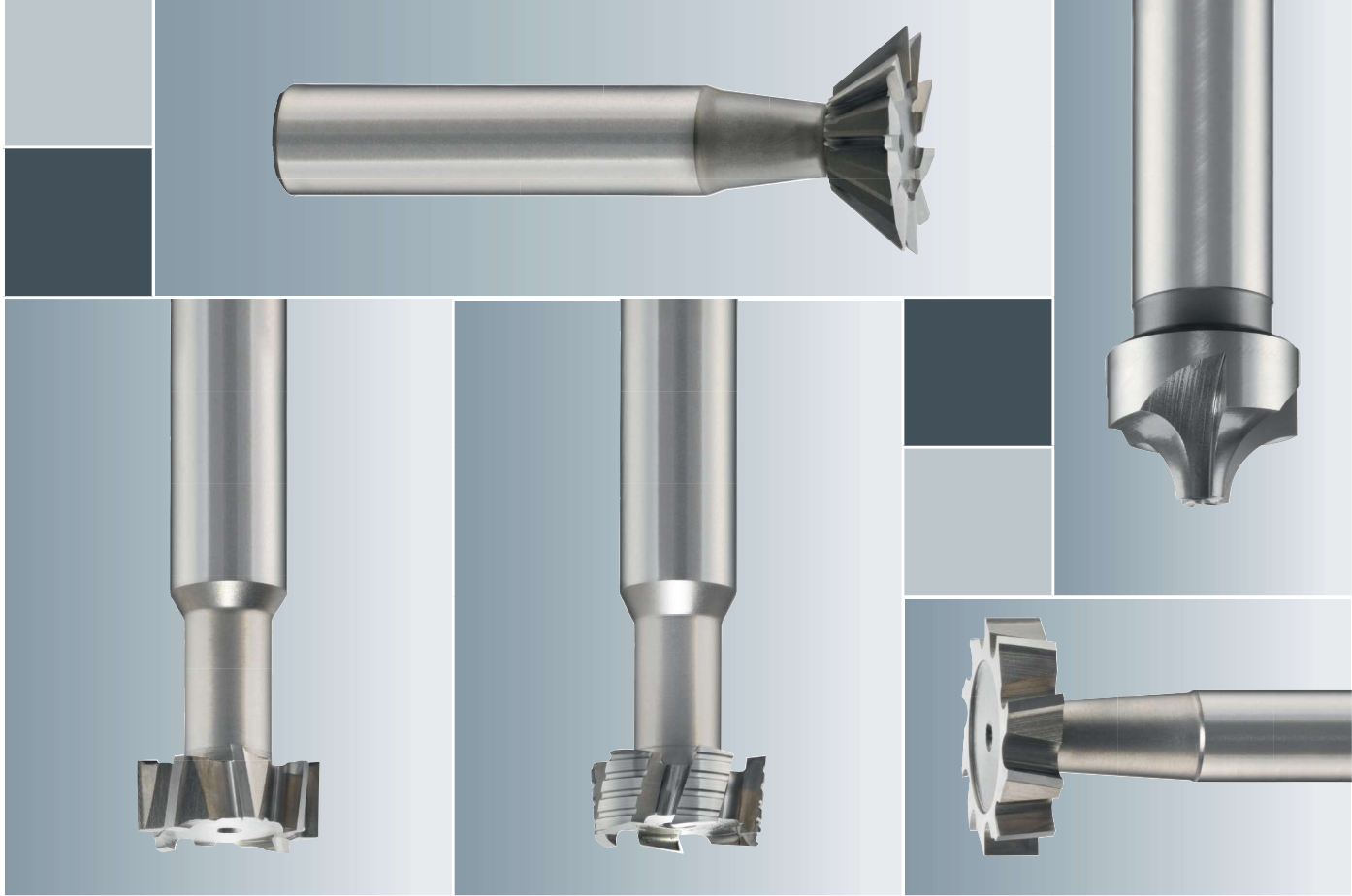




HSS- und Hartmetall-Schaftformfräser HSS and Solid Carbide Form End Mills



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Schnittwerte	Cutting conditions	322 - 330

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:

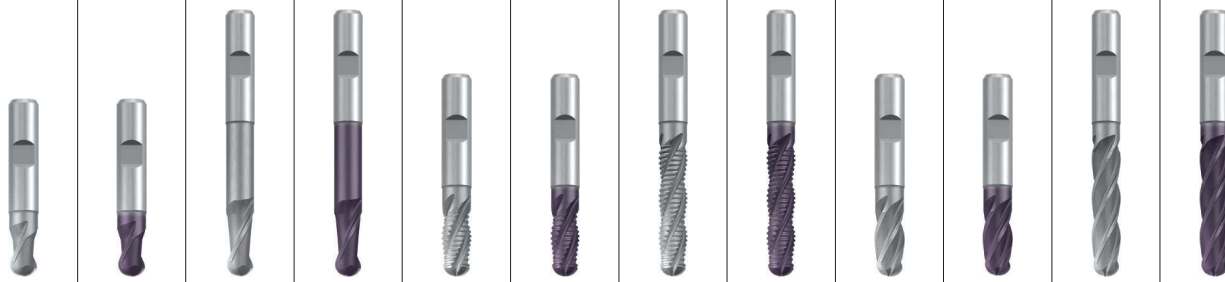
- = very suitable
□ = suitable

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		Steel materials		
	1.1	Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	Cq15 1.1132 S235JR (St37-2) 1.0037 10SPb20 1.0722 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218 20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515 X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
	2.1	Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	
	3.1	Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	
	4.1	Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	
M	5.1	Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	
	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
K	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
	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			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			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			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			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			≤ 350 N/mm ²	EN AW-ALMgSi EN AW-6060
	1.3			≤ 550 N/mm ²	EN AW-ALZn5Mg3Cu EN AW-7022
	1.4			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			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	(AMPCO® 8)
	2.8			≤ 1400 N/mm ²	(AMPCO® 45)
S	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
H	5.2	Wolfram-Kupfer-Legierungen	Tungsten-copper alloys		W-Cu 80/20
	5.3	Verbundwerkstoffe	Composite materials		Hylite, Alucobond
	Spezialwerkstoffe		Special materials		
	Titan-Legierungen		Titanium alloys		
	1.1	Reintitan	Pure titanium	≤ 450 N/mm ²	Ti1 3.7025
	1.2			≤ 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			≤ 1000 N/mm ²	Monel 400 2.4360
	2.3	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm ²	Inconel 718 2.4668
	2.4	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1000 N/mm ²	Udimet 605
	2.5			≤ 1600 N/mm ²	Haynes 25 2.4964
	2.6	Eisen-Basis-Legierungen	Iron-base alloys	≤ 1500 N/mm ²	Incoloy 800 1.4958
	Harte Werkstoffe		Hard materials		
	1.1			44 - 50 HRC	Weldox 1100
	1.2			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			60 - 63 HRC	Ferro-Titanit
	1.5			63 - 66 HRC	HSSE

