ca. 10 %, mindestens jedoch um 2 Stück über- oder unterschritten werden. Berechnet wird die Liefermenge.

III. Preis und Zahlung

1. Die Preise gelten mangels besonderer Vereinbarung ab Werk einschließlich Verladung im Werk, jedoch ausschließlich Verpackung und Entladung. Zu den Preisen kommt die Umsatzsteuer in der jeweiligen gesetzlichen Höhe hinzu.
2. Mangels besonderer Vereinbarung ist die Zahlung ohne jeden Abzug frei Zahlstelle des Lieferers innerhalb von 30 Tagen nach Rechnungsdatum (auch bei Teillieferungen) oder innerhalb 10 Tagen mit 2 % Skonto zu leisten.
3. Das Recht, Zahlungen zurückzuhalten oder mit Gegenansprüchen aufzurechnen, steht dem Besteller nur insoweit zu, als seine Gegenansprüche unbestritten oder rechtskräftig festgestellt sind.

IV. Lieferzeit, Lieferverzögerung

1. Die Lieferzeit ergibt sich aus den Vereinbarungen der Vertragsparteien. Ihre Einhaltung durch den Lieferer setzt voraus, dass alle kaufmännischen und technischen Fragen zwischen den Vertragsparteien geklärt sind und der Besteller alle ihm obliegenden Verpflichtungen, wie z.B. Beibringung evtl. erforderlicher behördlicher Bescheinigungen oder Genehmigungen oder die Leistung einer Anzahlung erfüllt hat. Ist dies nicht der Fall, so verlängert sich die Lieferzeit angemessen. Dies gilt nicht, soweit der Lieferer die Verzögerung zu vertreten hat.
2. Die Einhaltung der Lieferfrist steht unter dem Vorbehalt richtiger und rechtzeitiger Selbstbelieferung.
3. Die Lieferfrist ist eingehalten, wenn der Liefergegenstand bis zu ihrem Ablauf das Werk des Lieferers verlassen hat oder die Versandbereitschaft gemeldet ist. Soweit eine Abnahme zu erfolgen hat, ist – außer bei berechtigter Abnahmeverweigerung – der Abnahmetermin maßgebend, hilfsweise die Meldung der Abnahmebereitschaft.
4. Werden der Versand bzw. die Abnahme des Liefergegenstandes aus Gründen verzögert, die der Besteller zu vertreten hat, so werden ihm, beginnend einen Monat nach Meldung der Versand- bzw. der Abnahmebereitschaft, die durch die Verzögerung entstandenen Kosten berechnet.
5. Ist die Nichteinhaltung der Lieferzeit auf höhere Gewalt, auf Arbeitskämpfe oder sonstige Ereignisse, die außerhalb des Einflussbereiches des Lieferers liegen, zurückzuführen, so verlängert sich die Lieferzeit angemessen. Der Lieferer wird dem Besteller den Beginn und das Ende derartiger Umstände baldmöglichst mitteilen.
6. Der Besteller kann ohne Fristsetzung vom Vertrag zurücktreten, wenn dem Lieferer die gesamte Leistung vor Gefahrübergang endgültig unmöglich wird. Der Besteller kann darüber hinaus vom Vertrag zurücktreten, wenn bei einer Bestellung die Ausführung eines Teils der Lieferung unmöglich wird und er ein berechtigtes Interesse an der Ablehnung der Teillieferung hat. Ist dies nicht der Fall, so hat der Besteller den auf die Teillieferung entfallenen Vertragspreis zu zahlen. Dasselbe gilt bei Unvermögen des Lieferers. Im Übrigen gilt Abschnitt VIII.2. Tritt die Unmöglichkeit oder das Unvermögen während des Annahmeverzuges ein oder ist der Besteller für diese Umstände allein oder weit überwiegend verantwortlich, bleibt er zur Gegenleistung verpflichtet.
7. Gewährt der Besteller dem in Verzug befindlichen Lieferer – unter Berücksichtigung der gesetzlichen Ausnahmefälle – eine angemessene Frist zur Leistung und wird die Frist nicht eingehalten, ist der Besteller im Rahmen der gesetzlichen Vorschriften zum Rücktritt berechtigt. Weitere Ansprüche aus Lieferverzug bestimmen sich ausschließlich nach Abschnitt VIII.2. dieser Bedingungen.