HSS-Kugelfräser
HSS ball nose end mills



Allround

N

HR

fein · fine

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	Z (Flutes)
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	Seite · Page
323	323	324	324	322	322	322	322	323	323	324	324	v _c / f _z

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



Product Finder

NF

N

HR

H

90°

60°

Frässtifte
Burs

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

	HM		HM	HM	HSS						
											
	Allround										
	N						NF 		N		
	ø4 - 12 mm 60° / 90°	ø4 - 12 mm 60° / 90°	ø3 - 8 mm 60° / 90°	r=0,5 - 5 mm	r=0,5 - 5 mm	r=1 - 20 mm	r=1 - 16 mm	ø21 - 45 mm	ø21 - 45 mm	ø11 - 60 mm	ø11 - 60 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		3050		3030	
						3288	3288C	3058	3058C	3038	3038C
Seite - Page	308	308	309	310	310	311	311	312	312	313	313
	–	–	–	325	325	325	325	326	326	327	327

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HSS-Schlitzfräser HSS Woodruff keyseat end mills		HSS-Winkelfräser HSS dovetail end mills				Kegelsenker Countersinks						
						HM	HSS					
												
Allround												
N		H				90°			60°			
ø 4,5-45,5 mm	ø 4,5-45,5 mm	ø 16-25 mm 45-70°	ø 16-25 mm 45-70°	ø 16-25 mm 45-70°	ø 16-25 mm 45-70°	ø 10-31 mm	ø 4,3-31 mm	ø 4,3-31 mm	ø 6,3-25 mm	ø 6,3-25 mm		
6 - 12	6 - 12	10	10	10	10	3	3	3	3	3	Z (Flutes)	
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	Seite · Page	
328	328	329	329	329	329	330	330	330	330	330	 v_c / f_z	
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											1.3	
											H	
						□						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

Hartmetall-Frässtifte Carbide burrs	
	
ZYA	WCR
ø 3-12 mm	ø 3-12 mm
1721-1726	1731-1736
320	320
	
TRE	KUD
ø 3-12 mm	ø 3-16 mm
1741-1746	1751-1756
320	320
	
SKM	KEL
ø 3-12 mm	ø 3-12 mm
1761-1766	1771-1776
321	321
	
SPG	RBF
ø 3-12 mm	ø 3-16 mm
1781-1786	1791-1796
321	321

Product
Finder

NF

N

HR

90°

60°

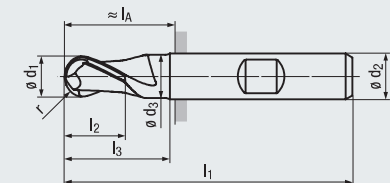
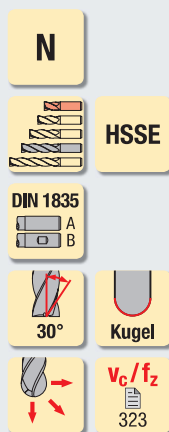
Frässtifte
Burrs

v_c / f_z

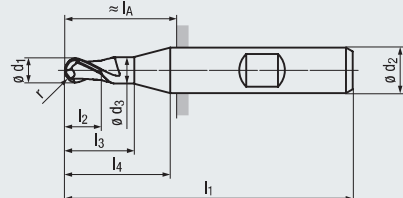
HSS/HM



- 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



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

ϕd_1 h10	r	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A	Z (Flutes)	Dimens.- Code	3262	3268	3268C
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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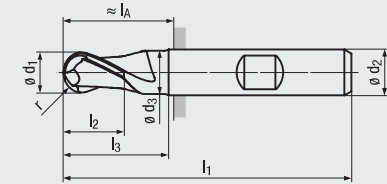
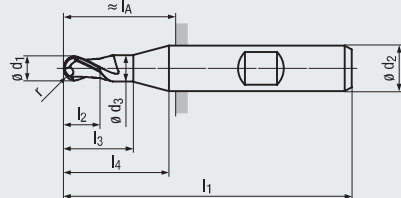
- Kugelfräser mit 2 Schneiden
- Zentrumschneidend
- Gute Spanabfuhr
- Vielseitig verwendbar
- Großer Abmessungsbereich
- Kurze Schneidenlänge

- Ball nose end mill with 2 flutes
- Centre cutting
- Good chip evacuation
- Highly versatile
- Wide range of diameters
- Short flute length

N



HSSE

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 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



Allround



Allround



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

ø d ₁ h10	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A h6	Z (Flutes)	Dimens.- Code	3272	3278	3278C
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
Burrsv_c / f_z

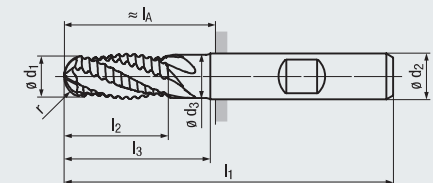
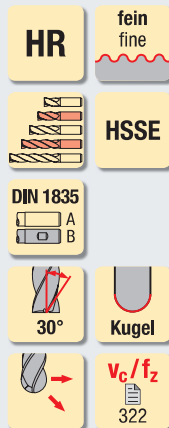
HSS/HM



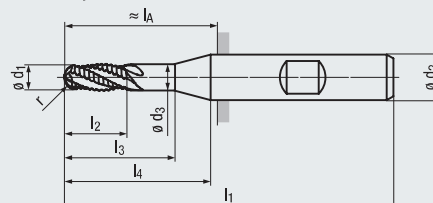
- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

- Gesenckfräser 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



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 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

$\emptyset d_1$ js14	r	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ 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

3333

3333C

DIN 1889 – Lange Ausführung · Long design

Bestell-Code · Order code

$\emptyset d_1$ js14	r	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ 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

3338

3338C

HSS/HM



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



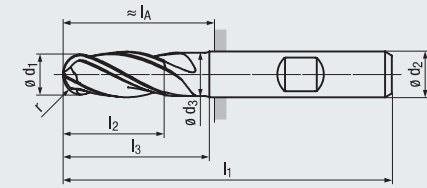
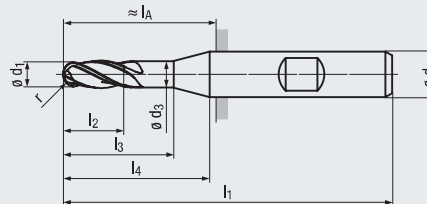
30°



Kugel

V_c / f_z

323 - 324

Design I₄:

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



Allround



Allround



Product Finder

NF

N

HR

H

90°

60°

Frässtifte
BursV_c / f_z

TICN

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

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
N		5.1-5.2
S	1.1	1.2-2.2, 2.4

DIN 1889 – Kurze Ausführung · Short design

Bestell-Code · Order code

Ø d ₁ k12	r	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø 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

3323

3323C

DIN 1889 – Lange Ausführung · Long design

Bestell-Code · Order code

Ø d ₁ k12	r	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø 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

3328

3328C

TOP-Cut Hartmetall-Kugelfräser
siehe Seite 108TOP-Cut solid carbide ball nose end mills,
see page 108

HSS/HM



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°

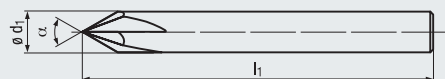
N

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

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	

TIALN

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	$\emptyset d_1$ 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°

N

HM

DIN 6535

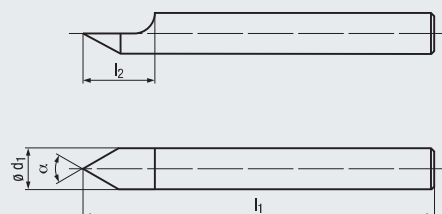
HA
HB

0°

Optional



Allround



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°

Frässtifte
Burs v_c / f_z

HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burs
- 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



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

≈ DIN 6518

Bestell-Code · Order code

r H11	ø d ₁	ø d ₃	l ₁	ø d ₂ h6	Z (Flutes)	Dimens.- Code	3281	3281A
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

HSS/HM



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



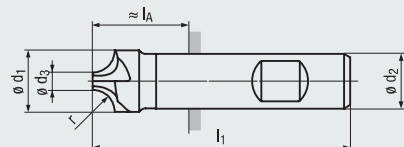
0°



90°

V_c/f_z

325



Allround



Allround



Product Finder

NF

N

HR

R

90°

60°

Frässtifte
BurrsV_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

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 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	●	●		○

HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- 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

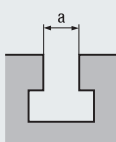
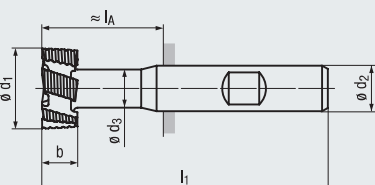
DIN 1835
A
B

20°

v_c / f_z

326

326



Allround

Allround

Stirnausführung · Face design



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²

Applications – material (see page 300)

- 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
$\emptyset d_1$ d11	b d11	$\emptyset d_3$ h12	l_1	$\emptyset d_2$ 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	●	●		●

HSS/HM



- 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

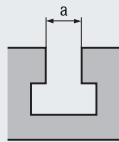
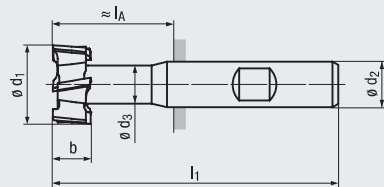
N

HSSE

DIN 1835



10°


 v_c / f_z
327


Allround



Allround



Product Finder

NF

N

HR

H

90°

60°

Frässtifte
Burrs v_c / f_z

Stirnausführung · Face design



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²

Applications – material (see page 300)

- 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
$\varnothing d_1$ d11	b d11	$\varnothing d_3$ h12	l_1	$\varnothing d_2$ 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	●	●		●

HSS/HM



Product Finder

NF

N

HR

H

90°

60°

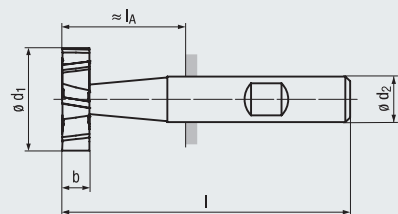
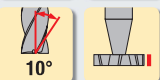
Frässtifte
Burrs

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



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 Scheibfedernuten 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



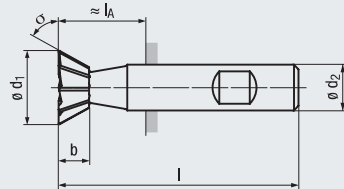
0°



0°

V_c / f_z

329



Allround



Allround



Product Finder

NF

N

HR

H

90°

60°

Frässtifte
BursV_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 ± 30°	ø d ₁ js16	b js14	l	ø d ₂ h6	l _A h6	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

HSS/HM



- Product Finder
- NF
- N
- HR
- H
- 90°
- 60°
- Frässtifte
Burrs
- v_c / f_z

- Geradeverzahnt
- Nur am Umfang schneidend
- Universelle Geometrie
- Straight teeth
- Peripheral cutting only
- Versatile tool geometry

H

HSSE

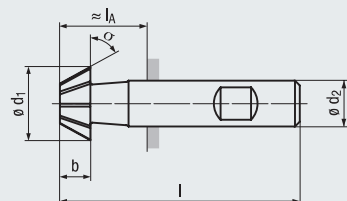
DIN 1835

A
B

0°

v_c / f_z

329



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 300)

- In fast allen Werkstoffen einsetzbar
- Für Materialien mit einer Zugfestigkeit bis 1200 N/mm²
- Zum 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 chamfering workpiece edges

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 1833

Bestell-Code · Order code

σ $\pm 30^\circ$	$\varnothing d_1$ js16	b js14	l	$\varnothing d_2$ h6	I_A	Z (Flutes)	Dimens.- Code	3210	3218		3218C
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	●	●		○

HSS/HM



- Mit angelötetem Hartmetall-Kopf
- Am Umfang radial und axial
hinterschliffen
- Komplett geschliffene Nuten
- Geometrie für Senkungen
ohne Rattermarken

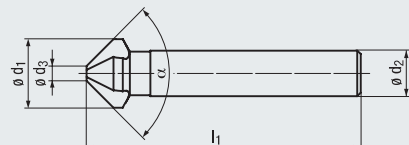
- With brazed carbide head
- Circumference radially
and axially relieved
- Fully ground flutes
- Geometry for countersinks
without chatter marks

90°

HM

v_c/f
330


Allround



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	●			

Product
Finder

NF

N

HR

H

90°

60°

Frässtifte
Burs

v_c / f_z

HSS/HM

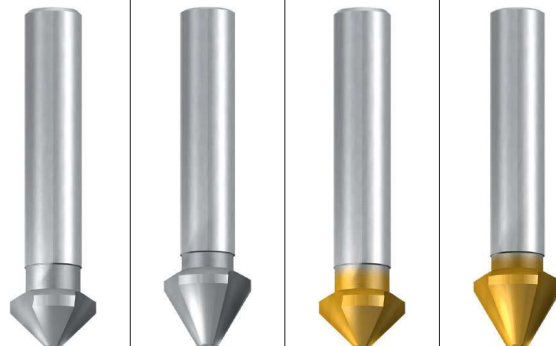
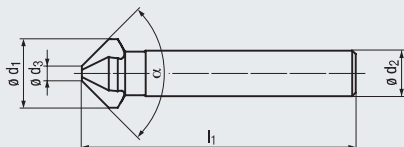