V. Gefahrübergang, Abnahme

1. Die Gefahr geht auf den Besteller über, wenn der Liefergegenstand das Werk verlassen hat, und zwar auch dann, wenn Teillieferungen erfolgen oder der Lieferer noch andere Leistungen, z.B. die Versandkosten oder Anlieferung und Aufstellung übernommen hat. Soweit eine Abnahme zu erfolgen hat, ist diese für den Gefahrübergang maßgebend. Sie muss unverzüglich zum Abnahmetermin, hilfsweise nach der Meldung des Lieferers über die Abnahmebereitschaft durchgeführt werden. Der Besteller darf die Abnahme bei Vorliegen eines nicht wesentlichen Mangels nicht verweigern.
2. Verzögert sich oder unterbleibt der Versand bzw. die Abnahme infolge von Umständen, die dem Lieferer nicht zuzurechnen sind, geht die Gefahr vom Tage der Meldung der Versand- bzw. Abnahmebereitschaft auf den Besteller über. Der Lieferer verpflichtet sich, auf Kosten des Bestellers die Versicherungen abzuschließen, die dieser verlangt.
3. Teillieferungen sind zulässig, soweit für den Besteller zumutbar.

VI. Eigentumsvorbehalt

1. Der Lieferer behält sich das Eigentum an dem Liefergegenstand vor, bis sämtliche Forderungen des Lieferers gegen den Besteller aus der Geschäftsverbindung einschließlich der künftig entstehenden Forderungen auch aus gleichzeitig oder später abgeschlossenen Verträgen beglichen sind. Dies gilt auch dann, wenn einzelne oder sämtliche Forderungen des Lieferers in eine laufende Rechnung aufgenommen wurden und der Saldo gezogen ist.
2. Der Besteller ist berechtigt, den Liefergegenstand im ordentlichen Geschäftsgang weiterzuverkaufen. Er tritt jedoch dem Lieferer bereits jetzt alle Forderungen mit sämtlichen Nebenrechten ab, die ihm aus der Weiterveräußerung gegen den Abnehmer oder gegen Dritte erwachsen. Zur Einziehung dieser Forderungen ist der Besteller auch nach der Abtretung ermächtigt. Die Befugnis des Lieferers, die Forderungen selbst einzuziehen, bleibt hiervon unberührt; jedoch verpflichtet sich der Lieferer, die Forderungen nicht einzuziehen, solange der Besteller seinen Zahlungsverpflichtungen ordnungsgemäß nachkommt. Der Lieferer kann verlangen, dass der Besteller ihm die abgetretenen Forderungen und deren Schuldner bekannt gibt, alle zum Einzug erforderlichen Angaben macht, die dazugehörigen Unterlagen aushändigt und den Schuldnern die Abtretung mitteilt. Wird der Liefergegenstand zusammen mit anderen Waren, die dem Lieferer nicht gehören, weiterverkauft, so gilt die Forderung des Bestellers gegen den Abnehmer in Höhe des zwischen Lieferer und Besteller vereinbarten Lieferpreises als abgetreten. Der Lieferer verpflichtet sich, die ihm zustehenden Sicherungen insoweit freizugeben, als ihr Wert die zu sichernden Forderungen, soweit diese



noch nicht beglichen sind, um mehr als 20 % übersteigt.