- Am Umfang radial und axial hinterschleifen
- Komplette geschliffene Nuten
- Geometrie für Senkungen ohne Rattermarken
- Circumference radially and axially relieved
- Fully ground flutes
- Geometry for countersinks without chatter marks

90° 60°

HSS

v_c / f
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	$\emptyset d_1$	$\emptyset d_3$	L_1	$\emptyset d_2$ 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	●		●	
90°	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	$\emptyset d_1$	$\emptyset d_3$	L_1	$\emptyset d_2$ 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:

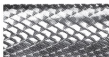
Zahnung 3



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:

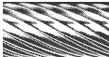
Zahnung 1



Besonders grobe Teilung

Geeignet, um Aluminium, Magnesium und Hartgummi zu bearbeiten. Große Spankammern verhindern, dass diese sich zusetzen.

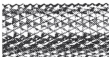
Zahnung 2



Grobe Teilung

Zur Bearbeitung von Bronze, Messing, Zink, Kupfer usw. geeignet.

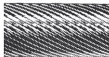
Zahnung 4



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:

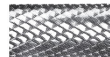
Toothing 3



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:

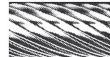
Toothing 1



Extra coarse spacing

Suitable for machining aluminium, magnesium and hard rubber; large chip spaces prevent loading and clogging.

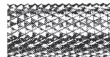
Toothing 2



Coarse spacing

Suitable for machining bronze, brass, zinc, copper etc.

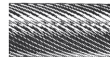
Toothing 4



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

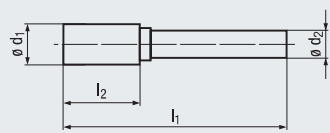
90°

60°

Frässtifte
Burrs

v_c / f_z

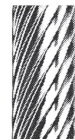
- Zylinder-Form
- Ohne Stirnverzahnung 1)
- Baumaße $\approx$ DIN 8033
- Cylindrical form
- Without cutting face 1)
- Dimensions $\approx$ DIN 8033



ZYA



HM

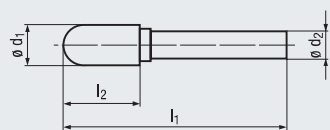


Zahnung · Tothing

Bestell-Code · Order code

$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code	1	2	3	4	5	6
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
8	18	63	6	.008	○	○	●	○	○	●
10	20	65	6	.010	○	○	●	○	○	●
12	25	70	6	.012	○	○	●	○	○	●

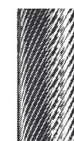
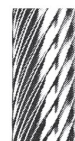
- Walzenrund-Form
- Baumaße $\approx$ DIN 8033
- Round nose form
- Dimensions $\approx$ DIN 8033



WRC



HM

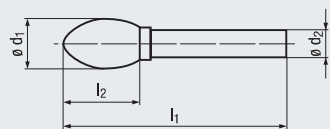


Zahnung · Tothing

Bestell-Code · Order code

$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code	1	2	3	4	5	6
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
8	18	63	6	.008	○	○	●	○	○	●
10	20	65	6	.010	○	○	●	○	○	●
12	25	70	6	.012	○	○	●	○	○	●

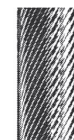
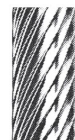
- Tropfen-Form
- Baumaße $\approx$ DIN 8033
- Oval form
- Dimensions $\approx$ DIN 8033



TRE



HM

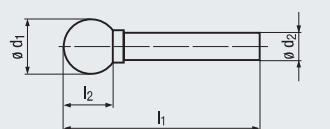


Zahnung · Tothing

Bestell-Code · Order code

$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code	1	2	3	4	5	6
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	○	○	●	○	○	●

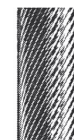
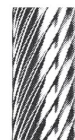
- Kugel-Form
- Baumaße $\approx$ DIN 8033
- Spherical form
- Dimensions $\approx$ DIN 8033



KUD



HM



Zahnung · Tothing

Bestell-Code · Order code

$\emptyset d_1$	l_2	l_1	$\emptyset d_2$	Dimens.-Code	1	2	3	4	5	6
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	○	○	●	○	○	●

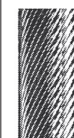
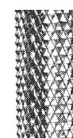
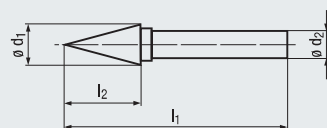
- Spitzkegel-Form
- Baumaße ≈ DIN 8033

- 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	1761	1762	1763	1764	1765	1766
3	14	40	3	.003	○	○	●	○	○	●
6	14	49	3	.00603	○	○	●	○	○	●
6	18	50	6	.006	○	○	●	○	○	●
12	20	65	6	.012	○	○	●	○	○	●

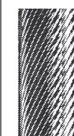
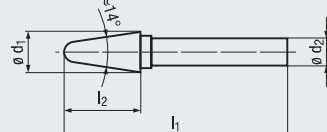
- Rundkegel-Form
- Baumaße ≈ DIN 8033

- 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	1771	1772	1773	1774	1775	1776
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	○	○	●	○	○	●

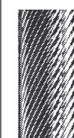
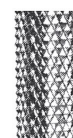
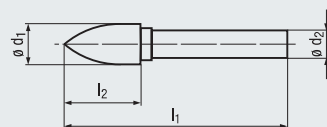
- Spitzbogen-Form
- Baumaße ≈ DIN 8033

- 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	1781	1782	1783	1784	1785	1786
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	○	○	●	○	○	●

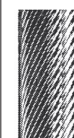
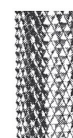
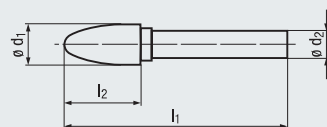
- Rundbogen-Form
- Baumaße ≈ DIN 8033

- 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	1791	1792	1793	1794	1795	1796
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

H

90°

60°

Frässtifte
Burs

v_c / f_z



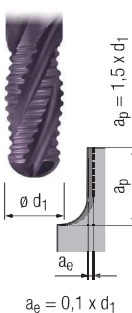
HSS-Kugelfräser – kurze und lange Ausführung HSS ball nose end mills – short and long design