3. Der Lieferer ist berechtigt, den Liefergegenstand auf Kosten des Bestellers gegen Diebstahl, Bruch-, Feuer-, Wasser- und sonstige Schäden zu versichern, sofern nicht der Besteller selbst die Versicherung nachweislich abgeschlossen hat.
4. Der Besteller darf den Liefergegenstand weder verpfänden noch zur Sicherung übereignen. Bei Pfändungen sowie Beschlagnahme oder sonstigen Verfügungen durch Dritte hat er den Lieferer unverzüglich davon zu benachrichtigen.
5. Bei vertragswidrigem Verhalten des Bestellers, insbesondere bei Zahlungsverzug, ist der Lieferer zur Rücknahme des Liefergegenstandes nach Mahnung berechtigt und der Besteller zur Herausgabe verpflichtet.
6. Der Antrag auf Eröffnung des Insolvenzverfahrens berechtigt den Lieferer vom Vertrag zurückzutreten und die sofortige Rückgabe des Liefergegenstandes zu verlangen.

VII. Gewährleistung

Für Sach- und Rechtsmängel der Lieferung leitet der Lieferer unter Ausschluss weiterer Ansprüche – vorbehaltlich Abschnitt VIII – Gewähr wie folgt:

Sachmängel

1. Alle diejenigen Teile sind unentgeltlich nach Wahl des Lieferers nachzubessern oder neu zu liefern, die sich infolge eines vor dem Gefährübergang liegenden Umstandes als mangelhaft herausstellen. Die Feststellung solcher Mängel ist dem Lieferer unverzüglich schriftlich zu melden. Ersetzte Teile werden Eigentum des Lieferers.
2. Zur Vornahme aller dem Lieferer notwendig erscheinenden Nachbesserungen und Ersatzlieferungen hat der Besteller nach Verständigung mit dem Lieferer die erforderliche Zeit und Gelegenheit zu geben; andernfalls ist der Lieferer von der Haftung für die daraus entstehenden Folgen befreit. Nur in dringenden Fällen der Gefährdung der Betriebssicherheit bzw. zur Abwehr unverhältnismäßig großer Schäden, wobei der Lieferer sofort zu verständigen ist, hat der Besteller das Recht, den Mangel selbst oder durch Dritte beseitigen zu lassen und vom Lieferer Ersatz der erforderlichen Aufwendungen zu verlangen.
3. Von den durch die Nachbesserung bzw. Ersatzlieferung entstehenden Kosten trägt der Lieferer – soweit sich die Beanstandung als berechtigt herausstellt – die Kosten des Ersatzstückes einschließlich des Versandes sowie die angemessenen Kosten des Aus- und Einbaus, ferner, falls dies nach Lage des Einzelfalles billigerweise verlangt werden kann, die Kosten der etwa erforderlichen Gestellung seiner Monteure und Hilfskräfte.
4. Der Besteller hat im Rahmen der gesetzlichen Vorschriften ein Recht zum Rücktritt vom Vertrag, wenn der Lieferer – unter Berücksichtigung der gesetzlichen Ausnahmefälle – eine ihm gesetzte angemessene Frist für die Nachbesserung oder Ersatzlieferung wegen eines Sachmangels fruchtlos verstreichen lässt. Liegt nur ein unerheblicher Mangel vor, steht dem Besteller lediglich ein Recht

zur Minderung des Vertragspreises zu. Das Recht auf Minderung des Vertragspreises bleibt ansonsten ausgeschlossen.

5. Keine Gewähr wird insbesondere in folgenden Fällen übernommen:
Ungeeignete oder unsachgemäße Verwendung, fehlerhafte Montage bzw. Inbetriebsetzung durch den Besteller oder Dritte, natürliche Abnutzung, fehlerhafte oder nachlässige Behandlung, nicht ordnungsgemäße Wartung, ungeeignete Betriebsmittel, chemische, elektrochemische oder elektrische Einflüsse – sofern sie nicht vom Lieferer zu verantworten sind.
6. Bessert der Besteller oder ein Dritter unsachgemäß nach, besteht keine Haftung des Lieferers für die daraus entstehenden Folgen. Gleiches gilt für ohne vorherige Zustimmung des Lieferers vorgenommene Änderungen des Liefergegenstandes.

Rechtsmängel

7. Führt die Benutzung des Liefergegenstandes zur Verletzung von gewerblichen Schutzrechten oder Urheberrechten im Inland, wird der Lieferer auf seine Kosten dem Besteller grundsätzlich das Recht zum weiteren Gebrauch verschaffen oder den Liefergegenstand in für den Besteller zumutbarer Weise derart modifizieren, dass die Schutzrechtsverletzung nicht mehr besteht. Ist dies zu wirtschaftlich angemessenen Bedingungen oder in angemessener Frist nicht möglich, ist der Besteller zum Rücktritt vom Vertrag berechtigt. Unter den genannten Voraussetzungen steht auch dem Lieferer ein Recht zum Rücktritt vom Vertrag zu.
8. Die in Abschnitt VII.7. genannten Verpflichtungen des Lieferers sind vorbehaltlich Abschnitt VIII.2. für den Fall der Schutz- oder Urheberrechtsverletzung abschließend.

Sie bestehen nur, wenn

- der Besteller den Lieferer unverzüglich von geltend gemachten Schutz- oder Urheberrechtsverletzungen unterrichtet,
- der Besteller den Lieferer in angemessenem Umfang bei der Abwehr der geltend gemachten Ansprüche unterstützt bzw. dem Lieferer die Durchführung der Modifizierungsmaßnahmen gemäß Abschnitt VII.7. ermöglicht,
- dem Lieferer alle Abwehrmaßnahmen einschließlich außergerichtlicher Regelungen vorbehalten bleiben,
- der Rechtsmangel nicht auf einer Anweisung des Bestellers beruht und
- die Rechtsverletzung nicht dadurch verursacht wurde, dass der Besteller den Liefergegenstand eigenmächtig geändert oder in einer nicht vertragsgemäßen Weise verwendet hat.

VIII. Haftung

1. Wenn der Liefergegenstand durch Verschulden des Lieferers infolge unterlassener oder fehlerhafter Ausführung von vor oder nach Vertragsabschluss erfolgten Vorschlägen und Beratungen oder durch die Verletzung anderer vertraglicher Nebenverpflichtungen – insbesondere Anleitung für Bedienung und Wartung des Liefergegenstandes – vom Besteller nicht vertragsgemäß verwendet werden kann, so gelten unter Ausschluss weiterer Ansprüche des Bestellers die

Regelungen der Abschnitte VII und VIII.2 entsprechend.

2. Für Schäden, die nicht am Liefergegenstand selbst entstanden sind, haftet der Lieferer – aus welchen Rechtsgründen auch immer – nur
 - bei Vorsatz,
 - bei grober Fahrlässigkeit des Inhabers/der Organe oder leitender Angestellter,
 - bei schuldhafter Verletzung von Leben, Körper, Gesundheit,
 - bei Mängeln, die er arglistig verschwiegen oder deren Abwesenheit er garantiert hat,
 - bei Mängeln des Liefergegenstandes, soweit nach Produktionshaftungsgesetz für Personen- oder Sachschäden an privat genutzten Gegenständen gehaftet wird.

Bei schuldhafter Verletzung wesentlicher Vertragspflichten haftet der Lieferer auch bei grober Fahrlässigkeit nicht leitender Angestellter und bei leichter Fahrlässigkeit, in letzterem Fall begrenzt auf den vertragstypischen, vernünftigerweise vorhersehbaren Schaden. Weitere Ansprüche sind ausgeschlossen.

IX. Verjährung

Alle Ansprüche des Bestellers – aus welchen Rechtsansprüchen auch immer – verjähren in 12 Monaten. Für vorsätzliches oder arglistiges Verhalten sowie bei Ansprüchen nach dem Produktionshaftungsgesetz gelten die gesetzlichen Fristen.