HR

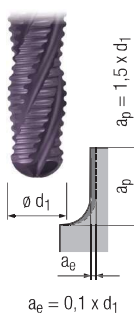
Gültig für · Valid for

3333 3338
3333C 3338C

kurze Ausführung
short design



lange Ausführung
long design



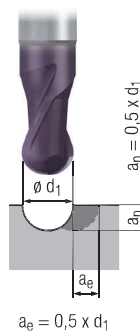
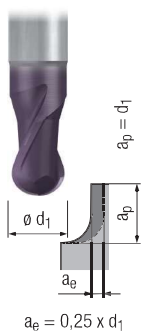
		v_c [m/min]		f_z [mm]		v_c [m/min]		f_z [mm]		TICN				Unbesch. Uncoated
		Unbeschichtet Uncoated	TICN		$d_1 \leq 20$ mm	Unbeschichtet Uncoated	TICN		$d_1 \leq 40$ mm					
P	1.1	35	60	$0,0052 \times d_1$	21	35	$0,0019 \times d_1$							■
	2.1	30	55	$0,0047 \times d_1$	18	33	$0,0018 \times d_1$							■
	3.1	25	40	$0,0043 \times d_1$	15	15	$0,0016 \times d_1$							■
	4.1		38	$0,0039 \times d_1$		15	$0,0014 \times d_1$							■
	5.1													
M	1.1	15	28	$0,0043 \times d_1$	14	15	$0,0016 \times d_1$							■
	2.1		24	$0,0039 \times d_1$		14	$0,0014 \times d_1$							■
	3.1		20	$0,0034 \times d_1$		12	$0,0013 \times d_1$							■
	4.1		18	$0,0030 \times d_1$		11	$0,0011 \times d_1$							■
K	1.1	25	48	$0,0052 \times d_1$	15	29	$0,0019 \times d_1$							■
	1.2	22	42	$0,0047 \times d_1$	13	25	$0,0018 \times d_1$							■
	2.1	20	38	$0,0047 \times d_1$	12	23	$0,0018 \times d_1$							■
	2.2	18	34	$0,0043 \times d_1$	11	15	$0,0016 \times d_1$							■
	3.1		29	$0,0039 \times d_1$		15	$0,0014 \times d_1$							■
	3.2		25	$0,0039 \times d_1$		15	$0,0014 \times d_1$							■
	4.1	21	40	$0,0047 \times d_1$	13	24	$0,0018 \times d_1$							■
	4.2	14	27	$0,0043 \times d_1$	10	15	$0,0016 \times d_1$							■
N	1.1													
	1.2													
	1.3													
	1.4													
	1.5													
	1.6													
	2.1		43	$0,0052 \times d_1$		26	$0,0019 \times d_1$							■
	2.2	26	47	$0,0047 \times d_1$	15	28	$0,0018 \times d_1$							■
	2.3		85	$0,0052 \times d_1$		40	$0,0019 \times d_1$							■
	2.4	25	44	$0,0039 \times d_1$	15	27	$0,0014 \times d_1$							■
	2.5	37	67	$0,0043 \times d_1$	22	40	$0,0016 \times d_1$							■
	2.6	43	77	$0,0052 \times d_1$	26	40	$0,0019 \times d_1$							■
	2.7		45	$0,0039 \times d_1$		23	$0,0014 \times d_1$							■
	2.8													
	3.1													
	3.2													
S	4.1													
	4.2													
	4.3													
	4.4													
	5.1													
	5.2		28	$0,0039 \times d_1$		17	$0,0014 \times d_1$							■
	5.3													
	1.1		40	$0,0043 \times d_1$		15	$0,0016 \times d_1$							■
	1.2		28	$0,0039 \times d_1$		15	$0,0014 \times d_1$							■
	1.3		20	$0,0034 \times d_1$		12	$0,0013 \times d_1$							■
H	2.1		26	$0,0043 \times d_1$		15	$0,0016 \times d_1$							■
	2.2		12	$0,0034 \times d_1$		10	$0,0013 \times d_1$							■
	2.3													
	2.4		7	$0,0034 \times d_1$		7	$0,0013 \times d_1$							■
	2.5													
	2.6													

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

HSS/HM




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°

Frässtifte
Burrs v_c / f_z

		v_c [m/min]		f_z [mm]		f_z [mm]		TICN		Unbesch. Uncoated
		Unbeschichtet 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									
H	1.1									
	1.2									
	1.3									
	1.4									
	1.5									

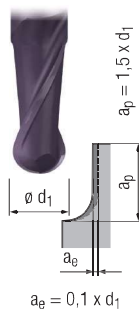
 ■ = sehr gut geeignet · very suitable
 □ = gut geeignet · suitable

HSS/HM



HSS-Kugelfräser – lange Ausführung HSS ball nose end mills – long design

N H



Gültig für · Valid for

3272 3328
3278 3328C
3278C

Product
Finder

NF

N

HR

H

90°

60°

Frässtifte
Burs

v_c / f_z

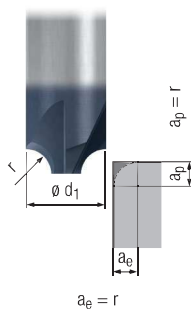
TICN Unbesch.
Uncoated



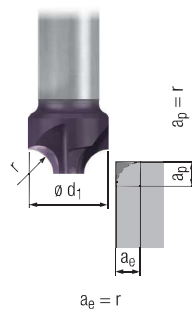
		v_c [m/min]		f_z [mm]					
		Unbeschichtet Uncoated	TICN	$d_1 \leq 25$ mm	$d_1 > 25$ mm				
P	1.1	21	35	$0,0044 \times d_1$	$0,0036 \times d_1$			□	■
	2.1	18	33	$0,0041 \times d_1$	$0,0033 \times d_1$				■
	3.1	15	15	$0,0037 \times d_1$	$0,0030 \times d_1$				■
	4.1		15	$0,0033 \times d_1$	$0,0027 \times d_1$				■
	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								
S	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								
	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	$0,0037 \times d_1$	$0,0030 \times d_1$				■
H	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								
	1.1								
H	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
Burrs v_c / f_z

		v_c [m/min]		f_z [mm]	f_z [mm]	v_c [m/min]		f_z [mm]	f_z [mm]	f_z [mm]				
		Unbeschichtet Uncoated	TiAlN	$r \leq 2,5$ mm	$r > 2,5-5$ mm	Unbeschichtet Uncoated	TiCN	$r \leq 2,5$ mm	$r > 2,5-12$ mm	$r > 12$ mm	HM HM-TiAlN HSS-TiCN	HSS Unbesch. Uncoated	MMS MQL	
P	1.1	100	135	$0,0024 \times d_1$	$0,0030 \times d_1$	30	33	$0,0030 \times d_1$	$0,0036 \times d_1$	$0,0024 \times d_1$	□	□	□	■
	2.1	95	120	$0,0022 \times d_1$	$0,0028 \times d_1$	25	28	$0,0028 \times d_1$	$0,0033 \times d_1$	$0,0022 \times d_1$		□	□	■
	3.1	68	88	$0,0020 \times d_1$	$0,0025 \times d_1$	20	22	$0,0025 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$			□	■
	4.1	65	85	$0,0018 \times d_1$	$0,0023 \times d_1$		17	$0,0023 \times d_1$	$0,0027 \times d_1$	$0,0018 \times d_1$				■
	5.1	52	67	$0,0016 \times d_1$	$0,0020 \times d_1$									■
M	1.1	48	62	$0,0020 \times d_1$	$0,0025 \times d_1$	12	15	$0,0025 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$				■
	2.1	40	53	$0,0018 \times d_1$	$0,0023 \times d_1$	10	12	$0,0023 \times d_1$	$0,0027 \times d_1$	$0,0018 \times d_1$				■
	3.1	34	44	$0,0016 \times d_1$	$0,0020 \times d_1$									■
	4.1		25	$0,0014 \times d_1$	$0,0018 \times d_1$									■
K	1.1	81	105	$0,0024 \times d_1$	$0,0030 \times d_1$	25	28	$0,0030 \times d_1$	$0,0036 \times d_1$	$0,0024 \times d_1$	□	□	□	■
	1.2	71	92	$0,0022 \times d_1$	$0,0028 \times d_1$	22	24	$0,0028 \times d_1$	$0,0033 \times d_1$	$0,0022 \times d_1$	□	□	□	■
	2.1	65	84	$0,0022 \times d_1$	$0,0028 \times d_1$	20	22	$0,0028 \times d_1$	$0,0033 \times d_1$	$0,0022 \times d_1$			□	■
	2.2	58	76	$0,0020 \times d_1$	$0,0025 \times d_1$	18	20	$0,0025 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$			□	■
	3.1	48	63	$0,0018 \times d_1$	$0,0023 \times d_1$	15	17	$0,0023 \times d_1$	$0,0027 \times d_1$	$0,0018 \times d_1$				■
	3.2	42	55	$0,0018 \times d_1$	$0,0023 \times d_1$									■
	4.1	68	88	$0,0022 \times d_1$	$0,0028 \times d_1$	21	23	$0,0028 \times d_1$	$0,0033 \times d_1$	$0,0022 \times d_1$			□	■
	4.2	45	58	$0,0020 \times d_1$	$0,0025 \times d_1$	14	15	$0,0025 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$			□	■
N	1.1					100	110	$0,0040 \times d_1$	$0,0048 \times d_1$	$0,0032 \times d_1$				■
	1.2	300	390	$0,0030 \times d_1$	$0,0038 \times d_1$	90	100	$0,0038 \times d_1$	$0,0045 \times d_1$	$0,0030 \times d_1$			□	■
	1.3	250	320	$0,0028 \times d_1$	$0,0035 \times d_1$	70	80	$0,0035 \times d_1$	$0,0042 \times d_1$	$0,0028 \times d_1$			□	■
	1.4	220	290	$0,0026 \times d_1$	$0,0033 \times d_1$	60	65	$0,0033 \times d_1$	$0,0039 \times d_1$	$0,0026 \times d_1$			□	■
	1.5	200	260	$0,0024 \times d_1$	$0,0030 \times d_1$	40	45	$0,0030 \times d_1$	$0,0036 \times d_1$	$0,0024 \times d_1$			□	■
	1.6	70	95	$0,0022 \times d_1$	$0,0028 \times d_1$									■
	2.1	70	90	$0,0024 \times d_1$	$0,0030 \times d_1$	40	45	$0,0030 \times d_1$	$0,0036 \times d_1$	$0,0024 \times d_1$			□	■
	2.2	80	105	$0,0022 \times d_1$	$0,0028 \times d_1$	50	55	$0,0028 \times d_1$	$0,0033 \times d_1$	$0,0022 \times d_1$			□	■
	2.3	145	190	$0,0024 \times d_1$	$0,0030 \times d_1$	50	55	$0,0030 \times d_1$	$0,0036 \times d_1$	$0,0024 \times d_1$			□	■
	2.4	75	95	$0,0018 \times d_1$	$0,0023 \times d_1$	18	20	$0,0023 \times d_1$	$0,0027 \times d_1$	$0,0018 \times d_1$			□	■
	2.5	110	145	$0,0020 \times d_1$	$0,0025 \times d_1$	42	46	$0,0025 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$			□	■
	2.6	130	170	$0,0024 \times d_1$	$0,0030 \times d_1$	48	54	$0,0030 \times d_1$	$0,0036 \times d_1$	$0,0024 \times d_1$			□	■
	2.7	75	100	$0,0018 \times d_1$	$0,0023 \times d_1$								□	■
	2.8		30	$0,0016 \times d_1$	$0,0020 \times d_1$								□	■
	3.1	290	380	$0,0026 \times d_1$	$0,0033 \times d_1$	100	110	$0,0033 \times d_1$	$0,0039 \times d_1$	$0,0026 \times d_1$	□	■		■
	3.2	210	270	$0,0030 \times d_1$	$0,0038 \times d_1$	65	90	$0,0038 \times d_1$	$0,0045 \times d_1$	$0,0030 \times d_1$	□	■		■
	4.1	170	220	$0,0040 \times d_1$	$0,0050 \times d_1$	60	65	$0,0050 \times d_1$	$0,0060 \times d_1$	$0,0040 \times d_1$	□	□	□	■
	4.2	320	410	$0,0040 \times d_1$	$0,0050 \times d_1$	100	110	$0,0050 \times d_1$	$0,0060 \times d_1$	$0,0040 \times d_1$	□	□	□	■
	4.3		70	$0,0034 \times d_1$	$0,0043 \times d_1$									■
	4.4													
	5.1		70	$0,0014 \times d_1$	$0,0018 \times d_1$							■		
	5.2	48	62	$0,0018 \times d_1$	$0,0023 \times d_1$									■
	5.3		28	$0,0016 \times d_1$	$0,0020 \times d_1$							■		
S	1.1	68	88	$0,0020 \times d_1$	$0,0025 \times d_1$	22	24	$0,0025 \times d_1$	$0,0030 \times d_1$	$0,0020 \times d_1$				■
	1.2	60	77	$0,0018 \times d_1$	$0,0023 \times d_1$									■
	1.3		25	$0,0016 \times d_1$	$0,0020 \times d_1$									■
	2.1	58	76	$0,0020 \times d_1$	$0,0025 \times d_1$									■
	2.2	20	30	$0,0016 \times d_1$	$0,0020 \times d_1$									■
	2.3													
H	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