X. Softwarenutzung

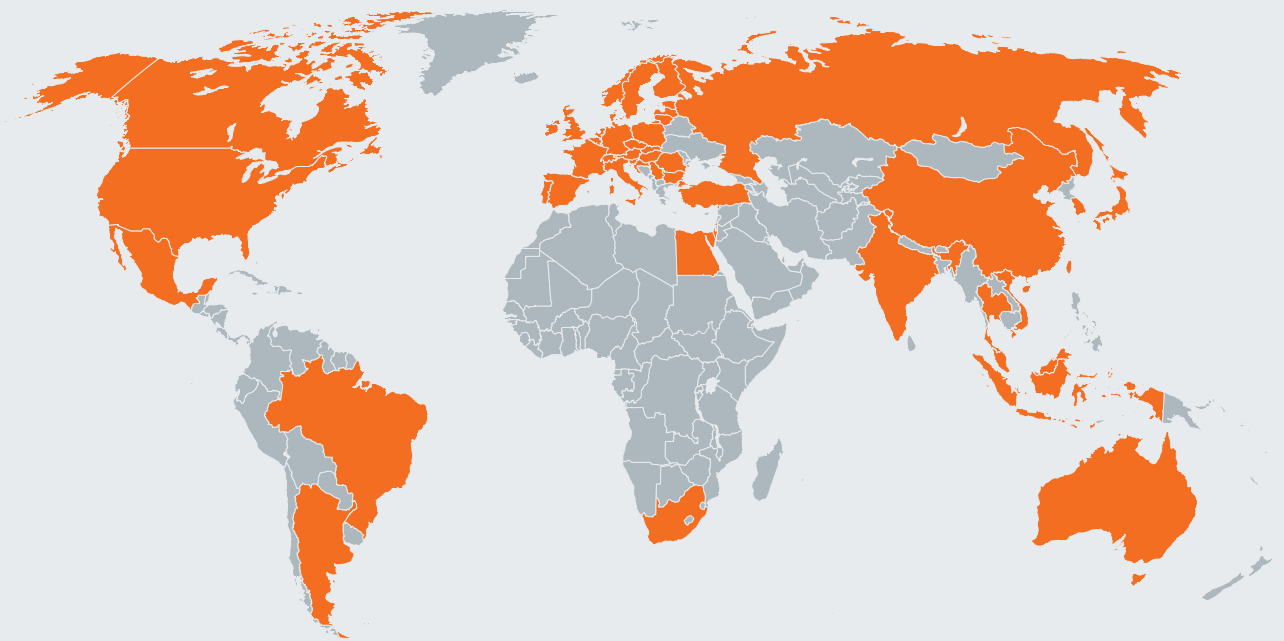
Soweit im Lieferumfang Software enthalten ist, wird dem Besteller ein nicht ausschließliches Recht eingeräumt, die gelieferte Software einschließlich ihrer Dokumentationen zu nutzen. Sie wird zur Verwendung auf dem dafür bestimmten Liefergegenstand überlassen. Eine Nutzung der Software auf mehr als einem System ist untersagt. Der Besteller darf die Software nur im gesetzlich zulässigen Umfang (§§ 69 a ff. UrhG) vervielfältigen, überarbeiten, übersetzen oder von dem Objektcode in den Quellcode umwandeln. Der Besteller verpflichtet sich, Herstellerangaben – insbesondere Copyright-Vermerke – nicht zu entfernen oder ohne vorherige ausdrückliche Zustimmung des Lieferers zu verändern.

Alle sonstigen Rechte an der Software und den Dokumentationen einschließlich der Kopien bleiben beim Lieferer bzw. beim Softwarelieferanten. Die Vergabe von Unterlizenzen ist nicht zulässig.

XI. Anwendbares Recht, Gerichtsstand

1. Für alle Rechtsbeziehungen zwischen dem Lieferer und dem Besteller gilt ausschließlich das für die Rechtsbeziehungen inländischer Parteien untereinander maßgebliche Recht der Bundesrepublik Deutschland.
2. Gerichtsstand ist das für den Sitz des Lieferers zuständige Gericht. Der Lieferer ist jedoch berechtigt, am Hauptsitz des Bestellers Klage zu erheben.





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