HSS-T-Nutenfräser
HSS T-slot end mills

NF



Gültig für · Valid for

3050

3058

3058C

		v_c [m/min]		f_z [mm]	TICN				Unbesch. Uncoated
		Unbeschichtet Uncoated	TICN	$d_1 \leq 45$ mm			MMS MQL		
P	1.1	33	35	$0,0036 \times d_1$			□	■	
	2.1	28	30	$0,0033 \times d_1$				■	
	3.1	22	25	$0,0030 \times d_1$				■	
	4.1		20	$0,0027 \times d_1$				■	
	5.1								
M	1.1	13	16	$0,0030 \times d_1$					■
	2.1	11	14	$0,0027 \times d_1$					■
	3.1								
	4.1								
K	1.1	28	32	$0,0036 \times d_1$	□	□	□	■	
	1.2	24	30	$0,0033 \times d_1$	□	□	□	■	
	2.1	22	25	$0,0033 \times d_1$			□	■	
	2.2	20	23	$0,0030 \times d_1$				■	
	3.1	17	20	$0,0027 \times d_1$				■	
	3.2								
	4.1	23	26	$0,0033 \times d_1$			□	■	
	4.2	15	18	$0,0030 \times d_1$				■	
N	1.1	110	120	$0,0048 \times d_1$					■
	1.2	100	110	$0,0045 \times d_1$			□	■	
	1.3	80	90	$0,0042 \times d_1$			□	■	
	1.4	65	70	$0,0039 \times d_1$			□	■	
	1.5	45	50	$0,0036 \times d_1$			□	■	
	1.6								
	2.1	26	50	$0,0036 \times d_1$				■	
	2.2	29	60	$0,0033 \times d_1$				■	
	2.3	52	60	$0,0036 \times d_1$			□	■	
	2.4	20	22	$0,0027 \times d_1$				■	
	2.5	41	50	$0,0030 \times d_1$				■	
	2.6	47	50	$0,0036 \times d_1$			□	■	
	2.7								
	2.8								
	3.1	88	120	$0,0039 \times d_1$	□	■		□	
	3.2	72	100	$0,0045 \times d_1$	□	■		□	
	4.1	65	70	$0,0060 \times d_1$	□	□	□	■	
	4.2	110	120	$0,0060 \times d_1$	□	□	□	■	
	4.3								
	4.4								
	5.1								
	5.2								
	5.3								
S	1.1	24	30	$0,0030 \times d_1$					■
	1.2								
	1.3								
	2.1								
	2.2								
	2.3								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

HSS/HM



HSS-T-Nutenfräser
HSS T-slot end mills

N



Gültig für · Valid for

3030 3038 3038C

Product
Finder

NF

N

HR

90°

60°

Frässtifte
Burrs v_c / f_z

		v_c [m/min]		f_z [mm]				TICN		Unbesch. Uncoated
		Unbeschichtet Uncoated	TICN	$d_1 \leq 16 \text{ mm}$	$d_1 > 16-22 \text{ mm}$	$d_1 > 22-32 \text{ mm}$	$d_1 > 32-60 \text{ mm}$			
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									
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									
	2.4									
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

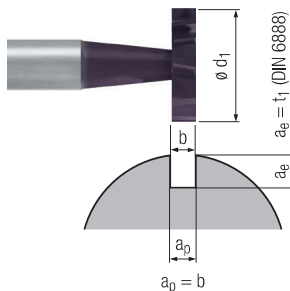
90°

60°

Frässtifte
Burs

v_c / f_z

HSS-Schlitzfräser HSS Woodruff keyseat end mills



Gültig für · Valid for
3010 3018 3018C

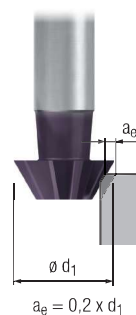
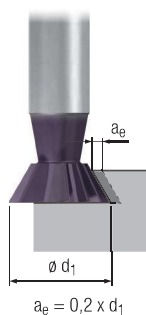
		v_c [m/min]		f_z [mm]			TICN				Unbesch. Uncoated	
		Unbeschichtet Uncoated	TICN	$d_1 \leq 10,5$ mm	$d_1 > 10,5 - 19,5$ mm	$d_1 > 19,5 - 45,5$ mm						
P	1.1	33	35	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$						
	2.1	28	30	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$						
	3.1	22	25	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$						
	4.1		20	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$						
	5.1											
M	1.1	13	16	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$						
	2.1	11	14	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$						
	3.1											
	4.1											
K	1.1	28	32	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$						
	1.2	24	30	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$						
	2.1	22	25	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$						
	2.2	20	23	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$						
	3.1	17	20	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$						
	3.2											
	4.1	23	26	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$						
	4.2	15	18	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$						
N	1.1	110	120	$0,0024 \times d_1$	$0,0021 \times d_1$	$0,0019 \times d_1$						
	1.2	100	110	$0,0023 \times d_1$	$0,0020 \times d_1$	$0,0018 \times d_1$						
	1.3	80	90	$0,0021 \times d_1$	$0,0018 \times d_1$	$0,0017 \times d_1$						
	1.4	65	70	$0,0020 \times d_1$	$0,0017 \times d_1$	$0,0016 \times d_1$						
	1.5	45	50	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$						
	1.6											
	2.1	26	50	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$						
	2.2	29	60	$0,0017 \times d_1$	$0,0014 \times d_1$	$0,0013 \times d_1$						
	2.3	52	60	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$						
	2.4	20	22	$0,0014 \times d_1$	$0,0012 \times d_1$	$0,0011 \times d_1$						
	2.5	41	50	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$						
	2.6	47	60	$0,0018 \times d_1$	$0,0016 \times d_1$	$0,0014 \times d_1$						
	2.7											
	2.8											
	3.1	88	120	$0,0020 \times d_1$	$0,0017 \times d_1$	$0,0016 \times d_1$						
	3.2	72	100	$0,0023 \times d_1$	$0,0020 \times d_1$	$0,0018 \times d_1$						
	4.1	65	70	$0,0030 \times d_1$	$0,0026 \times d_1$	$0,0024 \times d_1$						
	4.2	110	120	$0,0030 \times d_1$	$0,0026 \times d_1$	$0,0024 \times d_1$						
	4.3											
	4.4											
	5.1											
	5.2											
	5.3											
S	1.1	24	30	$0,0015 \times d_1$	$0,0013 \times d_1$	$0,0012 \times d_1$						
	1.2											
	1.3											
	2.1											
	2.2											
	2.3											
	2.4											
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

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



HSS-Winkelfräser
HSS dovetail end mills

Gültig für · Valid for

3200 3210
3208 3218
3208C 3218C

		V_c [m/min]		f_z [mm]		TICN			
		Unbeschichtet Uncoated	TICN	45° - 70°	45° - 70°			MMS MQL	Unbesch. Uncoated
P	1.1	28	33	$0,0007 \times d_1$	$0,0010 \times d_1$			□	■
	2.1	24	28	$0,0006 \times d_1$	$0,0009 \times d_1$				■
	3.1	18	22	$0,0006 \times d_1$	$0,0008 \times d_1$				■
	4.1		17	$0,0005 \times d_1$	$0,0007 \times d_1$				■
	5.1								
M	1.1	11	13	$0,0006 \times d_1$	$0,0008 \times d_1$				■
	2.1	10	11	$0,0005 \times d_1$	$0,0007 \times d_1$				■
	3.1								
	4.1								
K	1.1	24	28	$0,0007 \times d_1$	$0,0010 \times d_1$	□	□	□	■
	1.2	21	24	$0,0006 \times d_1$	$0,0009 \times d_1$	□	□	□	■
	2.1	19	22	$0,0006 \times d_1$	$0,0009 \times d_1$			□	■
	2.2	17	20	$0,0006 \times d_1$	$0,0008 \times d_1$				■
	3.1	14	17	$0,0005 \times d_1$	$0,0007 \times d_1$				■
	3.2								
	4.1	20	23	$0,0006 \times d_1$	$0,0009 \times d_1$			□	■
	4.2	13	15	$0,0006 \times d_1$	$0,0008 \times d_1$				■
N	1.1	95	110	$0,0009 \times d_1$	$0,0013 \times d_1$				■
	1.2	85	100	$0,0008 \times d_1$	$0,0012 \times d_1$			□	■
	1.3	67	80	$0,0008 \times d_1$	$0,0011 \times d_1$			□	■
	1.4	57	65	$0,0007 \times d_1$	$0,0010 \times d_1$			□	■
	1.5	38	45	$0,0007 \times d_1$	$0,0010 \times d_1$			□	■
	1.6								
	2.1	38	45	$0,0007 \times d_1$	$0,0010 \times d_1$				■
	2.2	48	55	$0,0006 \times d_1$	$0,0009 \times d_1$				■
	2.3	48	55	$0,0007 \times d_1$	$0,0010 \times d_1$			□	■
	2.4	17	20	$0,0005 \times d_1$	$0,0007 \times d_1$				■
	2.5	40	46	$0,0006 \times d_1$	$0,0008 \times d_1$				■
	2.6	46	54	$0,0007 \times d_1$	$0,0010 \times d_1$			□	■
	2.7								
	2.8								
	3.1	95	110	$0,0007 \times d_1$	$0,0010 \times d_1$	□	■		□
	3.2	76	90	$0,0008 \times d_1$	$0,0012 \times d_1$	□	■		□
	4.1	57	65	$0,0011 \times d_1$	$0,0016 \times d_1$	□	□	□	■
	4.2	95	110	$0,0011 \times d_1$	$0,0016 \times d_1$	□	□	□	■
	4.3								
	4.4								
	5.1								
	5.2								
	5.3								
S	1.1	21	24	$0,0006 \times d_1$	$0,0008 \times d_1$				■
	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

Kegelsenker 60° und 90° Countersinks 60° and 90°



Gültig für · Valid for

7550 7560 7581
7550T 7560T

HM HSS-TIN			HSS Unbesch. Uncoated

		HM Unbeschichtet Uncoated		HSS Unbesch. Uncoated		HM TIN Coated		HM AlN Coated	HM TiN Coated	HM TiAlN Coated	HM AlTiN Coated
		v_c [m/min]	f [mm]	v_c [m/min]	f [mm]	v_c [m/min]	f [mm]				
P	1.1	35	0,060	15	25	0,050	☐	☐	☐	☒	
	2.1	25	0,060	12	15	0,050	☐	☐	☐	☒	
	3.1	18	0,036	10	12	0,030	☐	☐	☐	☒	
	4.1	12	0,036		8	0,030	☐	☐	☐	☒	
	5.1	10	0,024				☐	☐	☐	☒	
M	1.1	9	0,036	6	8	0,030	☐	☐	☐	☒	
	2.1	8	0,036	4	6	0,030	☐	☐	☐	☒	
	3.1	7	0,024				☐	☐	☐	☒	
	4.1						☐	☐	☐	☒	
K	1.1	40	0,096	20	30	0,080	☐	☒	☐	☒	
	1.2	30	0,096	15	20	0,080	☐	☒	☐	☒	
	2.1	28	0,096	11	14	0,080	☐	☐	☐	☒	
	2.2	20	0,096	10	12	0,080	☐	☐	☐	☒	
	3.1	15	0,084	8	10	0,070	☐	☐	☐	☒	
	3.2	12	0,084				☐	☐	☐	☒	
	4.1	20	0,096	8	10	0,080	☐	☐	☐	☒	
	4.2	18	0,096	7	9	0,080	☐	☐	☐	☒	
							☐	☐	☐	☒	
N	1.1			40	50	0,060	☐	☐	☐	☒	
	1.2	60	0,072	30	40	0,060	☐	☐	☐	☒	
	1.3	50	0,072	25	30	0,060	☐	☐	☐	☒	
	1.4	45	0,072	20	25	0,060	☐	☐	☐	☒	
	1.5	30	0,072	15	20	0,060	☐	☐	☐	☒	
	1.6	10	0,065				☐	☐	☐	☒	
	2.1	45	0,096	25	30	0,080	☐	☐	☐	☒	
	2.2	60	0,096	30	40	0,080	☐	☐	☐	☒	
	2.3	80	0,096	35	55	0,080	☐	☐	☐	☒	
	2.4	30	0,084	15	20	0,070	☐	☐	☐	☒	
	2.5	45	0,084	20	30	0,070	☐	☐	☐	☒	
	2.6	30	0,096	15	20	0,080	☐	☐	☐	☒	
	2.7	15	0,078				☐	☐	☐	☒	
	2.8						☐	☐	☐	☒	
	3.1	85	0,120	50	60	0,100	☐	☒	☐	☐	
	3.2	75	0,120	45	50	0,100	☐	☒	☐	☐	
	4.1	90	0,060	55	65	0,050	☐	☐	☐	☒	
	4.2	100	0,060	60	70	0,050	☐	☐	☐	☒	
	4.3						☐	☐	☐	☒	
	4.4						☐	☐	☐	☒	
	5.1						☐	☐	☐	☒	
	5.2	15	0,070				☐	☐	☐	☒	
	5.3						☐	☐	☐	☒	
S	1.1	15	0,048	6	8	0,040	☐	☐	☐	☒	
	1.2	10	0,048				☐	☐	☐	☒	
	1.3						☐	☐	☐	☒	
	2.1	6	0,038				☐	☐	☐	☒	
	2.2	5	0,033				☐	☐	☐	☒	
	2.3						☐	☐	☐	☒	
	2.4						☐	☐	☐	☒	
H	1.1						☐	☐	☐	☒	
	1.2						☐	☐	☐	☒	
	1.3						☐	☐	☐	☒	
	1.4						☐	☐	☐	☒	
	1.5						☐	☐	☐	☒	

